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HISTORICAL LANDSCAPES OF THE SANDAWE HOMELAND, NORTH-CENTRAL TANZANIA

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Précis

This dissertation comprises an archaeological investigation of landscape occupation, food-getting repertoires, political and economic networks, and cosmological traditions over the last 3,000 years in what is now the Sandawe homeland of north-central Tanzania. Contemporary ethno-linguistic classification has been used as a proxy for reconstructing long-term socio-political and techno-economic histories of Africa. As the only location where all African language families exist side-by-side, north-central Tanzania has been described as one of the most ethnologically complex on the continent. Based on ethnographic, oral historical, linguistic, and genetic evidence, the Sandawe homeland has been characterized as an isolated social and ecological refuge for a relict population of Khoisan-speaking foragers. Khoisan-speakers are thought to be related branches of a deep-time lineage, ethnographic observations of which have contributed to an anthropological archetype: that of the low-latitude, immediate-return, egalitarian band. This social form has been described as stable and conservative baseline from which later complexity emerged. Thus, a dominant concern of scholarship on the Sandawe has been to "peel back" the effects of their interactions with food-producers to reveal the Khoisan cultural core, which is then projected into the past. Categorizing the Sandawe not only as Khoisan foragers (linguistically and culturally) but as autochthonous (that is, having emerged in situ) has led to historical reconstructions of the group that are, in effect, timeless. Oral histories describe a foraging past, but the Sandawe were engaged in a diverse food-getting repertoire that included agriculture and pastoralism at the time of their first ethnographic descriptions, and foraging contributes significantly to present-day Sandawe identity. Taken together, these factors make the homeland an ideal case study for examining interdisciplinary models concerning the spread of food production and the subsequent relations between foragers and food-producers – namely, those of food-producing frontiers and political economic mosaics.

Remarkably, archaeology has seldom featured in reconstructions of Sandawe pasts even though the group and their homeland are often evoked in long-term histories of Africa. During two seasons of fieldwork between 2015 and 2018, the Usandawe Landscape Archaeology Project gathered multi-scalar, landscape-level artifactual assemblages through systematic surface and subsurface sampling, selective surveys of rockshelters, and excavations at open-air and rockshelter sites. Over 375 sites were recorded, yielding artifacts ranging from the Early Stone Age (up to 2.6 mya) to the present. Material culture and spatial analyses indicate that food production and extra-regional exchange were longer established and followed different trajectories than has been proposed for the homeland. A diverse food-getting repertoire that entailed both foraging and food-production is time-deep in the homeland, and inhabitants of this region had well-established links to networks that ranged in scale from the Rift Valley zone of eastern Africa to the commodity flows of the Indian Ocean World and global modernity. This suggests that the region's characterization as a hinterland is based on a misrecognition of how its inhabitants have engaged with networks extending beyond the homeland through time rather than their actual isolation from these networks.

Beyond interpretations based on ethnography, linguistics, and recent history, little material evidence exists concerning how the diverse foraging communities of eastern Africa organized themselves and in relation to changing regional milieus. This dissertation is one of the first to apply the methods of landscape and historical archaeology to the study of foraging in Tanzania rather than to complex societies of the interior or urban, coastal societies with well-documented ties to maritime trade networks and colonial states. In addition to reexamining the history of the homeland in relation to long-term regional trends, this dissertation contributes to scholarship on forager diversity, the spread of food production, precolonial political and economic systems, and interdisciplinary approaches to prehistory and history. Most broadly, this dissertation contributes to reexaminations of the forager category and its role in reconstructions of African and, by extension, human history.

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Note on Orthography

Three click consonants have been recorded in studies of the Sandawe language: dental (represented as | in the orthography of the International Phonetic Alphabet (IPA), but also represented as / in some texts); alveolar (!); and lateral (|| or //). Each of these consonant types has five accompaniments: voiceless; voiceless aspirated; voiceless glottalized; nasal; and voiced (Steeman 2011). Spellings differ considerably across the published literature and through time in a single scholar's work, so cross-referencing texts is advisable. The Sandawe to English dictionary based on Eric Ten Raa's field notes has been a tremendous resource for this purpose (Ehret & Ehret 2012). In recent decades, SIL International has developed and promoted a practical orthography that represents these fifteen consonants using graphemes based on the Latin alphabet rather than the graphemes of the IPA. Few individuals have become adept at the use of this alphabet for transcription because most reading and writing is in Swahili. My colleagues and I attempted to use SIL International's alphabet to transcribe the names of sites and localities, but I defer to each scholar's spelling when citing published texts. Therefore, the spellings in this dissertation should be considered as tentative. These place names and other words contain a wealth of information concerning the historic and living landscape and should be examined by specialists before their inclusion in wordlists and dictionaries.

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Chapter 1

Historicizing Forager Landscapes: The Sandawe & Their Homeland

Beyond interpretations based on ethnography, linguistics, and recent history, little material evidence exists concerning how the diverse foraging communities of eastern Africa organized themselves and in relation to the changing milieus brought about by the spread of food production and expanding trade networks in recent millennia. Our knowledge has been limited because few systematic, regional surveys have been conducted to examine foraging landscapes and their transformations, despite recognition that this area is critical to long-term histories of the continent. Contemporary ethno-linguistic classifications have been used as proxies for reconstructing past migrations and techno-economic specialization in Africa, and so, by extension, this region has also been of interest to archaeologists, geneticists, historians, linguists, and others interested in reconstructing African pasts. As the only location where all African language families exist side-by-side, north-central Tanzania has been described as one of the most ethnologically complex on the continent. Among this diversity, speakers of Khoisan languages, which are famous for their click-consonants, are thought to be descendants of foraging communities that inhabited the area prior to large-scale population movements and technological transfers. The Sandawe are one of two groups in north-central Tanzania, along with the Hadza, whose language has been categorized (with controversy) as Khoisan. Further, ancestral Sandawe are thought to have been foragers until recent centuries and foraging contributes to present-day Sandawe identity. Taken together, these factors make the contemporary Sandawe homeland an excellent case study for testing dominant models of the spread of food production and the relations between foragers and food-producers. This dissertation is the first to apply the methods of landscape and historical archaeology to the study of foraging in Tanzania rather than to complex societies of the interior or urban, coastal societies with well-documented ties to maritime trade networks and colonial states. In addition to reexamining the history of the Sandawe and their homeland in relation to long-term regional trends, this dissertation contributes to scholarship on forager diversity, the spread of food production, precolonial social systems, the formation of regional political and economic landscapes, and interdisciplinary approaches to history.

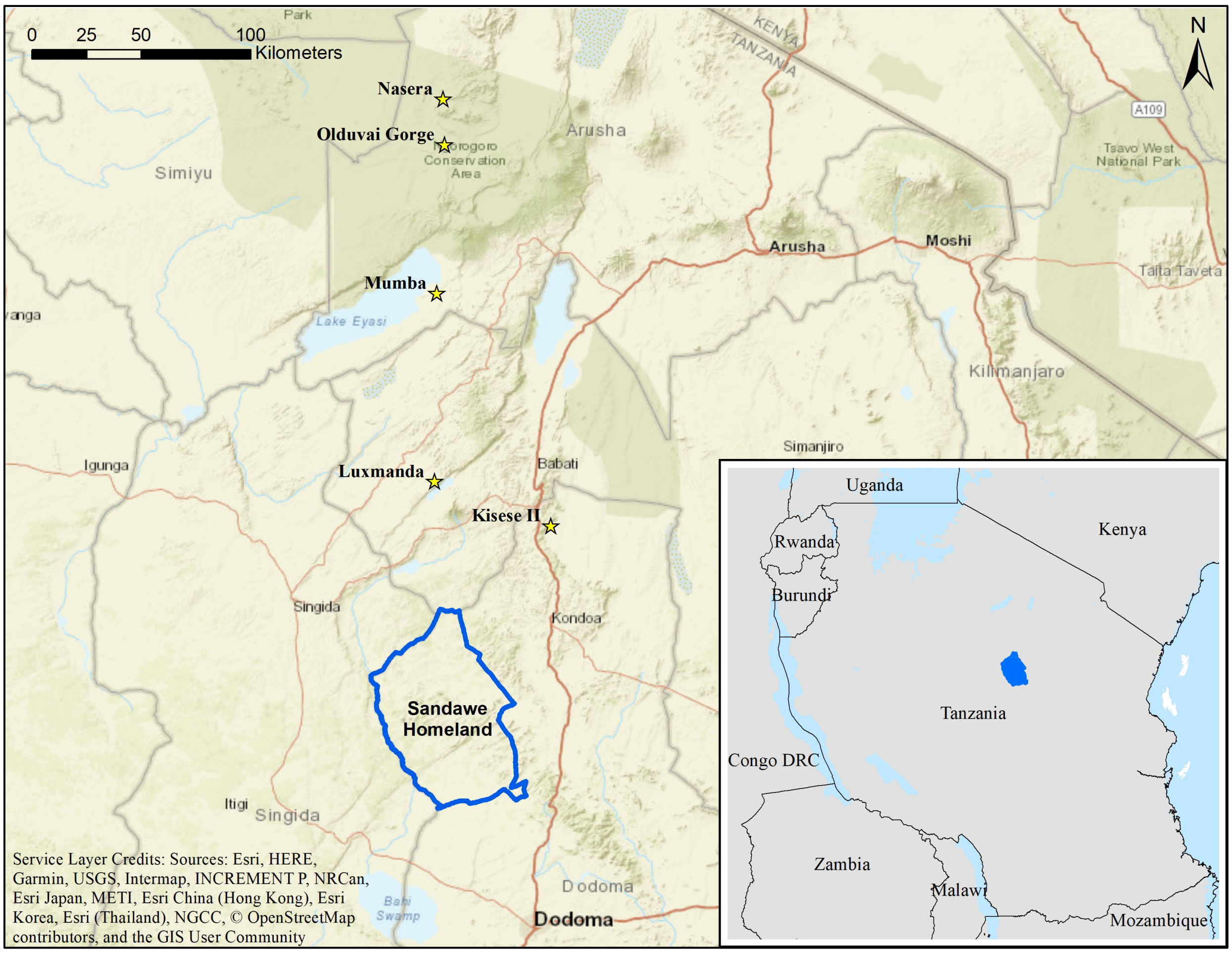

Figure 1.1: The Sandawe homeland (blue) in relation to major archaeological sites of Tanzania.

More specifically, this dissertation examines landscape occupation, food-getting repertoires, and exchange networks over the last 3,000 years in what is now the Sandawe homeland of north-central Tanzania (Figure 1.1). Although the earliest evidence of food production from this region dates to 3000 BP (Grillo et al. 2018), it has been suggested that the Sandawe homeland constituted an isolated, social and ecological refuge for a remnant forager population, possibly until as recently as the 1800s (Newman 1991/1992; Ten Raa 1969, 1986a, 1986b). Interdisciplinary historical reconstructions suggest that contact between autochthonous inhabitants and migrant food producers was minimal, intermittent, and localized and that reversions to foraging were common, thereby allowing ancestral Sandawe to remain relatively unaffected until recent centuries by the socio-political and techno-economic changes occurring elsewhere in eastern Africa (Newman 1991/1992; Ten Raa 1969, 1970, 1986a, 1986b; Tishkoff 2007a, 2007b).

Surprisingly, archaeology has seldom featured in reconstructions of the Sandawe past even though the group and their homeland are often evoked in long-term histories of Africa (see Ehret 1998; Iliffe 1979; Newman 1995). Their status as an ethnological curiosity derives from their categorization as the autochthonous remnants of a formerly widespread population of eastern African, Khoisan-speaking foragers (Baumann 1968; Newman 1991/1992; Ten Raa 1969, 1970, 1981; Tishkoff 2007a, 2007b). Khoisan-speakers are thought to be related branches of a deep-time lineage that can illuminate critical aspects of human history. Ethnographic accounts of the southern African San have become an anthropological archetype, that of the low-latitude, immediate-return, egalitarian band (Kusimba 2005). This social form has been described as stable and conservative baseline from which later complexity emerged. Although some oral histories indicate a former reliance upon foraging, it is also clear that the Sandawe were practicing agriculture and animal husbandry at the time of their first ethnographic descriptions (Baumann 1968). Thus, a dominant concern of scholarship on the Sandawe has been to "peel back" the effects of their interactions with food producers to reveal the Khoisan cultural core, which is then projected into the deep past (see Ten Raa 1964, 1969, 1974). Categorizing the Sandawe not only as foragers but as autochthonous (that is, having emerged in situ) has led to historical reconstructions of the group prior to food production that are, ironically, timeless. This discourages an investigation of present-day foraging practices in and of themselves or whether and how Sandawe food-getting repertoires have changed in relation to regional political economic networks.

To expand upon a limited body of archaeological evidence from the region (Fozzard 1966; Smolla 1957; Soper 1967, 1971a, 1971b; Sutton 1968; Ten Raa 1974), I began the Usandawe Landscape Archaeology Project in 2015 and subsequently conducted two field seasons over 19 months between 2015 and 2018 (in Swahili, the U- prefix indicates "land of"). Fieldwork methods were designed to capture multi-scalar, landscape-level data and included systematic surface and subsurface sampling, selective surveys of rockshelters, and excavations at open-air and rockshelter sites. The archaeological assemblages generated though this fieldwork were then examined in relation to the dominant analytical frameworks used by Africanists to study the spread of agriculture and pastoralism and the relations between foragers and food-producers, those of frontier expansion, and political economic mosaics.

Material culture and spatial analyses of these assemblages indicate that food production and extra-regional exchange were longer established and followed different trajectories than has been proposed for the homeland. A diverse food-getting repertoire that entailed both foraging and food-production is time-deep in the homeland. Direct evidence of agriculture remains elusive, but robust evidence for pottery production, metallurgy, and pastoralism dates to 1600 BP (350 AD), and this can be more tentatively extended to 2500 BP (550 BC). Whether the earliest forms of food-production emphasized agriculture, pastoralism, or a mixture of the two remains unclear but the patterning of occupation subsequent to the onset of food-production diverges both from the expectations of frontier theory, in general, and previous proposals for the introduction of these technologies into the Sandawe homeland, in specific. Further, the inhabitants of the Sandawe homeland had well-established links to the sociopolitical and economic networks of eastern Africa and the Indian Ocean world, as well as to multiple regional cosmological traditions. Evidence suggests that obsidian from central Kenya was arriving in the region by 2500 BP (550 BC), and this network may have lasted until recent centuries. Glass beads from India and Europe began arriving in the homeland by 300 BP (1650 AD), and cowry shell, iron, and plastic beads point toward the diversity of sources and continued importance of these items.

I assert, therefore, that the region's characterization as a hinterland and refuge does not reflect isolation, domination, or the conservatism of foraging as a mode of production, but is, rather, a dynamic, historical product of how its inhabitants have engaged these various networks through time. In lieu of the analytic metaphors of isolate, frontier, or mosaics, I prefer to examine these interactions through the more encompassing lens of landscape, which foregrounds the study of changes and contingency in material assemblages over time, without presuming historical directions or primary driving mechanisms. I then use these results as a material basis upon which to reappraise the scholarship concerning eastern African Khoisan peoples. My critical historiographic approach illuminates how interdisciplinary scholarship has inadvertently entrenched culture-historical frameworks that foreground narratives of forager replacement, acculturation, and loss, thereby inhibiting the development of alternative interpretive models. I conclude by offering a series of conjectural histories for the region that can guide future interdisciplinary research concerning the Sandawe, their homeland, and their regional milieu. Most broadly, my intent is to contribute to ongoing reexaminations of the forager category and its role in reconstructions of African and, by extension, human history.

Modeling Forager Pasts

Transitions from foraging to food production and the subsequent relations between foragers and food producers have been the subject of significant discipline-wide debates in anthropology and archaeology, including among Africanists (Hayden 2009; Ingold 1986, 1988; Marshall and Hildebrand 2002; Smith 2015; Wilmsen 1989; Wilmsen & Denbow 1990). Africanist literature on foraging histories can be grouped in three broad categories or models: frontiers, symbiosis, and political economic mosaics. Some have asserted that extant foraging communities survived through a small set of adaptations, ranging from deliberate and mutual isolation in geographic or ecological refugia (food-producing frontier models) to assimilation into complex societies as specialist producers of wild resources or as caste-like ritual specialists (the symbiosis model) (Alexander 1977; Blackburn 1982; Kassam 2000; Kohler & Lewis 2002; Lane 2004; Turnbull 1983; Woodburn 1982). In contrast, recent archaeological work shows that the spread of food production entailed complex processes of migration, technological transfer, and exchange, with considerable geographic and historical variation (the concept of political-economic mosaics) (Denbow 2014; Wright 2005). The frameworks of symbiosis, food-producing frontier expansion, and political economic mosaics originate in ethnography, history, and archaeology, respectively. Despite topical similarities, they exhibit a range of methodological and interpretive differences that must be addressed in relation to the particulars of the Sandawe homeland.

Ethnographic observations of central and eastern African foragers, especially the Batwa and Okiek, were used in early efforts to explain the survival of foragers into the present. This model came to be known as the symbiosis model, and it asserts that forager survival depended on their assimilation into complex societies as specialist producers of wild resources or as caste-like ritual specialists, both of which entailed the strict maintenance of social boundaries (Blackburn 1982; Kassam 2000; Kohler and Lewis 2002; Kusimba 2005; Turnbull 1983). The archival and ethnographic records, described in more detail below, do not indicate that the Sandawe were or are economically reliant upon, socially subordinated to, or structurally integrated with their neighbors. Accordingly, this model is not deployed as an analytic frame in this dissertation.

The symbiosis model could be considered a subset of frontier theory, which is more general in scope and focuses on historical process rather than end states. Frontier studies trace their origins to Turner's thesis about Euro-American expansion across North America (Turner 1921). Informed by this tradition of scholarship, Alexander (1977, 1984a, 1984b) and Kopytoff (1987) developed models attuned to the specificities of sub-Saharan political transformation. Whereas Kopytoff's "internal frontier" described the rise of new polities in the interstices of existing complex societies, Alexander's "moving" and "static" frontiers were meant to describe the initial spread of food producers into lands occupied by indigenous foragers. These models emphasize deliberate or incidental seclusion in geographic and ecological refugia, allowing foragers and food-producers to remain mutually isolated across barriers to the expansion of growth by the latter (Alexander 1977, 1984a, 1984b; Lane 2004; Woodburn 1986).

Alexander (1977) asserted that several aspects of frontier expansion were consistent across known cases. For example, although frontier zones affect the core regions of parent societies, pioneers shed "cultural baggage" as they move beyond areas of easy control, often taking on the social and economic forms of the groups encountered in new lands, and upon whose knowledge they initially depend. Frontier egalitarianism between long-term inhabitants and newcomers gradually gives way as productive lands are exploited, given the bounds of geography, climate, and technology. The end of this moving frontier gives rise to a static frontier, which is a crisis point for both food producers and foragers. If foragers survive, it is through deliberate isolation in ecological refugia or assimilation as specialist producers (following the symbiosis model). Food-producers may expand or remain stable using a variety of methods (such as new cultivars or more intensive techniques), but the perturbations caused by attempts to absorb surplus population eventually causes structural instability. This instability facilitates the elaboration of social complexity but can also prompt portions of the population to leave, further endangering foragers (this also provides a conceptual conjunction with Kopytoff's model). Alexander was explicitly concerned with interdisciplinary historical analysis and thought his model was applicable on a global scale. Although archaeological adaptations of Alexander's model have been applied extensively in northern and southern Africa, but less frequently in eastern Africa (Lane 2004; Marks et al. 2015; Murphy et al. 2001; Robertshaw and Collett 1983; Sawchuk et al. 2018; Wadley 1996).

In contrast to food-producing frontier models, recent archaeological work demonstrates that the spread of food production entailed complex processes of migration, technological transfer, and exchange, with considerable geographic and historical variation (Denbow 2014; Wright 2005). Although not a model as much as a metaphor, the concept of political economic mosaics emerged in response to growing archaeological recognition of such fluidity (Denbow 1999; Kusimba & Kusimba 2005; Stahl 2004). Whether or not they were tied to population migrations, new technologies prompted experimentation, interaction, and negotiation. This led to collaboratively constructed, integrated regional milieus that may have, for example, facilitated the circulation of patchy resources (da Luna 2016; Wynne-Jones 2010). Extreme economic specialization combined with strict ethnic boundaries may have been a relatively recent phenomenon spurred by global entanglements and colonial encounters (Stahl 2004). An implication of the mosaics approach is that ethnographically and historically derived models capture only a subset of all cases and must be applied cautiously to archaeological contexts.

A limitation of frontier theory is that it prefigures economically specialized and ethnically distinct groups and projects them into the past (see Lane 2004:245). As such, there is a risk that "mixed" assemblages containing both evidence of foraging and food production may be misread as evidence of a moving frontier as one population enters another's territory. They may instead reflect a long-term, resilient, and flexible system that incorporated numerous groups. On the other hand, writing on political economic mosaics has not yet produced clear interpretive frameworks akin to those of frontier theory to identify and assess variance within or between regional milieus through time. Ironically, the mosaic metaphor is so capacious that it risks flattening the diversity of archaeological landscapes by giving insufficient attention to regimes of value and the production of inequality. Even if forager and food producer relations were diverse, mosaic models do not yet seem capable of explaining the frequent, if gradual, material and ideological dominance of food production. The following section describes how I address the limitations of these models by drawing upon the theoretical, methodological, and interpretive insights of historical archaeology, forager studies, and landscape theory.

Forager Studies & Landscape Theory

My interpretive strategies are also informed by historical archaeology, forager studies, and landscape theory. By grappling with how to effectively use textual evidence, historical archaeologists working in Africa have developed a number of productive stances toward interdisciplinary and historical datasets (see MacEachern 2000; Stahl 2001; Fleisher et al. 2012). Archaeological, linguistic, and genetic data reflect a variety of social processes operating over discordant spatial and temporal scales and necessarily have gaps internally and in relation to each other. Historical analysis must account for both convergences and divergences across these lines of evidence rather than seeking to emphasize points of correspondence (Trouillot 1995; Stahl 2001).

Tension exists among Africanists between, on the one hand, ecological and materialist models of foraging as a general evolutionary or developmental type and, on the other hand, those who view all "subsistence types," even foraging, as political strategies rather than environmentally determined necessities. African groups have figured prominently in attempts to isolate axes of forager variation (Arnold 1996; Binford 1980; Gamble 1978; Gould 1976; Hayden 1990; Lee & Devore 1976; Price and Brown 1985; Testart 1982; Woodburn 1982, 1988). Khoisan-speaking foragers have often placed at the simple end of developmental scales, with their "immediate-return" strategies, mobility, and flexible and egalitarian social structures regarded as the baseline of human sociality (Kusimba 2005). Others counter that egalitarianism is itself a complex institution (Cobb 1993; Flanagan 1989; Paynter 1989; Wiessner 2002). The archaeological record demonstrates that "delayed-return" strategies, which entail resource intensification, long-term planning, and social relations mediated by property, were more common among past foragers than in the present, and there is evidence for cycles of intensification and decline (Dale et al. 2004; Hall 1990; Jerardino and Yates 1997; Kusimba 2005; Plug et al. 2003; Robbins et al. 1994; Sadr et al. 2003; Smith 2001). These observations undermine models of linear development and emphasize the need to document local trajectories and transformations.

Reconceptualizations of foraging as an ethos that structures social and human-environment relations further blurred the boundaries between foraging and other food-getting repertoires (Bird-David 1988, 1990, 1992; Ellen 1982; Fowler and Turner 1999; Guenther 2007; Ingold 1986, 1988; Kelly 1995). It also shifted the focus of analysis to temporality and relationality, which resonates with landscape studies in that spatial practices are viewed as components of the production of social and political difference (Lefebvre 1991; Smith 2003; Richard 2018). Taken together, critical forager studies and landscape theory suggest that the social expressions and material correlates of foraging must not be presupposed but established empirically and historicized. It follows that a study of the Sandawe homeland as a landscape must consider how foraging, as a historically specific set of practices and identification, emerged in response to changing regional milieus. A similar reorientation has occurred in scholarship on the Hadza, another group of north-central Tanzania often categorized as culturally and linguistically Khoisan. For example, Woodburn (1982, 1988) initially described the Hadza socioeconomic system as stemming from environmental constraints but later argued that Hadza band-level organization and egalitarianism was a tactic for remaining ungovernable by neighboring food producers. A landscape perspective facilitates the contextualization of forager sociality by not presuming the existence of prime drivers or a directionality to history, unlike most approaches to forager pasts. Rather, it generates and queries chronological and spatial archives in search of historical transformations and historical forces, piecing together plausible historical accounts in dialogue with other sources and lines of evidence.

Regional Background

The Sandawe and Their Homeland

The Sandawe homeland is located in the Central Highlands of Tanzania and is currently in the Chemba District of Dodoma Region. The climate is semiarid, with 95 percent of the annual total falling between November and April (Newman 1970). The region's physiography is due to relatively recent faulting and uplift associated with the Gregory Rift system (Newman 1970). The centrally located Sandawe Hills rise to an elevation of 1370-1430 m, whereas the northern Songa Hills are more rugged and reach 1525-1740 m (Newman 1970). The hills are mantled with residual sandy loam and, when undisturbed, support *Brachystegia* woodlands (Newman 1970) Valley floors and plains average 1200 m in elevation and their colluvial clay loam supports *Acacia-Commiphora* woodland and thicket, with occasional open grasslands. Gallery forests flank the Bubu and Mponde rivers, which flow along the base major escarpments (Newman 1970).

Prior to their adoption of food production, the Sandawe are thought to have been organized in patrilineal and patrilocal bands that resided near a watering hole and a sacrificial hill over which clan lineages had stewardship (Ten Raa 1969). Other notable features of the landscape, such as baobab trees, serve as the sacrificial site for some clans, but rockshelters on the sacrificial hills are the most common and central to Sandawe cosmology. A dense cluster of associations links human and natural fertility to rockshelters, which are regarded as akin to wombs and beehives (Lim 2010). Many clans are widely dispersed and intermingled across the homeland in the present, but this mode of identification remains salient for organizing rituals, such as those performed post-birth and for healing and rainmaking (Lim 1992). Of particular note is the *simbó* entrancement ritual, which cures individual illness while also refertilizing the land and often entails visits to rockshelters by the afflicted (Ten Raa 1985). This ritual, in particular, has been cited as evidence of a cultural continuity between southern and eastern African Khoisan-speaking groups (Lewis-Williams 1986). Together with observations of and oral histories about the Sandawe producing pictographs in rockshelters, these conceptual similarities have been used to further link the Sandawe to both the "shamanistic" and "naturalistic" pictographs of north-central Tanzania, especially the well-known paintings of the UNESCO World Heritage Kondoa Rock-Art Sites, bolstering interpretations that the group is autochthonous to their homeland (Lewis-Williams 1981, 1986; Ten Raa 1969, 1971, 1974).

Several aspects of the local and regional economy in the centuries immediately preceding European conquest remain ambiguous, but it is certain that the Sandawe practiced a diverse food-getting repertoire by the time of their first ethnographic descriptions in the late 1800s (Baumann 1968). Some oral accounts suggest that the Sandawe were subjected to raiding that forced them to remain dispersed throughout the bush and prevented them from acquiring and maintaining livestock or other property, while other accounts suggest that the Sandawe had been capable of well-organized, fierce military activity prior to their subjugation by an influx of Nyamwezi trader-colonists and, later, the Germans (Great Britain Naval Intelligence Office [GBNIO] 1920; Ten Raa 1986a, 1986b). Their reliance upon food production was sufficiently great such that Sandawe resistance to incipient German rule was met with punitive raids specifically targeting food stores and livestock (GBNIO 1920). Early European explorers traveled along existing trade routes and were hosted by Nyamwezi and Omani traders who had established trading posts in and near the Sandawe homeland (Baumann 1968). These routes and outposts appear to have been established within the last two or three centuries (Iliffe 1979), but these nodes would have linked the Sandawe to trade networks stretching from the Great Lakes region to the coast and beyond (Wynne-Jones 2010). Descendants of these traders still reside in the homeland, one of whom maintains estates in both Sanzawa village and Oman. Baumann 1968 says that his interlocutors claimed little traffic with the outside world, but Bagshawe (1925) comments three decades later that the Sandawe were major suppliers to coastal traders of wild products.

During the mid-twentieth century, Sandawe foodways entailed relatively extensive forms of hunting, gathering, fishing, beekeeping, salt production, farming, and herding (Newman 1970, 1980). Individuals trade some of the products obtained through these activities, such as beeswax and salt, in the monthly, regional market circuit known as the *mnada*, but other goods, especially livestock, find their way into networks that supply Tanzania's major urban centers. While there is a robust, but informal, local market for foraged items such as mushrooms and bush meat, the extent of this trade in economic terms or geographic reach is unclear. Interestingly, no historical studies have been conducted on the emergence of the *mnada* circuit and how it initiated, built upon, or transformed earlier trade flows. Maize, millet, and sorghum formed the bulk of local diets at least by the time systematic studies were first conducted (Newman 1970, 1980), and these continue to be supplemented by a wide variety of wild, cultivated, and domestic plant and animal products.

Food production and foraging remain essential elements of contemporary Sandawe identity, although one or the other may be emphasized more heavily depending on the circumstances, with millet and sorghum just as likely as hunted meat and honey to be described as quintessential Sandawe foods. During ethnographic fieldwork in 2005 and 2006, for example, several families residing near a politically contentious game reserve were so hesitant to discuss anything related to hunting and gathering that my inquiries about gathered vegetables led to repeated tours of their grain fields, whereas those living farther away from the reserve often voluntarily and eagerly discussed foraging, including its tools, such as bows, and its products, including animal horns used to make musical instruments.

Prior to and during colonialism, the population was described as being widely dispersed, outside of a limited number of trading, missionary, and administrative centers (Bagshawe 1925; Baumann 1968; Newman 1970). Villagization, a key component of Tanzania's *Ujamaa* project in the 1970s, concentrated much of the population in easily accessible settlements along navigable corridors, most of which remain occupied today. However, economic and other activities, such as clan-based rituals, often occur at great distances from an individual's primary residence, and many individuals began returning to "the bush" as the *Ujamaa* program neared its end, due to both a desire to be closer to foraging grounds and a preference for the privacy from one's neighbors that dense stands of vegetation provide (Lim 1992).

The homeland is notable for its low and extremely variable rainfall, which averages 63 cm annually, but fluctuates between 28 and 103 cm (Newman 1970). Precipitation can fall from October to May with a short break in December separating the "short" from the "long" rains, but 95 percent falls between November and April (Newman 1970). However, many current residents note that the short rains have increasingly become shorter, less intense, or simply absent. Food shortages and famine occur frequently, historically as often as every three years based on oral accounts and other records (Newman 1970; Ten Raa 1968). Food crises occasionally extend over multiple years at a time, even when rainfall is plentiful in the season following a drought, because farmers who fear that a delay in the rains indicates a prolonged failure will attempt to rely on remaining food stores rather than risk the time and expense of cultivation. The cultivation of fields variously relies on reciprocal kin relations or waged day labor, depending on the size of one’s holdings and financial means, although day labor is more common around the larger villages that access to tractors and other machines. Animal husbandry is limited in heavily wooded areas by infestations of tsetse fly (*Glossina morsitans*) (Bagshawe 1924; Newman 1980). Current tsetse fly distributions may not be representative of past conditions, however, because a confluence of social and ecological disasters during the early colonial period promoted bush regeneration across northern Tanzania and facilitated the rapid spread of the insect (Gifford-Gonzalez 2000; Headrick 2014).

Local sediments are low in organic matter and high in clay content, which can reduce their agricultural productivity, although the Sandawe are adept at matching traditional and newly adopted crop varieties to sediment types and microclimates (Newman 1970). Despite the relatively low rainfall, vegetation can be quite dense, and this tendency is further promoted by local farming practices, which, outside of certain recent exceptions, consist of low-intensity “slash and burn” techniques. Rapidly and densely regenerating vegetation presents numerous challenges to archaeological survey, which will be discussed in more detail below.

The adoption of food production by ancestral Sandawe (and their cultural survival) has been described as resulting from forager experimentation on the margins of expanding frontiers of food producers. Reconstructions based predominantly on historical linguistics, oral historical, ethnographic, and genetic evidence suggest that contact with migrant food producers was minimal, intermittent, and localized, such that the Sandawe remained relatively unaffected by broader political and economic changes in the region, possibly until as late as the early 1900s (Newman 1991/1992; Ten Raa 1969, 1970, 1986a, 1986b; Tishkoff 2007a).

Ten Raa (1969, 1970, 1986a, 1986b) hypothesizes that the Sandawe had a brief but failed – even traumatic – early experiment with cattle keeping, which was subsequently followed by a more sustained transition from foraging. He asserts that the Sandawe were still reliant mainly upon foraging in the mid-1700s, although some may have had small cultivations in the bush (Ten Raa 1986). Using oral historical and other linguistic evidence, he suggests two introductions of cattle: one in the latter half of the 1700s and another in the mid-1800s (Ten Raa 1983). In this account, he speculates that cattle-poor refugees (ancestors of the contemporary Alagwa clan) first introduced livestock, but that these animals were lost. The only long-term trace of this event consists of a basic livestock terminology. He suggests that both agro-pastoral Nyaturu pioneers and Nyamwezi traders began settling in the homeland by the early- to mid-1800s. The Nyaturu reintroduced cattle, and the greater number of livestock terms borrowed from their language (which were themselves borrowed from the Barabaig language by the Nyaturu) reflect slightly more stable conditions. Neither of these historical developments was without reverse, nor were they rapid. Those living in the outlying bush maintained their older lifeways, and those who intensified cultivation and attempted to build livestock herds were at constant threat of drought-induced famine and raiding, especially by the Barabaig. Although the Sandawe had acquired things that needed to be defended, they had developed neither the population nor the social organization to defend them. This is because their small-scale cultivation could not support a large population and, so, they continued to opt for the traditional mode of conflict resolution through avoidance and hiding. Nonetheless, more intensive contact with the Nyaturu initiated a gradual process of "acculturation" that reached the midpoint of the homeland by the onset of European conquest (Figure 1.2). Ten Raa (1983:373) concludes by suggesting that the Sandawe may have been saved as an ethnic group by the advent of European colonialism, which put an end to cattle-raiding and more broadly changed the course of cultural and economic dynamics in the region.

Factors such as the lack of obvious geographic and climatic barriers to entry complicate application of frontier models to the particulars of the Sandawe homeland, but it is possible that the presence of tsetse fly presented a zoonotic limit to those engaged in pastoralism (Gifford-Gonzalez 2000). Newman (1991/1992) suggests that their homeland was slightly too arid relative to surrounding lands to be attractive to early farmers and pastoralists. Synthesizing a wider range of evidence than Ten Raa, Newman proposes a scenario that unfolded over a longer period of time, but one that is still recent compared to evidence for the onset of food production elsewhere in Tanzania. He observes that the apparent rarity of archaeological sites associated with food production in the Sandawe homeland, such as Lelesu, suggest that food-producers may have occasionally settled in the homeland but eventually left in search of more productive land or were absorbed into the Sandawe (in this regard, it is critical to note the paucity of systematic,

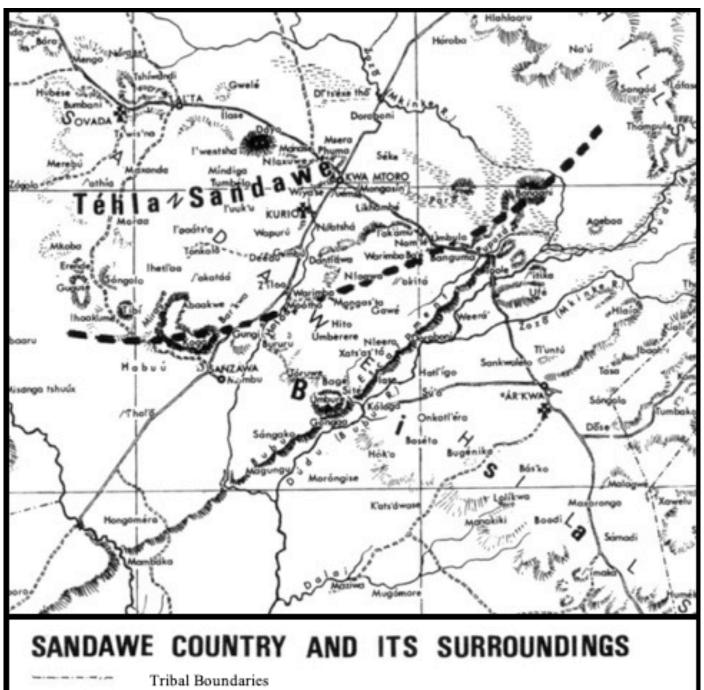

Figure 1.2: Ten Raa's division (heavy dotted line) between the "Tehla" and "Bisa" Sandawe. Adapted from Ten Raa (1970).

large-scale archaeological survey and excavation in the homeland – or most of mainland Tanzania, for that matter). Using census figures and demographic modeling of forager carrying capacity, he argues that experimentation with food production must have started by the early 1500s. Maintaining constant, positive growth seem unlikely under pre-modern conditions because Ten Raa (1968, 1983) documents past famine, disease, and emigration due to warfare). Newman, therefore, suggests that a far more reasonable proposition is that the Sandawe began incorporating agriculture and pastoralism over a much longer period of time, perhaps as long as 3,000 years ago with the arrival of ancestral Cushitic-speakers. In either case, the gradual adoption of food production would have allowed the resident population to grow sufficiently large to resist the more intensive encroachments that occurred in the last 100-200 years. He does not explicitly discuss directionality, but he notes that the most sustained contact with food producers, possibly the ancestors of the contemporary agro-pastoral, Bantu-speaking Nyaturu, occurred in the north and northwest portions of the homeland.

Both Ten Raa and Newman note that the reliance upon food production is variable, and that differing intensities of contact have left lasting linguistic, cultural, economic, and ecological traces. For example, Ten Raa (1970) describes how the interaction with food producers produced more and less culturally conservative areas of the homeland. He enumerates differences in material culture, economic activities, customs, political organization, and dialect between the "Tèhla" Sandawe of the northwest and the "Bisa" Sandawe of the southeast. Despite identifying as a single people, the Tèhla viewed themselves as "proper Sandawe," in contrast to the "uncouth," "unsophisticated," and "aboriginal" Bisa. Bisa remains in use as both a clan appellation and as a term for those more reliant on foraging (indeed, often toward the southeast, but never in the immediate vicinity of the speaker!), but Tèhla does not appear to retain the civilizational connotation, although some do use the term to refer to a clan-like subset of Sandawe (those who have both Nyaturu and Sandawe ancestry). Newman (1970), who was trained as a geographer and incorporated a variety of botanical and pedological surveys into his research, observes that these processes also created more and less ecologically pristine vegetational communities and erosional regimes. He categorizes much of the northwestern sector as "Actively Induced Vegetation," a term developed in studies of eastern African rangeland to describe vegetational communities kept in early stages of succession due to intense human use. Indeed, much of Newman's research was guided by a concern for how residents of the Sandawe homeland could best produce a diverse and adequate food supply given the environmental pressures of a growing population.

The Homeland and its Regional Milieu

Neither frontier models nor the political economic mosaic concept immediately stand out as a preferred explanatory device when looking broadly at the evidence from across northern Tanzania, but this is partly a result of a misfit between the models and the chronological and spatial scales of the available datasets.

Linguistic reconstructions of this region suggest that ancestral Southern Cushitic languages (Burunge, Alagwa, Gorwaa, and Iraqw) entered the region approximately 3,000 years ago, whereas ancestral Bantu languages (Nyaturu and Rangi) appeared 2,000 years ago, and ancestral Southern-Nilotic languages, represented locally by the Barabaig and Maasai, appeared most recently, within the last 500 to 1,000 years (Ehret 1974; 1998). This sequence of introductions could be amenable to frontier models if these groups can be linked to the spread of novel techno-economic or socio-political forms. It has been argued on linguistic grounds that the first pastoralists in north-central Tanzania were speakers of ancestral Cushitic languages, and, although this appears to correlate with genetic evidence from the early pastoral archaeological site of Luxmanda, no straightforward correspondences has been discerned elsewhere in Tanzania between ethno-linguistic reconstructions and the archaeological record of food production (Kieβling et al. 2008; Prendergast et al. 2019).

The correlation between "click" consonants and foraging was previously thought to reflect common ancestry, but most linguists now agree that the Khoisan Family is composed of multiple independent families, and this means that processes other than natural language change, migration, and territorial fragmentation (the latter two of which are amenable to explanation through frontier models), such as borrowing or language shift, are responsible for the distribution of this linguistic feature (Güldemann & Stoneking 2008). In other words, the present-day location of these languages cannot be taken as straightforward proxies for past migration routes. A regional mosaic is, perhaps, indicated by recent linguistic studies that consider north-central Tanzania as a whole rather than focusing on pairwise exchange between two languages. Recent analyses have revealed multiple and mutual linguistic exchanges of varying intensity among these languages over the last 3,000 years. These exchanges impacted lexemes, phonetics, morphology, syntax, semantics, and pragmatics to such an extent that it has become an area of linguistic convergence, or *Sprachbund* (Kieβling et al. 2007). In other words, even if the region saw numerous moving frontiers of specialized food producers, speakers of the ancestral Hadza and Sandawe languages cannot be characterized as passive recipients of linguistic innovation (and, by extension, socio-political and techno-economic innovation). Similarly, while some genetic investigations between speakers of languages including click consonants indicate that they are related and distinct from other ethno-linguistic groups of Africa, other studies reveal considerable genetic exchange with neighboring groups, situating these groups within regional variation (Trevor 1947; Schepartz 1988; Godber et al. 1976; Ikeda & Hayama 1982; Tishkoff 2007a, 2007b).

The archaeological record is just as confounding, especially related to periodization of major culture-historical phenomena, such as the boundary between the "Middle" and "Later" Stone Ages (MSA/LSA) and the transitions to various "Pastoral Neolithic" (PN) and "Iron Age" (IA) traditions. For example, ceramic wares associated elsewhere in eastern Africa with Later Stone Age fisher-foragers (Kansyore), Pastoral Neolithic agropastoralists (Narosura), and early Iron Age farmers (Urewe, Lelesu, Kwale) are contemporaneous at some sites in north-central Tanzania rather than chronologically sequential or geographically discrete, as would be expected if these ceramic typologies were accurate reflections of socially, politically, and economically distinct culture-historical groups. Dates for these wares vary drastically across eastern Africa but, in northern Tanzania, they appear to cluster in the early first millennium AD. These wares have been recovered together from archaeological deposits at sites such as Mumba and Kisese, and this may indicate mixed economies or complex exchange networks, possibly incorporating numerous ethnic groups (see Mehlman 1989; Prendergast 2008, Tryon et al. 2018).

No direct evidence of early farming has been found in the Tanzanian interior, but the earliest and most reliable indirect evidence, in the form of iron production and land clearance, is documented in the northwestern Great Lakes region by the middle of the first millennium BC (Schmidt 1997). Across Tanzania as a whole, radiocarbon dates associated with "early" Iron Age wares and metallurgy span nearly 3,000 years, from 1400 BC to 1400 AD. Given the low number of sites, wide geographic distribution, and suspect radiocarbon dates, no clear migration or technological transfer can be discerned from this line of evidence alone (cf. Soper 1971a, 1971b). We are on somewhat surer footing when considering more local (but still indirect) evidence of agriculture. In neighboring Kondoa District, “early” Iron Age wares and slag range in age from the early first millennium BC to the first century AD. This is followed by a marked increase in “middle” Iron Age sites after 1000 AD (Kessy 2013; Lane 2009). Unexpectedly early evidence of domestic animals has been found at the Pastoral Neolithic site of Luxmanda, which is located 100 km north of the Sandawe homeland and dates to approximately 1000 BC (Grillo et al. 2018; Prendergast et al. 2013).

Any appearance of accordance between these various bodies of evidence and food-producing frontier or mosaic frameworks is superficial at best. This is because these frameworks demand a level of detail concerning variability through time and space that, quite simply, has not yet been obtained in Tanzania. Further complicating matters, Lane (2004) notes that Africanist archaeologists have long critiqued the use of material culture as a straightforward marker of identity or social form (Dietler and Herbich 1989, 1998; Hodder 1978; 1982, 1985; Richard and McDonald 2015; Stahl 2004), but the practice remains entrenched. For example, Iron Age wares, such as Urewe, Kwale, and Lelesu, are seen as indicative of Bantu-speaking migrants, cereal agriculture, and metallurgy, even in the absence of direct evidence of such practices (Lane 2004). In contrast, some studies have suggested that the techno-economic traits associated with food production did not move together but may have developed and spread independently of each other (Ambrose 1998; Bower 1991; Cohen 1970; Ehret 1998, 2001; Lane 2004; Marean 1992; Mehlman 1989; Odner 1972; Prendergast 2011; Sadr 1998; Salas et al. 2002; Vansina 1995).

Research Design

Archaeological adaptations of frontier models and the mosaics concept require multi-scalar artifactual data, which, in turn, depends upon surveys that do not discriminate between large and small sites, particular geographic features, such as rockshelters, or classes of artifactual remains. Excluding research related to human origins, systematic, regional surveys in Tanzania have been rare and focused on complex societies of the interior and urban, coastal societies, especially those with well-documented ties to overland and maritime trade networks (Fleisher & LaViolette 1999; Pawlowicz 2012; Schmidt 1978; Walz 2010; Wynne-Jones 2010, but see Chami 1998; Kessy 2013; Lim 1992; Mabulla 1996; Mapunda 1991; Masao 1976a). The most robust archaeological datasets from the interior have been obtained from a small number of recurrently excavated sites, especially rockshelters (and namely Mumba and Kisese II), from which extrapolations are made about the form and function of social life across entire landscapes (Mehlman 1989; Prendergast 2008; Tryon 2018; cf. Mabulla 1996).

Neither Ten Raa nor Newman explicitly use the term "frontier," but their historical reconstructions are clearly amenable to the application of these models, even though several facts, such as the lack of obvious geographic and climatic barriers to entry, complicate their application. As noted above, some evidence evokes a regional mosaic. It should also be noted that symbiotic relations could have existed in the past between foragers and food-producers in this region, but the difficulty of discerning ethnic boundaries inhibits the application of this model in this dissertation.

A robust space-time matrix is necessary to examine the applicability of either of these frameworks to the Sandawe homeland. The Usandawe Landscape Archaeology Project (ULAP) was designed to systematically collect new archaeological and paleoenvironmental evidence that could be placed in conversation with a corpus of other linguistic, ethnographic, and genetic evidence, to address three broad aspects of life in the Sandawe homeland through time: 1.) Long-term histories of settlement, landscape occupation, and food-getting repertoires; 2.) Political and economic interactions, potentially operating over multiple geographic and temporal scales, between residents of the study area and other regions; and 3.) The social construction of natural milieus. Due to the pioneering nature of this fieldwork, recovery was not limited to sites of a particular age. However, the earliest evidence of food production from this region dates to 3000 BP (Grillo et al. 2018), which was set as an arbitrary date in order to focus and manage the subsequent analysis and interpretation.

In addition to standard, descriptive artifactual analysis, major goals of post-fieldwork research were to, first, chronologically anchor key transitions and phases, and, second, link excavated and surface assemblages through targeted use of high-resolution absolute dating. An additional goal consisted of studies intended to reveal the spatial scale and intensity of exchange networks through which goods and ideas circulated. These ranged from chemical analyses of glass beads and obsidian to an investigation of rock art motifs. The results of these investigations enabled me to address the following sets of questions that, in turn, provide an empirical basis through which archaeological materials can be brought into conversation with other forms of historical evidence concerning the region[1]:

1. Was the onset of food production and extra-regional exchange in the area early, intermediate, or late (before 1500 AD, between 1500 AD and 1850 AD, or after 1850 AD)? Was the adoption of food production gradual or rapid? Is evidence of food production associated with specialization or was it incorporated into existing food-getting practices?
2. Are exotic goods incidental occurrences or does spatiotemporal patterning suggest well-established networks? Did these networks vary spatially over time? What do changes

[1] A fourth question (Have foraging and food production left discernible traces on paleoenvironmental proxies?) was dropped due to limits on time and access to water that prevented the processing of archaeobotanical samples. These samples are described in a footnote in Chapter 3.

suggest about shifting political and economic relations between inhabitants of this region and elsewhere?

3. Does the evidence indicate the existence of a northwest to southeast moving frontier, as hypothesized by Ten Raa (1970)?

Model Testing

I argue that the political economic mosaic model better explains archaeological patterning in the Sandawe homeland than does the frontier expansion model. The material correlates and interpretive strategies of the models can be briefly summarized as follows.

Model 1: Moving and Static Frontiers

Lane (2004:245) provides the most comprehensive attempt to translate models of frontier expansion into their archaeological correlates (Table 1.1). This model supposes that migrant food producers will initially inhabit small, dispersed, transient camps (i.e. single-component sites) with occasional traces of domesticates or exotic goods. Their material culture will otherwise resemble indigenous foragers, whose landscape-level artifactual patterning will remain unchanged. Over time, migrant settlements will become larger and inhabited for longer, possibly creating multi-component sites. More intensive food production will leave discernible traces in environmental proxies, and the ratio of domesticates and exotic goods will increase in comparison to earlier phases, indicating stronger relations to a migrant group's sociopolitical and economic core. Indigenous forager sites will begin to show evidence of specialization, such as reduced diversity of species used, or spatial restriction to certain parts of the landscape. As this moving frontier becomes a static frontier, sites inhabited by food producers will begin to fill in productive areas, and evidence of intensive methods, such as irrigation or manuring, will appear. There may also be evidence of increased violence and social stratification. Forager assemblages will either disappear from the archaeological record or clear spatial boundaries will be observed across contemporaneous material culture assemblages.

Model 2: Regional Mosaic

The scholarship on political economic mosaics has not yet produced clear interpretive frameworks akin to those of scholarship on food producing frontiers. Rather, it seeks evidence of entangled, overlapping, and shifting economic activities instead of attempting to discern successive stages or evolutionary forms (Denbow 2014). Whereas the frontiers scholarship tends to view population migrations and the introduction of exotic goods as linked phenomena, the mosaics scholarship is interested in shifts in the directionality and intensity of trade through time, as well as their association with other artifact classes. Advocates of this model construct a view of past social relations and their transformations based on artifactual analysis. This view is then compared to non-archaeological evidence, such as historical linguistic or genetic data, and both convergences and divergences are identified across these datasets. Changing artifact frequencies and distribution can reveal instances of specialization and ethnogenesis, while find-grained comparative linguistic analysis can track technological exchange, and genetic data can reveal population-level dynamics that may have been ethnically inflected. For example, linguistic evidence indicates that the adoption of livestock by the Sandawe was halting (Ten Raa 1986a, 1986b), and this can be compared to zooarchaeological evidence.

Chapter Summary

In the following chapter, I review the state of research concerning the major archaeological entities and periods of eastern African culture-history, ranging from the "complex" foraging of the later Holocene to various "Pastoral Neolithic" traditions and the agro-pastoral "Iron Age." Using case studies from the region, I summarize dominant models of transformations in foraging lifeways, the transition to food production, and the relations between foragers and food producers. A gap exists between these models, which emphasize the social conservatism and isolation of foraging communities, and a growing archaeological record of diverse foraging practices. The chapter ends with a discussion of how these models might be modified to more adequately account for this record, which includes evidence of interaction and exchange occurring over multiple spatial and temporal scales, as well as earlier and more widespread evidence of "complex" behaviors than has been expected.

In Chapter 3, I describe my fieldwork methods and provide an inventory of the sites and assemblages recorded through surface and sub-surface sampling, opportunistic surveys of rockshelters, and excavations at open-air and rockshelter sites. Fieldwork demonstrated that the Sandawe homeland comprises a remarkably diverse archaeological landscape, with the artifacts obtained from over 375 sites ranging from the Early Stone Age (up to 2.6 mya) to the present. Portable artifactual assemblages include: lithics; ochre; ceramics (including vessels, pipes, and tuyère fragments); domestic and wild fauna; avian shell, marine shell, glass, and plastic beads; slag and metal objects (including an iron nail possibly dating to the early Iron Age and a bullet casing likely post-dating 1900); vessel glass; and plastic objects (bottle and bucket fragments). Non-portable assemblages include: objects known as "cave drums;" pictographs; petroglyphs; grindstone; and other forms of worked rock (bao boards and cupules in massive rock). I then propose a space-time matrix based on radiocarbon dates derived from charcoal, ostrich eggshell, and slag that allowed me to relate excavated and surface assemblages to each other and to anchor them chronologically. The final section of this chapter summarizes the results of material and spatial analyses of a subset of the diagnostic ceramics recovered during fieldwork. At least four distinct, time-sensitive ceramic traditions became apparent through this analysis. When used as a proxy for changing occupation patterns through time, these materials suggest a trend that directly counters Ten Raa's hypothesis concerning the northwest-to-southeast moving frontier. As noted above, the evidence suggests that pastoralism and metallurgy were firmly established in the homeland by at least 350 AD and possibly by 550 BC.

Chapter 4, entitled "Map-making and the (De-)construction of the Homeland Refuge," considers contradictory notions of isolation and connectivity encountered in scholarship about the Sandawe. On one hand, accounts written by colonial agents and scholars tend to emphasize continuities across Khoisan peoples and seek to establish that the Sandawe are deeply rooted in place. While certain oral histories among the Sandawe seem to support the scholarly consensus, they can be read against the grain to argue, on the other hand, that the region and its inhabitants have long been engaged with regional milieus. The archaeological assemblages provide several new lines of material evidence regarding these varying accounts, and the remainder of this chapter elucidates the temporal and spatial scales of the extra-regional networks through which trade goods and other exotic items made their way to the homeland. These goods include obsidian that was likely sourced from central Kenya and glass beads from India, Europe, and other, as yet unidentified, sources.

In the fifth chapter is entitled "The Rockshelter Assemblage: Reconstructing Political Economy and Cosmological Landscapes Within and Beyond the Sandawe Homeland." In this chapter, I examine archaeological, ethnographic, and linguistic evidence of regional cosmological traditions and political economies through which meaningful landscapes have been constructed and contested. This investigation is based on analyses of objects known as "cave drums," as well as pictographs, petroglyphs, and other forms of worked rock, such as cupules and grinding hollows, rock gongs, and bao boards. These lines of evidence suggest that

Table 1.1: Sociological and archaeological correlates of the transition from a moving to a static frontier. Adapted from Lane (2004:245)

Farmers/Herders	***Hunter/Gatherer/Fisher Foragers***
A – Pioneer Phase (Moving Frontier): Pioneers exploiting the wilderness, searching for land, pasture, "wild products," escape "routes."	Interaction with pioneer farmers/herders – exchange of wild products (e.g. bush meat, skins, honey) for "domesticates," farmer/herder objects.
Archaeological Signatures: Often similar hunting-gathering-fishing technologies used by the indigenes. Transient camps and settlements. Sporadic traces of domesticates and farmer/herder material culture.	Occasional traces of "exotic" items such as domestic fauna & plants, non-indigenous items of material culture, or raw materials. Otherwise often minimal change.
B – Substitution Phase (Moving Frontier): Farmers/herders begin subduing the land, leading to acquisition of pasture, arable land, water, and other resources; Creation of "permanent" homes; Intermarriage with forager populations; Establishment of client or symbiotic exchange relations; Potential for more conflict – warfare, raiding, etc.; Adoption of loan words from foragers.	Increasing interference of farmer/herder strategies, with various possible consequences, e.g.: Greater access to new technologies, products, and "prestige" goods; Development of symbiotic or client relationships with herder/farmer groups; Absorption through intermarriage; Adoption of loan words from farmers/herders; Destruction of habitats; Retreat into isolation.
Archaeological Signatures: Modification of local habitats. Creation of more permanent settlements and monuments. Changes in mtDNA (of human population). Evidence for exchange in prestige goods or specialized products. Changes in social organization of production.	Major changes in material culture related to specialized hunting, craft production, honey-collecting etc. New diet and disease pathologies, longer-term site occupation, reduced seasonal rounds, changing mtDNA. Disappearance, destruction, or spatial restriction of forager settlements/camps.
C – Consolidation Phase (Static Frontier): Development of new farming technologies/intensification. Specialized exploitation of wild resources, especially animals. Increased warfare, including with neighboring farmers/herders. Voluntary restriction of population. Development of sociological devices for absorbing time and energy (prestige hierarchies)	Loss of, or massive reduction in, means of subsistence. Consolidation of symbiotic/client based relationships with farmers/herders. Destruction and dispersal of communities in previously marginal land. Endemic warfare with farmers/herders. Encapsulation. Disappearance of forager language.

Table 1.1: Continued

Farmers/Herders	*Hunter/Gatherer/Fisher Foragers*
Archaeological Signatures: Introduction of irrigation, stall-grazing, manuring & similar systems of agricultural intensification. Infilling of more marginal productive areas. Partial migration to new land. Growth in circulation of weapons, evidence of physical attacks/ destruction. Greater material expression of wealth & status differentiation.	Disappearance of forager sites and evidence for foraging as a viable means of subsistence. Incorporation of foragers into the settlement systems of farmers/herders. Destruction of sites, skeletal remains exhibiting evidence of violent death or injury. Maintenance of distinct material culture boundaries.

inhabitants of this region have participated in yet modified numerous traditions, of varying geographic scales, over the *longue durée*. Previously, it has been underappreciated that the Sandawe homeland is home to numerous petroglyphs that exhibit similarities to those of southwestern Africa associated with foragers and those of northern Kenya associated with pastoralists (but numerous factors complicate simplistic links between these regions). We are on firmer footing when considering the numerous cave drums that point toward participation in a regional political economy of significant time depth that was (and to a certain extent remains) organized around prowess in rainmaking.

The sixth chapter, "Disciplinary Déjà Vu: The Problem Space of the Eastern African Khoisan Foragers," steps back from the archaeological analyses that undergird the preceding three chapters to think more broadly about both the Sandawe and the Hadza. Both of these ethno-linguistic groups are frequently described as enigmatic remnant lineages capable of providing insight into the deep past. Due to the presence of "click" consonants in their languages, seemingly atypical bodily form as compared to their neighbors, and a reliance upon wild food resources, scholars have long sought to establish ties between these groups and other African groups categorized as foragers, particularly the Khoisan peoples of southern Africa. While critiques have destabilized many elements of nineteenth-century evolutionary theories, progressivist, stage- and race-based ethnological typologies persist in current research about these groups. Drawing upon Wylie's (2000) examination of theoretical and evidentiary independence and archaeological reasoning, as well as Scott's (2004) notion of the problem-space, I conduct a critical genealogical analysis of scholarship on these two groups. I explore the interdisciplinary feedback loops that have created commensurabilities across disparate datasets, thereby limiting the questions that could be asked of these groups. By unraveling the evidentiary "bundling" of linguistic, archaeological, ethnographic, and biological evidence, this chapter contributes to efforts that seek to chart a new problem-space less beholden to the often unacknowledged legacy of seemingly outdated, yet still relevant theoretical and interpretive frameworks.

In the Conclusion, I briefly summarize the results and offer a number of conjectural histories based on the evidence described in the preceding chapters. These histories can be used to guide more targeted fieldwork in the future and as a material basis upon which to further develop the theoretical and interpretive models through which we apprehend African pasts.

Conclusion

In her exceptional review of Africanist forager studies, Kusimba (2005:354) notes that, "a research agenda driven by identifying hunter-gatherers either in general or with reference to ethnographically known groups misses the goal of understanding ancient ways of life in and of themselves and sets up a circularity of interpretation where the nature of the society in question is assumed from the start." It is, therefore, necessary to emphasize that I do not view this dissertation as a prehistory of the Sandawe per se. In contrast to an ethnohistory that traces the group backwards in time, I am interested in establishing the material and discursive genealogies against which one may consider the Sandawe as an extant community and as an object of study.

The culture-historical impulse of ethnology in this region has encouraged linguistic, genetic, and narrowly focused ethnographic research among the Sandawe at the expense of more capacious forms of ethnography and archaeology. This is, perhaps because, as a "hybrid" group, they were not seen as notable examples of either foraging or food production.

Disentangling overlapping ideas and practices can clarify the origins of analytic categories but risks being deconstruction for its own sake if one does not ask what is gained or forfeited by a commitment to any particular framework. As stated previously, I have come to understand that scholarship on the Hadza and Sandawe has been locked into reductive accounts of replacement, acculturation, and loss that are increasingly at odds with growing bodies of evidence and broader social theory. Genealogical deconstruction can help to illuminate why certain kinds of questions have heretofore not been possible to ask of the Sandawe or their homeland. This scholarship, however, has provided a well-articulated set of expectations about longer-term sociohistorical processes in the region. By facilitating an "encounter" between this discursive tradition and new bodies of material evidence, a deconstructive project leads to a positive project of building new modes of interdisciplinary historical analysis less beholden to and, perhaps, finally able to move beyond, the strictures of the well-trodden interpretive paths. My intent is that this will lead to new forms of historical inquiry more attuned to the often-tacit political stakes of scholarly knowledge production about African foragers.

Chapter 2

Modeling Forager Transformations & Interactions in Eastern Africa

This chapter reviews the major archaeological entities of eastern Africa and the culture-historical frameworks into which they have been organized. In the following sections, I pursue three related tasks. The first is to provide the contours of eastern African culture history from approximately 6000 BC to 1000 AD (spanning roughly from the first appearance of ceramics to the widespread dominance of agro-pastoral systems). The second task is to review major models concerning the emergence of forager complexity, food production, and, especially, the relations between foragers and food-producers. "Food production," as typically used by archaeologists refers to systems in which humans have gained control over their food supply, in contrast to systems of "food procurement" that depend upon minimally managed or unmanaged wild resources (Braidwood 1960; Childe 1951; Smith 2001). The former relies on technological mediation and entails a temporal delay between preparatory activities and yield ("technology," in this case, is an expansive that includes not only tools but domesticated plants and animals, as well as novel forms of social organization and ideology), whereas the latter has been described as relatively unmediated and with a reduced time lag between food-getting activities and yield. The third task is to review the theoretical, methodological, and interpretive benefits and limitations of these models in relation to the archaeological record and to suggest alternative approaches.

A reliable culture-historical framework has remained elusive for eastern Africa because large and well-dated artifact assemblages necessary to the task are scarce, despite relatively good coverage in some sub-regions, such as Kenya's Central Rift (Robertshaw 1991). Archaeological periodization in eastern Africa remains confounding, although some level of agreement has coalesced around the timing of macro-level technological shifts, if not the tempo and characteristics of the finer-grained social and economic histories associated with these shifts. Large scale transitions include the boundary between the Middle and Later Stone Ages (MSA, LSA), the emergence of "complex" Later Stone Age foraging, the rise and spread of numerous Pastoral Neolithic (PN) traditions, and the onset of the metallurgical and agro-pastoral Iron Age (IA). While scholars increasingly accept that both anatomical and behavioral "modernity" emerged together near the onset of the MSA in Africa, the LSA has been characterized as a florescence of the full suite of those behaviors such that we first begin to discern groups that are human like "us" and behave in ways that resemble ethnographically known foragers. Definitions for each of the preceding terms are contentious, but the Pastoral Neolithic has likely caused the most debate among regional specialists. At the broadest level, the term refers to economies relying to some extent on a combination of ground stone tools, domestic livestock (and possibly crops), and ceramics. The Iron Age refers to the appearance of metallurgy but otherwise entails a similar suite of material culture as the Pastoral Neolithic with, perhaps, more sedentary settlement patterns due to a greater focus on agriculture. As Robertshaw (1991) notes, research about urbanism and cosmopolitanism along the "Swahili Coast" has occurred relatively independently of other research traditions, but the scholarship may have overstated the extent to which the development of social complexity in these city-states occurred independently of changes in the interior (see Walz & Dussubieux 2016).

Beyond familiarization with the state of the field, this review allows for the research questions and methodologies outlined in the preceding chapter to be further refined. Reading most broadly across the regional literature, several observations can be made. First, a growing gap exists between models of forager sociality and the expanding archaeological record of diverse foraging practices. Second, early food production may have entailed ideological shifts and novel social and political forms that created social divisions vis-à-vis foragers (Gifford-Gonzalez 1998, Sawchuk et al. 2018, Robertshaw 1988, 1990), but it is also true that extreme economic specialization appears to have been an outlier, and, further, animals (wild and domestic) may have provided an economic and symbolic means through which otherwise dissimilar groups were brought together, so the extent to which foraging and food production are opposed remains an open question (see Ingold 1986). When considering the more local archaeological record of northern Tanzania in relation to broader, regional culture historical phasing, several discrepancies immediately become apparent. Earlier generations of research held that northern Tanzania comprised a boundary between two great cultural traditions: an older, more pastoral economy derived from southward-migrating Cushitic-speakers and a younger, more agricultural economy derived from eastward-migrating Bantu-speakers (Phillipson 1977). In contrast, several lines of evidence indicate that food-production began earlier than expected in this region and that the region has a long history of linguistic, genetic, technological, and other forms of exchange. On current evidence, it is impossible to determine if culture-historical phases derived mainly from research elsewhere in eastern Africa are applicable here or if the region represents a unique confluence of factors and historical sequence.

The implications of these observations are manifold. Locally specific and regionally variable manifestations of forager sociality would necessarily have influenced the complex mix of innovation, exchange, and migration associated with the introduction and spread of food production. Further, demographics, techno-economic capacities, and socio-political organization are important but insufficient to describe the formation of regional milieus. Food-getting repertoires and inter-group relations are simultaneously material and ideological, but frontier models tend to emphasize material conditions and the mosaics concept is amenable to but has seldom been used to explore ideological phenomena. As described in Chapter 1, landscape archaeology promises to ameliorate some of the weaknesses of these approaches in its attention to the construction of space in its "objective" and "subjective" dimensions. Chapters 3 through 5 provide a variety of perspectives on how this might be accomplished. An additional but critical observation that emerges from the following review and that informs the remainder of this dissertation is that various institutional and conceptual legacies have left their imprint on the kinds of data and narratives produced to describe the archaeological record of Africa. I argue that these legacies must be examined alongside archaeological evidence in order to understand if and how the data and interpretations produced at different points in time and through traditions of research are, in fact, directly comparable to each other or relevant to the application of an interpretive model. I note several examples in the following sections but address this issue most extensively in Chapter 6.

Several aspects of the archaeological record of both foragers and food-producers in Africa diverge from other regions of the world, and there are instances for which existing models and data appear to be misaligned, but eastern Africa (and north-central Tanzania) nonetheless promises to continue challenging and expanding our understandings of human history, both in Africa and from a global, comparative perspective. As discussed in the following chapters, the Sandawe homeland, in particular, can contribute to the generation of new perspectives on the formation of regional milieus.

Part I: Later Stone Age Foraging & Its Transformations

The "Later Stone Age" was proposed originally to refer to the period of African history during which a diverse array of microlithic industries emerged to produce small blades and bladelets (Ambrose 1998). These tools require considerable skill to produce but appear to have been made expediently and for specific purposes on abundantly available local materials, such as quartz, which stands in contrast to older, multi-purpose toolkits on a more diverse set of raw materials. These microliths were hafted onto multi-component tools, such as wooden or bone shafts, using fiber and adhesives. Low intensity site occupation, the use of seasonally available fauna, and unelaborate material culture has been used as evidence that a generalized hunting and gathering strategy prevailed during the LSA among relatively mobile foragers (Dale 2007). However, some evidence exists for intensive use of resources, such as game drives and mass kills, and sedentism (Kusimba 2013). Fishing and its associated toolkits also became widely incorporated into food-getting repertoires during this time.

The Later Pleistocene and Early Holocene experienced several climatic shifts, including relatively drier and wetter periods, but the lack of fine-grained paleoenvironmental proxies make it difficult to talk about the relationship between local food-getting repertoires and changing climate beyond broad correlations. However, wetter environments in northern, central, and eastern Africa did seem to draw foragers, and fishing technologies are frequently found in what is now desert (Arkell 1972; Sutton 1974; Yellen 1998). Sutton (1974) suggested that these geographically widespread adaptations were related and constituted a uniquely African developmental pathway, which he termed the "Aqualithic" (in contrast the Near Eastern Neolithic). The possibility of deeper historical connections between these regions remains compelling and provocative, but research has tended to focus on local manifestations of three early- to mid-Holocene archaeological entities that diverge from the mode of generalized foraging thought to characterize the LSA: 1.) the Lake Turkana basin fisher-foragers; 2.) the Eburran "ecotonal" foragers of Kenya's Central Rift Valley; and 3.) Kansyore fisher-foragers of the Lake Victoria basin.

Turkana Basin Fisher-Foragers

Fishing with harpoons first appears in eastern Africa around Lake Turkana in what is now northern Kenya, and pottery has been dated to 7000 BP in this area (Robbins 1972, 2006). Aquatic resources were incorporated into diets that also relied on large game, including crocodiles, hippopotamus, and mammals found in open grasslands (Robbins 1968; Phillipson 1977). These fisher-foragers produced lithics on obsidian that was obtained locally, which differs from cotemporaneous and later groups that moved obsidian over long-distances either by highly mobile groups or through exchange (Nash et al. 2011; Ndiema et al. 2010; Mehlman 1989). Archaeologists have debated whether pottery indicates new forms of symbolically mediated social differentiation, logistical organization, or dietary practices (see Arnold 1985, Close 1995, Hayden 1990, Ikawa-Smith 1976), but Sutton (1974) suggests that early African pottery may indicate a diet more oriented toward stewing than roasting. Kusimba (2013) proposes that a switch away from larger species like Nile perch toward smaller and more rapidly reproducing species could indicate a form of seasonal intensification. It seems clear that the transition to food-production in this region entailed both interaction and the migration of pastoralists leaving the drying Sahara (Marshall & Hildebrand 2002; Prendergast et al. 2019; Sawchuk et al. 2018).

Eburran Ecotonal Foragers

In the Central Rift of Kenya, the evidence for lake fishing is more limited (Leakey 1931; Stewart 1989). A robust dataset suggests the existence of a long-term foraging community centered on Mt. Eburru that spanned from 12,000 BP to 2000 BP (Ambrose 1998). By selectively residing at intermediate altitudes or, perhaps, moving up and down altitudinal gradients seasonally in a pattern akin to transhumance, these foragers were able to obtain resources from both montane forests and grasslands near lakeshores on the valley floor

(Ambrose 1984a, 2002; Ambrose et al. 1980). Ambrose (1984) suggests that they harvested honey and used traps and snares to catch smaller mammals of montane forests. Faunal evidence supports the latter conclusion, whereas a relational, ethnographic analogy to the modern Okiek of that region is cited as support that these foragers also relied upon honey. Although honey collecting is difficult to detect archaeologically, it is also true that the altitude gradient provides unique opportunities for the use of honey, and so the hypothesis is compelling and worthy of further exploration.

In contrast to both Turkana basin and Kansyore fisher-foragers, discussed in the following section, the Eburran foragers did not initially use ceramics, relied extensively on terrestrial animals, and apparently did not revisit or inhabit sites with the same intensity or duration as foragers near the lakes (Ambrose 1984a, 1984b). Eburran lithics are notable for their long, narrow obsidian blades, but no preference for particular obsidian sources appears to have existed until after this group began interacting with early pastoral communities (Ambrose 1998, 2001, 2012; Merrick and Brown 1984). It is also during this latter period that ceramics first appear in the local archaeological record. Due to the continuity of the lithic tradition alongside the appearance of livestock and ceramics, Ambrose (1998) argues that Eburran foragers were not replaced but gradually adopted food production.

Kansyore Fisher-Foragers of the Victoria Basin

The Kansyore tradition appears to represent an independently developed form of LSA forager complexity and, as such, has sustained scholarly interest for several decades. Sporadic, limited finds of pottery in this region date to the 1930s (Brachi 1960; Chapman 1967; Gabel 1969; Leakey 1931; Owen 1941; Pearce and Posnansky 1963; Soper and Golden 1969), but only slowly did recognition emerge that it occupies a unique position within both regional culture history and broader anthropological theorization (Collett and Robertshaw 1983; Dale 2007; Soper and Golden 1969). Initially associated with early food production, archaeologists began to recognize by the 1980s that Kansyore sites are the only locations in eastern Africa where significant quantities of pottery are found prior to the appearance of domesticates.

Some hesitancy accompanied early studies of Kansyore pottery due to the wide date range and geographic spread. Mehlman (1979) suggests that disparate dates could indicate a conservative tradition or significant dating errors. As Collett and Robertshaw (1980) note, the tradition could also have been poorly defined, thereby suggesting a cultural unity where none existed. Although early radiocarbon dates obtained from bone apatite and collagen are likely spurious, subsequent studies with more reliable dates from charcoal have confirmed that Kansyore pottery was, indeed, produced for nearly seven millennia, from 6000 BC to 500 AD, placing it among the oldest, and longest produced, in Africa (Dale et al. 2004; Lane et al. 2006; Robertshaw et al. 1983). Collett and Robertshaw (1983) suggest that these wares for a single tradition with three geographic facies. The northern facies includes several sites in Sudan, whereas the southern facies extends from the Serengeti Plains through to Lake Eyasi, Kondoa and, perhaps, as far south as the border between Tanzania and Mozambique (Arkell 1949; Bower 1973; Chami 2007; Chami and Kwekason 2003; Mehlman 1979, 1989; Robertshaw 1982; Robertshaw 1991; Tryon et al. 2018). The northern cluster does appear to be associated with a similar time period and orientation toward aquatic resources as the Kansyore material (recall Sutton's Aqualithic), but the variety of decorative techniques and vessel forms and is much broader, which could indicate they had different uses (Robertshaw 1982). The southeastern finds of Kansyore ware, have not been analyzed systematically and have fewer associated dates and less evidence of associated economic practices (but see Prendergast 2008 concerning the latter issue in the vicinity of Lake Eyasi).

The densest and most famous cluster of sites, named after the type-site of Kansyore Island, encircles Lake Victoria. When discussing Kansyore as a culture-historical entity, we are, therefore, on the firmest ground when discussing Kansyore wares *sensu stricto* because this cluster of sites has produced the most robust archaeological assemblages with reasonable chronological and stratigraphic control (see especially Dale 2007; Dale & Ashley 2010; Frahm et al. 2017; Lane et al. 2006). Kansyore ware is most notable for vertical and horizontal bands or panels that give an “all over” or “busy” appearance. These bands consist of incised wavy lines, punctates, and linear or zigzag motifs created by combs and shells. Forms consist most commonly of open or slightly restricted, medium-to-large bowls with rounded or tapering rims (Collett and Robertshaw 1980; Dale 2007; Soper and Golden 1969). Rarer forms include “polygonal” vessels with non-circular rims and bowls with in-turned rims, as well as vessels with internal decoration (Chapman 1967; Collett and Robertshaw 1980; Soper and Golden 1969). These ceramics have been described as being poorly fired, chunky, and gritty, but Dale (2007) and Mehlman (1989) note a number of exceptions to this generalization.

Virtually all Kansyore sites are found on the shores of Lake Victoria or in the vicinity of rapids, shallows, and other locations in which aquatic resources are at least seasonally abundant. Faunal remains at older sites are exclusively wild and often dominated by fish and shellfish, although a wide range of terrestrial species are also found, which suggests a broad-based and possibly seasonal use of resources. Deeply stratified open-air sites, especially those with thick middens, suggest some combination of repeated site use and intensive, if periodic, use of aquatic resources (Dale 2007). These may also indicate some level of sedentism and complex social relations related to the ownership of fishing-related technology (Dale 2007). All of these occupation patterns stand in contrast to those observed among Eburran foragers (Dale 2007). In addition to faunal studies suggesting that foragers produced the pottery initially, it is found alongside quartz microliths broadly similar to those that had become widespread across Africa during the LSA. Although often referred to as "non-descript," Seitsonen (2010) has demonstrated that changing landscape occupations patterns which reflect growing sedentism can be discerned through careful analysis of this material. Based on excavated sequences, Dale (2007) suggests that two broad temporal phases could be discerned. During the earlier phase, Kansyore foragers may have had minimal contacts with fisher-foragers to the north. Numerous later sites include both wild and domestic fauna or are overlain by artifacts associated elsewhere with agriculture and pastoralism (Lane 2004).

Modeling Forager Transformations and the Rise of Complexity

Due to both the recognition that humans emerged in sub-Saharan Africa and the rise of cultural ecology in the mid-1900s, southern and eastern African groups categorized as foragers were of particular interest for ethnographic studies intended to aid in the development of models that could be used to understand the paleontological and archaeological records (see Devore 1965; Lee & Devore 1968). Anthropologists and archaeologists, however, came to acknowledge an increasingly poor fit between explanatory models derived from African cases and foraging communities known from both the archaeological and ethnographic records in other regions of the world. Due to the long-running presumption that surpluses made possible through food-production facilitated the elaboration of social complexity, the most glaring challenge to existing models was the existence of foraging communities exhibiting social hierarchy. In response, numerous scholars attempted to isolate axes of variation among groups otherwise categorized together. Common binaries include: generalized/simple versus complex (Arnold 1996; Gould 1976; Hayden 1990; Price and Brown 1985); generalized versus specialized (Gamble 1978; Price and Brown 1985); foragers versus collectors (Binford 1980); storing versus nonstoring (Testart 1982); immediate-return versus delayed-return (Woodburn 1982, 1988); and egalitarian versus nonegalitarian (Kelly 1995).

These binaries elegantly standardize diversity across foraging communities. They also accommodated a growing awareness that the divide between hunter-gatherers and farmers is not as stark or "revolutionary" as was once presumed. For example, in Woodburn's model, which has been the most relevant for studies of African prehistory, immediate-return and delayed-return systems share common features, as do delayed-return systems, farming, and pastoralism. Despite the blurring of categorical boundaries between foraging and other subsistence strategies, as well as the recognition that humans have long modified their surroundings, discussions of foraging communities that existed in Africa before the adoption of domesticated crops and livestock have tended to emphasize a technological "mapping onto" resources in line with the tradition of cultural ecology.

Other perspectives have emerged in recent decades that attempt to account for weaknesses of 1970s-era systems theory and the "people-to-nature" models to which it gave rise (Mitchell 2005). Two such approaches are known as Resiliency Theory (Redman 2005) and Niche Construction Theory (Laland and O'Brien 2010). The latter attempts to trace the organization and reorganization of human communities in relation to changing ecological and social conditions, whereas the latter is interested in the "triple inheritance" of genetic, cultural, and ecological selection on human and social evolution. Although not entirely incompatible with the preceding approaches, others approaches could be described as "people-to-people" models

(Mitchell 2005). For example, it has been observed that some band-level societies agglomerated seasonally and engaged in both collaborative and competitive behavior that produced dynamic tension between more authoritarian and more anarchic social forms (Carballo et al. 2014; DeMarrais 2016; Wengrow & Graeber 2015).

Although I doubt the ability of Resiliency Theory and Niche Construction Theory to ultimately avoid either determinism or interpretations that are so vague as to be meaningless, all of the approaches in the preceding paragraph are compelling because they promise to consider all foraging societies on equal footing. However, very few studies have applied these models to African societies (but see Jones 2020). Rather, in both academic and popular discourse, it remains the case that past and present groups categorized as Khoisan foragers tend to be described as technologically and strategically limited opportunists whose lifeways reflect environmental constraints (Kusimba 2005). Accordingly, they are also situated at the simple end of an evolutionarily scale of development, and the immediate-to-delayed return sequence remains the dominant mode through which African foragers are examined (Kusimba 2005).

Perhaps due to the explicit intention of providing both a "horizontal" differentiation of contemporary peoples and a "vertical" differentiation of evolutionary forms, certain problematic, but implicit, assumptions remain when the immediate-to-delayed return sequence is applied to African history. For example, rather than doing away with a fundamental split between foragers and politically "complex" societies (that is, that they represent a difference of kind rather than scale), the condition of rupture is pushed into the forager category itself.

Consider Woodburn's (1982) model in closer detail. Immediate-return hunter-gatherers, exemplified by the Hadza, are said to enjoy a direct return upon their labor by using simple and easily replaceable tools to procure food which is eaten the day that it is obtained or soon thereafter. Individuals have flexible and frequently changing social groupings; may freely choose with whom they will reside, trade, and forage; have relatively equal ability to satisfy basic needs; and engage in sharing and mutuality but not long-term commitments or dependencies. Alternatively, delayed-return systems are characterized by individualized rights to assets that represent a return for labor applied over time. Such assets can include technical facilities (such as boats, nets, beehives, etc.); processed or stored foods; improved but wild resources (such as cultivated plants or herds); and rights over female kin. Such systems require ordered, differentiated, and jurally defined relationships that guide the transmission of assets, goods, and services. This, in turn, implies long-term binding commitments and dependencies that ensure cohesion and allow for hierarchy. The subtext of this framework is that delayed-return hunter-gatherers were the first truly political humans.

Subsequent research has led others to propose that "moderate delayed-return hunter-gatherers" bridge the gap between the two extremes of Woodburn's model (Dale *et al.* 2004), but even this modification emphasizes property relations and a particular temporal orientation as necessary foundations for political life. In contrast, others, such as Wiessner (2002), argue that egalitarianism is itself a complex institution rather than a blank slate out of which complexity emerges, while the "people-to-people" models described above see all societies as having a capacity for both authoritarianism and anarchism (Wengrow & Graeber 2015).

Whereas immediate-return systems are said to be oriented to the present, delayed-return systems are said to account for the past, the present, and the future. The emphasis on immediacy has implications for how we conceive of the relationship between people and objects – namely, that objects are merely the means to survival for immediate-return hunter-gatherers. This is precisely where the model's paradoxical theory of the political, which is linked to its implicit nature-culture divide, emerges most clearly. First, the notion of egalitarianism elides numerous kinds of inequality – between genders, between age groups, and so on (Flanagan 1989; Paynter 1989; Cobb 1993; Wiessner 2002). Further, Woodburn stresses that immediate-return foragers actively resist the accumulative practices seen in delayed-return systems in order to prevent the domination this would allow. This, however, would seem to imply knowledge of the political among individuals whose relations are, by definition, pre-political.

This model overstates the extent to which immediate-return hunter-gatherers lead an existence oriented to the present. Even among the Hadza, seasonal mobility, camp size variation, the creation of hunting blinds, butchering strategies, and repeat visits to groves of useful plant species demonstrate the need for long-term planning and memory, both individual and collective (Woodburn 1970; O'Connell *et al.* 1988a, 1988b, 1990, 1991, 1992; Marlowe 2002, 2010). These observations appear to have contribution Woodburn's (1988) reconsideration of his model, in which he suggested that immediate-return systems may be a direct response to encapsulation by exploitative systems, such as colonialism, rather than the original condition of humanity – a politics of avoidance rather than a lack of politics. Unfortunately, Woodburn's modification has been seldom noted in the scholarship, either among Africanists or in comparative studies (see, for example, Marlowe 2002, who acknowledges the role of encapsulation but who, nonetheless, sees the immediate-return practices of the Hadza as conservative and time-deep).

Institutional and Conceptual Legacies

It was once thought that the African LSA was roughly equivalent to the European Upper Paleolithic, and that "behavioral modernity" emerged suddenly over the last 40 kya, during this time period (McBrearty & Brooks 2000; Wadley 2001). Although better research coverage appeared to suggest that modern behaviors, such as the external "storage" of symbols in objects like rock art, first emerged in Europe, McBrearty & Brooks (2000) forcefully argue that both behavioral and anatomical modernity emerged simultaneously at the onset of the MSA (up to 300 kya) across eastern and southern Africa. The usefulness of the LSA as a category is, therefore, somewhat limited given that its key conceptual feature (that is, "behavioral modernity) and many of its characteristic categories of material culture are now known to significantly predate the time period (as one example, see Miller and Willoughby 2014 concerning the antiquity of ostrich eggshell and other kinds of beads). However, microlithic industries (and the broad social and economic shifts with which they appear to be related) do come to dominate the archaeological record of eastern and southern Africa after this point (Ambrose 1998, 2002; Barham and Mitchell 2008; Clark 1970; Gramly 1975; Merrick 1975; Miller and Willoughby 2014; Prendergast et al. 2007; Skinner et al. 2003; Tryon et al. 2015; Van Noten 1977; Wadley 1993, 2001; Willoughby 2012).

Both the search for the origins of anatomical and behavioral modernity and efforts to delineate pathways toward food production have inadvertently directed attention away from the diversity of Later Stone Age social and economic practices. Further, no systematic effort has been made yet to examine the relationship between the features of behavioral modernity and the immediate-to-delayed return sequence. As noted above, there remains a tendency to view the LSA period through models derived from ethnographic studies of southern African, Khoisan-speaking foragers (who represent the archetypal low-latitude, immediate-return, egalitarian band), but considerable diversity exists. Kusimba (2005) provides one of the earliest summaries of this diversity, and other evidence has continued to accumulate, only some of which can be dealt with here. First, patterns of past resource use with no correlates in the ethnographic record have been observed (Sealy & Pfeiffer 2000). Second, delayed-return resource management strategies (which entail long-term planning and, in some cases, social inequality related to property relations) appear to have been more, not less, common in the past than in the present (Dale et al. 2004; Hall 1990; Keeley 1999; Plug et al. 2003; Robbins et al. 1994). Third, evidence exists for cyclical intensification and decline in resource use (Sadr et al. 2003). Fourth, there is great variation in artifact types across multiple spatial scales, suggesting numerous modes of social differentiation, possibly built on notions of ethnicity or kinship (Wadley 2000; Wilshaw 2016). Fifth, other behaviors associated with "complex" sociality have been observed, including long-term extra-regional exchange (Stewart et al. 2020) and territoriality and violence (Lahr et al. 2016). Taken together, these observations suggest that both the LSA a chronological period and a culture-historical entity are in need of significant revision.

Part II: Pathways to Food-Production

The Pastoral Neolithic

The suitability of the term "Neolithic" for the African archaeological record has caused controversy due both to the continent's anomalous developmental trajectory and the racism of older, hyper-diffusionist narratives. The emergence of food production in Africa is interesting from a global, comparative perspective because it is one of only a few cases in which pastoralism emerged before agriculture (Marshall and Hildebrand 2002). Whereas greater sedentism is associated with early food production in the Near East, mobile herds of domestic livestock allowed early African food producers to better manage risk as the Sahara began to desiccate. It is widely accepted that Africa was home to several centers of domestication for plants and animals, but some aspects of the material culture of early food-producers (such as lithic industries) resemble those of foragers. Beyond the definitional challenges to which these issues contribute, studies of early food-production must be cognizant of political debates. Colonial-era frameworks that hypothesized the southward migration of pastoralists were intimately tied to evolutionary frameworks in which racially superior outsiders had introduced all innovation to the continent (Karega-Münene 2002; Sanders 1969), and so it can be difficult to discuss contemporary archaeological understandings of robust evidence concerning past migrations given sensitive and ongoing political debates about, for example, ethnicity and national belonging. Despite these limitations, the term has remained in use because food production is widely recognized to be associated with major shifts in sociopolitical and economic organization. Further, the emergence of food production was broadly contemporary on a global scale, and so the use of "Neolithic" places Africa firmly within this macro-scale process, while the "Pastoral" modifier highlights Africa's unique experience of this global "event."

Bower and Nelson (1978:562) define Pastoral Neolithic cultures as those "which 1.) relied substantially on domesticated livestock for their livelihood; 2.) used pottery; and 3.) employed typical Later Stone Age technology for the manufacture of edged tools." Many such groups also produced ground stone vessels and tools. Gifford-Gonzalez (2005:188) expands upon this definition by defining pastoralists as those who organize their settlement and mobility strategies to suit the needs of their livestock, often through the use of ideology that emphasizes the mutual dependence on humans and their livestock.

Certain elements of the Pastoral Neolithic are more easily ascribed to migration and technological transfer than others. Domestic cattle, caprini (i.e. sheep and goats), and donkeys, for example, were domesticated across northern Africa and the Near East, and so their appearance in eastern Africa must be due to some form of exchange and their introduction to new regions. Whether and under what conditions this technological transfer also entailed population movements remains an open question. The evidence for an early migration is stronger in the Turkana Basin of northern Kenya, but the picture to the south of this sub-region is decidedly more complicated. This is particularly true for the first two millennia after the appearance of domesticates across eastern Africa. Although Ambrose (1982, 1984, 2001) has grouped all early sites into the "Savanna Pastoral Neolithic" due to their frequent location on highland savannas (and in an attempt to align the archaeological record with historical linguistic analysis), these groups produced highly diverse lithics and ceramics and exhibited differing social and economic practices, such as their burial practices and their relative reliance on domestic versus wild taxa. Some have suggested that it may be more accurate to simply refer to these communities as "early" or "exploratory" pastoral communities, in contrast to "later" pastoral communities for which there is stronger evidence of cultural similarity and a consolidated sociopolitical and economic status vis-à-vis groups more reliant upon foraging (Lane 2013; Marshall et al. 2011).

The Northern Early/Exploratory Savanna Pastoral Neolithic. As noted above, several lines of evidence indicate that both migration and technological transfer and exchange were involved with the spread of domesticates into the Turkana Basin. Two distinctive pottery traditions, known as Nderit and Ileret, appear by 4500 BP, and Turkwel pottery is dated to 1800 BP. Although the makers of this pottery exhibit similarities to contemporaneous fisher-foragers in the region in terms of their reliance on aquatic and terrestrial resources and use of obsidian, they consumed a wider array of taxa, used relatively more scrapers (presumably for processing animal hides), and began producing ground stone tools, most famously stone bowls (Barthelme 1985; Marshall et al. 1984; Stewart 1989). The first habitations with large proportions of domestic stock are Dongodien and GaJi2 on what would have been the eastern paleo-lakeshore.

These sites may be contemporaneous with the earliest pottery or date to 500-1,000 years later (Ashley et al. 2011).

The Southern, Early/Exploratory Savanna Pastoral Neolithic. The Savanna Pastoral Neolithic is somewhat problematic as a culture-historical term because it masks considerable diversity across sites, which themselves cover a broad area from Kenya's Central Rift Valley and north-central Tanzania, and is defined by what it is not: that is, the Elmenteitan tradition, which is discussed in the following section. Some similarities have been observed across these sites, however. For example, many are located between 1500 and 2000 m above sea level (Lane 2013). Sites are often large and preferentially located on gently sloping ridges and hills. Most sites relied to some extent on wild taxa, with some, such as Prolonged Drift, quite extensively so (Gifford et al. 1980; Marshall 1990; Odner 1972; Onyango-Abuje 1977). Burial practices varied widely (ranging from burial in monumental structures to rock crevices), as did the stylistic aspects of the associated ceramics. Although most SPN sites include obsidian from a single source in central Kenya, their lithics are generally produced from local materials and are otherwise similar to contemporaneous "LSA" foraging communities of the regions in which these sites are found (Ambrose 1984a; Goldstein and Shaffer 2016). The exchange networks through which obsidian changed likely varied in intensity through time, but whether these exchanges entailed "down the line" or other forms of interpersonal relationships cannot yet be discerned (Goldstein 2017).

Nderit and Ileret wares have been described as forming a broadly similar, northern tradition, whereas Narosura, Maringishu, and Akira wares have been grouped together as a southern tradition (Robertshaw and Collett 1983). Narosura wares are the oldest and have been found at sites dating from 3000-1400 BP, whereas Marangishu and Akira ware are more recent, dating to between 1700 and 1200 BP. The geographic and chronological distribution of sites with these wares in Kenya and Tanzania exhibit no clear trends, and Robertshaw (1990) suggests that Akira ware could have been made by foragers participating in regional exchange systems rather than by pastoralists.

Unexpectedly early evidence of domestic animals has been found at the site of Luxmanda in north-central Tanzania, which dates to 3000 BP (Grillo et al. 2018; Prendergast et al. 2013). Luxmanda is particularly interesting for understanding the spread of pastoralism because, among sites categorized as SPN, it is the largest, oldest, and farthest south. Inhabitants of this site were heavily reliant upon domesticates and obtained obsidian from central Kenya. This suggests that northern Tanzania did not present as many zoonotic limits on pastoralism as expected (see Gifford-Gonzalez 1998) or, perhaps, connections to groups farther to the north ameliorated an otherwise risky situation in some way.

The Consolidated Pastoral Neolithic. In contrast to the Savanna Pastoral Neolithic, archaeologists are in agreement about many features of what is termed the Elmenteitan tradition, which, although roughly contemporaneous to the SPN, appears to have been produced by pastoral communities that had achieved some level of sociopolitical and economic standardization, with a relatively consistent suite of material culture. The earliest sites, such as Njoro River Cave, date to 3000 BP and, while they overlap spatially and temporally with SNP sites for two millennia, they are less geographically dispersed. Elmenteitan sites are most concentrated near Lakes Naivasha and Nakuru in south-central Kenya but extend especially to the east toward Lake Victoria and the north toward the Laikipia Plateau. Quite elaborate burials of dozens of cremated individuals that include significant numbers of stone bowls, ceramics, and grindstones, in addition to ochre, are found in rockshelters and caves throughout this area.

Elmenteitan pottery is distinctive for its relative lack of decoration as compared to SNP wares, its use of spouts and lugs, and the inclusion of mica as temper (Nelson 1980; Wandibba 1980).

Large settlements are typically located on highland grasslands, but most include a single occupation, suggesting considerable mobility to take advantage of shifting vegetation growth related to a bimodal rainfall pattern. Faunal evidence suggests that these communities maintained large, healthy herds and relied heavily on both meat and dairy from domestic livestock and chose not to eat wild taxa, even when present (Marshall 1990; Robertshaw 1988, 1990).

One of the most remarkable features of the Elmenteitan pastoralists is their obsidian exchange network. Upwards of 90 percent of the lithics produced by these groups used green obsidian obtained from a single outcrop on the north slope of Mt. Eburru, although other sources on and near the mountain were also exploited (Merrick and Brown 1984). The use of this obsidian is found at Elmenteitan sites up to 250 km (and possibly 400 km) away from Mt. Eburru, suggesting the existence of a robust and long-running exchange network that far exceeds serendipitous, "down the line" transmission (Grillo et al. 2018; Goldstein 2017; Renfrew 1977). Further, this obsidian is found only rarely at archaeological sites where Elmenteitan material culture appears to have been obtained via exchange. This possibly suggests that its use was a profound ethnic marker and that its extraction and distribution was tightly controlled. Material culture and site structure do not suggest power differentials among Elmenteitan pastoralists and ethnographic analogy suggests that pastoralists are relatively egalitarian (Ambrose 2001; Robertshaw 1988, 1990).

Around 1300 BP, the appearance of iron and agriculture seems to have caused a rather rapid unraveling of the Elmenteitan complex (Ambrose 1984a). On the other hand, Robertshaw and Collett (1983) suggest that the Elmenteitan may have been able to become so specialized precisely because of the simultaneous rise of increasingly specialized agriculturalists, so the end of this unusually discrete tradition is likely not to have been a straightforward case of technological or population replacement.

The Iron Age

In eastern Africa, the “Iron Age” is, in many ways, equivalent to discussions of the “Bantu Expansion.” The genealogical unity of the Bantu languages had been recognized in the mid-1800s, but it was not until the 1960s that archaeologists and linguists began a sustained collaboration to determine how these languages became so widely dispersed. Oliver (1966) objected to earlier assertions that the spread of Bantu-speakers had occurred through conquest because conquest alone could not explain how these languages became dominant. Rather, he asserts that more rapid population growth vis-à-vis indigenous farmers and southward-migrating Cushitic-speakers was responsible. By synthesizing newly developed linguistic and archaeological datasets, he suggests that an early, and possibly very small, group of Bantu-speakers had established themselves on the savannas south of the Congo Basin, where they combined a preexisting knowledge of pottery-making, agriculture, and metallurgy with newly acquired eastern African sorghums and millets. This blending of technologies then facilitated their rapid population growth and movement further to the east and south across the sub-continent. It is thought that this process of dispersion began as early as 4000 BP near the border of present-day Nigeria and Cameroon, with Bantu-speakers reaching southern Africa by 1500 BP (Filippo et al. 2012). In more recent years, genetic evidence has been added to linguistic and archaeological evidence of apparently rapid spread of this “Iron Age package” that included at some level of population movement in addition to technological exchange (Greenberg 1963;

Huffman 1970, 2006; Oliver 1966; Pereira et al. 2001; Salas and Richards 2002; Richards et al. 2004; Phillipson 1977, 2005, 2007; Pakendorf et al. 2011).

As Robertshaw (1991) notes, when the British Institute in East Africa directed the Bantu Studies Project (BSP) between 1965 and 1971, the dominant form of evidence related to the Bantu Expansion was linguistic, and the goal was to add an archaeological dimension in the form of ceramic sequences and radiocarbon dates. The BSP was completed before most of the evidence concerning the time depth and the diversity of Pastoral Neolithic lifeways was produced and by scholars operating under very different theoretical frameworks. The geographically dispersed surveys of the BSP and their associated dates were, therefore, given an exaggerated importance in what we now know to be a simplistic model of the migration of Bantu-speakers (see Crowther et al. 2018).

Lane (2004) observes that Africanist archaeologists have long critiqued the use of material culture as a straightforward marker of identity or social form (Dietler and Herbich 1989, 1998; Hodder 1978; 1982, 1985; Richard and McDonald 2015; Stahl 2004), but that the practice remains firmly entrenched concerning the Bantu Expansion, possibly because the spread of Bantu languages did entail some form of population movement. Iron Age pottery is often seen as indicative of the rest of the Bantu "package," even in the absence other evidence. Yet, the archaeological evidence, such as that described above, suggests that the various technological innovations associated with fully developed, specialized food production did not move together but may have developed and spread independently of each other (Ambrose 1998; Bower 1991; Cohen 1970; Ehret 1998, 2001; Marean 1992; Mehlman 1989; Odner 1972; Prendergast 2011; Sadr 1998; Salas et al. 2002; Vansina 1995). For example, domesticates likely entered eastern Africa from the north and pottery was likely invented locally at least twice. Perhaps, the only novel technological aspect of the spread of Bantu languages was metallurgy, but this, too, is debated due to persistent doubts about radiocarbon dates from early Iron Age contexts.

Nonetheless, several pottery traditions emerge at approximately the same time across central, eastern, and southern Africa, and these are in some cases associated with agriculture and the use of iron. In eastern Africa, linguistic analysis points toward the Great Lakes Region as being the geographic origin for the "Eastern Stream" of Bantu languages. Likewise, the seemingly sudden appearance of "Dimple-based" or Urewe pottery (as it is now known) occurred in this region by 2500 BP and was hypothesized as having been linked to Bantu expansion (Ashley 2010; Hiernaux 1962; Leakey at al. 1948; Posnansky 1961). The linguistic and archaeological links between the Great Lakes and present-day Cameroon remain unclear. Urewe pottery appears along with elaborate ironworking technology, but recent work by Ashley (2010) demonstrates that the pottery was neither uniform nor necessarily associated only with domesticated plants and animals. Surprisingly, very little direct evidence of agriculture or pastoralism has been found in eastern Africa in association with early Iron Age pottery, although limited archaeobotanical evidence, such as seeds and pollen, suggest that agriculture was practiced (Ambrose et al. 1984; Giblin & Fuller 2011; Mitchell 2002; Pawlowicz 2011; Schmidt 1997; Van Grunderbeek & Roche 2007).

Early Iron Age wares appear to be replaced by Later Iron Age wares by 900-1100 BP (800-1000 AD). Phillipson (1977) and Huffman (1989, 2007) have argued based on ceramic analysis that all Iron Age ceramics of eastern Africa can be traced back phase-wise to Urewe ware (and, by extension, the rest of the Bantu "package"). The Nkope Branch appears to have spread lake-to-lake along the western Rift Valley, entering southern African between 1500 and

1000 BP. The Kwale Branch follows the Indian Ocean coast southward over approximately the same period, giving rise to the early Tana wares of the Swahili Coast along the way.

Phillipson (1977:142-152, 227-230) suggests that Early Iron Age society lived in semi-permanent villages built of wattle and daub. Burial practices and grave goods suggest that significant wealth was unequally distributed in society but that this does not necessarily indicate political centralization. Cattle appear to have been relatively late additions to an agro-pastoral food-getting repertoire that also exploited wild resources. Gold and copper were used in some areas in addition to iron. He also suggests that trade with coastal regions was limited and indirect, although this has been questioned in recent years through the appearance of robust and long-running trade networks between the interior of southern and eastern Africa and the coast (Walz & Dussubieux 2016; Wood 2016). A large-scale shift in ceramic traditions to roulette-decorated pottery has been used as an chronological indicator marking the Later Stone Age. Although some regional archaeological records begin to exhibit characteristics that seem to match oral histories of present-day Bantu-speakers, Phillipson (1977) notes that one should not presume that a direct link can be made between artifacts and contemporary inhabitants. Rather, he suspects that Later Iron Age diversity was likely driven by contributions from many linguistic groups and cultural traditions. This assertion has been supported by recent research on localized archaeological records that indicates that no clear, consistent, or straightforward relationship exists between food-getting repertoires and *fossiles directeurs* previously seen as indicative of LSA and Iron Age culture-historical groups (Crowther et al. 2018).

Part III: Modeling Forager and Food-Producer Relations

Transitions from foraging to food production and the subsequent relations between foragers and food producers are the subject of significant discipline-wide debates that have generated both biological and social scientific approaches (Hayden 2009; Ingold 1986, 1988; Marshall and Hildebrand 2002; Smith 2015; Wilmsen 1989; Wilmsen & Denbow 1990). Figure 2.1 illustrates the relationship between many of the models used by Africanists in recent decades (some of which, but not all, will be discussed in more detail below). In this heuristic device, each column contains a model developed within or used frequently by a particular discipline. For example, whereas the demic diffusion model arose in genetics and focuses on genes, the demographic subsistence model was developed to span archaeology, history, linguistics, and genetics. Dark lines between rows indicate major differences between models, whereas dotted lines indicate that the models have certain similarities. For example, the dotted line between the demic diffusion and demographic subsistence models indicates that they are broadly aligned in their understanding of the drivers of genetic change at a population level. Although the models of parallelism and symbiosis can be understood as kinds of a static frontier, they differ in their characterization of forager sociality after the emergence of food production. In Figure 2.1, I have divided the models into two overarching categories: those of techno-ecological functionalism versus commodity relations and status. In the former set of models, those groups most capable of supporting the largest populations necessarily achieve political dominance. The latter set of models does not necessarily contradict this assertion, but they are more concerned with how regimes of value form and guide political relations. While both demic diffusion and historical materialism, for example, have been critiqued as deterministic, I suggest that they have fundamentally distinct notions of political life. This is, of course, an overly simplistic summary of the literature, but I believe that it roughly approximates the vast majority of scholarship on African foragers and their relations with food producers. Whether and how “anarchic” models of forager sociality will be incorporated into the scholarship on the spread of food production in

Africa remains to be seen. In the following sections, I will focus most heavily on models of food-producing frontiers and political economic mosaics.

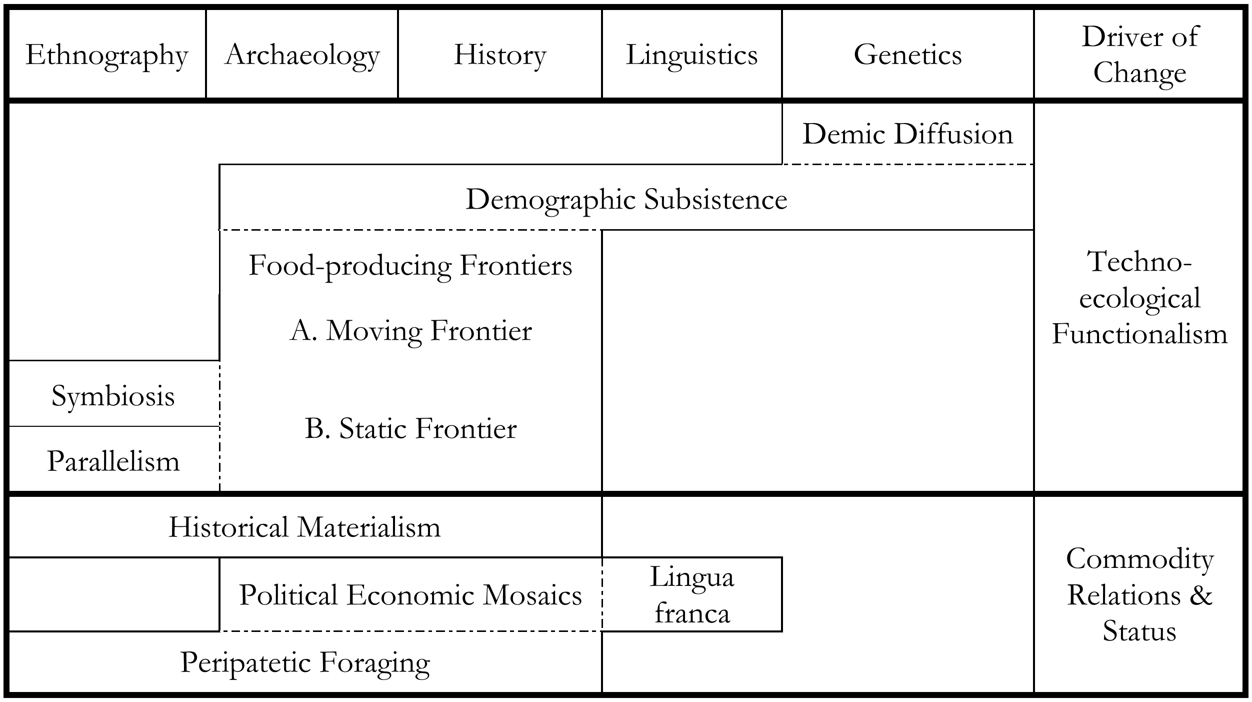

Figure 2.1: Interdisciplinary models of forager and food-producer relations in Africa

Drawing mainly on ethnography and recent history, Africanists have asserted that extant foraging communities survived through a variety of strategies. These can be categorized into three overarching categories. First, there are a variety of frontier models ("moving," "static," and "internal") that describe deliberate and mutual isolation in geographic or ecological refugia (Alexander 1977; Kopytoff 1987; Lane 2004; Woodburn 1982). Second, there are models that explore strategies to maintain distinct social identities among groups who, nonetheless, have become functionally interrelated. One variant is the symbiosis model, in which foragers are assimilated into complex societies as specialist producers of wild resources or as caste-like ritual specialists (Kohler & Lewis 2002; Turnbull 1983). Another variant is parallelism, in which foragers model their societies after those of food-producers in order to form strategic alliances, such as the Okiek use of Maasai age sets (Blackburn 1982; Kusimba 2003). In contrast, archaeological research has shown that the spread of food production entailed complex processes of migration, technological transfer, and social and economic exchange, with considerable geographic and historical variation. This implies that ethnographically and historically derived models capture only a subset of all cases and must be applied cautiously to archaeological contexts. Reconstructions of such milieu have been done through the use of the political-economic mosaic model, which represents the third major category (Denbow 2014; Wright 2005). The peripatetic model of foraging has a similar view of forager "entrepreneurship" and could be considered broadly identical. Studies in this tradition have examined how foragers survived by becoming mobile and flexible generalists who supplied wild resources for regional economies based on fluctuating demand (Berland and Rao 2004; Kassam 2000; see also Morrison and Junker 2002).

Food-Producing Frontiers

Models of food-producing frontier expansion have been applied extensively in northern and southern Africa, but less frequently in eastern Africa (Lane 2004; Marks et al. 2015; Murphy et al. 2001; Robertshaw and Collett 1983; Thorp 2000; Wadley 1996). Frontier studies trace their origins to a paper given by Frederick Jackson Turner at a meeting of the American Historical Association at Chicago's 1893 World's Columbian Exposition. It is difficult to overstate the scholarly impact of Turner's "frontier thesis," which has been adopted, reworked, and extended to contexts well beyond that considered by Turner. The frontier, as originally defined in relation to Euro-American expansion westward across North America, referred to "the temporary boundary of an expanding society at the edge of substantially free lands" (Turner 1962). Turner argued that the expansion of the frontier entailed more than a functional spread of technology and socioeconomic organization through amenable geographic locations. Rather, the interactions between indigenes and pioneers gave rise to a new, uniquely American, cultural and ideological spirit. The frontier, from this perspective, was both a physical space and a social process (Billington 1967).

Informed by this tradition of scholarship and drawing on ethnography, archaeology, and oral history, Alexander (1977, 1984a, 1984b) and Kopytoff (1987) developed models attuned to the specificities of sub-Saharan political transformation. Whereas Kopytoff's "internal frontier" described the rise of new polities in the interstices of existing complex societies, Alexander's "moving" and "static" frontiers were meant to describe the initial spread of food producers into lands occupied by indigenous foragers. Alexander (1977) asserted that several aspects of frontier expansion were consistent across known examples. For example, although frontier zones affect the core regions of parent societies, pioneers shed "cultural baggage" as they move beyond areas of easy control, often taking on the social and economic forms of the groups encountered in new lands, and upon whose knowledge they initially depend. Frontier egalitarianism between long-term inhabitants and newcomers gradually gives way as productive lands are exploited, given the bounds of geography and climate. The end of this moving frontier gives rise to a static frontier, which is a crisis point for both food producers and foragers. If foragers survive, it is through deliberate isolation in ecological refugia or full assimilation as specialist producers (the latter of which has been described by the symbiosis model). Food-producers may expand or remain stable using a variety of methods (such as new cultivars or more intensive techniques), but the absorption of surplus population eventually causes structural instability and facilitates the elaboration of social complexity, further endangering foragers.

As illustrated in Table 1.1, Lane (2004) translated a model of frontier expansion into its expected material correlates. This model supposes that migrant food producers will initially inhabit small, dispersed, transient camps (i.e. single-component sites) with occasional traces of domesticates or exotic goods. Their material culture will otherwise resemble indigenous foragers, whose landscape-level artifactual patterning will remain unchanged. Over time, migrant settlements will become larger and inhabited for longer, possibly creating multi-component sites. More intensive food production will leave discernible traces in environmental proxies, and the ratio of domesticates and exotic goods will increase in comparison to earlier phases, indicating stronger relations to a migrant group's sociopolitical and economic core. Indigenous forager sites will begin to show evidence of specialization, such as reduced diversity of species used, or spatial restriction to certain parts of the landscape. As this moving frontier becomes a static frontier, sites inhabited by food producers will begin to fill in productive areas, and evidence of intensive methods, such as irrigation or manuring, will appear. There may also be evidence of increased violence and social stratification. Forager assemblages will either disappear from the archaeological record or clear spatial boundaries will be observed across contemporaneous material culture assemblages.

One limitation of frontier theory is that it prefigures the very categories Africanists have sought to avoid (i.e. discrete ethnic groups composed of techno-economic specialists who are then projected into the past) (see Lane 2004:245). As such, there is a risk that "mixed" assemblages containing both evidence of foraging and food production may be misread, for example, as evidence of a moving frontier as one population enters another's territory. They may instead reflect a long-term, resilient, and flexible system that incorporated multiple groups or a single group with a socially determined division of labor. The interpretive simplicity of frontier models is appealing. However, it has become increasingly clear social, linguistic, and techno-economic change may have operated independently of each other in eastern Africa (Lane 2007).

We must, therefore, ask whether the goal of archaeological inquiry is to develop parsimonious models or to understand past lifeways in and of themselves (Kusimba 2005).

A similar conceptual challenge is that frontier theories (from Turner's thesis to its adaptations in Africa and elsewhere) were not designed or intended to seriously account for foragers or pastoralists. To explain why frontier models may not be able to account for hunter-gatherers (or decentralized food producers), Feuer modulates the discussion of the seemingly universal link between corporeal experience and territorial behavior. Drawing on Soja (1971) and a longer tradition of anthropological inquiry, Feuer (2016:6-7, 42-43) asserts that in "archaic and traditional societies," the conceptual organization of space reflects the ideologies of kin-based social structure and may not map onto Cartesian space. He argues that, although a homeland core exists where sufficient food and water can be found, hunter-gatherers have little connection to the land itself. Peripheral areas overlap and, during rare encounters with other groups, they are unlikely to defend the territory. The domestication of plants and animals causes the ties to specific territories to be strengthened, although less drastically among pastoralists due to their continued mobility. Early food producers continued to organize themselves through kin-based networks, which Feuer views as inherently unstable and which, given low populations levels and abundant land, allow conflicts to be settled by "voting with one's feet." It is only when sufficient population density is reached that limits on expansion lead to a shift toward non-kin-based political forms with tightly integrated institutions rather than kin-based organization. And it is these forms of social organization that are the most likely to leave behind the kinds of "archaeological cultures" that can be used to define and track both cores and peripheries through space and time via stylistic typologies and artifact density maps (Feuer 2016:34-35).

As noted above, great variation existed in the social organization of African foragers, and the initial spread of domesticates in eastern Africa appears to have been associated with pastoral economies responding to unpredictable environments in a decentralized manner. Phenomena like territoriality, centralization, or standardization can be discerned among both foragers and food producers in Africa and these would have been context-dependent rather than necessary or automatic features of particular socio-political and techno-economic regimes. Feuer's universalisms are, therefore, suspect and the implicit assumptions of frontier theory regarding forager and pastoral sociality must be better articulated and justified (or adapted or rejected) accordingly.

Additionally, many applications of frontier models in Africa look at either vast stretches of territory and time or at a relatively small set of sites. These spatial and temporal scales may be inadequate to the task of historicizing and nuancing social, political, and economic histories in specific landscapes through time.

A final consideration is that frontier theory owes much to the colonial legacy of American westward expansion, including the presumption that foragers are passive groups upon whom history is enacted rather than agents in their own right. The conquest of the American West entailed great imbalances in power related, in part, to disease, social fragmentation, and industrialization (even if some indigenous communities exploited these processes, such as the adoption of the horse in the Great Plains). Scholars should consider whether and how the material and ideological backdrop against which this body of theory arose influences the production of historical narratives about contexts for which the conditions of American colonialism do not hold, such as much of Africa.

Symbiosis and Parallelism

Models of symbiosis and parallelism could be considered subsets of frontier theory. Frontier theory is more general in scope and focuses on both diachronic processes and end states. Both symbiosis and parallelism, which are derived from observations of central and eastern African foragers such as "Batwa" and "Dorobo" communities and the Okiek, can be understood as relatively stable states resulting from the establishment of a static frontier. The symbiosis model suggests that forager survival depends on the maintenance of social boundaries through economic specialization and the exchange of wild products or ritual services (Blackburn 1982; Kassam 2000; Kohler and Lewis 2002; Kusimba 2005; Turnbull 1983). The parallelism model suggests that foragers adopt certain institutional features of neighboring, dominant societies (Kusimba 2005). This could result from the cachet of high-status practices or, more functionally, to allow foragers to (strategically) interface with food-producers while maintaining a distinct identity (see Ambrose 1986).

Turnbull's work, in particular, has become a classic of Africanist ethnography and forager studies, but the archival and ethnographic records, however, do not suggest that these models accurately capture the past or present and relations between the Sandawe and their neighbors. It is, therefore, not deployed in the remainder of this dissertation.

Political Economic Mosaics

The concept of political economic mosaics emerged in response to growing archaeological recognition of such fluidity (Denbow 1999; Kusimba & Kusimba 2005). Whether or not they were tied to population migrations, new technologies prompted experimentation, interaction, and negotiation. This led to collaboratively constructed, integrated regional milieus that facilitated the circulation of patchy resources (da Luna 2016; Wynne-Jones 2010). Extreme economic specialization combined with strict ethnic boundaries appears to be a relatively recent phenomenon spurred by global entanglements and colonial encounters (Stahl 2004).

The scholarship on political economic mosaics has not yet produced clear interpretive frameworks akin to those of scholarship on food producing frontiers. Rather, it seeks evidence of entangled, overlapping, and shifting economic activities instead of attempting to discern successive stages or evolutionary forms (Denbow 2014). Whereas the frontiers scholarship tends to view population migrations and the introduction of exotic goods as linked phenomena, the mosaics scholarship is interested in shifts in the directionality and intensity of trade through time, as well as their association with other artifact classes. Advocates of this model construct a view of past social relations and their transformations based on artifactual analysis. This view is then compared to non-archaeological evidence, such as historical linguistic or genetic data, and both convergences and divergences are identified across these datasets. Changing artifact frequencies and distribution can reveal instances of specialization and ethnogenesis, while find-grained comparative linguistic analysis can track technological exchange, and genetic data can reveal population-level dynamics that may have been ethnically inflected. For example, linguistic evidence indicates that the adoption of livestock by the Sandawe was halting (Ten Raa 1986a, 1986b), and this can be compared to zooarchaeological evidence.

A limitation of the political economic mosaic model is that it is so capacious that it becomes analytically imprecise. Nor can this model account for the eventual dominance of agro-pastoral systems. Ironically, the overly broad metaphor risks flattening the diversity of archaeological landscapes by giving insufficient attention to regimes of value and the production of inequality. Even if forager and food producer relations were diverse, mosaic models do not yet seem capable of explaining the frequent, if gradual, material and ideological dominance of food production.

Eastern African Case Studies

Generally speaking, frontier models have been used in eastern Africa to describe the initial spread of domesticates, whereas the mosaics concept has been applied mainly to early modern history and the colonial period. In this section, I briefly summarize these studies, moving roughly from north to south and from older to more recent time periods.

As noted above, there is evidence that the introduction of domestic livestock near Lake Turkana entailed both migration and exchange networks (Ndiema et al. 2010). Monumental cemeteries, often containing upright pillars and cairns, that appear on both sides of the Lake Turkana have been interpreted as evidence of a "moving" frontier (Grillo and Hildebrand 2012; Hildebrand et al. 2011; Lynch and Robbins 1979; Nelson 1995; Sawchuk et al. 2018). Early pastoralists may have been migrants or resident foragers experimenting with animal herding. Sawchuk et al. (2018) argue that these early pastoralists likely faced novel social and environmental challenges that they addressed, in part, through increased investment in cooperative social networks, exemplified in the production of these monumental features.

The first appearance of domesticates in Kenya's Central Rift Valley preceded specialized pastoralism by 1,000 years and appear in what are essentially forager contexts (Lane 2004). During that millennium, some contexts show a deliberate effort by foragers to adopt livestock, whereas other groups seem to have acquired livestock through trade or, perhaps, theft. Still other sites show a growing reliance upon domestic livestock followed by a resurgence of foraging. It should be noted that this could also indicate a symbolic role for certain kinds of animals that, perhaps, brought groups together or encouraged some level of herding, but no clearly ritual contexts have been found at these sites. After 3000 BP, there appears to be territorial and possibly ethnic divisions between SNP, Elmenteitan, and later Eburran groups in multiple areas throughout the Central Rift Valley, which Lane (2004:255) suggests may have constituted static frontiers, some of which may have lasted into the 1900s. It should be noted, however, that this pattern could also be understood as diverging from frontier theory because all groups experimented as new technologies and populations appeared on the landscape. Nor is it clear based on current evidence that an initial population of foragers was the same population that later came to specialize on foraging after this period of experimentation.

Lane speculates that western Kenya may have also experienced multiple frontiers advancing from different directions, although his review was made more difficult by the considerable mixing of deposits at many sites. An analysis of site types and landscape occupation suggests that a "moving frontier" of food-production may have entailed an initial but insubstantial influx of migrants, as well as behavioral changes among resident foragers and exchange between foragers and food-producers. Based on an analysis of obsidian exchange, Frahm et al. (2017) suggest that resident foragers traded with food-producers without becoming fully assimilated into their lifeways. Although some deeply stratified sites show experimentation akin to that of the Central Rift, others have more distinct cultural horizons, which could indicate the successive replacement of relatively specialized economies.

Given the widespread evidence for experimentation and "hybrid" economic forms, Bower (1991:74) suggests that the southward spread of domesticates beyond the Lake Turkana basin followed a pattern better described as "trickle-and-splash" than the "bow wave" hypothesized by frontier theory. He suggests that Kopytoff's (1987) "interstitial frontier" better captures this dynamic than Alexander's (1977) "moving" and "static" frontiers. The diversity of lithics across SPN sites could lend support to such a hypothesis, for example, if autochthonous foragers who adopted pastoralism produced these sites (possibly along with small groups of relative newcomers) rather than groups of migrating herders alone.

Northern Tanzania has been described as a rather extreme version of a frontier. On one hand, the early dates for both Urewe ware near Lake Victoria and Kwale ware in southeastern Kenya have been interpreted as evidence of a rapid expansion of Bantu-speaking agriculturalists from Cameroon to the Indian Ocean. On the other hand, the lack of pastoral sites in northern Tanzania has been interpreted as evidence that the southward migration of pastoralists slowed down in this region. Gifford-Gonzalez (1998) has suggested that ecological factors, such as forest belts infested with tsetse fly, were behind this temporary delay in the movement of domesticates into southern Africa. Huffman (1989) has suggested that rapid movement of ceramics indicates that farmers quickly established dominance across this belt, imposing social and political barriers to the expansion of pastoralism.

Conclusion

This review makes clear that the archaeological record of Tanzania serves as an edge case for regional culture-history. While it is true that some regions and topics are relatively unstudied in Tanzania, which complicates comparisons to other reasons, it is also true that recent archaeological work in the country has profoundly challenged our understanding of many aspects of human history, from foraging to food-production. Landscape archaeology is one method through which to continue generating the novel archaeological datasets that will be necessary to re-center Tanzania (and Africa, more broadly), in interdisciplinary theorizing about the human past.

Chapter 3

Landscape Survey and Culture-History

As described in the Introduction, Ten Raa (1969, 1970, 1986a, 1986b) and Newman (1991/1992) can be read synthetically to provide an account of the adoption of food production by ancestral Sandawe that is amenable to applications of frontier theory. To briefly summarize, although the Sandawe homeland does not have obvious barriers to entry, migrating groups are thought to have found the area marginally less conducive to food production, thereby leaving ancestral Sandawe in relative isolation. Early farmers may have preferred upland forest or savannas with richer soils, whereas early pastoralists may have sought better forage and browse than could be found in locally widespread *Brachystegia* woodlands. The region did see occasional settlement by pioneers and refugees, but these individuals and groups were eventually incorporated into the Sandawe. Various lines of evidence can be read to argue for either an early, intermediate, or late onset of food production. Early experimentation with agriculture and pastoralism was tenuous but ultimately allowed the Sandawe to grow enough in population to, at first, absorb newcomers and, later, retain cultural autonomy in the face of intensified contact with others in the 1800s and 1900s.

Many facets of this historical reconstruction, which is based predominantly upon ethnographic, oral historical, and linguistic evidence, would have produced material indices that are potentially visible and testable archaeologically, such as the timing, directionality, and intensity of changing food-getting repertoires and political and economic interactions. Triangulating the archaeological materials generated through my fieldwork with interdisciplinary datasets and interpretive models necessarily requires a robust, regional space-time matrix in which to situate artifactual assemblages. After describing my survey and excavation methods, this chapter describes the assemblages recovered through on- and off-site survey and excavation and provides a site inventory. I also propose a regional chronological framework based on radiocarbon dating (obtained from charcoal, ostrich eggshell bead blanks, and slag) and other material analyses. I then describe the results of ceramic analysis and offer a history of landscape occupation. In the final section, I briefly consider these results in relation to the dissertation's questions concerning the onset of food production and its spread across the Sandawe homeland. The implications of these findings will be examined in more detail in the Conclusion, but I argue that food production had an "early" onset (prior to 1500 AD, following the timeline as described above and in the Introduction) and that landscape occupation through time does not support the existence of a "moving" frontier, as typically understood, nor does it follow a northwest-to-southeast trajectory.

Part I: Survey & Excavation Methods

Conducting large-scale, long-term archaeological fieldwork in rural Tanzania presents a number of financial, logistical, and other challenges. In order to encourage others by providing a realistic account of these challenges and how they can be addressed, Appendix A provides a detailed description of the iterative process through which both daily logistics and my field methods were refined in relation to changing conditions. To briefly summarize, the first season of fieldwork from July 2015 to July 2016, and the second season of fieldwork, from July 2017 through March 2018, occurred under drastically different weather conditions. Although an El Niño weather event subjected south central Africa to severe drought in 2015, it brought atypically early and heavy rains to eastern Africa (including the semi-arid interior) that continued nearly unabated between October and June. In contrast, the second season of fieldwork occurred under moderate drought conditions. Survey and excavation methods were designed to balance the various concerns discussed in Appendix A while continuing to generate relevant archaeological assemblages and maintaining positive community relations. To ease daily logistics, the core research team lived in and near the village of Kwa Mtoro, the largest and most centrally located administrative center.

The size of the core fieldwork team varied slightly across both seasons and was limited to the number of people (nine) who could safely be transported in the field vehicle. During the first season of fieldwork (2015-2016), I drove the vehicle, and the core team consisted of myself, Dr. Emmanuel Bwasiri of the Antiquities Division, and six individuals who reside in and near Kwa Mtoro (Selestin Afa, Degera Chima, Joseph Chima, Marselin Deo Leba, Beatus Tamba, and Juve Gregor). We were joined in April 2016 by Henriette Rødland, a graduate attaché of the British Institute in Eastern Africa, which is headquartered in Nairobi. During the second season of fieldwork (2017-2018), I hired a driver and mechanic with significant experience on archaeological projects (Shabani Pingu), and Amon Mgimwa served as the Antiquities representative. Joseph and Juve had moved to pursue opportunities elsewhere in Tanzania, and so Raymond Mateye and Rukia Dihigo, two recent graduates of the undergraduate archaeology program at the University of Dar es Salaam, took their place on the team.

The survey universe consisted of six, 10 x 10 km quadrants (for a total area of 600 km^2). Following Ten Raa (1969), the survey universe was stratified into a northwestern, “acculturated” sector and a southeastern, “unacculturated sector,” each of which contained three quadrants. Newman (1970) identified six vegetational zones that correspond in large measure with five sediment types. The most accessible portions of the homeland are comprised *Brachystegia* woodland, which dominates on hill ranges, and *Acacia-Commiphora* woodland and thicket, which dominates in low-lying areas and valleys (Newman 1970). The survey universe could not be stratified such that every vegetational community and sediment type was represented because rarer communities were located at considerable distance from Kwa Mtoro, but each of the two sectors (northwest and southeast) was further stratified into upland and lowland sub-sectors in order to account for possible differences in occupation and food-getting repertoires related to elevation. In each sector, one of the three quadrants was placed selectively over areas known to have been inhabited during the early colonial period.

A variety of off-site, on-site, and opportunistic surveys were then conducted in each quadrant. "Off-site" refers to strategies that account for Foley's (1977, 1981) proposition that the archaeological record is spatially continuous, and "on-site" refers to place-based approaches that give primacy to concentrations of artifacts and features thought to preserve evidence of past human activity. Off-site approaches included shovel test pits (STPs) and "dog-leash" collections (DLCs) in 500 m x 2 km transects. Quadrants and transects were selected through a constrained randomized sampling procedure, which is described in more detail below. On-site survey consisted of pedestrian survey in active and recently abandoned agricultural fields in each of the six 10 x 10 km^2 quadrants (Figure 3.1). Rockshelters were surveyed opportunistically using information that was contained in the scholarship, provided by Imogene Lim (who conducted a rockshelter survey in the Sandawe homeland during the 1980s), and reported to the research team by community members. Finally, a limited number of excavations were conducted at rockshelter and open-air sites. Although the assemblages obtained through these strategies cannot be directly compared to each other through statistics due to the differences in the sampling strategies employed, they nonetheless allow for the archaeological landscape to be examined through multiple chronological and spatial lenses.

Figure 3.1: A typical vista demonstrating visibility in a recently fallowed field.

Using topographic maps, A 10 km^2 grid was placed over the bulk of the Sandawe homeland in order to select three each within the northwestern and southeastern sectors (for a total of six quadrants and an area of 600 km^2). The northern third of the homeland, which overlaps with the Swaga Swaga Game Reserve, was excluded. Although the reserve has long been known to contain archaeological sites and survey has been conducted there in recent years (Fozzard 1959; Grzelczyk 2019, 2021; Ten Raa 1974), I chose to exclude it for a variety of financial and safety concerns. Survey in the reserve would have entailed extra permitting costs and wages for guards, and the reserve is home to tsetse flies and growing populations of large carnivores. I then categorized the grid cells (quadrants), as consisting predominantly of hills or level ground and valleys. Quadrants that had been determined to be inaccessible due to a lack of passable roads or excessively long travel times were removed from consideration (Figure 3.2). After this exercise, eight quadrants remained in each sector, and it was observed that one quadrant in each sector significantly overlapped the "line of acculturation." Two lowland quadrants remained in the northwest and two upland quadrants remained in the southeast. Coincidentally, one quadrant from each of these pairs also contained a settlement that had been occupied since at least the late 1800s. These four quadrants were, therefore, included for survey. The remaining five upland quadrants in the northwest and five lowland quadrants in the southeast were numbered sequentially from west to east and from north to south and a random number list was used to select the final quadrant in each sector. A final modification related to the lowland quadrant in the southeastern sector. Although this quadrant was technically accessible, the road at lower elevations was prone to flooding and so the quadrant was shifted 5 km to the north in order to avoid travel delays, as well a hillier area directly to the north.

A similarly iterative process was completed to select three transects for STPs and DLCs within each of the six quadrants (for a total of 18, see Figure 3.3). Rather than a 1 km^2 block, as originally proposed, I shifted to a 500 m by 2 km rectangle in order to increase the ratio of the perimeter to the area, which increases the likelihood of encountering archaeological scatters that intersect with, but are not fully contained within, a survey area. In order to simplify the process, I oriented all transects from east to west in the northwestern sector and north to south in the southeastern sector, but, in retrospect, I would have developed a system to randomize this orientation. Grid cells were drawn by pencil in each quadrant on topographic maps. The first transect in each quadrant was placed selectively over an area with high archaeological potential. In the northwestern sector, these included the Takwa salt production site and the villages of Ovada and Kwa Mtoro. In the southeastern sector, these included a salt production site near the village of Sanzawa, an area between the archaeological sites of Lelesu and Bage (both of which were first recorded by the Kohl-Larsens in the 1930s), and the village of Farkwa. The remaining grid cells in each quadrant were numbered sequentially from west to east and north to south. In each quadrant, two transects were selected. If the transects were located more than 2 km from a passable road or if over one half of its area included a hill, the transect was shifted the shortest distance possible in any cardinal direction until these conditions could be avoided. This served two purposes: First, it limited the amount of time required to reach each transect after arriving in the quadrant, allowing us to cover more ground each day, and thereby reducing costs; Second, it reduced time spent on difficult hillsides. An additional quirk of the offset quadrant in the southeast is that the two halves of one transect were misaligned due to a transcription error. This transect was surveyed over two days and we did not notice the error while in the field.

This system did not, of course, produce a truly randomized sample, and potential biases can certainly be identified. For example, level land and valleys between hills tended to resemble hill bases in terms of vegetational communities, sediment types, and elevation. Flat areas on hilltops, which have a unique combination of vegetation and sediment, and relatively level saddles between hills were systematically excluded. The broad, flat peneplains that surround the two major hill ranges in the Sandawe homeland are characterized by their "black cotton soils," which are impassible when wet. Several stands of a vegetational community unique to this region of eastern Africa, which is known as Itigi thicket, were also unreachable. These two ecotypes were, therefore, also systemically excluded from representation. Finally, the road network services the most densely populated areas of the Sandawe homeland. The survey universe, then, was biased toward relatively flat areas of modest elevation and higher population (by local standards). However, this process provided the closest approximation of randomization that was possible under the circumstances while also maintaining my research goals and, crucially, balancing constraints on time, money, and the crew's goodwill.

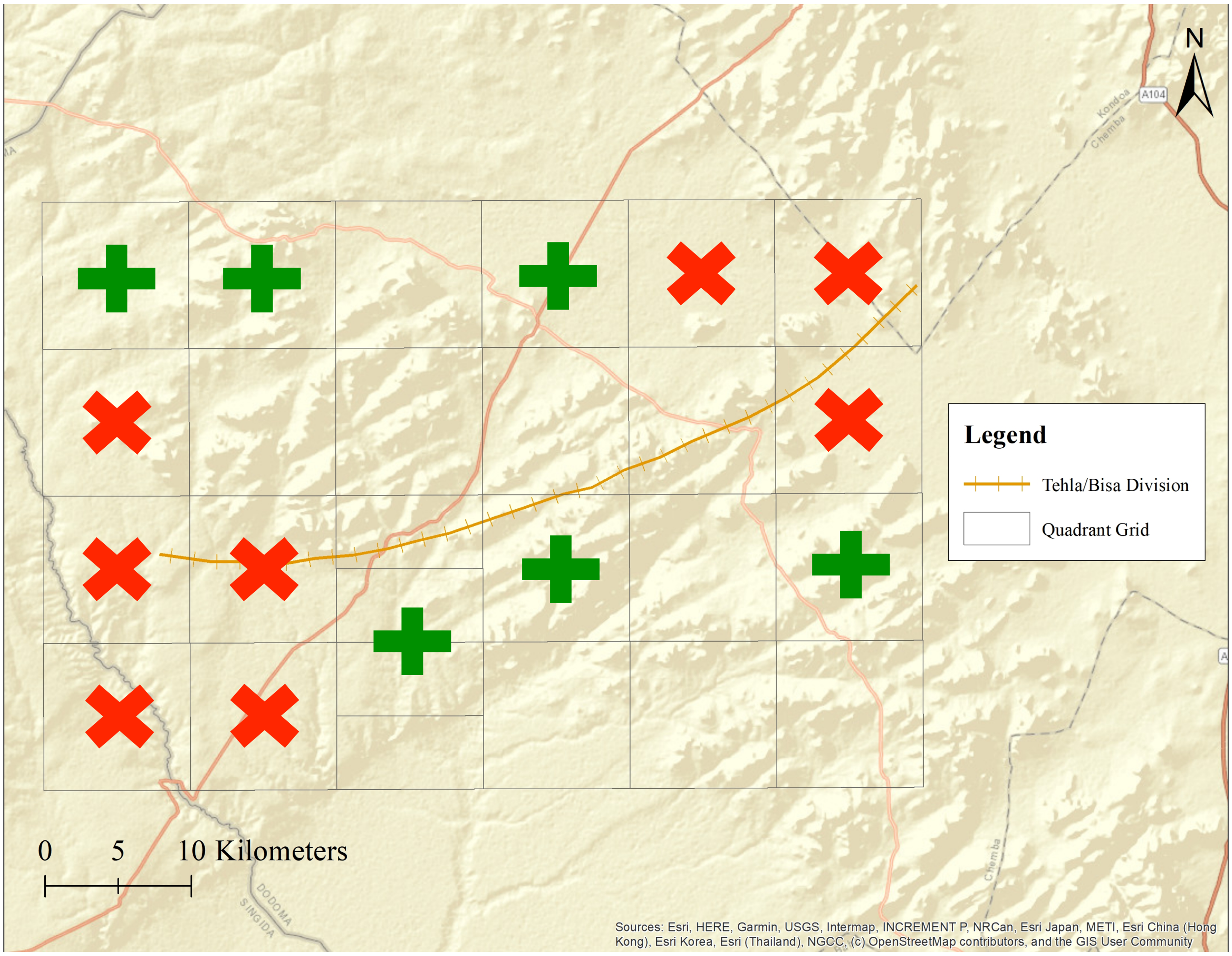

Figure 3.2: Survey universe grid. Cells marked in red were inaccessible in 2015 and 2016. Cells marked in green were selected randomly for survey.

Educational Outreach & Community Engagement

During the first season of fieldwork, I organized several educational outreach events, but it became clear that more would be needed to build strong relationships with local communities. The STP survey, in particular, caused alarm among residents because Tanzania has experienced conflicts between communities and a variety of extractive industries in recent years. Although many individuals recalled my earlier ethnographic work in 2005 and 2006, there was widespread concern that we were surreptitiously conducting geological prospecting. This realization prompted us to stop using flagging tape and pin flags, and we reiterated to local officials and residents that they could join us on survey at any time to get a sense of our work (several individuals did join!). Further, residents expressed concern that wages and other financial benefits of the research project were benefitting mainly those who live in and near Kwa Mtoro.

To address these issues, I organized meetings in each village that intersected the six survey quadrants. For each of these approximately 20 meetings, village councils invited at least 15 to 20 adults known to have great familiarity with the area, regardless of ethnicity, religion, etc. (I requested that they attempt to encourage an equal mix of genders). These meetings, which were held in August and September 2016, were public and all other interested individuals were welcome to attend. At these meetings, the team and I introduced the goals of the project and discussed the purpose behind each research strategy. We also explained the kinds of information that could be derived from various material analyses (my knowledge of Swahili did not allow me to explain radiocarbon dating, but the team other members did so excellently!). Participants were shown and encouraged to interact with examples of materials collected during the previous field season, such as ceramics, lithics, animal bone, glass and shell beads, ochre, iron, and slag. During these meetings, many individuals wanted to alert us to the existence of landscape features of potential archaeological and ecological importance or other phenomena of cultural significance. These included: artifact scatters; rockshelters containing rock art, cave drums, or other material culture; sources of salt, clay, and iron ore; stone quarries; permanent and ephemeral water sources and wetlands; local clans and their sacrificial sites; and other notable sites (such as rock gongs). We began recording this information and soon had a list of over 200 landscape features and other phenomena. This reinforces the need for and benefits of archaeological projects that explicitly seek to build community relations at all stages of the research program. This is especially critical when archaeological research is conducted among residents for whom the landscape is living heritage.

One idea that was proposed during these meetings was to train a small number of residents in each community in survey and excavation techniques. Although this would entail a greater cost, the second field season was shorter than the first, and so I had more money to spend each week. Further, it would allow me to cover more ground each day, and it gave the core team members more flexibility to take time off and attend to other tasks, such as field preparation. Funds allowed for three teams of five to six individuals. Two core team members lead each walking crew. Village leaders selected the remaining three to four members. I requested that these individuals include a balance mix of age and gender from as many sub-villages or neighborhoods as possible. Further, I asked that leaders give preference to individuals who would have time and interest but who were also likely to benefit from a small influx of cash, which can be difficult to acquire in rural communities. The first morning was spent training these individuals in the basics of pedestrian survey. These crews were extraordinarily effective and play a critical role in the recovery of a remarkably diverse array of assemblages.

During 2016, members of the core research team conducted excavations at Merebu 1 and Msembere 1. In 2017, approximately 15 community members assisted with the excavation at Gekuma 1 and three assisted with the excavation at Guguse 1. As with the pedestrian survey teams, local leaders were again asked to identify a representative group of interested individuals, and this was done with the intent of increasing familiarity with archaeological practice and broadening the economic benefits of the project. All individuals were trained in each aspect of excavation and processing and had an opportunity to rotate through the various tasks.

Off-site, Surface and Sub-surface Survey

As noted above, the revised survey universe consisted of six quadrants that measured 10 x 10 km, or 100 km^2 each, for a total of 600 km^2. The eighteen transects represented 3% of this area, or 0.79%, if the calculation is based on the area of the DLCs, which were 10 m in diameter. Initially, one individual walked ahead of the team and marked points with pin flags using the single GPS handheld device available during the first field season. It was difficult to see the flags in areas of dense vegetation, and so we ultimately opted for a relay system in which we would "leap frog" each other, collecting the device along the way to our next point from the team at the end of the line. The team preferred to dig the STPs using a *jembe* (akin to large hoe on a short handle) because it was too difficult to dig through coarse sediments with a shovel. This meant that a standard STP was a rectangle 35-50 cm wide and 65-75 cm long. We could easily reach 75 cm in depth within 15-20 minutes, and, although it was possible to reach 1 m in depth in loose sediments, it was typically difficult due to the *jembe*'s angle of attack.

Processing the large amount of sediment brought to the surface created another set of challenges. Due to rains, it was often impossible to pass the material through purpose-built, handheld sieves, and so we hand sorted the sediment. This was the single most time consuming aspect of the survey and undoubtedly reduced the rate of artifact recovery. Similarly, the team found it unwieldy to carry sticks with 5 m lengths of string attached for the purpose of the DLC. I had trained the team to measure distance using natural paces, and so we opted to estimate the area in which surface finds would be collected.

An additional consideration was the level of detail that could be included on the fieldwork forms. Rather than detailed stratigraphic information, the forms focused on a rapid assessment of key details, including dimensions, sediment and vegetation type, visibility, and whether artifacts were present or absent. When artifacts were present, sub-surface and surface finds were bagged separately, and the coordinate of the point was written on a tag in each bag. With a team of eight to ten, we could complete 50 STPs and 50 DLCs in six to eight hours, although 30 of each was more typical. Due to time constraints, I spaced the STPs and DLCs 100 m apart. This was not ideal given that we would only be likely to find all sites a hectare or larger, but this allowed me to balance geographic coverage with other constraints. We were generally unable to revisit transects with the aim of determining whether positive STPs and DLCs were indicative of larger, site-based concentrations of artifacts and features. Between January and May of 2015, we completed a total of 1800 STPs and DLCs across the 18 transects.

As will be discussed below, the number of artifacts recovered from the STP and DLC survey were disappointingly low, but those strategies were necessary given high rainfall and low visibility, and they provided insights into taphonomic processes and landscape occupation that would have been inaccessible through on-site survey alone, given that mode's bias toward discrete concentrations of artifacts and features rather than random sampling. Hillsides and valley floors had particularly low recovery rates and were generally difficult to access due variously to dense vegetation, a lack of sediment, or a high water table due to the rains.

On-site Survey

As time allowed during the first field season, the team would visit artifact scatters reported to us by residents. Most of these sites were located in recently cultivated fields on lower hill slopes. A fortunate side effect of the delayed start to the second field season was that survey began in earnest at the height of the dry season, after fields had been cleared and other vegetation had been grazed or burnt. Despite the improvement in visibility during the dry season, pedestrian survey remained limited because of acacia thickets regenerating in abandoned fields. As mentioned above, I had also been asked to incorporate more residents as part of the field crew. For these reasons, my committee and I decided not to continue to the STP and DLC survey or to revisit positives. Instead, pedestrian survey (at 10m spacing) focused only on active or recently abandoned fields within each of the six survey quadrants in the survey universe. When possible, we preferentially targeted fields at the base of hills. Otherwise, we began in an easily accessible field and proceeded to the next nearest field.

As mentioned above, the first morning of survey was dedicated to training the local crews in the fundamentals of pedestrian survey, typically in soccer fields, marketplaces, or other open areas near the village office. After training, we would scan the surroundings, and the first team would set off toward a prominent hill located within a reasonable walking distance (or any easily accessible field, in the case of quadrants lacking hills). The other two teams walked in a different direction toward another hill or field. These latter two teams shared a single handheld GPS device and would "leap frog" each other from field to field. Once all fields in a locale were surveyed, the teams continued to the next closest hill or set of fields. In an attempt to balance the chance that each quadrant would receive equivalent coverage, survey was conducted for about five days in each quadrant, following this general pattern.

In order to estimate total coverage, the approximate length and width of each field was recorded using paces. All scatters consisting of more than ten artifacts within 10 m^2 were considered a site. Sites were named after neighboring localities or landscape feature and numbered sequentially. Multiple scatters within 20 m of each other were considered concentrations within a larger site and given a unique suffix (A, B, C, etc.). GPS points were taken at the center of each scatter. A sketch map was drawn for the entire site and associated scatters were recorded together on the same recording form. For logistical reasons, only about one third of sites were photographed. With some exceptions, all portable artifacts were collected.

After completing pedestrian survey in all quadrants, the team conducted intensive pedestrian survey and mapping of the large, open-sites of Lelesu 1, Guguse 1, and Msembere 8. As will be discussed below, Lelesu 1 and Guguse 1 date to the mid-first millennium AD or earlier. Lelesu 1 was first recorded and excavated by the Kohl-Larsens in the 1930s, followed by Sutton in the 1960s. I relocated the site during exploratory fieldwork in 2013. Guguse 1 was reported to the research team in 2017. The individual who reported the site to us had spent weeks trying to relocate a spot where he had once come across a material that he had come to understand was slag due to his participation in the public, educational meetings. Msembere 8 was observed during rockshelter survey is located near a permanent spring and salt lick that has been heavily eroded by livestock, thereby revealing a large, deflated concentration of lithics that, based on morphological characteristics, ranges from the Middle through Later Stone Ages (and possibly the Early Stone Age). Pedestrian survey at salt production sites near the villages of Takwa and Sanzawa did not yield artifactual material.

Opportunistic Rockshelter Survey

Numerous rockshelters exist throughout the Sandawe homeland. Using geospatial software, I georectified previously published maps and those provided to me by Imogene Lim, who conducted a site-orientated study of rock art and rockshelter use in the Sandawe homeland in the 1980s. The resulting map was used to derive the approximate coordinates of approximately 100 previously recorded rockshelters. This list of rockshelters was cross-referenced with the list of sites reported to the team by residents. In consultation with village leaders, we developed schedules to maximize the number that could be visited during the same timeframe as pedestrian survey in that village. For each trip, two to three residents familiar with the day's route accompanied us. Each rockshelter was recorded using a standard form, sketch maps were drawn, and photographs taken. Full collections of artifacts were taken.

Open-air and Rockshelter Excavations

Excavations occurred at four units at three deeply stratified rockshelters and two open-air sites. The rockshelter excavations include two 1 x 2 m units at Merebu 1 and a 1 x 2 m unit at Msembere 1 in 2016, followed by a 2 x 2 m unit at Gekuma 1 in 2017. The open-air excavations consisted of a 1 x 3 m unit at Msembere 5 in 2016 and a 1 x 1 m unit at Guguse 1 in 2017. This latter excavation bisected an intact iron bloomery, leaving the remaining half in place for a future excavation, preferably with the assistance of metallurgical specialists.

Each 1 x 1 m module was divided into four quadrants, and these modules and quadrants were numbered sequentially across both seasons of fieldwork. A GPS point was taken at each datum, the surveys were mapped in relation to the rest of the sites, and each level was documented in recording forms, plans, and photographs. Most excavated material was removed in arbitrary, 5 cm spits due to the absence of natural layers and then sieved through mesh screens with apertures of approximately 5 mm and bagged by quadrant, along with a tag containing contextual information. Charcoal was collected from all excavations for radiocarbon dating. When possible, charcoal was removed from the matrix with a cleaned trowel and placed directly in foil, on which was written the contextual information. In most cases, the depth assigned is the average for the level from which the sample was collected, but, in the case of the Guguse bloomery, some samples were extracted after taking a more precise measurement of the their distance from the datum in three dimensions. Numerous samples were taken for archaeobotanical analysis. Column samples of approximately 2 L were taken from a single quadrant of each unit for macrobotanical analysis (seeds and charcoal), and samples of approximately 200 mL were taken from the profile wall for microbotanical analysis (pollen and phytoliths). Point samples were collected from features, such as suspected hearths. Profiles were cleaned and drawn prior to closing and backfilling each unit.

Curation and Analysis

During survey and excavation, artifacts were placed in bags with contextual information included on tags. Upon return to the laboratory space in Kwa Mtoro, materials were washed (unless deemed too fragile or at risk of contamination), dried, re-bagged, and stored by class at the end of each day in a secure storeroom in Kwa Mtoro. Most diagnostic artifacts were shipped to the University of Chicago for analysis after obtaining export permits from the Antiquities Division of the Ministry of Natural Resources and Tourism, as well as the Ministry of Energy and Minerals. Import permits were obtained from the United States Department of Agriculture. Most slag, undiagnostic body sherds, sediment samples from excavations, and lithics from a particularly large, open-air Middle and Later Stone Age site (that possibly includes an Early Stone Age component) remain stored in Kwa Mtoro and await future research. In collaboration with Kelsey Rooney, a doctoral student at the University of Chicago, I conducted multi-attribute descriptive and statistical analyses of ceramics focused on vessel and rim form, surface treatment, and decorative motifs. These analyses were intended to determine if quantitatively identifiable sub-groups could be discerned among the assemblage. I also conducted multi-attribute descriptive and statistical analyses of all metal objects, vessel glass, beads (avian shell, marine shell, glass, and plastic), and rock art. Dr. Fiona Marshall and Dr. Mica Jones of

Washington University in St. Louis analyzed the faunal assemblages, focusing in particular on the identification and proportions of wild and domestic species from surface assemblages. Dr. Laure Dussubieux of the Elemental Analysis Facility at the Field Museum of Natural History in Chicago conducted the analyses of glass beads and obsidian. Radiocarbon dating was conducted at the University of Arizona Accelerator Mass Spectrometry Laboratory.[1]

PART II: Site Inventory & Chronological Phasing

Off-site vs. On-site Survey

There was a relatively low recovery rate from STPs and DLCs as compared to pedestrian survey in open fields. Across all categories of material culture, more artifacts were recovered in the southeast than the northwest. The reasons for this remain unclear. Recall that Newman described much of the northwest as "Actively Induced Vegetation," which refers to areas in which early successional stages predominate due to intense human activity. It could be that more intensive cultivation has led to greater sheet-wash, possibly concentrating artifacts on the surface through deflation. It might also be possible that sites have been buried rather than destroyed, but both surface and sub-surface recovery rates were lower in this sector. Exploratory investigations of artifact counts in relation to vegetation indices (a measure of vegetation cover extrapolated from satellite imagery) were not indicative of a statistically significant relationship between land clearance and recovery, but this possibility could be examined in greater detail.

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[1] Due to the size of the lithic assemblages and the difficulty in dating surface collections, lithic analyses do not form a significant component of this dissertation but will be addressed through future research. Similarly, the vast majority of excavated materials are beyond the temporal scope of the dissertation and so will not be addressed in detail here. As noted above, an early goal of this dissertation was to examine the construction of socio-natural landscapes. A variety of sediment samples were collected from excavated contexts, including column samples (from the same quadrant in each excavated level), samples from features (such as hearths), and profile samples taken from trench walls. These samples were intended for archaeobotanical analysis, paleoenvironmental reconstruction using pollen and phytoliths, and luminescence dating (in the case of samples from excavation profiles). Due to travel restrictions implemented in response to the global Covid-19 pandemic, I was unable to return to Tanzania to process these samples for analysis, and so an exploration of changing ecological milieus cannot be addressed in this dissertation.

Site Types and Basic Chronology

In total, 304 open-air sites and 78 rockshelters were recorded (Figure 3.3, Appendix B). Most of these 382 sites were newly recorded (exceptions include Lelesu 1, the “hard clay ring” sites, and some rockshelters). Coordinates obtained by georectifying published maps and maps provided by Imogene Lim are approximations, and so it is difficult to be certain that a previously reported site has been relocated absent distinctive features of the site, but I revisited about 30 sites first reported by other scholars. Portable artifactual assemblages include: lithics; ochre; ceramics (including vessels, pipes, and tuyère fragments); domestic and wild fauna; avian shell, marine shell, glass, and plastic beads; slag and metal objects (including vessel fragments, a nail, and a bullet casing); vessel glass; and plastic objects (bottle and bucket fragments). Non-portable assemblages include: “cave drums” (discussed in Chapter 5); pictographs; petroglyphs; grindstone; and other forms of worked rock (bao boards and rock gongs).

Table 3.1: Time ranges for economic activities represented by the archaeological assemblages

Activity	Time Span
Hunting	>50 kya to present
Microlithic Production	>50 kya to 1750 AD
Ostrich Eggshell Bead Production	>50 kya to 1750 AD
Pottery Production	550 BC to present
Extra-regional Exchange	550 BC to present
Obsidian	550 BC to 1750 AD
Glass, Marine Shell, Plastic Beads	1650 AD to present
Vessel Glass	1850 AD to present
Metallurgy	350 AD to present (in the form of smithing)
Herding	350 AD to present
Gathering Plants	??? to present
Beekeeping & Honey Harvesting	??? to present
Fishing & Shellfish Harvesting	??? to present
Agriculture	??? to present
Salt Production	??? to present

On the basis of morphological and comparative analyses and radiocarbon dating, sites were assigned to broad economic activities and chronological periods (Tables 3.1 and 3.2). In most cases, I erred toward conservative chronological estimates. It is important to recall that, in recent decades, it has become apparent that many of the criteria once thought to be diagnostic of major periods of human evolution are time-transgressive (McBrearty & Brooks 2000). Lithic industries (such as Acheulian and microlithic industries) do not align with archaeological periods (such as the Early and Later Stone Ages), and archaeological periods do not themselves align with geochronological units (such as the Pleistocene and Holocene). As discussed below, this issue is of relevance for understanding the relationship between LSA and Iron Age assemblages.

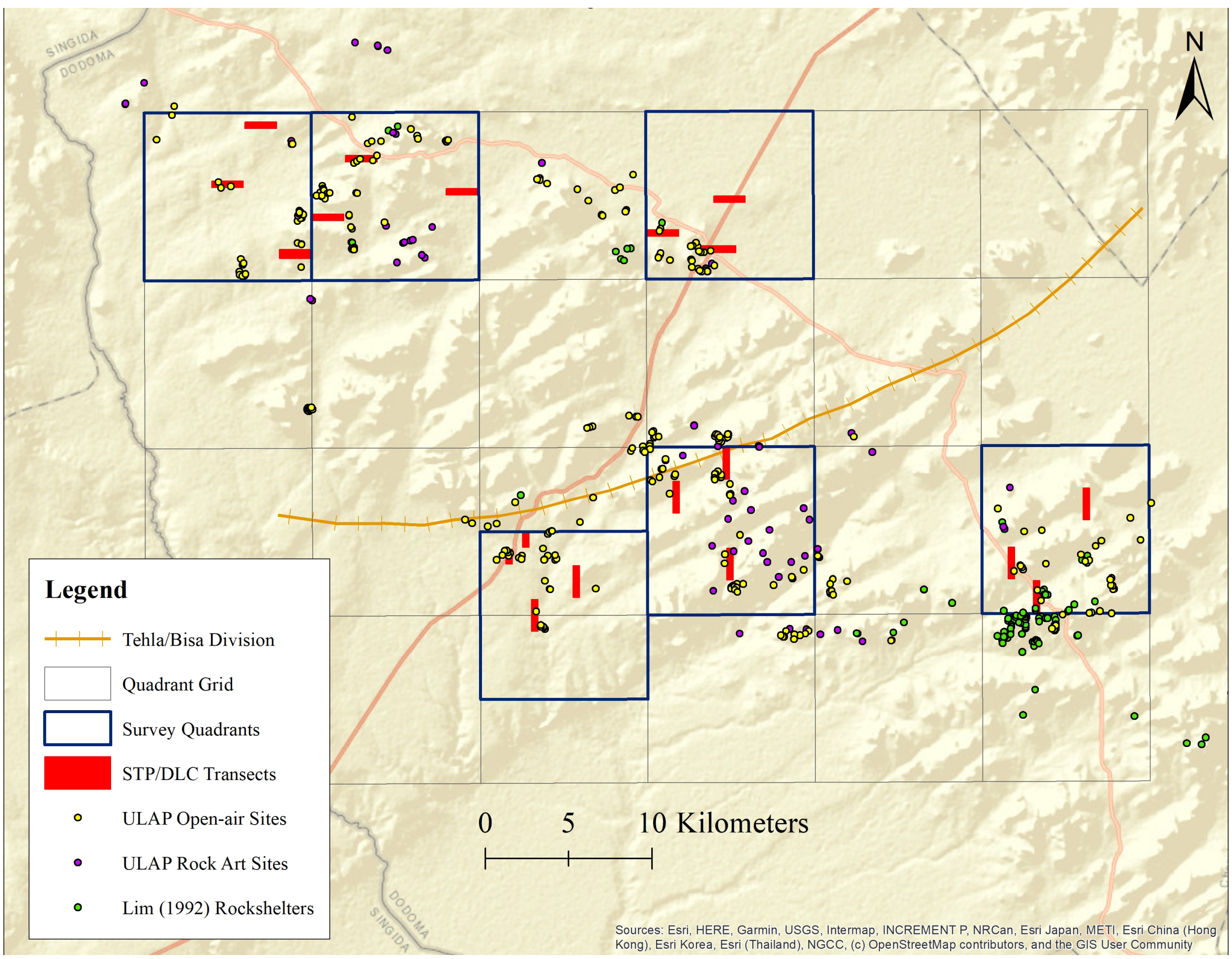

Figure 3.3: Survey quadrants showing “off-site” transects and open-air and rockshelter sites.

Table 3.2: Sites by time period and culture-historical phases

Period	Estimated Time Range		Count
	BP	**BC/AD**	
Early Stone Age	2.6 mya to 250 kya	2.6 mya to 250 kya	1
Middle Stone Age	300 kya to >50 kya	300 kya to >50 kya	1
Later Stone Age	>50 kya to <2500 BP	>50 kya to 550 BC	46
Iron Age	2500 – 150 BP	550 BC – 1850 AD	
Early Iron Age	2500 – 1600 BP	550 BC – 350 AD	16
Middle Iron Age	1600 – 300 BP	350 – 1650 AD	28
Later Iron Age	300 – 150 BP	1650 – 1850 AD	87
Historic	150 BP to present	1850 AD - present	
Historic			54
Multi-component	Variable	Variable	
Early Stone Age - Later Stone Age			1
Early Stone Age – Later Iron Age			1
Middle Stone Age - Later Stone Age			6
Later Stone Age - Early Iron Age			1
Later Stone Age - Middle Iron Age			2
Later Stone Age - Later Iron Age			15
Later Stone Age - Historic			29
Early Iron Age - Middle Iron Age			23
Middle Iron Age - Later Iron Age			5
Later Iron Age - Historic			2
Indeterminate Iron Age - Historic			20
Indeterminate	Variable	Variable	
Indeterminate Iron Age			40
Indeterminate			4
TOTAL			**382**

Early Stone Age (2.6 mya to 250 kya). Several pebbles and cobbles from Msembere 6 exhibit similarities to Oldowan tools but are heavily eroded, complicating their identification. If confirmed through specialist analyses, the oldest elements of the full assemblage recovered during fieldwork would date to the Early Stone Age, which extends from the later Pliocene to the mid-Pleistocene. Acheulian handaxes are thought to derive from the Oldowan Industry and span the Early and Middle Stone Ages (at sites ranging from approximately 2 mya to 250 kya). A small number of complete and fragmented cordate (heart- or pear-shaped) and ovate handaxes were recovered during fieldwork, one of which had been repurposed as an upper grinding stone (Figure 3.4). As with the possible Oldowan tools, all were recovered from the surface of multi-component, open-air sites with evidence of considerable erosion or mixing.

Figure 3.4: Acheulian Handaxe Used as an Upper Grinding Stone. Note the smoothed upper surface. Isolated Find at Boseto 0.

Middle Stone Age (300 kya to >50,000). Points, blades, scrapers, and other flakes made by radial or Levallois core reduction strategies were categorized as Middle Stone Age. Sites with significant Early and Middle Stone Age components were found almost exclusively as deflated concentrations on large expanses of exposed hardpan (a dense layer of sediment that is relatively impervious to water) with little vegetation. The cause of this erosion was not always immediately obvious, but several of these expanses of hardpan are large enough to be visible on satellite imagery due to their distinctive grey color. Future research could capitalize on this fact to develop a rapid survey strategy that could provide a significant savings of time and cost, although the tradeoff is that these sites are likely to exhibit the depositional and taphonomic complexities that have plagued other eastern African ESA and MSA sites (Wright et al. 2017). While preparing to excavate at Msembere 1, it became apparent that the nearby sites of Msembere 5, 6, 7, and 8 are actually components of a single, expansive concentration of artifacts. Erosion was started or compounded by livestock being brought to a permanent spring and salt lick located at the base of the hill around which these sites are located. In response, we set up an additional trench at Msembere 5 (Units 5, 6, and 7) that ran perpendicular to a heavily eroded waterway and was intended to ascertain whether an intact sequence could be obtained. A limited number of LSA lithics were recovered but the unit was otherwise sterile.

Due to the extent of erosion and the risk of trampling by livestock, we also targeted this area for intensive pedestrian survey to determine its full extent (which is about 3.25 ha). We developed a rapid survey method to balance limits on time and transport with a desire to generate a representative sample. First, a handheld GPS device was used to lay out a 10 m grid that was marked with pin flags. Each grid cell was given a unique code based on letters and numbers. The team was divided into pairs and each pair moved from west to east along a single row. Two minutes were spent quickly surveying the artifacts contained within the grid cell. At the end of the two minutes, the pair then spent three minutes collecting a representative sample, which was bagged and tagged according to its code. This process was repeated until the site's edges had been identified. This method yielded 150 kg of lithics, which await analysis in Tanzania.

Later Stone Age (>50,000 to <2500 BP?). It was once thought that the Later Stone Age was the period during which behavioral modernity emerged, and that an efflorescence of regionally distinctive microlithic traditions reflect patterns of resource use and territorial organization patterns that resemble recent African foragers (Ambrose 1998). Evidence increasingly indicates that anatomical and behavioral modernity arose together near the beginning of the Middle Stone Age, about 300 kya (McBrearty & Brooks 2000). The Later Stone Age does seem to be characterized by the emergence of various expedient microlithic traditions produced on local materials (although it should be noted that microliths have also been observed in MSA contexts). Accordingly, bladelets, backed microliths, and cores (usually less than 5 cm in length) were categorized as Later Stone Age (>50 kya to 2500 BP). Lithics categorized as Early and Middle Stone Age were produced on a wider variety of raw materials (quartz, quartzite, chert, etc.) than lithics categorized as Later Stone Age, which were produced almost exclusively on quartz.

The transition between the Middle and Later Stone Ages is a topic of debate, but a growing body of evidence suggests that it was a 15 kyr process that began by 55 kya in eastern Africa and spread outward (Ambrose 1998; Gliganic et al. 2012; Marks & Conard 2008; McBrearty & Brooks 2000; Mehlman 1989; Tryon 2018; Tryon & Faith 2013; Willoughby 2012). This places the transition just beyond the limit of radiocarbon dating. Greater precision remains beyond reach because few sites have been located that span the transition, and fewer still have been excavated (or re-excavated) by specialists in order to take advantage of other forms of radiometric dating. The excavations at Units 1 and 2 at Merebu 1 provide support arguments that the eastern African Later Stone Age predates 50 kya (Table 3.3). Quartz bladelets, backed microliths, and fauna were recovered throughout the sequence. Two dates on charcoal and two dates on ostrich eggshell (OES) fragments from the lower half of the unit reach the limit of accelerator mass spectrometry (AMS) radiocarbon limit. Fauna from lower levels was relatively heavy relative to their size, indicating that these materials had begun to fossilize.

The OES fragments were selected for dating because they had broken in two while in storage, and this avoided complete destruction of the samples while also maximizing the specimens available for future technological analyses of bead production (this logic follows that of Tryon 2018). Neither of these fragments shows evidence of production (drilling or grinding), and they are slightly larger than archaeologically and ethnographically recorded bead blanks (approximately 3 and 5 cm across rather than 1-2 cm). However, these two specimens bracket fragments that are the size of typical bead blanks, and the higher of the two dated fragments (AA115187) was recovered one context below the lowest complete OES bead. Further, all other OES fragments obtained from the unit are the size range of bead blanks, and many show evidence of drilling. Therefore, I find it reasonable to presume that the dated fragments were large blanks or “pre-blanks.” The lowest complete OES bead is bracketed by two dates that exceed the AMS radiocarbon limit. Taken together, this evidence suggests that Merebu 1 contains some of the earliest known LSA deposits in eastern Africa, including some of the oldest OES beads (Table 3.4).

The lowest dated charcoal sample (AA115185) yielded an anomalously young date, which could be due to post-depositional mixing, contamination, or excavation and curation errors. None of these possibilities can be ruled out definitively, but I suspect that it relates to an excavation error. The sediment throughout the unit consisted of dry, unconsolidated, possibly aeolian silts and sands, which resulted in extremely fragile profile walls that occasionally released materials from higher levels onto the active excavation surface. As can be seen in Table 3.3, an unconformity may exist between levels 16 and 8, and this will be investigated through additional radiocarbon dating (see Figures 3.5, 3.6, and 3.7).

Table 3.3: Accelerator mass spectrometry radiocarbon dates from Merebu 1, Units 1 and 2

Unit	Level	Quad.	cmbd	Material	Lab Number	Uncal. BP	Cal. BP
2	2	6	12	Charcoal	AA115181	97 ± 24	252 to 6
1	5	4		Highest complete OES bead (undated)			
1	8	4		Lowest ceramics			
2	8	6	48	Charcoal	AA115182	2466 ± 41	2705 to 2349
1	16	4	103	Charcoal	AA115183	>46100	AMS Limit
1	18	3		Lowest complete OES bead (undated)			
2	19	6	120	Ostrich Eggshell	AA115187	>49900	AMS Limit
2	25	5	154	Charcoal	AA115184	>49900	AMS Limit
1	26	1	158	Ostrich Eggshell	AA115186	>49900	AMS Limit
2	32	5	187	Charcoal	AA115185	342 ± 32	461 to 298

Note: Calibrated with atmospheric data from Hogg et al. (2020) and OxCal v4.4.4 (Bronk Ramsey 2021) at the 95.4% confidence interval.

Units 1-4 at Merebu 1 hold great potential for a number of paleoenvironmental and comparative studies. The faunal material includes abundant remains of tortoise (family Testudines), warthog (*Phacochoerus* spp.), land snail (family Achatinidae), and ostrich eggshell (*Struthio* spp.). Klein and Cruz-Uribe (1983) investigated changing population dynamics and hunting strategies across the MSA and LSA by examining changes in the size of tortoise bones. Warthog teeth, land snail shell, and ostrich eggshell are particularly useful proxies for paleoenvironmental reconstruction and studies of these materials have become common across Africa in recent years (Ecker et al. 2015; Goodfriend 1992; Johnson et al. 1998; Niespolo et al. 2020; Prendergast et al. 2016; Padgett et al. 2019; Reid et al. 2019). Ostrich eggshell and snail shell beads have also been used to study the emergence of macro-scale social networking (through analogy to *hxaro* exchange among southern African foragers) and changing technologies across the MSA and LSA (Kandel & Conard 2005; Miller et al. 2018; Mitchell 1996; Orton 2008; Stewart et al. 2020; Tryon 2018)

The assemblages at Msembere 1 (Units 8 and 9) and Gekuma 1 (Units 10, 11, 12, and 13) contain abundant bladelets and other microliths but relatively few faunal remains. At Msembere 1, this is likely related to a high water table associated with the aforementioned spring. The excavation at Msembere 1 was halted at just over 1 m in depth despite the continued presence of artifacts because of standing water in the trench. The crew was initially quite excited by Gekuma 1 because its flat, shady floor was easily accessible and protected by a broad drip-line, all of which seemed to offer optimal conditions for an excavation. It also appeared to harbor a rich assemblage because the surface was covered in a dense layer of quartz bladelets and microliths. It quickly became apparent that this apparent richness was caused by significant deflation of the sediments (possibly due to the site's drainage pattern). Although the top 30 cm were composed almost entirely of lithics and debitage, we reached sterile, decaying bedrock within 50 cm. Despite the lack of chronological control, Gekuma 1 does, nonetheless, offer a robust composite assemblage of Later Stone Age lithics.

Although the onset of the Later Stone Age has been a topic of great interest in recent decades, less attention has been given to the wide array of regional microlithic traditions observed over the course of the LSA (Soper & Golden 1969; Wilshaw 2016). It is clear that, like the Acheulian Industry, microliths are not a reliable chronological indicator. Stone tool use remained robust among early food producing economies, exemplified by the ground stone and microlithic tools associated with the Pastoral Neolithic (PN) traditions described in Chapter 2. Further, there are ethnographic accounts of stone tool use by ethnographically recorded foragers in Africa and elsewhere (Hayden 1977; MacCalman & Grobbelaar 1965), including among the Sandawe. Ten Raa (1966) notes the use of bored stone rings as weights for dropping-spear traps and elephant hunting spears. In the 1960s, these objects were not widely known among the Sandawe, perhaps because they were reportedly tedious to produce, and it is not clear that he actually observed any (outside of museums) or merely spoke with those who had participated in elephant hunts before the practice was banned through conservation legislation.

Table 3.4: Ostrich eggshell beads and blanks older than 18 kyr at African archaeological sites

Site	Country	Lab Code	Method (Material)	Uncal. BP	Cal. BP	Source
Mumba	Tanzania		AAR (OES bead)	ca. 52,000	NA	Hare et al. 1993
Magubike	Tanzania	OxA-27628	^{14}C (OES bead)	>50,100	NA	Miller & Willoughby 2014
Nasera	Tanzania	UBA-32353	^{14}C (OES)	>50,120	NA	Ranhorn & Tryon 2018
Nasera	Tanzania	UBA-32356	^{14}C (OES)	>50,120	NA	Ranhorn & Tryon 2018
Nasera	Tanzania	UBA-32352	^{14}C (OES)	>50,120	NA	Ranhorn & Tryon 2018
Merebu 1	Tanzania	AA115186	^{14}C (OES)	>49900	NA	
Merebu 1	Tanzania	AA115187	^{14}C (OES)	>49900	NA	

Note: Dates are as reported in the original publications and have not been recalibrated.

Table 3.4: Continued

Site	Country	Lab Code	Method (Material)	Uncal. BP	Cal. BP	Source
Magubike	Tanzania	OxA-27626	^{14}C (OES bead)	47,750 ± 750	54,940 – 48,478	Miller & Willoughby 2014
Nasera	Tanzania		^{14}C (OES)	>46,000	48,939 – 47,634	Ranhorn & Tryon 2018
Enkapune Ya Muto	Kenya		^{14}C (OES)	39,900 ± 1600	47,166 – 41,781	Ambrose 1998
Kisese II	Tanzania	UBA-27442	^{14}C (OES)	41,300 ± 1,000	45,955 – 42,828	Tryon et al. 2018
Kisese II	Tanzania	UBA-27440	^{14}C (OES)	41,200 ± 1,000	45,879 – 42,799	Tryon et al. 2018
Kisese II	Tanzania	UBA-34484	^{14}C (OES)	40,600 ± 1,000	45,354 – 42,538	Tryon et al. 2018
Border Cave	South Africa		^{14}C (OES bead)	38,020 ± 1240	44,403 – 40837	d'Errico et al. 2012
Enkapune Ya Muto	Kenya		^{14}C (OES)	37,000 ± 1100	43,009 – 39,938	Ambrose 1998
Kisese II	Tanzania	UBA-34478	^{14}C (OES)	38,040 ± 400	42,620 – 41958	Tryon et al. 2018
Kisese II	Tanzania	UBA-34483	^{14}C (OES)	36,740 ± 680	42,350 – 40655	Tryon et al. 2018
Boomplaas Cave	South Africa		^{14}C (Charcoal, OES); U-series (stalagmite); AAR (OES)	ca. 42,000		Fairhall and Erickson 1976; Miller et al. 1999; Vogel 2001
Kisese II	Tanzania		^{14}C (OES)	31,480 ± 1640	40,944 – 33,119	Deacon 1966
Magubike	Tanzania	OxA-27627	^{14}C (OES bead)	31,810 ± 180	36,556 – 35,665	Miller & Willoughby 2014
Mumba	Tanzania		^{14}C (OES)	26,960 ± 760	36,198 – 32,332	Mehlman 1991
White Paintings Shelter	Botswana		^{14}C (OES bead)	26,460 ± 300	31,121 – 30,144	Robbins, 1999; Robbins et al., 2000
Apollo 11	Namibia		^{14}C (charcoal)	19,760 ± 175	24,214 – 23,292	Wendt 1976; Maggs 1977; Vogelsang et al. 2010
Kisese II	Tanzania		^{14}C (OES)	18,190 ± 306	22,896 – 21,293	Deacon 1966

Note: Dates are as reported in the original publications and have not been recalibrated.

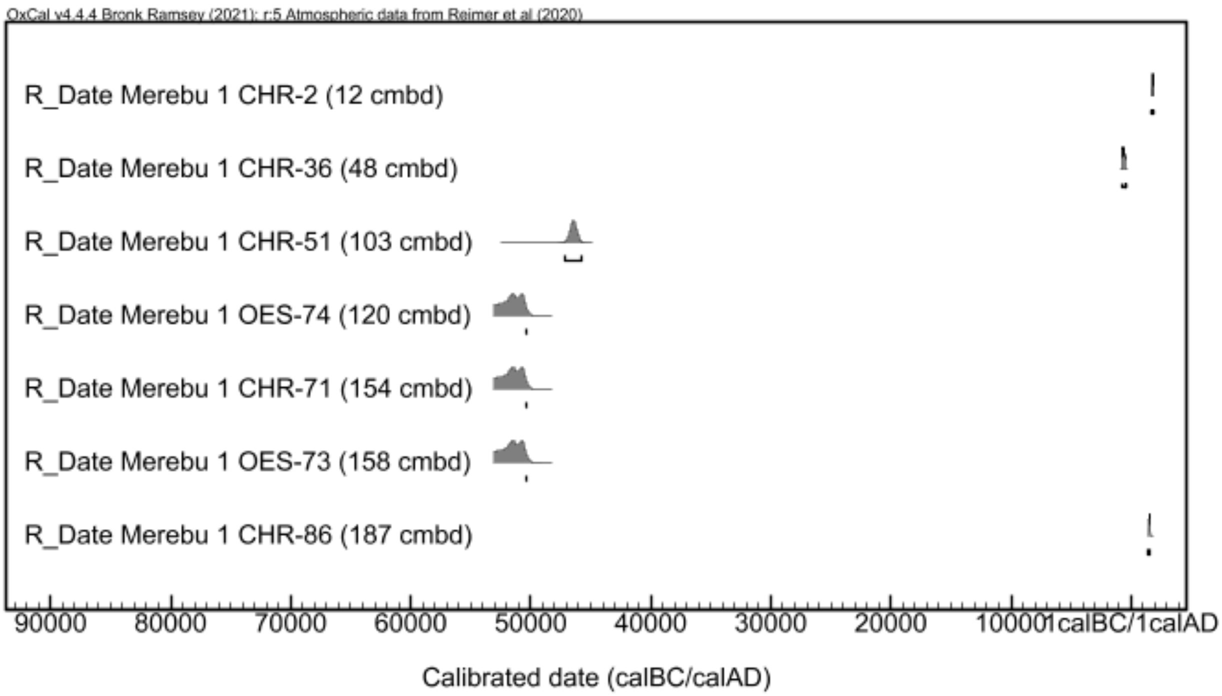

Figure 3.5: Radiocarbon dates from Merebu 1, Units 1 and 2, indicative of an uncomformity

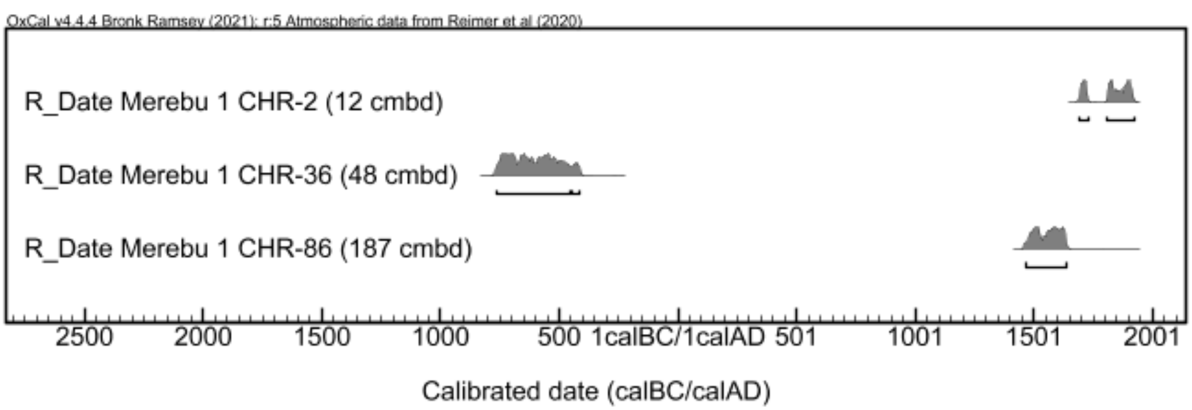

Figure 3.6: Youngest radiocarbon dates from Merebu 1, Units 1 and 2, demonstrating the anomalous date from 187 cmbd.

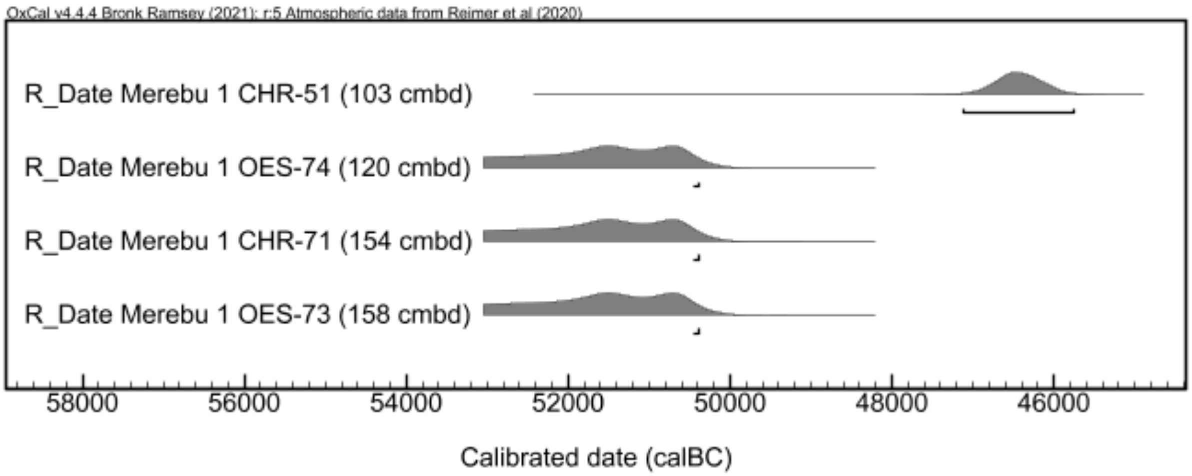

Figure 3.7: Oldest radiocarbon dates from Merebu 1, Units 1 and 2, demonstrating the antiquity of depths below 1 m.

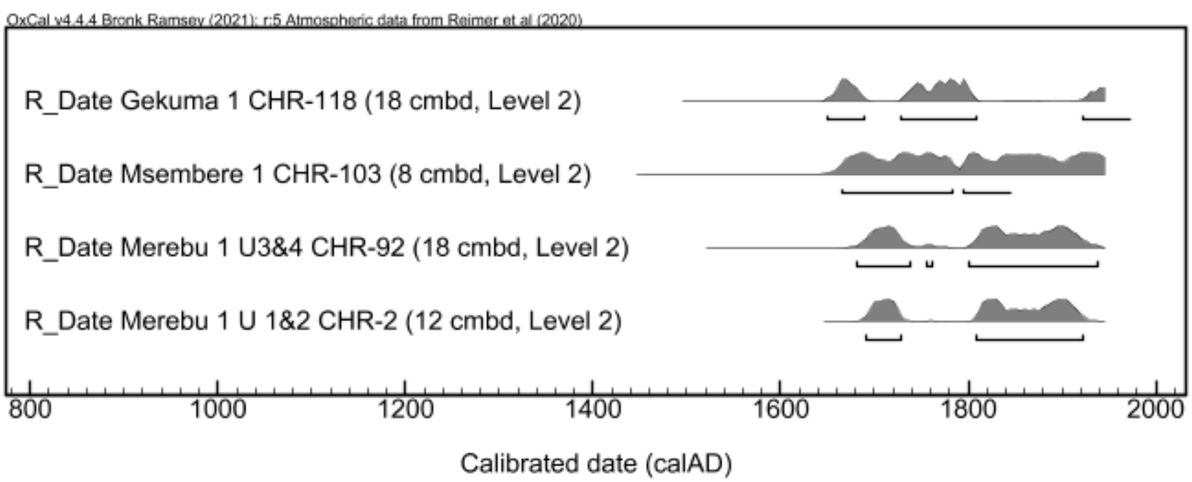

Figure 3.8: Uppermost dated contexts from Merebu 1, Msembere 1, and Gekuma 1 with "LSA" microliths.

As can be seen in Table 3.5, more sites were recorded that contained both "LSA" lithics and ceramics than there were sites that consisted only of LSA lithics. Further, approximately 20% of sites with ceramics also contained "LSA" lithics. Given the richness of the local archaeological assemblages, it is possible, of course, that this is an effect of the palimpsest quality of the landscape. However, it is also possible that lithics continued to be produced and used even after the introduction of ceramic and metallurgical technology. Another line of evidence that microliths are time-transgressive and were possibly produced and used throughout the Iron Age and into Historic Period is provided by radiocarbon dates from the uppermost excavated levels in which "LSA" lithics were recovered, although mixing, of course, cannot be ruled out (Figure 3.8).

Table 3.5: Sites with ceramics and "LSA" microlithic tools

	No LSA Component	**"LSA" Component**	**Total**	**Percentage with "LSA" Component**
Later Stone Age	0	46	46	100%
Iron Age				
Early Iron Age	16	1	17	6%
Middle Iron Age	28	2	30	7%
Later Iron Age	87	15	102	15%
Historic				
Historic	54	29	83	35%
Total IA / Hist.	185	47	232	20%

Iron Age (2500 BP to 150 BP). To briefly summarize Chapter 2, the Iron Age has historically referred to a cluster of historical developments across sub-Saharan Africa that are thought to be related to each other and to the migration of Bantu-speaking groups. These include the production of ceramics and metal, agro-pastoral economies, sedentism, and increasing political complexity. Although some form of population growth and movement is accepted, it is also now understood that these novel practices did not necessarily move together or in the same direction. There is a broad consensus that the Iron Age can be divided into two distinct time periods based on macro-scale shifts in ceramic styles. The "early" Iron Age spans from the mid-first millennium BC to the end of the first millennium AD, whereas the "later" Iron Age spans from the beginning of the second millennium AD to the colonial period (which, for many regions of Africa, marks the beginning of the archival record). Generally speaking, the age of the earliest Iron Age sites decreases as one moves from north to south.

If the Sandawe homeland did, in fact, consist of a relatively isolated refuge for a remnant population of foragers until recent centuries, then it would be suspect to use the Iron Age as anything but a chronological marker for the archaeological assemblages from this region. This is because, like many culture-historical categories, the Iron Age refers simultaneously to time and other elements of cultural life. However, sizeable assemblages of ceramics, slag, metal, and domestic fauna were recovered from hundreds of geographically disperse sites during fieldwork. This indicates that inhabitants of this region participated in the historical developments of the Iron Age, but the timing and nature of that participation remain open questions, which will be partially addressed in this and the following section. One should bear in mind that the following proposals are to be understood as hypotheses in need of further testing.

Pedestrian survey yielded approximately 3,500 diagnostic ceramic sherds. Unfortunately, few of the excavated ceramics are diagnostic, so their ability to provide chronological control to surface assemblages is limited. Even so, we can derive a *terminus post quem* for the production of pottery through two lines of reasoning derived from radiocarbon dating. Guguse 1 covers nearly 7 hectares, and an intact iron bloomery was bisected during the excavation of a 1 x 1 m^2 unit. The lowest excavated contexts of this bloomery were composed almost entirely of apparently in situ charcoal. The proportion of sand increased as the distance below datum decreased, which I interpret to mean that the bloomery was either not cleaned after its final use or filled with charcoal and not used. At some point, most of the above ground structure was destroyed, after which the below ground structure filled in through erosion. Slag and ceramics were found in all excavated contexts. Ceramics were common across the entire site but slag was mainly located on low spoil heaps near the bloomery. The ceramics recovered through pedestrian survey and the excavation resemble early Iron Age wares, such as those from Lelesu, but also exhibit distinctive traits like finer fabric, grooved lips, and different decorative elements. The three radiocarbon dates from bloomery are tightly clustered and range in age from 1703 to 1530 cal BP (247 to 420 AD, see Figure 3.9). These dates do not, of course, provide direct evidence of pottery production. However, based on my interpretation of the life course of the bloomery, it is reasonable to infer that the surface finds were contemporaneous with its use. Therefore, 350 AD represents a *terminus post quem* for both metallurgy and pottery production.

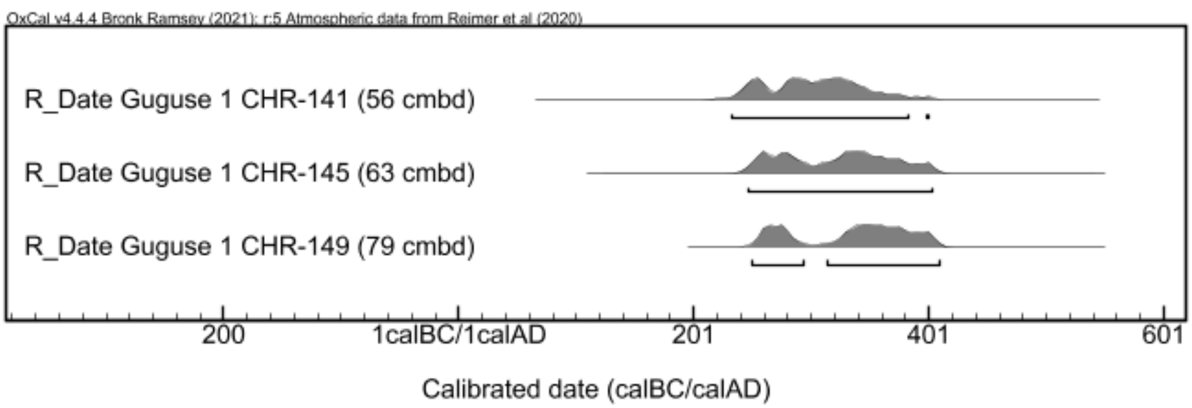

Figure 3.9: Radiocarbon dates from the Guguse 1 iron bloomery

Another possible *terminus post quem* for pottery production can be derived from the excavation at Merebu 1, Units 1 and 2, although it should be noted that this evidence does not extend to metallurgy. Sherds and small pottery fragments are found throughout the first 8 levels (which extended to approximately the first 0.5 m below datum). Charcoal from this level ranged from 2705 cal BP to 2349 cal BP (or approximately 550 BC), which is in line with other evidence of early pottery production from neighboring Kondoa District (Lane 2009). As noted above, it is possible that the upper levels of these units have been disturbed. It is also possible that smaller pottery fragments migrated to lower levels due to bioturbation. However, given that this date is in line with other regional evidence it stands as a reasonable possibility.

A small metal nail or chisel and slag were recovered during pedestrian survey at Lelesu 1. This is the first direct evidence of metallurgy from this site, which scholars have long believed dates to the early Iron Age (Soper 1971a, 1971b). Radiocarbon dating of two pieces of slag yielded widely discrepant dates (the older date ranged from 6181 cal BP to 5920 cal BP and the younger date ranged from 1261 cal BP to 988 cal BP). I consider these dates unreliable, and future research will attempt to obtain datable material from excavated contexts.

Gekuma 1 contained a single iron bead, which could have been made locally. Ten Raa (1969) illustrates an iron necklace in which such beads were used historically. His interlocutors describe these necklaces as being of northern origin, and Ten Raa notes that similar necklaces were circulating among the northerly Iraqw and Sukuma at the time of his research. This bead was found in association with the radiocarbon date from 18 cmbd displayed in Figure 3.10, but this unit showed evidence of considerable disturbance and deflation. Although the dates from this excavation do not contradict other evidence concerning metallurgy in this region, I do not find them reliable.

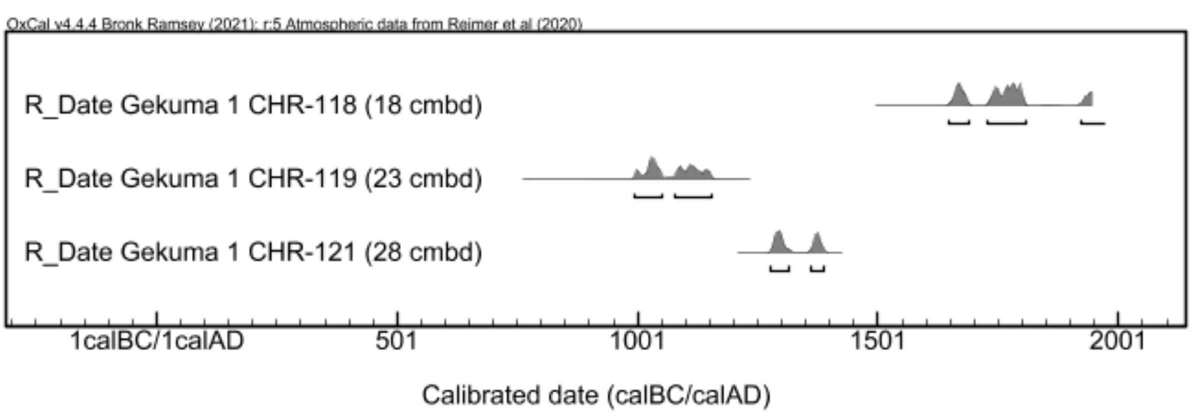

Figure 3.10: Radiocarbon dates from the Gekuma 1, Units 10-13

This evidence suggests that the Iron Age (as indexed by metallurgy and pottery production) began in the Sandawe homeland as early as 2500 BP and certainly by 1600 BP. Chronological subdivisions of the Iron Age are possible but should be understood as tentative and in need of refinement through addition excavation and dating. The ceramics from Guguse 1 present something of a dilemma because they diverge stylistically and morphologically from Lelesu and other "early" Iron Age wares, as well wares of the later first millennium (this will be address in the following section, see also Pawlowicz 2011). These could be a previously unrecognized early Iron Age type, which might indicate that two pottery-producing groups lived in the Sandawe homeland contemporaneously, or they could be a local development of an earlier ware. If we recognize them as an early ware, then no chronological subdivision can be made prior to the "later" Iron Age. If we recognize these ceramics as a developed, "middle" Iron Age ware, then we could date the beginning of that period to 1600 BP (350 AD). Early Iron Age would necessarily, of course, predate this time period. If we consider the date from Merebu 1 to be reasonable, then the early Iron Age in this region would span from 2500 BP to 1600 BP. Soper (1971a, 1971b) proposed a date for Lelesu ware of 1800 BP based on its morphological similarities to dated Kwale ware. This date falls within my proposed range, but it must be noted that this proposal relies on several acts of interpretive faith and should be examined more rigorously through the accumulation of additional evidence.

As noted above, the "later" Iron Age is roughly dated to the early second millennium AD and is associated with diverse ceramic styles, the most famous of which were decorated with cord roulettes. Phillipson (1977) also observes that evidence for trade between the eastern African interior and the coast becomes more frequent after this point. Based on chemical composition and morphology, approximately a third of the glass bead assemblage resembles beads produced in southern Asia between latter half of the 1600s and the 1700s. Another third of this assemblage resembles beads produced in Europe during the 1800s and 1900s. As will be discussed in the following section, the ceramics with which these beads are found differ from both "early" Iron Age wares and ceramics known to have been produced since the mid-1900s. We can tentatively use the glass beads to propose boundaries for the "later" Iron Age from 300 to 150 BP (1650 to 1850 AD).

Most conservatively, it can be argued that the local manifestation of the Iron Age began by 1600 BP (350 AD) and that a proliferation of ceramic forms in a late phase of the Iron Age began by 300 BP (1650 AD). More speculatively, the Iron Age may have begun by 2500 BP (550 BC), with the period between 1600 BP and 300 BP representing a middle phase. Based on survey and excavation in the Lake Haubi basin of Kondoa District, Lane (2009) argues that a shift in occupation practices of later Iron Age farming communities occurred between 1000 and 200 BP. The estimated shift from the early or middle to the later Iron Age in the Sandawe homeland at 1600 BP may, therefore, be too recent. It could, of course, also reflect a real difference between these neighboring areas.

Historic (150 BP to present). This designation relates, of course, to the onset of the archival record for eastern Africa but it is also associated with changes in material culture and settlement patterns. As described in the Introduction, the Sandawe were widely dispersed during the latter half of the 1800s, but the extent to which this is related to regional political and economic circumstances remains unclear. By the late 1800s, the Sandawe were practicing a diverse food-getting repertoire and interacting with the caravan trade. Europeans introduced new kinds of glass beads to the interior during this time, some of which were modeled after beads that were produced in India and had previously dominated the market (Marshall 2012). Additionally, all diagnostic vessel glass recovered during fieldwork post-dates the 1850s, and some is identifiable to the 1950s and later. During the 1970s, Tanzania's resettlement program led to the creation of several new villages in the Sandawe homeland, and I argue below that this may be visible archaeologically.

Part III: Ceramic Analysis and Landscape Occupation History

Ceramic Analysis

Applications of frontier theory and the mosaics concept necessarily demand an ability to discern changes in landscape occupation and economic practices through time. Among the assemblages recovered during fieldwork, ceramics are the best-suited material for reconstructing occupation patterns. This is because it is available in sufficient quantities and is the most likely to exhibit variability during the time period under study. Although lithics were also recovered in great numbers, the technologies used to produce them changed over many thousands of years and, generally speaking, have a more restricted range of diagnostic criteria than ceramics for the purposes of reconstructing landscape occupation.

Tanzania has seen infrequent analyses of relatively small ceramic assemblages, most of which have no associated dates and have not been compared to materials collected from other regions of the country or the continent (Kessy 2005; Liesegang 1975; Masao 1979; Odner 1971; Pawlowicz 2011, 2013; Smolla 1957; Sutton 1966, 1968; cf. Fleisher & Wynne-Jones 2011; Soper 1971a, 1971b). However, several ceramic assemblages have been recovered from north-central Tanzania that exhibit stylistic similarities to well-known typologies from across eastern Africa. For example, the Luxmanda site contains abundant Narosura wares, which have been categorized as part of the Savanna Pastoral Neolithic (Grillo et al. 2018). The Sandawe homeland itself is home to the type-site for Lelesu ware, which is thought to be stylistically and chronologically intermediate between early Iron Age Urewe and Kwale wares (Smolla 1957; Soper 1967, 1971). Lelesu has been found in neighboring Kondoa District (Lane 2009), but it is generally difficult to discuss inter-regional exchange in Tanzania because the lack of data is compounded by an apparent proliferation of ceramic styles in the later Iron Age, many of which have few or no associated dates.

As Pawlowicz (2013) explains, typological studies of eastern African ceramics have been subjected to several critiques. The first debate, by now largely settled, emphasized that ceramic types cannot be equated to specific groups of people. A second area of concern relates to the association of ceramic types with culture-historical entities that are themselves poorly defined both chronologically and conceptually. The third issue is that ceramic typologies can hide variation in space and time that may be reflective of smaller-scale social, political, and economic histories. McIntosh (1994) responded to debates over typology by taking two concepts as axiomatic in her study of the ceramics from Jenné-jeno in the inland Niger Delta of western Africa: 1.) The primary goal of any artifactual analysis is to document chronological and spatial variability, which is requisite for the production of archaeological knowledge; and 2.) Variability can be observed along multiple axes. Artifactual analyses, then, must allow for the creation of multidimensional datasets that can be use to identify and examine patterns in relation to problem-centered inquiries. McIntosh (1994:131) observes that ceramic typologies conflate the processes of recording, classifying, and interpreting. In regions without robust pottery classifications and culture-historical typologies, such as the Niger Delta in the 1980s (and much of Tanzania today), the search for time-sensitive variability must begin with trial and error.

As described in the preceding section, I was able to identify some ceramics as Lelesu ware and others as being broadly similar to later Iron Age ceramics from elsewhere in Tanzania.

I then used these to assign time estimates to different components of the archaeological assemblages recovered during fieldwork. Continued examination of the ceramics suggested the existence of two additional kinds of ceramics, one of which appeared to be an early or middle Iron Age ware, and that other of which I was able to identify through previous ethnographic research as being produced during the historic period. During fieldwork in 2005 and 2006, I included interviews with several potters. They stated that contemporary vessel forms and styles, which tend to be of standard sizes and shapes and are burnished but otherwise unadorned, have remained relatively unchanged since at least the mid-1900s. This restricted range of vessels was described as a response to demand at the monthly *mnada* market, which follows a regular circuit through numerous villages in the Sandawe homeland and elsewhere in north-central Tanzania. Two questions that arose were whether my sense of variation among the ceramics was supported through statistical analysis and, if so, whether these groupings could provide insight into occupation histories.

The artifacts do not represent a simple random sample due how pedestrian survey was conducted. The analyses use chi-square testing to examine the strength of associations between variables rather than overall frequencies in the survey universe. Representative samples of 50 rim sherds from each grouping were selected randomly in order to ensure a sufficient population size for the application of statistical tests. A small number of sites appeared to contain sherds from each grouping, and these were excluded from the sample universe. The remaining sites were numbered and selected randomly until the total number of sherds representing each grouping exceeded 50. Many of these groupings included both open-air and rockshelter sites, but the middle Iron Age was represented by a single open-air site.

The following attributes were recorded for each sherd: rim angle, rim shape, the presence of rim eversion or inversion, lip modifications, decorative motifs, vessel form, radius, and minimum and maximum thickness. Rim angle was determined following McIntosh's (1994) method of determining the angle described by the line of the outer rim surface in relation to a vertical plane through the vessel. Rim shape describes the variation in thickness between the interior and exterior surfaces of the rim, which can be parallel or preferentially thickened in one direction. Eversion and inversion considers whether the rim is pulled inward toward or pushed outward from the center of the pot relative to the body. Lip can be simple or modified through beveling, flattening, grooving, or thickening. Vessel form refers to the morphology of the complete pot and could only be coded definitively when a sufficient amount of the rim, neck, shoulder, and body were present to make a reasonable inference. Codes for vessel forms were based on Phillipson (1976) but reduced to bowls (which included open bowls, bowls with up-turned rims, and platters), necked pots (which included necked vessels, pots with up-turned rims), narrow-mouthed globular vessels, carinated bowls, and indeterminate forms.

Chi-square tests were used to examine the strength of the relationship between time periods and the degree of lip eversion or inversion, lip modification, rim shape, rim angle, and vessel form. The null hypothesis was that the relationship observed between the dependent variable and the time period was due to chance or to sampling strategies. In all cases, the chi-square tests were statistically significant, allowing us to reject the null hypothesis. A summary of the chi-square scores is provided in Table 3.6 and the most diagnostic ware types for each time period are summarized in Table 3.7. Table 3.8 through 3.17 show the expected and observed counts for each variable, as well as the result of the chi-square tests.

Table 3.6: Hypothesized ceramic wares and chronology from the Sandawe homeland

Independent Variable	Dependent Variable	χ2	*p*-value	Degrees of Freedom
Time Period	Lip modification[1]	92	$p<0.001$	9
Time Period	Rim shape[1]	139.7	$p<0.001$	12
Time Period	Rim angle[1]	55	$p<0.001$	9
Time Period	Eversion/ inversion[1,2]	46.4	$p<0.001$	6
Time Period	Vessel type[1]	97.3	$p<0.001$	6

1. Some tests had fewer than 5 in the Observed counts.
2. Some tests had fewer than 5 in the Expected counts

Table 3.7: Summary of most common traits in ceramic wares by time period

Period: Time Estimate	Early Iron Age: 2500 BP – 350 AD	Middle Iron Age: 350-1650 AD	Later Iron Age: 1650-1850 AD	Historic: 1850 AD – present
Lip Modification	Beveled	Grooved	Simple	Simple, flattened
Rim Shape	Tapered out, thickened	Parallel, tapered out, thickened	Parallel, tapered in	Thickened internally
Rim Angle	4, 5+	-	2, 3	3, 4
Eversion/ Inversion	Everted	-	Inverted	Everted
Vessel Form	Necked pots	Open bowls, necked pots	Globular vessels	Globular vessels

Table 3.8: Period by Lip Modification Observed & Expected Counts

		Beveling	Flattening	Grooving	Simple	Total
Early	Count	29	1	5	15	50
Early	Expected	14.2	8.3	7.5	19.9	50
Middle	Count	15	4	21	10	50
Middle	Expected	14.2	8.3	7.5	19.9	50
Later	Count	9	10	2	22	43
Later	Expected	12.3	7.1	6.5	17.2	43
Historic	Count	2	17	1	30	50
Historic	Expected	14.2	8.3	7.5	19.9	50
Total	Count	55	32	29	77	193
Total	Expected	55	32	29	77	193

Table 3.9: Period by Lip Modification χ^2 Results

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	92.042	9	0.000
Likelihood Ratio	93.912	9	0.000
N of Valid Cases	193		

Table 3.10: Period by Rim Shape Observed & Expected Counts

		Parallel	Tapered In	Tapered Out	Thickened	Thickened Internally	Total
Early	Count	16	5	15	14	0	50
Early	Expected	14.6	10.1	11.4	7.3	6.6	50
Middle	Count	17	2	17	14	0	50
Middle	Expected	14.6	10.1	11.4	7.3	6.6	50
Later	Count	17	23	6	0	0	46
Later	Expected	13.5	9.3	10.5	6.7	6	46
Historic	Count	8	10	7	1	26	52
Historic	Expected	15.2	10.5	11.8	7.6	6.8	52
Total	Count	58	40	45	29	26	198
Total	Expected	58	40	45	29	26	198

Table 3.11: Period by Rim Shape χ^2 Results

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	139.656	12	0.000
Likelihood Ratio	142.466	12	0.000
N of Valid Cases	198		

Table 3.12: Period by Rim Angle Observed & Expected Counts

		Angle 2	**Angle 3**	**Angle 4**	**Angle 5+**	**Total**
Early	Count	2	2	32	12	48
Early	Expected	5.4	11	23.5	8.1	48
Middle	Count	7	7	25	11	50
Middle	Expected	5.6	11.5	24.5	8.4	50
Later	Count	12	22	10	2	46
Later	Expected	5.2	10.6	22.5	7.7	46
Historic	Count	1	14	29	8	52
Historic	Expected	5.8	11.9	25.5	8.8	52
Total	Count	22	45	96	33	196
Total	Expected	22	45	96	33	196

Table 3.13: Period by Rim Angle χ^2 Results

	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	54.963	9	0.000
Likelihood Ratio	59.398	9	0.000
N of Valid Cases	196		

Table 3.14: Period by Eversion/Inversion Observed & Expected Counts Table

		Everted	Inverted	N/A	Total
Early	Count	18	1	31	50
Early	Expected	17.2	3.3	29.5	50
Middle	Count	8	5	37	50
Middle	Expected	17.2	3.3	29.5	50
Later	Count	7	7	32	46
Later	Expected	15.8	3	27.2	46
Historic	Count	35	0	17	52
Historic	Expected	17.9	3.4	30.7	52
Total	Count	68	13	117	198
Total	Expected	68	13	117	198

Table 3.15: Period by Eversion/Inversion χ^2 Results

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	46.375	6	0.000
Likelihood Ratio	48.725	6	0.000
N of Valid Cases	198		

Table 3.16: Period by Vessel Form Observed & Expected Counts Table

		Globular Vessel	Necked Pot	Open Bowl	Total
Early	Count	22	12	10	44
Early	Expected	23.9	5.5	14.6	44
Middle	Count	45	0	6	51
Middle	Expected	27.7	6.4	16.9	51
Later	Count	33	0	11	44
Later	Expected	23.9	5.5	14.6	44
Historic	Count	0	11	34	45
Historic	Expected	24.5	5.6	14.9	45
Total	Count	100	23	61	184
Total	Expected	100	23	61	184

Table 3.17: Period by Vessel Form χ^2 Results

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	97.299	6	0.000
Likelihood Ratio	124.505	6	0.000
N of Valid Cases	184		

Several limitations of this analysis can be addressed through future analyses of the full ceramic assemblage. Even with 50 sherds in each sample, some codes had five or fewer observed counts, which is a rule of thumb for the minimum sample size in chi-square tests. Some of the variables are clearly related, such as lip eversion and vessel form, so it is possible that the tests have misleadingly amplified the strength of the proposed categories. The middle Iron Age sample included only a single site and it is unclear whether it is representative of other sites assigned to that period. The activities conducted in open-air and rockshelter sites may influence the kinds of ceramics used in each location, and future studies could examine whether differences can be observed between these kinds of sites within and between time periods. Although typological analyses have limitations, they are nonetheless useful for identifying and examining possible inter-regional exchange. Subsequent analyses of the full assemblage should consider whether similarities can be observed to major ceramic types of the region that may have been masked for the analytic strategy used here. A notable absence, for example, are ceramics that have been linked to early pastoral communities. Finally, this analysis focused on ceramics alone, and future research should examine the extent to which the observed trends in ceramic wares and occupation patterns do or do not correlate with other evidence of economic activity.

Geospatial Analysis & Landscape Occupation History

After completing the statistical analysis, sites assigned to each group were mapped using geospatial software. Exploring spatial trends was complicated by the fact that the survey was conducted in geographically discontinuous zones. The quadrants and transects were only partly randomized, the spatial relationship of transects within each quadrant varied, and pedestrian and rockshelter surveys were conducted in a qualitative manner. However, there is no known systematic bias that would have prevented sites of a particular time period from being found in any particular quadrant. Two methods of measuring a trend in a set of points is to calculate what are known as centroids and standard deviational ellipse. Centroids are a point place at the mean center of all features in a class. This method calculates the standard deviation of x- and y-coordinates from the centroid to define the axes of an ellipse that is then drawn around 68% of those features. Standard deviational ellipses help illustrate the dispersion and spread features, including whether they have a particular orientation.

As seen in Figures 3.11 through 3.14, there is a southeast to northwest movement from the early Iron Age to the later Iron Age. As described above, it is possible that my division between the early and middle Iron Age may not reflect chronological change but the presence of two distinct communities of practice (at least in terms of ceramic production), so I combined the early and middle Iron Age sites and recalculated the standard deviational ellipse and centroid for these features. The movement toward the northwest remains but is less pronounced. The northwestward expansion in the Iron Age is followed by a contraction and a return toward the southeast in the historic period. Ceramics and metallurgy are not, of course, direct evidence of food production. However, because some early and middle Iron Age sites have ceramics, metal or slag, and the remains of domestic fauna, it is reasonable to use ceramics as a tentative and indirect line of evidence that can be tested through more robust analyses. These patterns suggest that settlement trends run counter to proposals that food production entered the Sandawe homeland from northwest and moved to the southeast.

Of particular note is that early Iron Age wares are located in the portion of the homeland described by Ten Raa and contemporary residents as the most culturally conservative. Beyond this interpretive curiosity, it is also intriguing that these sites are located near one of the few permanent water sources (and one of the largest). Numerous hot springs at the base of the Bubu escarpment provide water year-round, and the remains of freshwater mollusks and catfish were found in several rockshelters along the Bubu River. This raises the archaeologically testable possibility that the cyclical use of freshwater resources familiarized past inhabitants with methods of resource intensification. The middle Iron Age site represented in the ceramic analysis, Guguse 1, is also located within a few kilometers of semi-permanent and permanent water sources.

The possible contraction of sites could be a reflection of the mid-1900s project of villagization, in which rural Tanzanians were relocated for the purposes of socioeconomic development. In the Sandawe homeland, many of these villages were located along the two most accessible and centrally located transportation corridors. Recall also that potters reported a reduction in ceramic forms and styles during the 1900s in response to the regional monthly market cycle. Alternatively, this apparent contraction is in relation to the more dispersed pattern observed during the later Iron Age. This could reflect accounts of conflict during the 1800s that that led residents to disperse throughout the bush, or it could reflect an effort by residents to obtain wild resources for trade during an intensification of the caravan network.

As seen in Figures 3.16 through 3.19, site size increases over the course of the Iron Age before dropping during the Historic Period. This trend also holds when early and middle Iron Age sites are combined. On one hand, this would seem to support the expectation of frontier theory, which hypothesizes that early food-producing communities increase in size through time as these groups come to assert their dominance over ecological and sociopolitical landscapes. On the other hand, sites over one hectare in size were recorded during every time period, including the early and middle Iron Age. This could be explained by a number of factors, all of which should be examined through future research. First, it could be that certain locales were lived in for long periods of time. If ceramic styles were stable, this would give the appearance of a large, single-component settlement. Second, it is also possible that each time period did, in fact, have an extremely wide range of settlement sizes. Third, vegetation (or the lack thereof) and the local field rotation cycle could have impacted visibility such that large settlements appeared to surveyors as numerous smaller settlements, or, alternatively a cluster of small settlements may have been recorded as a single site. These dynamics may be compounded by the differing time ranges tentatively assigned to each period. For example, the middle Iron Age, as proposed above, represents 1,300 years, whereas the historic period represents 150 years.

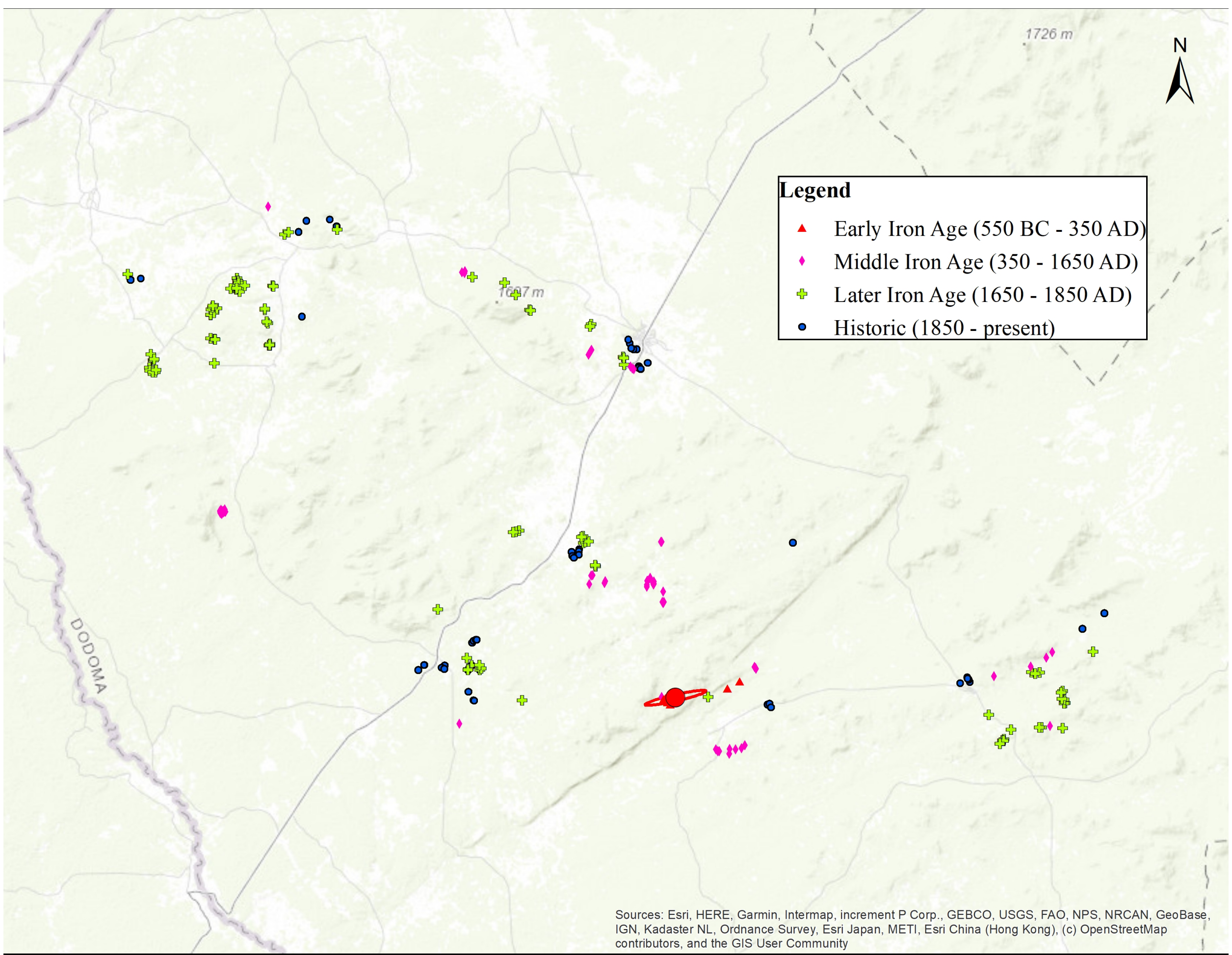

Figure 3.11: Standard deviational ellipse and centroid showing the distribution of early Iron Age sites (red).

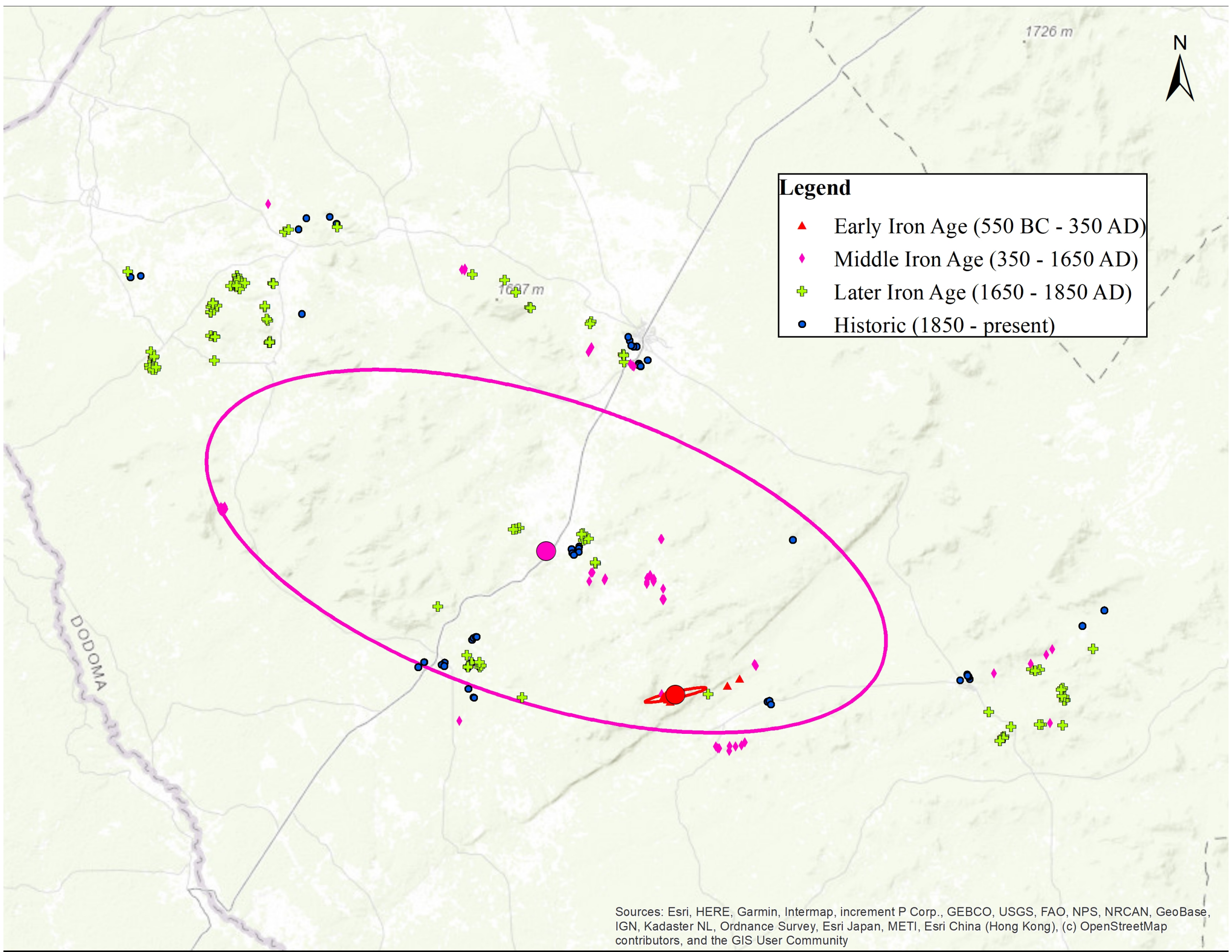

Figure 3.12: Standard deviational ellipse and centroid showing the distribution of middle Iron Age sites (pink).

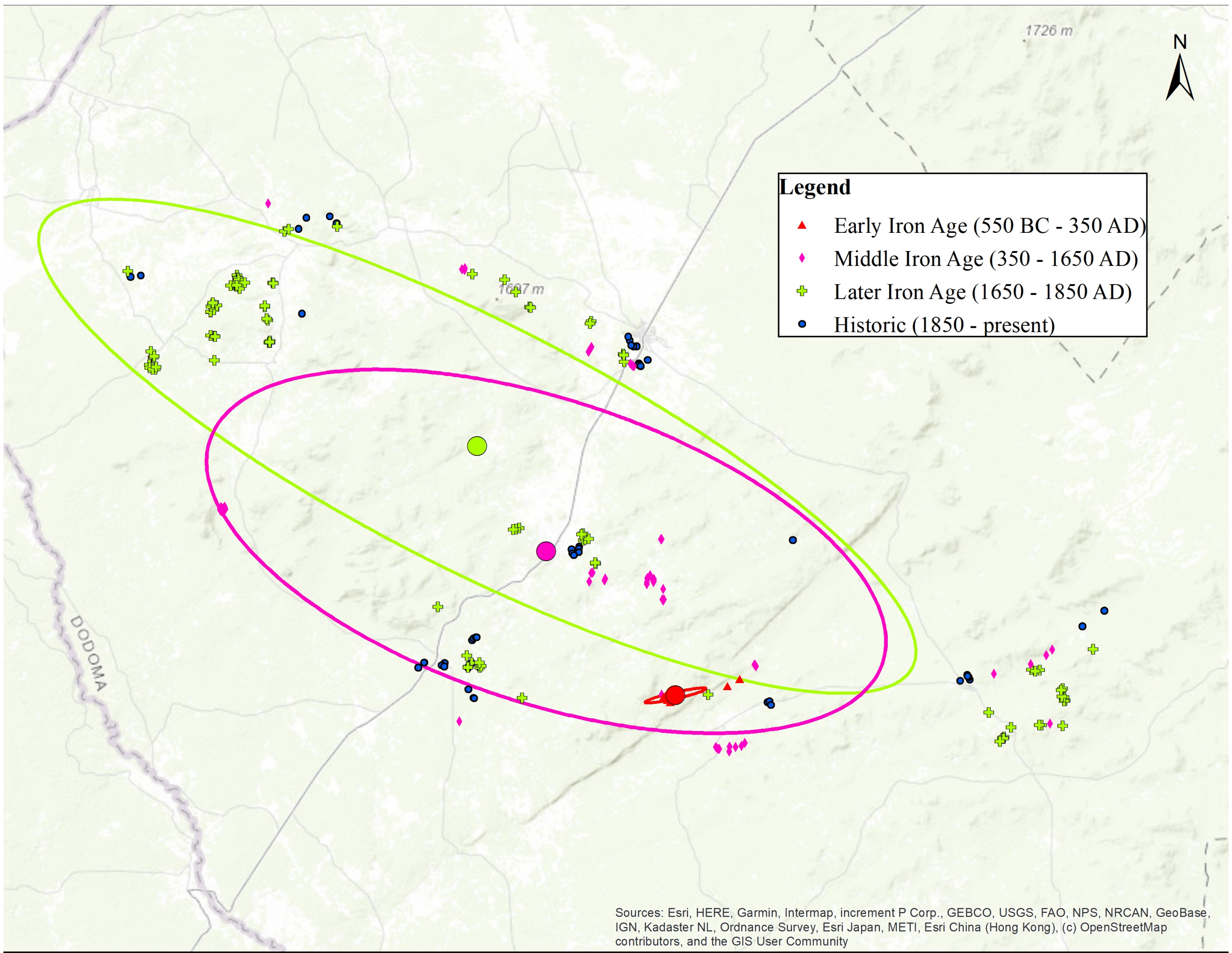

Figure 3.13: Standard deviational ellipse and centroid showing the distribution of later Iron Age sites (green).

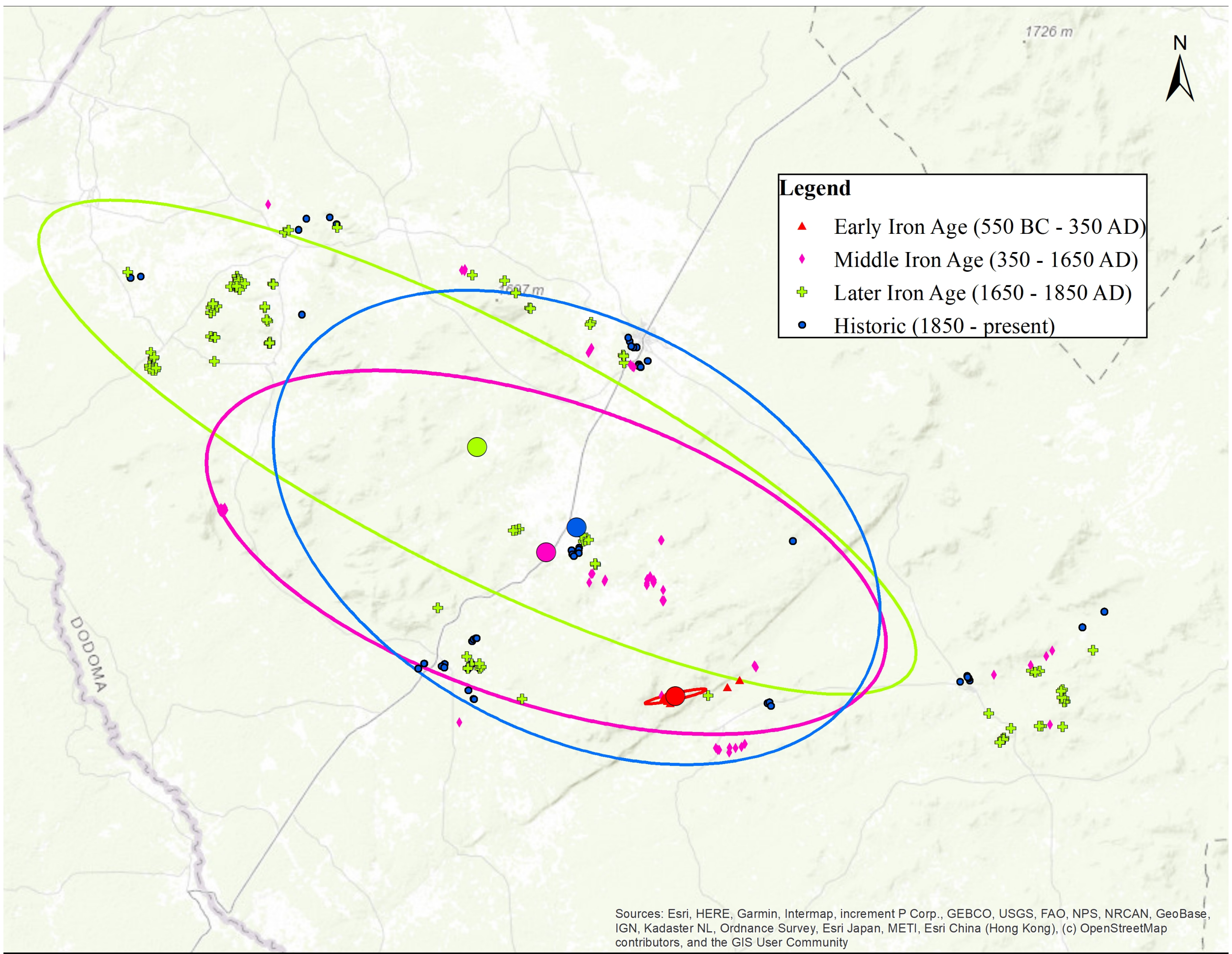

Figure 3.14: Standard deviational ellipse and centroid showing the distribution of historic sites (blue).

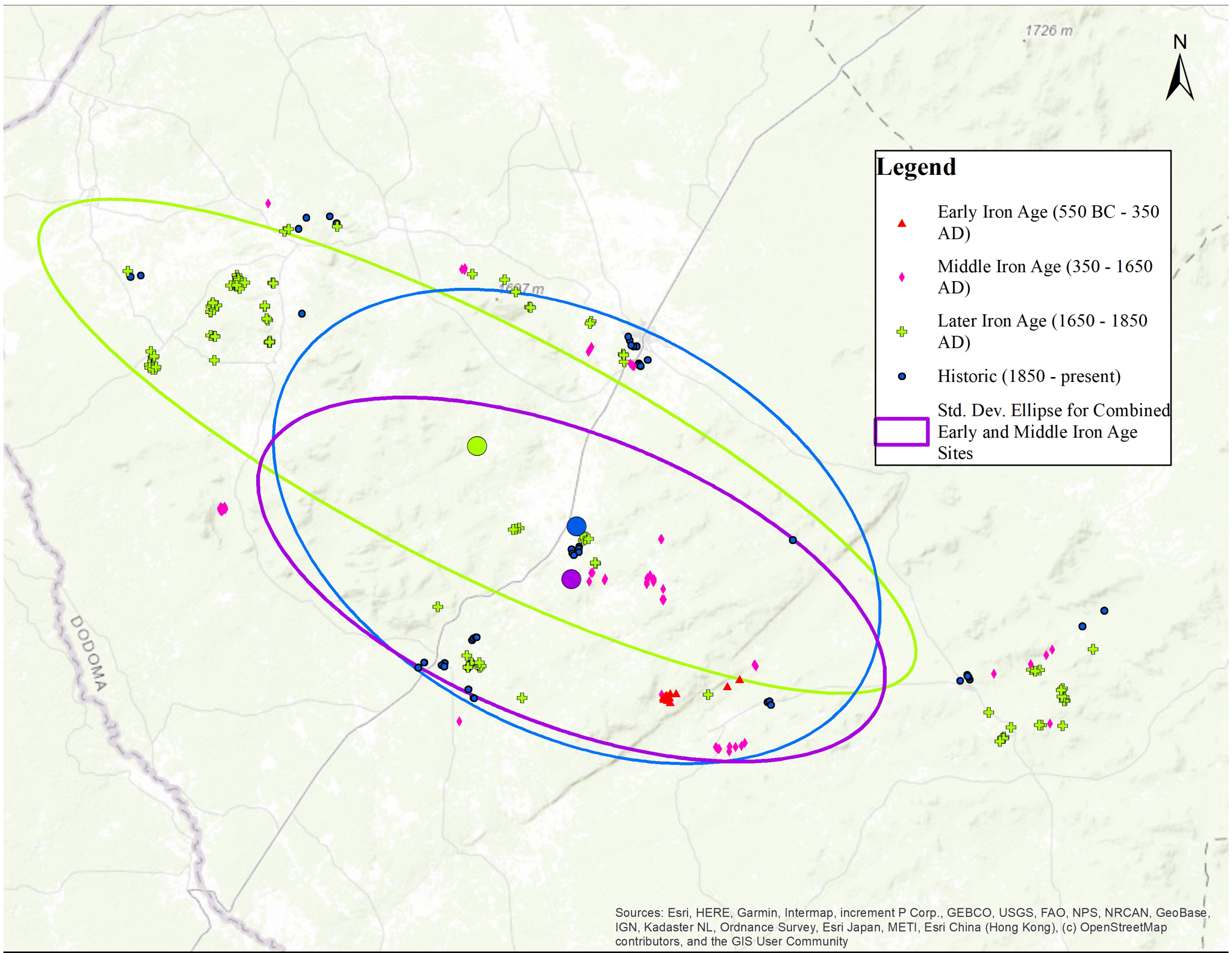

Figure 3.15: Standard deviational ellipse and centroid showing the distribution of combined early and middle Iron Age sites (purple).

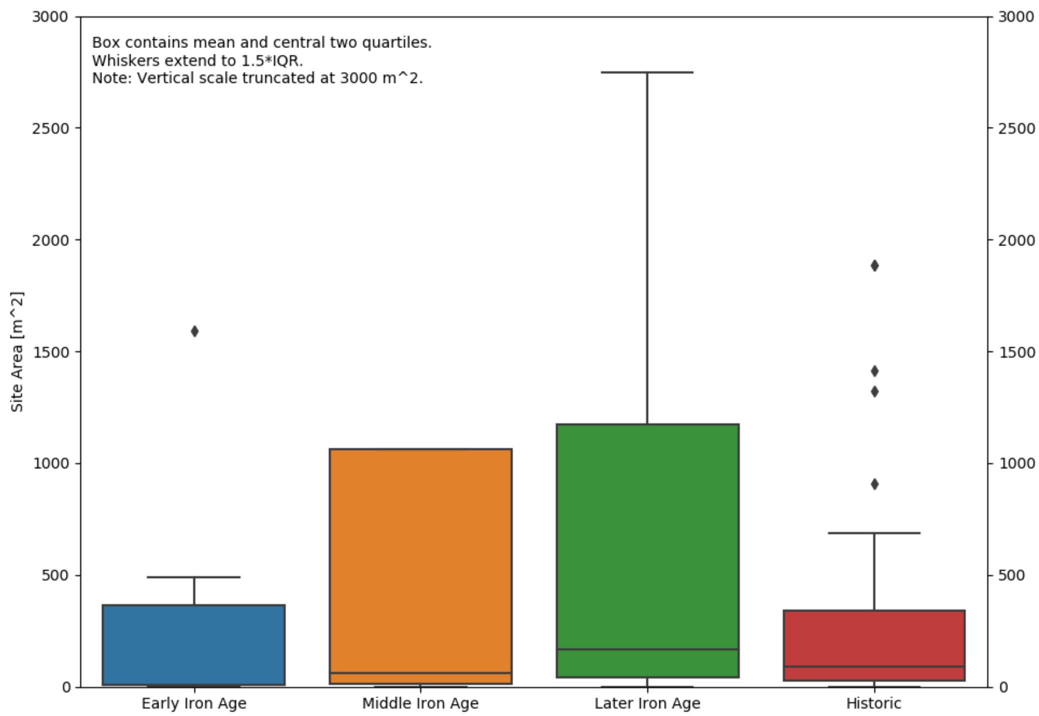

Figure 3.16: Box and whisker plot of site sizes by time period. Linear scale, with outliers removed. Early and middle Iron Age sites are separated.

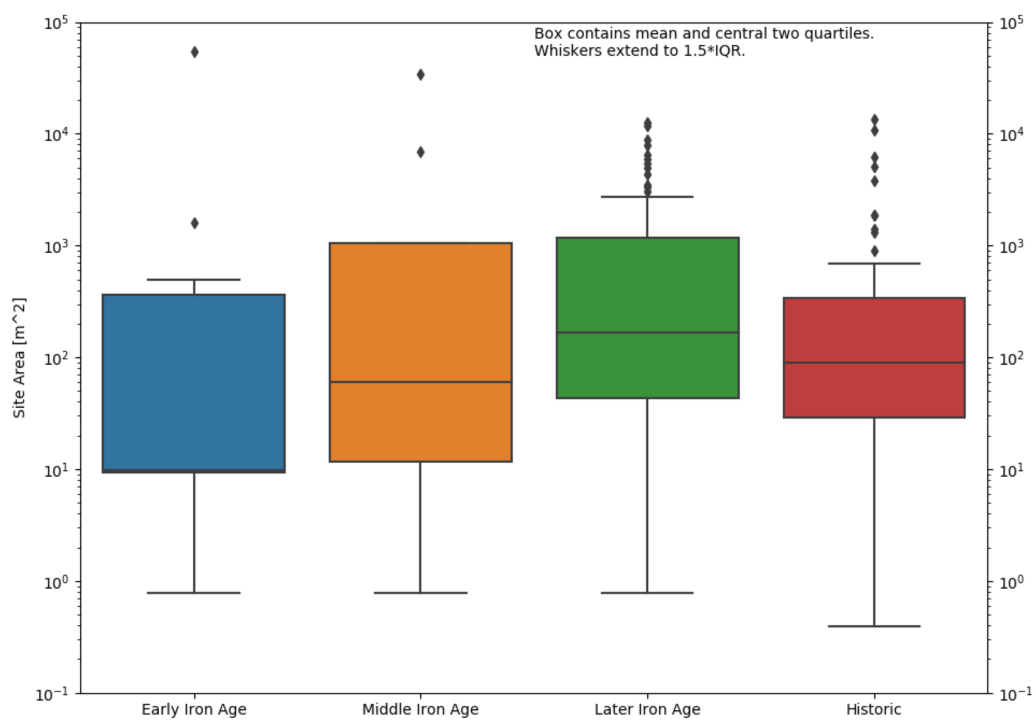

Figure 3.17: Box and whisker plot of site sizes by time period. Logarithmic scale, outliers included. Early and middle Iron Age sites are separated.

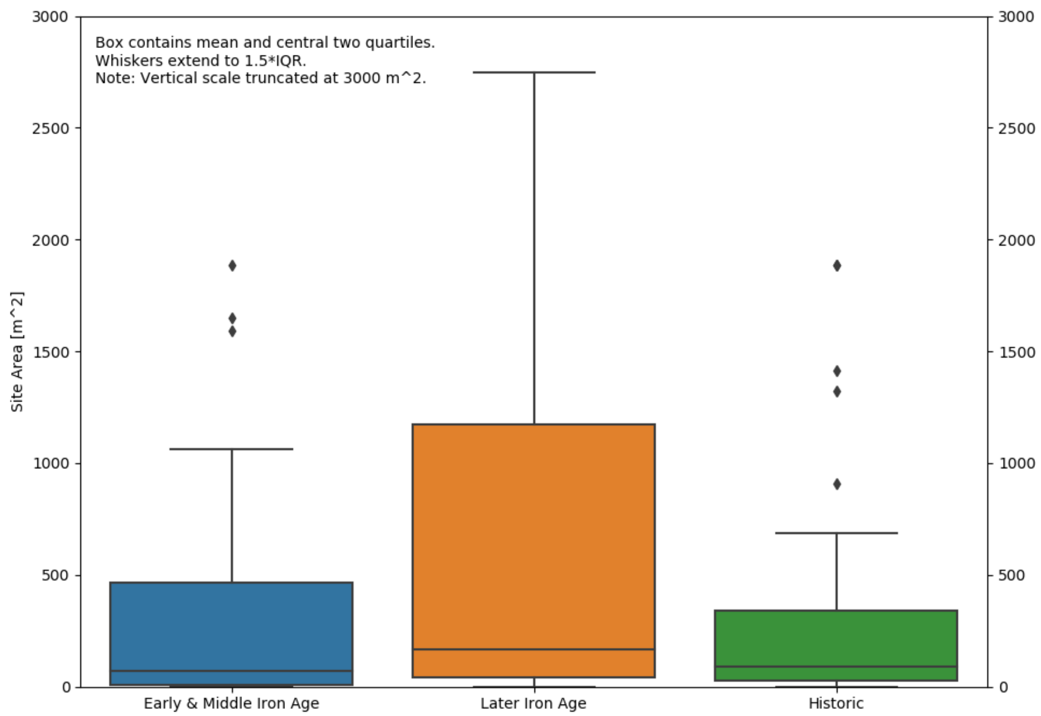

Figure 3.18: Box and whisker plot of site sizes by time period. Linear scale, with outliers removed. Early and middle Iron Age sites are combined.

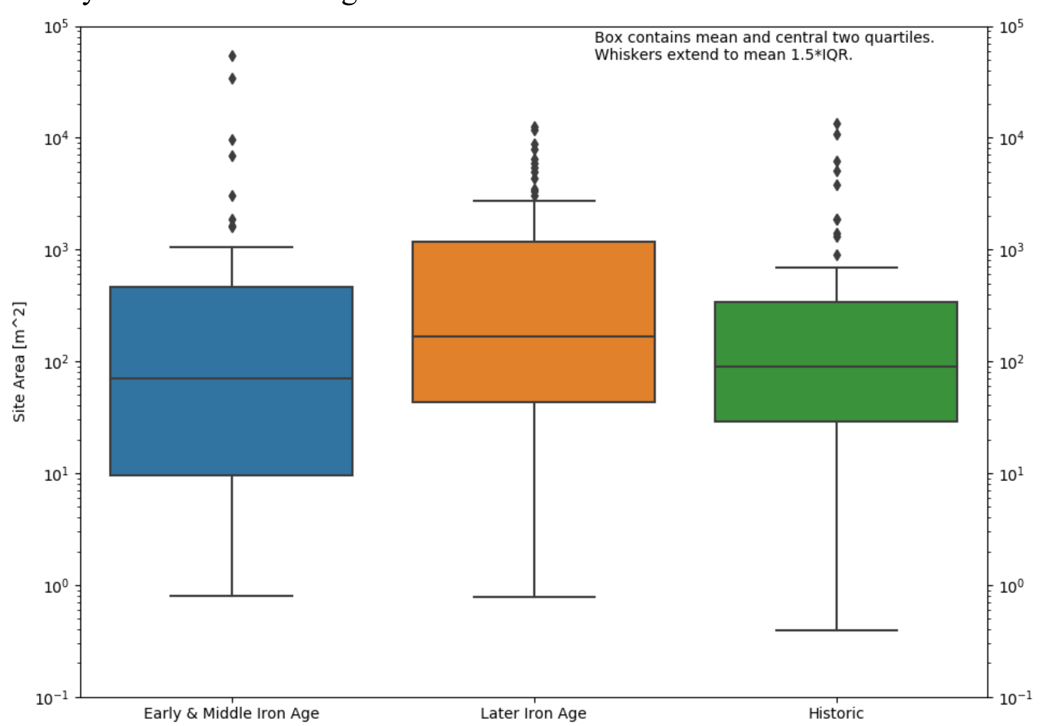

Figure 3.19: Box and whisker plot of site sizes by time period. Logarithmic scale, outliers included. Early and middle Iron Age sites are combined.

The limitations of the ceramic analysis and the various historical interpretations provided above can be investigated through both additional statistical analysis and fieldwork strategies. An example of the latter would be to examine the recovery rate of ceramics and the total number of sites recorded in the northwestern and southeastern survey zones. Similarly, some mapped sites were technically beyond the borders of the quadrants due to the challenges of determining one's location during pedestrian survey, and this analysis could be run again to exclude those sites. Future pedestrian survey should explore the peneplains to the north and south of the Sandawe Hills, as well as their core. The Bubu escarpment is also of particular interest given evidence for both freshwater resource use, as well as early metallurgy and pottery production.

Conclusion

The archaeological record of the Sandawe homeland is remarkably diverse and ranges from the Early and Middle Stone Ages to the present. For example, excavations at Merebu 1 yielded some of the oldest known ostrich eggshell bead blanks in Africa, which suggests that the site may also be relevant for better understanding the relationship between the Middle and Later Stone Ages. Food production may date to 550 BC in the Sandawe homeland but was certainly established by 350 AD, if metallurgy and pottery production are accepted as indirect evidence. Early food-production was likely agro-pastoral, but direct evidence of agriculture remains elusive. Based on statistical and geospatial analyses of four time-sensitive ceramic groupings, I argue that occupation patterns through time contradict historical reconstructions that propose a northwest-to-southeast moving frontier and instead suggest that food-production may have first occurred in the region of the homeland described as the most culturally conservative. However, sites grow in size through time and to become more widely distributed, which does resonate with the frontier model.

Chapter 4

Map-making and the (De-)construction of the Homeland Refuge

In his examination of changing perceptions of the Amazonian interior, Raffles (1999) proposes the concept of a "locality," which he defines as "a set of relations, an ongoing politics, a density, in which places are discursively and imaginatively materialized and enacted through the practices of variously positioned people and political economies." Historical narratives, exemplified by Ilife 1979, have characterized the history of the interior as fundamentally distinct and disconnected from that of the coast until the early 1800s. Given the perceived status of the Sandawe and Hadza as true autochthons and deeply rooted in place, these groups are seen as doubly isolated. Ilife (1979) does acknowledge a diversity of political economic forms prior to the nineteenth century, as well as various kinds of local "entrepreneurship" after that point, but social development in the interior has long been characterized as happening in response to the external, global forces.

Early European explorers described the interior as *terra incognita* despite clear evidence that their treks followed well-established trade routes. Such descriptions contrast with stories told to me by the Sandawe about the rock art and other features of the cultural landscape that speak to an interconnected past. In contrast to colonial and scholarly accounts of isolation, local discourse about a collection of mysterious structures recalls diverse forms of interaction and exchange. During archaeological reconnaissance, Sutton (1968) was alerted to the existence of roughly circular features of hard clay measuring approximately 5 m in diameter and consisting of collapsed and irregular walls one or two meters thick and about one meter high. These circles are certainly remarkable due to their restricted distribution and high density near the Motto sub-village of Mangasta (nearly three dozen were recorded during my fieldwork). These structures superficially resemble those observed elsewhere in Tanzania of unknown function (Chittick 1959; Fosbrooke 1957; Masao 1976a; Sutton 1973). They also resemble structures in central Kenya known as “Sirikwa holes,” which were saucer-shaped depressions used as livestock enclosures (Chapman 1966; Kyule 1997; Sutton 1965, 1968, 1987). They are, however, smaller, seemingly devoid of archaeological material, and lacking clear evidence of construction techniques, such as postholes. Sutton (1968) withholds hypothesizing what purpose they may have served due to a lack of evidence, but my Sandawe interlocutors are quite certain. Both Sutton and I were informed repeatedly and vehemently that these were once homes for the Portuguese: short, light-skinned people who introduced maize to the Sandawe. Sutton quickly dismisses the notion that the structures were built by the Portuguese due to the fact that they never ventured this far into the eastern African interior. He notes that many local miracula are ascribed to the Portuguese and the Germans, yet he was still compelled to investigate these structures in part because of the fantastic claims about them.

It could be argued that there is a kernel of historical truth in this account: the Portuguese likely did introduce maize to Africa (Miracle 1965). I am less interested in the veracity of the specific claims about the Portuguese as much as I am in how contrasting notions of isolation or interaction have emerged in this place through an encounter with material traces of the past. Isolation and interaction, as qualities of social relations, are amenable to archaeological investigation through material analysis. In the remainder of this chapter, I examine two assemblages of “exotic” goods that, based on current evidence, were not available or produced locally: obsidian and glass beads. The results suggest that inhabitants of the Sandawe homeland had long-standing ties to spheres of interaction and exchange both internal to the continent (obsidian) and extending beyond it via the Indian Ocean trade network and later, global commodity flows.

An intriguing possibility that emerges from the analysis of glass beads is that 1800 is too late for the confluence of "internal" Iron Age and "external" early modern trajectories, and that these processes occurred alongside each other in the interior. Such a claim, of course, seems obvious by now for other areas of the Old World where studies of global modernity have examined how this phenomenon built upon preexisting technologies and networks. Scholars working in the eastern African coastal hinterland have explored how early caravan trade built upon existing networks, and survey further inland could examine their extent in space and time. This would, of course, make for some useful provocations regarding how archaeologists, historians, and linguists are and are not able to integrate their datasets, especially as oral histories begin to fade out. Although not discussed in this dissertation, there is ample evidence of salt production in the Sandawe homeland. Although salt is not an exotic item, it does for an essential trade good, especially after the onset of agricultural and pastoralism.

Part I: Obsidian

Obsidians are naturally occurring volcanic glasses that form when silica-rich, or rhyolitic, lavas cool quickly into amorphous solids. Due to their non-crystalline structure, obsidians are an ideal material for the production of lithics with razor-sharp edges. Many obsidians are compositionally homogenous and geographically restricted, with distinct combinations of major, minor, and trace elements that are thought to reflect their origin in discrete episodes of volcanic eruption (Frahm et al. 2017; Merrick & Brown 1984b). Archaeologists and paleoanthropologists maintain a keen interest in obsidian because it is the rare material that promises to simultaneously account for both time and space in studies of human evolution and cultural development. For example, a comparison of geological occurrences and artifactual assemblages allows for the development and testing of models concerning the evolution of human behavior and cultural change, such as the emergence of abstract thinking and planning depth, the intensity and scale of exchange and communication networks, ethnic boundaries and political centralization, and craft specialization (Ambrose 2012; McBrearty & Brooks 2000; Merrick and Brown 1984a, 1984b).

Regarding its potential to account for time, obsidian undergoes mineral hydration, absorbing water at a known rate after fracture, and Friedman & Smith (1960) used this observation to develop a dating method calibrated initially to archaeological assemblages of known age. Although this appears to offer a straightforward method of dating obsidian artifacts whose production entailed the creation of fresh surfaces (the thicker the hydration band, the older the artifact), numerous theoretical flaws and unanticipated physical properties were identified in subsequent decades that lessened confidence in the technique, only some of which have been addressed through methodological innovation (Liritzis 2006; Liritzis & Laskaris 2009; Liritzis & Stevenson 2012). Obsidian hydration dating was adopted slowly among Africanist archaeologists and paleoanthropologists (see Michels 1983), and it remains rarely employed on the continent, especially at sites for which other dating techniques are available.

In contrast, the geochemical profiling of obsidian sources and artifacts has been regarded as an archaeological "success story," with major traditions of research existing for the Americas, the eastern Mediterranean basin, and Oceania (Negash & Shackley 2006). Africa is an outlier from a global perspective in that is has numerous, well-documented occurrences of obsidian, clear evidence of time-deep and intensive use of obsidian, and relatively robust datasets characterizing those sources and artifacts yet the full potential of this line of inquiry remains unrealized (Merrick & Brown 1984b). This characterization remains true, despite a number of recent publications and a consistent recognition that studies of the availability, exploitation, and distribution of obsidian could contribute significantly to a number of perennial debates (see, for example, Frahm et al. 2017 concerning the exchange of obsidian between foragers and pastoralists). This state of affairs is especially surprising given the extraordinary time-depth, intensity, and geographic scales of obsidian use on the continent. For example, the earliest use of obsidian predates *Homo sapiens*, dates to at least 1.75 million years ago (during the Early Stone Age), and may have entailed long-distance transport, albeit rarely (Ambrose 2012; Leakey 1971; Walter et al. 1991).

The earliest sourcing studies in eastern Africa focused on physical properties, such as the color, specific gravity, and refractive index of obsidians (see Leakey et al. 1945), but these methods are limited when multiple sources exist (Brown et al. 2013). The Eastern African Rift system is one such region, having produced one of the most obsidian-rich regions of the world (Frahm et al. 2017). In response to a challenge posed by Mary Leakey regarding the origin of obsidian artifacts found in the Later Stone Age levels of Olduvai Gorge, Harry Merrick and Frank Brown initiated a multi-decade project to identify and characterize the obsidian sources of Kenya, focusing mainly on central Kenya (Brown et al. 2013; Merrick & Brown 1984a, 1984b; Merrick et al. 1988, 1994; Nash et al. 2011). Other groups have examined northern Kenyan and Ethiopian obsidians, but no systematic surveys of obsidian sources have been conducted in Tanzania (Ndiema et a. 2011; Negash & Shackley 2006; Negash et al. 2006; Piperno et al. 2009).

Despite significant volcanic activity associated with the Albertine and Gregory Rifts, which form the two arms of the East African Rift system in Tanzania, only one known source exists in the country, near the summit of Mt. Kilimanjaro (Schmid & Stern 1976). Fortuitously, all obsidian artifacts from Tanzania that have been analyzed to date, with the exception of the artifacts on Mt. Kilimanjaro (Schmid & Stern 1976), were produced on materials obtained from Kenyan sources (Grillo et al. 2018; Mehlman 1989; Prendergast et al. 2013).

Elemental Analysis of Obsidian

Brown et al. (2013) comprises the most robust, published dataset of eastern African obsidians and, crucially, includes the geographic coordinates of sources, consolidates studies from across Kenya, and includes data derived from multiple analytic methods (electron microprobe analysis [EPMA], laser ablation inductively coupled plasma mass spectrometry [LA-ICP-MS], and X-ray fluorescence [XRF]). Obsidian sources tend to be defined in the literature either geographically (a point on a map) or chemically (a cluster on a graph), and factors such as complex physiography and smaller scale variations in lava demand caution regardless of which strategy is chosen (Frahm et al. 2017). A chemically defined "source" should not be confused with a discrete outcrop or occurrence of obsidian, nor should it be assumed that all sources were exploited as a source of raw material. Chemically dissimilar obsidians may be geographically proximate and chemically similar obsidians may be geographically distant, but the aspect of distance alone has no bearing on the definition of a source. An additional issue, although one that does not at present appear to be a major complicating factor for eastern African obsidians, is that their distribution could be primary (in situ formation) or secondary (colluvial or alluvial transport) (Fram et al. 2017). Brown et al. (2013) take note of geography while ultimately favoring a chemical definition. In their initial study, Merrick & Brown (1984b) note that merely three elements (Fe_2O_3, CaO, and TiO_2), which are reported as oxides following convention, can distinguish most obsidian sources of eastern Africa. They observe in Brown et al. (2013) that the addition of Cl and Al_2O_3 allows for the statistical discrimination of all 84 sources. If any two specimens differed by more than one standard deviation for any of the five chemicals and elements listed above, the authors considered them to be distinct sources.

In total, Brown et al. (2013) analyzed 194 specimens directly and included data from an additional 46 specimens (for a total of 240). An additional 16 specimens are reported in the supplementary data tables but not incorporated into the main body of the text, including the data tables organized by region, sub-group, and source. They divide the 240 specimens into four regional groups (Northern Kenya, the Mt. Kenya and Baringo Region, the Naivasha-Nakuru Region, and Southern Kenya). Within these four regions, they identified 11 sub-groups of geographically proximate occurrences of obsidian that include a total of 84 chemically distinct sources. Many sources are represented by a single specimen, and the extent to which a single source is, in fact, chemically homogenous could be explored through future research. To facilitate cross-study compatibility, Frahm et al. (2017) also adopt a chemical definition of sources, but they note that a greater focus on trace elements (they prefer Zr, Rb, Nb, Sr, and Mn) and other forms of petrological data suggest may require modifications of the sources.

Three obsidian flakes were recovered during survey and excavation in the Sandawe homeland. One flake was recovered from surface survey at the Kimau A/B rockshelter, whereas the Msembere 1 rockshelter yielded two flakes during excavation. In order to ascertain whether inhabitants of the Sandawe homeland used obsidian from known sources, this assemblage was analyzed in collaboration with Dr. Laure Dussubieux in the Elemental Analysis Facility (EAF) at the Field Museum of Natural History in Chicago, USA, with a Thermo ICAP Q Inductively Coupled Plasma – Mass Spectrometer (ICP-MS) connected to a ESI-Elemental Scientific Lasers NW213 laser for direct introduction of solid samples.

The following is a description of the standard protocol provided by the EAF. The parameters of the ICP-MS are optimized to ensure a stable signal with a maximum intensity over the full range of masses of the elements and to minimize oxides and double ionized species formation (XO^+/X^+ and $X^{++}/X^+ < 1$ to 2 %). For that purpose, the argon flows, the RF power, the torch position, the lenses, the mirror and the detector voltages are adjusted using an auto-optimization procedure.

For better sensitivity, helium is used as a gas carrier in the laser. The choice of the parameters of the laser ablation not only will have an effect on the sensitivity of the method and the reproducibility of the measurements but also on the damage to the sample. To be able to determine elements with concentrations in the range of ppm and below while leaving a trace on the surface of the sample invisible to the naked eye, we use the single point analysis mode with a laser beam diameter of 55 μm, operating at 40% of the laser energy (0.7 mJ) and at a pulse frequency of 20 Hz. A pre-ablation time of 20 s is set in order, first, to eliminate the transient part of the signal and, second, to be sure that a possible surface contamination or corrosion does not affect the results of the analysis. For each glass sample, the average of four measurements corrected from the blank is considered for the calculation of concentrations.

To improve reproducibility of measurements, the use of an internal standard is required to correct possible instrumental drifts or changes in the ablation efficiency. The element chosen as internal standard must be present in relatively high concentration, so its measurement is as accurate as possible. To obtain absolute concentrations for the analyzed elements, the concentration of the internal standard must be known. The isotope Si29 was used for internal standardization. Concentrations for major elements, including silica, are calculated assuming that the sum of their concentrations in weight percent in glass is equal to 100% (Gratuze 2016).

Fully quantitative analyses are possible by using external standards. To prevent matrix effects, the composition of standards has to be as close as possible to that of the samples. One standard reference materials (SRM) is manufactured by the National Institute for Standards and Technology (NIST) and is named SRM 610. It is a Soda-lime-silica glass doped with trace elements in the range of 500 ppm. Certified values are available for a very limited number of elements. Concentrations from Pearce et al. (1997) are used for the other elements. The second series of standards were manufactured by Corning. Glass B and D are glasses that match compositions of ancient glass (Brill 1999:544). Tables 4.1 and 4.2 provide the major, trace, and minor elements in these samples. In keeping with standards for glass analyses, major and minor elements are reported as oxides.

Comparisons to Regional Datasets

We encountered several difficulties when comparing our results to the Brown et al. (2013) dataset. For example, we could not recreate all source groups using their statistical method. Further complicating matters, their standard deviations for several elements are many orders of magnitude larger than those obtained during our analyses. It is not possible to ascertain from their publication how the standard deviations were calculated, and so it is not clear that the results of statistical tests between their dataset and ours are based on equivalent measurements or assumptions. Some tangible and significant implications of this observation will be discussed below.

Table 4.1: Percentages of major and minor elements in obsidians from the Sandawe homeland

	Msembere 1, Level 1		Msembere 1, Level 10		Kimau A/B, Surface	
Element	**Wt. pct.**	**Std. dev. (n=4)**	**Wt. pct.**	**Std. dev. (n=4)**	**Wt. pct.**	**Std. dev. (n=4)**
SiO2	73.0%	-	73.5%	-	76.9%	-
Na2O	5.6%	0.0020%	5.6%	0.0692%	4.6%	0.102%
MgO	0.0%	0.0000%	0.0%	0.0003%	0.0%	0.000%
Al2O3	7.9%	0.0078%	7.7%	0.0738%	10.1%	0.130%
P2O5	0.0%	0.0000%	0.0%	0.0002%	0.0%	0.000%
Cl	0.3%	0.0000%	0.3%	0.0056%	0.3%	0.005%
K2O	4.0%	0.0008%	3.9%	0.0213%	3.9%	0.070%
CaO	0.3%	0.0000%	0.3%	0.0030%	0.1%	0.003%
MnO	0.2%	0.0000%	0.2%	0.0010%	0.1%	0.002%
Fe2O3	8.6%	0.0068%	8.4%	0.0586%	4.0%	0.085%
CuO	0.0005%	0.0000%	0.0005%	0.0000%	0.0008%	0.000%
SnO2	0.0%	0.0000%	0.0%	0.0000%	0.0%	0.000%
PbO	0.0%	0.0001%	0.0%	0.0000%	0.0%	0.000%

To address these limitations, we devised two strategies, qualitative and quantitative, that yielded concordant results. Only 136 specimens had reported LA-ICP-MS data in either the main or supplementary data tables, Brown et al. (2013) analyzed a smaller number elements using LA-ICP-MS than we did (n=39 versus n=56). After removing specimens and elements for which no data are available, the comparative dataset included a total of 139 specimens (three from the Sandawe homeland and 136 from Kenya). The number of removed specimens was not proportional across the four regions, and it should be noted that only two specimens were included from Northern Kenya. First, we created bivariate plots for each pair of the ten elements (Al_2O_3, Fe_2O_3, CaO, TiO_2, Cl, Zr, Rb, Nb, Sr, and Mn) regarded as the most diagnostic by previous studies (Brown et al. 2013; Frahm et al. 2017; Merrick & Brown 1984a, 1984b). We also devised a chi-squared “discrepancy” score. The discrepancy score is the sum across chemicals and elements of the absolute difference of central values for the two samples normalized by the root sum square of their standards deviation. The figure of merit (or "similarity") for quantifying the degree of compatibility for the chemical compositions of two samples 1 and 2 (where f is the fractional composition of a given chemical element) can be represented as follows:

$$\sum^{elements} \left(\frac{f_1 - f_2}{\sqrt{\sigma_1^2 + \sigma_2^2}} \right)$$

In this manner, we were able to compare each of the Sandawe specimens to each of the 136 other specimens in the dataset provided by Brown et al. (2013). This normalization ensures that the difference between the two samples contributes to our discrepancy score in proportion to its statistical significance. This score was calculated twice. The first calculation included only the ten elements considered to be the most diagnostic and for which data were available. The second calculation included all 39 elements for which data were available across the entire set of 139 specimens. Across both methods, the obsidian artifacts from the Sandawe homeland consistently cluster nearest to sources from the Naivasha-Nakuru basin of central Kenya (Tables 4.3 and 4.4). Figures 4.1, 4.2, and 4.3 show the bivariate plots for the major and minor elements.

The most cautious interpretation is that these three objects derive from three unknown sources near Lake Naivasha. More speculatively, we believe that the two specimens from Msembere 1 derive from a single source to the northwest of Lake Naivasha, whereas the specimen from Kimau A/B derives from a source to the southeast of Lake Naivasha. These sources are either currently unknown or technical differences between our study and Brown et al. (2013) prohibit greater precision. Based on both sets of discrepancy scores, the Msembere 1 specimens most closely resemble three sources located on Mt. Eburru. The Kimau A/B specimen is chemically distinct from the Msembere 1 specimens and is most similar to three sources within the Ol Karia sub-group in and around Njorowa Gorge, as well as an additional source from the Mt. Eburru sub-group.

Table 4.2: Trace elements (parts per million) in obsidians from the Sandawe homeland

	Msembere 1, Level 1		**Msembere 1, Level 10**		**Kimau A/B**	
Element	**ppm**	**Std. dev. (n=4)**	**ppm**	**Std. dev. (n=4)**	**ppm**	**Std. dev. (n=4)**
Li	46.7	0.20	44.8	0.76	78.3	2.5
Be	10.4	0.21	10.7	0.52	14.7	0.3
B	12.3	0.43	12.1	0.09	20.3	0.2
Sc	3.5	0.02	3.5	0.03	3.4	0.0
Ti	1372.1	8.15	1329.6	7.14	753.7	10.5
V	0.2	0.02	0.2	0.01	0.2	0.0
Cr	0.0	0.05	0.1	0.06	0.2	0.1
Ni	0.0	0.01	0.0	0.02	0.1	0.0
Co	0.3	0.01	0.3	0.02	0.1	0.1
Zn	450.4	11.11	412.6	2.93	285.3	12.0
As	3.4	0.07	3.4	0.18	4.6	0.1
Rb	187.8	1.31	185.5	2.08	393.5	23.6
Sr	7.7	0.16	7.3	0.13	1.5	0.0
Zr	1732.5	23.22	1662.5	39.36	1600.2	27.2
Nb	338.2	3.61	333.7	3.66	341.0	6.4
Ag	0.5	0.01	0.5	0.02	0.5	0.0
In	0.2	0.01	0.2	0.01	0.2	0.0
Sb	0.3	0.01	0.3	0.04	0.6	0.0
Cs	1.7	0.04	1.7	0.01	5.3	0.1
Ba	76.5	0.80	73.9	1.04	3.6	0.1
La	226.9	8.61	193.9	6.26	101.4	1.7
Ce	456.2	2.24	440.9	3.67	253.7	4.6
Pr	45.3	0.39	43.9	0.67	24.8	0.3
Ta	17.5	0.21	17.4	0.30	19.8	0.2
Au	0.1	0.01	0.1	0.02	0.1	0.0
Y	188.2	2.96	178.6	4.45	149.2	3.1
Bi	0.3	0.01	0.4	0.03	0.7	0.0
U	9.7	0.15	9.5	0.09	20.3	0.5
W	4.5	0.05	4.4	0.09	7.4	0.1
Mo	9.6	0.17	9.6	0.22	7.0	0.1
Nd	183.9	2.18	178.4	2.57	97.0	1.6
Sm	37.4	0.74	35.9	0.64	23.0	0.4
Eu	2.6	0.02	2.5	0.07	0.5	0.0

Table 4.2: Continued

	Msembere 1, Level 1		Msembere 1, Level 10		Kimau A/B	
Element	**ppm**	**Std. dev. (n=4)**	**ppm**	**Std. dev. (n=4)**	**ppm**	**Std. dev. (n=4)**
Tb	5.2	0.07	5.0	0.06	3.8	0.1
Dy	38.9	0.69	37.1	0.69	29.4	0.5
Ho	7.4	0.11	7.1	0.10	5.8	0.1
Er	23.8	0.40	22.8	0.49	18.8	0.3
Tm	3.1	0.06	3.0	0.07	2.5	0.1
Yb	23.9	0.44	22.9	0.41	19.4	0.3
Lu	3.1	0.05	3.0	0.07	2.4	0.0
Hf	38.0	0.71	36.5	0.78	38.6	0.7
Th	58.3	0.87	55.9	1.02	108.9	1.8

A significant implication of the differences in standard deviations noted above is that the method used by Brown et al. (2013) to statistically differentiate sources may be of limited utility until technical differences between labs and machinery can be examined. For example, the standard deviations associated with our measurements are so small that the obsidians from Msembere 1 would be considered distinct using the statistical method devised by Brown et al. (2013) even though they seem quite similar. If the specimens analyzed by Brown et al. (2013) had similarly small standard deviations, very few, if any, of their sources would have contained multiple specimens. It is possible that the Msembere 1 obsidians do, indeed, derive from two sources with remarkably similar compositions. It is also feasible that these specimens derive from a single occurrence of obsidian that is more chemically variable than has been documented elsewhere in Kenya. Absent targeted fieldwork or calibration studies using Merrick and Brown's specimens (see Frahm et al. (2017), it is not currently possible to definitively choose among these three possibilities (technical differences between analysts and machinery, inter-source similarity, and intra-source variability).

Table 4.3: Discrepancy score based on the ten most diagnostic elements

Tested Specimen	Rank	Discrepancy Score	Matched Specimen	Region	Sub-Group	Source Group Name
Msembere 1: OBS001	1	24.88	CMN 6	Naivasha-Nakuru	Mt. Eburu	Cedar Hill South, Eburu Station West, and Naivasha Scarp #2
	2	25.44	CMN 9	Naivasha-Nakuru	Mt. Eburu	Masai Gorge Box Canyon
	3	31.87	MER 100	Naivasha-Nakuru	Mt. Eburu	Eburu GsJj 50, North Slope, Hilltop, and Steam Jets
	4	32.06	CMN 8	Naivasha-Nakuru	Mt. Eburu	Masai Gorge Box Canyon
Msembere 1: OBS002	1	24.01	CMN 6	Naivasha-Nakuru	Mt. Eburu	Cedar Hill South, Eburu Station West, and Naivasha Scarp #2
	2	26.42	CMN 9	Naivasha-Nakuru	Mt. Eburu	Masai Gorge Box Canyon
	3	31.90	MER 100	Naivasha-Nakuru	Mt. Eburu	Eburu GsJj 50, North Slope, Hilltop, and Steam Jets
	4	34.79	MER 72	Naivasha-Nakuru	Mt. Eburu	Eburu GsJj 50, North Slope, Hilltop, and Steam Jets
Kimau A/B: OBS003	1	19.57	MER 82	Naivasha-Nakuru	Ol Karia Group	Ololbutot 1 (Oserian Farm)
	2	24.77	MER 31	Naivasha-Nakuru	Ol Karia Group	Hell's Gate 1
	3	25.60	CMN 7	Naivasha-Nakuru	Mt. Eburu	Naivasha Scarp #1
	4	32.37	CMN 24	Naivasha-Nakuru	Ol Karia Group	Kibikoni 1

Table 4.4: Discrepancy score based on all 139 elements in the comparative dataset

Tested Specimen	Rank	Discrepancy Score	Matched Specimen	Region	Sub-Group	Source Group Name
Msembere 1: OBS001	1	116.60	CMN 9	Naivasha-Nakuru	Mt. Eburu	Masai Gorge Box Canyon
	2	125.51	MER 72	Naivasha-Nakuru	Mt. Eburu	Eburu GsJj 50, North Slope, Hilltop, and Steam Jets
	3	128.75	MER 100	Naivasha-Nakuru	Mt. Eburu	Eburu GsJj 50, North Slope, Hilltop, and Steam Jets
	4	134.33	CMN 8	Naivasha-Nakuru	Mt. Eburu	Masai Gorge Box Canyon
Msembere 1: OBS002	1	113.22	CMN 9	Naivasha-Nakuru	Mt. Eburu	Masai Gorge Box Canyon
	2	129.55	CMN 8	Naivasha-Nakuru	Mt. Eburu	Masai Gorge Box Canyon
	3	136.75	MER 100	Naivasha-Nakuru	Mt. Eburu	Eburu GsJj 50, North Slope, Hilltop, and Steam Jets
	4	137.22	MER 72	Naivasha-Nakuru	Mt. Eburu	Eburu GsJj 50, North Slope, Hilltop, and Steam Jets
Kimau A/B: OBS003	1	142.58	MER 83	Naivasha-Nakuru	Ol Karia Group	Ololbutot 1 (Oserian Farm)
	2	142.62	MER 82	Naivasha-Nakuru	Ol Karia Group	Ololbutot 1 (Oserian Farm)
	3	158.51	K80-399W	Naivasha-Nakuru	Ol Karia Group	Hell's Gate 1
	4	161.99	CMN 7	Naivasha-Nakuru	Mt. Eburu	Naivasha Scarp #1

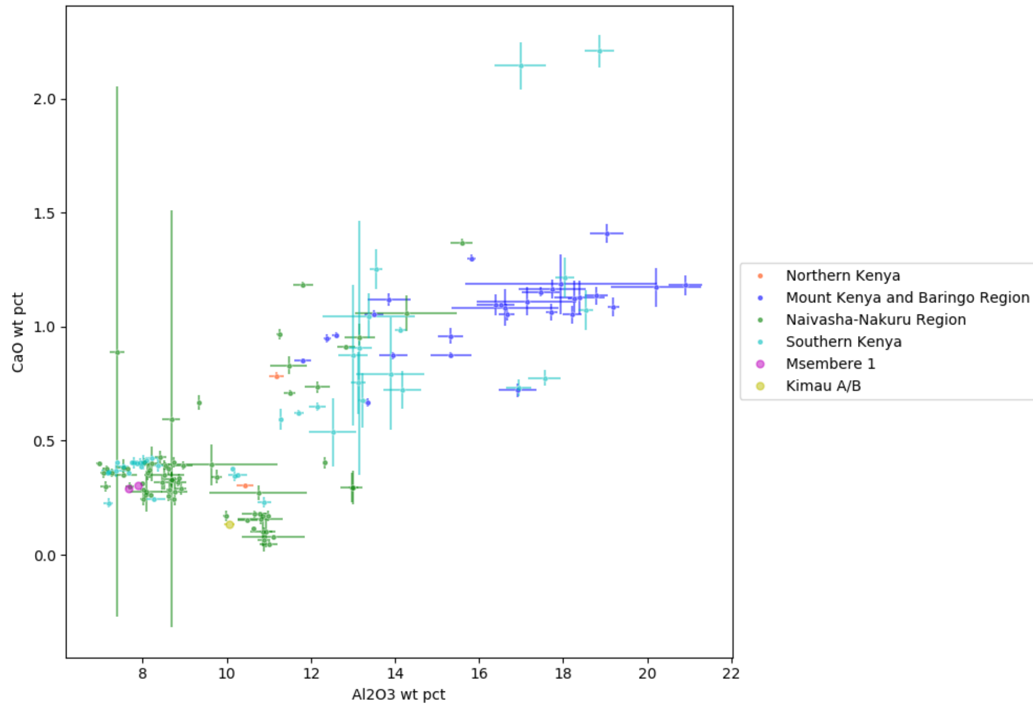

Figure 4.1: Bivariate plot of Al_2O_3 and CaO concentrations in eastern African obsidians

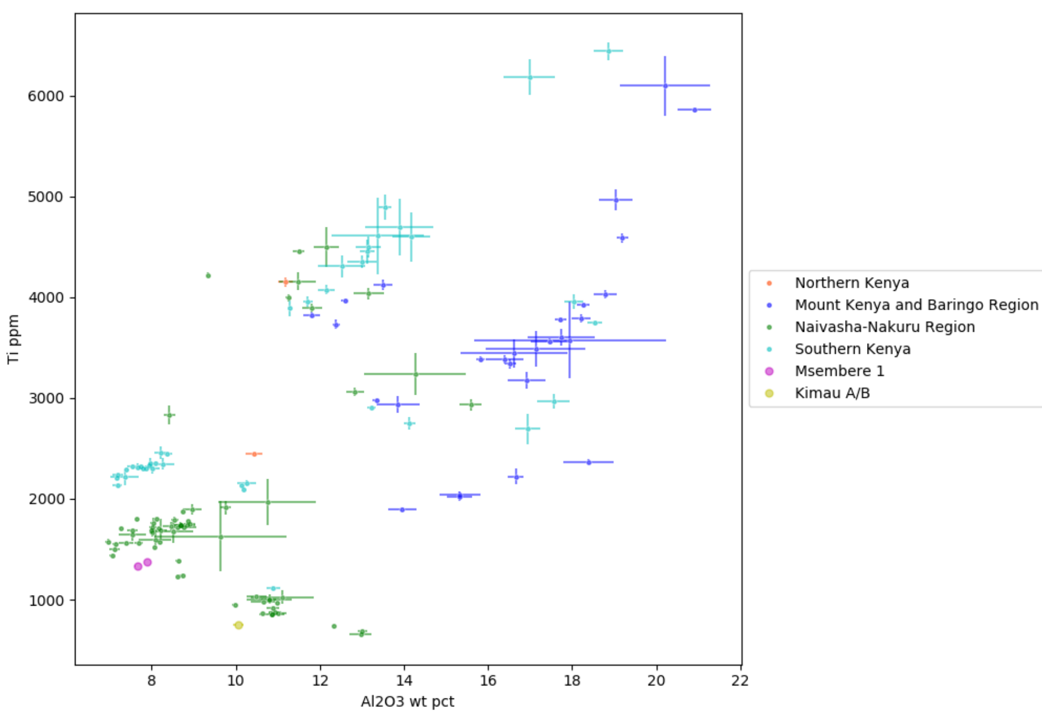

Figure 4.2: Bivariate plot of Al_2O_3 and Ti concentrations in eastern African obsidians

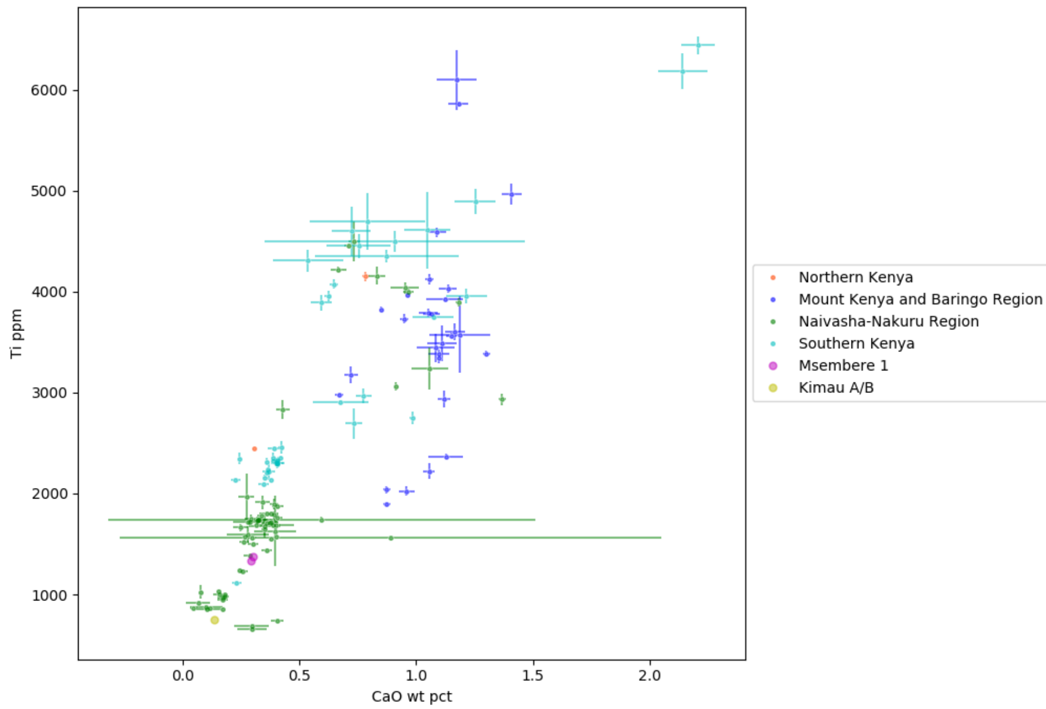

Figure 4.3: Bivariate plot of CaO and Ti concentrations in eastern African obsidians

Implications of Obsidian Sourcing

In his review of obsidian transport from the Early, Middle, and Later Stone Ages, Ambrose (2012) states that the size of discernible interaction spheres in the eastern African highlands grew through time, reaching an apparent maximum of 400 km associated with early Pastoral Neolithic sites. Luxmanda, a recently published Savanna Pastoral Neolithic site with numerous obsidian artifacts from the Naivasha-Nakuru basin (Grillo et al. 2018; Prendergast et al. 2013), is also located at this threshold. The Msembere 1 and Kimau A/B rockshelters are approximately 525 kilometers south of Lake Naivasha. If future analysis supports the attribution of these obsidians to sources in the Naivasha basin, then they represent the southernmost known extent of this network. These results also, therefore, represent the farthest distance obsidian has been observed to travel in sub-Saharan Africa, increasing the scale of known interaction spheres by approximately 30%. This figure remains dwarfed, however, by studies that suggest coastal, maritime trade routes provided ancient Egypt with obsidians for several thousand years (from the Predynastic period through at least the New Kingdom) that originated 1300 km to the south in Ethiopia and Yemen (Aston et al. 2000; Tykot 1996). It does not appear as if the eastern African zones of obsidian exchange intersected with those linking the Horn the northern Africa.

It is known that the transport of obsidian in eastern Africa and the Horn spanned a vast time period (Merrick & Brown 1984b; Ambrose 2012). In Tanzania, the oldest obsidian tools at Mumba date to 130,000 BP, while younger material from Luxmanda and Kisese dates to 3-4,000 BP (Grillo et al. 2018; Mehlman 1989; Tryon 2018). Chemical analyses of MSA, LSA, and PN obsidian artifacts from Tanzania have consistently linked them to sources near Naivasha, Kenya, several hundred kilometers away, although sourcing strategies and trade dynamics remain unclear (Grillo et al. 2018; Merrick and Brown 1984b; Tryon 2018). The flake from Kimau A/B was obtained from a surface collection that also included quartz microliths and undiagnostic ceramics, and so it is not possible to assign an estimated time range to this object. The excavated specimens from Msembere 1 have associated dates of 278 cal BP to present and 2701-2350 cal BP, respectively. The flakes are small enough in size that downward migration through the deposits is feasible. If, however, the deposits are stratigraphically secure, then the network though which this material was transported was long-standing and is broadly contemporaneous with the appearance of Pastoral Neolithic sites in northern Tanzania.

Merrick & Brown (1984b) caution against describing all obsidian transport as “trade” in the absence of “middle-range” modeling to explain its extraction, movement, and use. For example, if home ranges were considerably larger in the past, then obsidian recovered far from its source could reflect individual exploitation of the resource rather than exchange. Down-the-line trade is model that has been proposed to describe a pattern of exchange in which each recipient of a good retains a portion of the resource before transmitting the remainder to another recipient such that the volume of the material declines as distance from the source increases. Sufficient data exists in some regions of Kenya to plot this graphically, but this is not possible for the archaeological obsidians of Tanzania. However, because the material recovered consists of small flakes rather than unprepared or worked cores, this could indicate that inhabitants of the Sandawe homeland received relatively small volumes of obsidian and, so, were at the outer margins of the exchange network. This pattern resembles that observed elsewhere in northern Tanzania at Mumba, Nasera, and Kisese II, in which obsidian forms a small fraction of lithic raw material.

This, however, contrasts with Luxmanda where obsidian is still relatively rare but forms approximately 2.8% of the lithic assemblage. The evidence strongly suggests that early pastoral communities maintained strong social ties over long distances, facilitated (or, perhaps, allowed) by the regular exchange of obsidian (Goldstein 2017). Some have suggested that these social networks were necessary for pastoral adaptations to become fully established and spread in a period of changing climate, and possibly the changing social, political, and economic backdrop related to specialized pastoralism itself. In this regard, it is notable that Luxmanda is the farthest south and oldest known Savanna Pastoral Neolithic site, but that fact is itself anomalous and has not yet been adequately explained (PN sites were thought to get progressively older from north to south).

The data from the obsidians are too limited to make sweeping claims, but the geographic scale and timeframe involved (from central Kenya, for 2,500 years) can be read in different ways and though both frontier and mosaic models. First, it is possible that the trade of obsidian by

“Pastoral Neolithic” groups is a difference in degree and not of kind. Somewhat akin to the later European explorers, early pastoralists, perhaps, followed existing routes that can be discerned by the distribution of obsidian. That said, it is clear that early pastoral groups were involved with an increasing intensity of obsidian use, and the inhabitants of the Sandawe homeland may have had access to obsidian as a result of those changes.

Part II: Glass Beads

A detailed literature on bead manufacture, import, and exchange documents links between Africa, Europe, and Asia, but little information exists specifically concerning the eastern African interior (but see Walz and Dussubieux 2016). Compositional analysis of glass beads using LA-ICP-MS has revealed a diversity of glass recipes, but, crucially, these recipes can be associated with production centers and trade flows that are geographically and chronologically constrained (Wood 2011). Twenty-eight glass beads were recovered at seven sites, six of which were in contexts datable through association with radiocarbon. Three *cornaline d’Aleppo* beads could be assigned to the colonial period (Marshall 2012), but the remaining beads were not chronologically diagnostic based on macroscopic analysis alone. In order to better understand the Indian Ocean trade network, while also building knowledge of how exotic beads were incorporated into the lifeways and exchange networks of the interior, the chemical compositions of the entire assemblage were analyzed. As with the obsidian, this entailed LA-ICP-MS analysis at the FMNH-EAF in collaboration with Dr. Laure Dussubieux. A further goal of this analysis was to help constrain ceramic assemblages, especially those of the “later Iron Age,” a term that is effectively meaningless as chronological indicator for the Tanzanian interior. Descriptive traits of this assemblage, as well as the likely glass recipes and periods of manufacture are provided in Table 4.5

Table 4.5: Recipes, estimated time period of manufacture, and descriptive traits of glass beads

Site	Specimen	Date Range	Recipe	Colorant	Transparency / Color	Technique
Merebu 1	GBD001	17^{th} to 18^{th} c. AD	Soda-lime with Pb	Co-Ni-As-Bi-U + Sb	Corroded / dark blue	Drawn
Merebu 1	GBD002	18^{th} – 19^{th} c. AD	Soda –low lime but higher Pb	Co-Ni (maybe As no Bi) As>Sb	Corroded / dark blue	Drawn
Merebu 1	GBD003	17^{th} to 18^{th} c. AD	Soda-lime with Pb	Co-Ni-As-Bi-U + Sb	Corroded / dark blue	Drawn
Merebu 1	GBD004	18^{th} – 19^{th} c. AD	Soda-low lime but higher Pb	Co-Ni (maybe As no Bi) As>Sb	Corroded / dark blue	Drawn
Merebu 1	GBD005		m-Na-Al	Sn/Pb	Opaque / yellow	Drawn
Merebu 1	GBD006		m-Na-Al	Cu	Translucent / blue	Drawn
Warimba 2	GBD007R	18^{th} to late 19^{th} c. AD		Au	Translucent / red exterior	Drawn (Cornaline d'Aleppo)
Warimba 2	GBD007W	18^{th} to late 19^{th} c. AD		As	Opaque / white core	Drawn (Cornaline d'Aleppo)
Warimba 2	GBD008R	18^{th} to late 19^{th} c. AD		Au	Translucent / red exterior	Drawn (Cornaline d'Aleppo)
Warimba 2	GBD008W	18^{th} to late 19^{th} c. AD		As	Opaque / white core	Drawn (Cornaline d'Aleppo)
Warimba 2	GBD009R	18^{th} to late 19^{th} c. AD		Au	Translucent / red exterior	Drawn (Cornaline d'Aleppo)
Warimba 2	GBD009W	18^{th} to late 19^{th} c. AD		As	Opaque / white core	Drawn (Cornaline d'Aleppo)
Warimba 2	GBD010	?		Co-As-Sb	Translucent / dark blue	Drawn (fragment)
Warimba 2	GBD011	end of the 17^{th} c.	Soda-lime	Co-Ni-As-Bi, Sb	Opaque / dark blue	Drawn (tubular)
Warimba 2	GBD012	end of the 17^{th} c.	Soda-lime	Co-Ni-As-Bi, Sb	Opaque / dark blue	Drawn (tubular)

Note: Both the red and white components of Cornaline d'Aleppo beads were sampled.

Table 4.5: Continued

Site	Specimen	Date Range	Recipe	Colorant	Transparency / Color	Technique
Warimba 2	GBD013	18^{th}-19^{th} c. AD	Pb-Na	As	Opaque / white	Drawn (larger tubular)
Warimba 2	GBD014	end of the 17^{th} c. AD	Soda-K-Ca	Sb	Opaque / white	Drawn
Warimba 2	GBD015	End of the 17th c. AD	Soda-K-Ca	Sb	Opaque / white	Drawn
Warimba 2	GBD016	End of the 17th c. AD	Soda-K-Ca	Sb	Opaque / white	Drawn
Warimba 2	GBD017	End of the 17th c. AD	Soda-K-Ca	Sb	Opaque / white	Drawn
Warimba 2	GBD018	End of the 17th c. AD	Soda-plant ash	Sb	Opaque / white	Drawn (small)
Miambani 2	GBD019	End of 19^{th} –beg. 20^{th} c. AD		Zn-Cd-Se	Opaque / red	Drawn (seed)
Miambani 2	GBD020	End of 19^{th} –beg. 20^{th} c. AD		Zn-Cd-Se	Opaque / red	Drawn
Tl'aya 1	GBD021				Translucent / green	Not glass
Tl'aya 1	GBD022	20th c. ?	Soda-potash; high Ba	Zn	Opaque / white	Drawn
Tl'aya 1	GBD023	20th c. ?	m-Na-Al - low U; high B	?	Opaque / white	Drawn
Tl'aya 1	GBD024	20th c. ?	m-Na-Al - low U; high B	?	Opaque / white	Drawn
Tl'aya 1	GBD025	20th c. ?	m-Na-Al - low U; high B	?	Opaque / white	Drawn
Tl'aya 1	GBD026	20th c. ?	m-Na-Al - low U; high B	?	Opaque / white	Drawn
Tl'aya 1	GBD027	20th c. ?	m-Na-Al - low U; high B	?	Opaque / white	Drawn
Tl'aya 1	GBD028	20th c. ?	Soda-lime	Co-Ba-Ce-Er	Translucent / dark blue	Drawn

Note: Both the red and white components of Cornaline d'Aleppo beads were sampled.

While numerically small, the assemblages permit a number of suggestive observations Inhabitants had access to beads from both South Asian and European sources. A third of the beads could date to the 1600s.

Two beads found in association with a cowry shell bead at the Merebu 1 rockshelter are mineral Soda alumina (m-Na-Al) glass. The recipe aligns with that of newly described "Group 6" beads, which are made from an "Indo-Pacific" glass with no known source but that was likely produced in South Asia and has been found in contexts ranging from the 6th-18th centuries in Asia and the 9th-13th centuries in eastern Africa. The full set of beads recovered during excavation at Merebu 1 came from upper levels with radiocarbon dates from the 1900s. The next levels date to between 1000 and 2500 BP, so we likely cannot chronologically constrain those beads other than through recourse to their chemical profile.

Numerous glass recipes, some of which have no known equivalents, and some of which are unusual (high levels of boron as a white pigment, high levels of gold as a red pigment, etc.). Some of these may reflect the diversification of glass recipes among European producers in the 1800s and 1900s. In archaeological contexts dating to the colonial-era in upstate New York, a gradual transition has been observed in the last half of the 1600s in the use of antimony as an opacifier of white beads. This transition appears to be nearly total by 1700. It's unclear if this holds for Africa, but we do see similar profiles. By analogy to the North American beds, the white pigment in the *cornaline d'Aleppo* beads in the Warimba assemblage can be assigned to the 18th-late 19th centuries. The high arsenic and gold levels suggest a Venetian origin. The other, entirely white Warimba beads would then appear to be older, from the latter half of the 1600s. This would appear to be in broad correspondence with my ceramic analysis that placed the Warimba pottery into the "later Iron Age." That is, material which resembles neither the better-known “early” and “middle” Iron Age wares of eastern Africa nor the morphological forms and decorative styles said by potters to have been in use since at least the mid-1900s. I had previously estimated this time period to span from 1500 to 1800. The beads from Miambani have an unusual composition. Based on the high levels of cadmium, a compound of which was not discovered as a coloring agent until the 1890s, they likely date to around 1900. That said, an article mentions that cadmium may have taken until the 1920s to become widely used and was abandoned beginning in the 1990s, so they could be younger. The white beads from Tl’aya have unusual recipes. It seems as if there are three different recipes. One is distinguished by its high boron levels. There are some unpublished studies I may be able to refer to. Only two plastic beads were found – green and blue. There are sites in both the northwest and southeast with beads. There is potentially time-deep use of dark blue and white, drawn, tubular beads. This could reflect a combination of local preference and availability, but, in either case, it differs from the wide range of colors and morphologies among beads found in urban contexts on the coast. The Warimba assemblage (blue, white, and *cornaline d’Aleppo*) could represent an “aesthetic set.”

Conclusion

The materials analyzed in this chapter, along with the rock art assemblage discussed in the following chapter, provide a material basis upon which to examine the construction of the Sandawe homeland as a particular kind of place within different traditions of discourse (colonial, scholarly, present-day Tanzanian politics, etc.). The growing evidence suggests that the inhabitants of this region have not been isolated in a refuge but were active participants in a variety of long-term and large-scale political, economic, and cultural systems.

Chapter 5

The Rockshelter Assemblage: Reconstructing Political Economy and Cosmological Landscapes Within and Beyond the Sandawe Homeland

In this chapter, I consider several categories of material culture recurringly found together in and near rockshelters, including "cave drums," petroglyphs, pictographs, and other forms of worked rock. When considered as an assemblage, these objects reveal histories of contestation and collaboration that have contributed to the formation of political and spiritual landscapes that encompass but also extend beyond the Sandawe homeland. These rockshelter assemblages suggest that inhabitants of the Sandawe homeland participated in while also modifying long-term modes of territorial occupation and place-making centered on notions of fertility, growth, and healing that were central elements of cultural (re-)production for many groups of northern Tanzania. As with evidence concerning settlement patterns and exchange networks discussed in Chapters 3 and 4, rockshelter assemblages evoke vibrant histories of entanglement with changing economies, politics, and demographics that stand in contrast to the narrative of primeval autochthony into which the Sandawe and their homeland have been interpolated repeatedly.

Tanzania has a rich tradition of rock art studies, and my notion of the rockshelter assemblage contributes to previous efforts to investigate rock art through the lens of landscape (see Bwasiri 2016; Lim 1992). As discussed in Chapter 1, "landscape" refers to a tradition of scholarship interested in the production of space and place. Following Lefebvre (1991), this approach traces the interactions between spatial experience (the flow of bodies and things through physical space), spatial perception (the sensual interaction between actors and physical space), and spatial imagination (representations of space). From this perspective, landscape is not an arbitrarily delimited segment of physical reality but the co-constructed, material and conceptual worlds produced by human activity, as mediated by subjective experience (Richard 2018:35-36). Past subjectivities are, of course, never fully recoverable, but, as Smith (2003:67-69) notes, archaeologists are well positioned to consider how meaning becomes materialized or, conversely, how the material becomes meaningful. My approach expands upon these earlier works from Tanzania by considering numerous material forms and media in the same frame. This tactic allows me to engage with a larger body of scholarship focused on aesthetic and artistic concerns while also examining the role of the rockshelter assemblage as a critical component in the ideological and material histories of the regional politico-spiritual landscape. Because these landscapes and landscape-making practices span multiple temporal and spatial scales, they should not be read as indexes of "ethnic" traditions or territories but as evidence of how particular places have been created, inherited, and interacted with anew. This landscape is prior to extant peoples of the region and spans contemporary ethno-linguistic boundaries, and its continued liveliness and significance depends upon sustained activation by human actors (including, sometimes inadvertently, by archaeologists and our investigations).

After providing a brief overview of the abundance and distribution of the components of rock art assemblages in Tanzania and elsewhere in sub-Saharan Africa, I summarize major trends in rock art studies in Tanzania. In the remaining sections, I focus most heavily on material, linguistic, and ethnographic analyses of cave drums and petroglyphs, although I also briefly consider pictographs and other forms of worked rock (more detailed analyses of these latter two categories will be addressed in future publications). Numerous cave drums located throughout the Sandawe homeland point toward participation in a regional political economy of significant time depth that was (and to a certain extent remains) organized around prowess in rainmaking. The petroglyphs of the Sandawe homeland exhibit similarities to a petroglyphic tradition from southwestern Africa that has been associated with foragers, as well as to pictographic and petroglyphic traditions observed across a large swath of eastern Africa that have been associated with food-producing communities (and especially the early pastoral rock art of northern Kenya). However, several aspects of chronology and material culture complicate simplistic links between these widely separated regional traditions and caution against an uncritical application of culture-historical phasing derived from rock art studies elsewhere on the continent. Although pictographs of both the Sandawe homeland and the neighboring Kondoa World Heritage site have been attributed to ancestral Sandawe, the Sandawe homeland exhibits a number of differences in rock art motifs that differ from those of Kondoa. This indicates that this supposed regional tradition is more diverse than previously realized, which could indicate that multiple modes of differentiation existed through time over relatively small geographic scales. The comparative lack of worked rock in the vicinity of rock art sites in the Sandawe homeland suggests an additional axis of divergence from other regions, especially the Lake Victoria basin, although research on this topic is particularly sparse and precludes anything beyond cautious speculation. In either case, it is clear that several cultural orders can be discerned across northern Tanzania that sit uneasily with the ethno-linguistic, socio-political, and techno-economic boundaries that characterize regional culture-history and ethnology, as well as the forms of historical narrative to which these schema have given rise.

The ambivalence among my contemporary Sandawe interlocutors toward rockshelter assemblages resonates with those of food-producing communities who consider themselves to be relative newcomers upon the landscape. I am not the first to recognize or comment upon the widespread tendency among the Sandawe and other groups to vacillate between recognizing and renouncing rock art and other elements of these assemblages as their direct cultural heritage. I do diverge somewhat from previous commentary about rock art in Tanzania by arguing that we should not ignore, downplay, or explain away this uncertainty among the Sandawe but use it to further develop novel models of interaction and change in this region of Tanzania. There has been a tendency to ascribe the major rock art traditions of Tanzania to specific ethno-linguistic and techno-economic groups (see Anati 1986; Coulson & Campbell 2001). For example, Bwasiri & Smith (2015) attribute a naturalist tradition mainly to ancestral Hadza and Sandawe, a white tradition to the agro-pastoral Burunge and Rangi, and a cattle tradition to the Maasai or their linguistic predecessors. Although there is certainly value in this approach, I believe that it is limited in its interpretive possibilities (as the authors themselves recognize in the concluding remarks). As noted in Chapters 1 and 2, the archaeological evidence does not currently support a culture-historical sequence based on specialized economies, and other evidence points toward a long history of significant linguistic and cultural exchange. The rockshelter assemblage becomes yet another line of evidence that contemporary Sandawe beliefs and practices cannot be understood as a lamination onto or a reduction of a cultural core but as a product of their participation in politico-spiritual landscapes that have long transcended social and geographic boundaries. Or, in other words, even if it could be proven demonstrably that direct ancestors of the Sandawe produced certain elements of the rockshelter assemblage, this would tell us little about the dynamic and ongoing significance of these objects to past and present inhabitants of the regional landscapes that continue to be activated, in part, by the presence of these objects.

Numerous communities of eastern Africa understand themselves as being distinct from quasi-mythical, primordial foragers, while also being legatees of landscapes that have been imbued with powers that are derived, at least in part, from those earlier inhabitants (Prins & Hall 1994). Certain themes emerge repeatedly in discourse and practice related to rainmaking, fertility, and healing across northern Tanzania and irrespective of ethnological categorizations of the groups involved. Common elements include: primordial foragers as wellsprings of power; rockshelters or other places, such as springs, that are associated with female fertility; and the use of pythons as a metaphor for resolving contradictions in social, political, and economic, including the boundaries between life and death (Hunter 1953; Jellicoe 1969, Jellicoe et al. 1967; Lim 1992; Prins & Hall 1994; Schoenburn 2016; Walz 2010). This constellation of beliefs and practices could indicate the existence of a cross-group, regional tradition stretching from the Lake Victoria basin, through central Tanzania to the coast, a possibility that appears to have first been recognized by Jellicoe (1969).

It could be argued that the elements of this constellation are too widespread globally and historically to have any analytic purchase. Certainly, local manifestations are diverse, and there may be no original form that can be discerned through comparative research. Even so, examinations of this ideological and material cluster may useful to the extent that they can help facilitate problem-oriented interdisciplinary research. Examples of phenomena that could benefit from inquiry into this apparent tradition include patterns in the material culture repeatedly found in or near ritually charged spaces (such as cave drums, arrows, and shields), as well as the increasingly well-documented evidence of long-term linguistic exchange and convergence in the region (Kieβling et al. 2007; and see below for terminology related to cave drums). Further exploring the legacies of this tradition could also extend previous scholarship concerning rainmaking and healing as modes of both political cohesion and fragmentation, as well as an inter-ethnic financial activity (for Tanzania, see Gray 1955; Håkansson1998; Jellicoe 1969; Jellicoe et al. 1967; Mhajida 2019; Schoenbrun 2006, 2016; and, for other regions of Africa, see Lan 1985; Ranger 1991; Schoffeleers 1992; Wada 1975).

As a brief illustration, consider the Tita shrine of the Nyaturu, a group that lives immediately to the west of the Sandawe and with whom the Sandawe have frequently intermarried (Newman 1970). Tita, which contains a water-filled chasm protected by a python, is connected to both the spirits of ancient hunters and the underworld aspect of the creator god (Jellicoe 1969, Jellicoe et al. 1967). Although Tita is of central importance in Nyaturu cosmology, Jellicoe's (1969) interlocutors viewed it as occupying a less powerful position within a regional hierarchy of shrines used for rainmaking and success in war and hunting. More potent shrines maintained by the Sandawe, Iramba, and Isanzu were visited if supplications failed at Tita (Jellicoe 1969). During the early colonial period, numerous diviners and spiritual leaders were of different ethno-linguistic origins than the political leaders and communities they advised (Jellicoe 1969; Jellicoe et al. 1967). One such Barabaig diviner, Saigilo, united local groups against Maasai raiding and instructed warriors to bring their weapons to Tita to make them invincible (Jellicoe et. al 1967). Saigilo's son later organized inter-group resistance to the Germans using sacred water possibly collected from rain shrines throughout the region (Jellicoe et al. 1967). This effort failed, and Tita became powerless for war and hunting rites after being desecrated by the first German administrator, although rain rites have continued to the present (Jellicoe et al. 1967; Kristin Phillips, personal communication).

The rockshelter assemblage addresses shortcomings of both frontier models and the concept of political economic mosaics. The ideological and material landscapes that the rockshelter assemblage has helped to construct and animate have perdured despite a variety of social, political, and economic shifts through time. It could be that the ideological role of foraging first-comers is incidental, a byproduct of ideologies of change and distinction from the past. However, it could also indicate that past foragers and their ideological and material networks functioned as a form of infrastructure that both enabled the spread of food production and guided its subsequent development. This possibility demands a reconsideration of the tendency of frontier theory to frame early, intimate relations between foragers and food-producer as ultimately doomed. The mosaics scholarship has helpfully foregrounded issues of scale and diversity in archaeological assemblages but generally fails to examine the constitution of power in any particular sociohistorical instance. The rockshelter assemblage could serve as one route for historicizing power in northern Tanzania and provide a lens through which oral historical, historical linguistic, archaeological, ethnographic evidence could be read in ways that counter the categorical exercises of earlier forms of ethnological research, which have tended to isolate groups rather than seek evidence of interaction and exchange.

Part I: Definitions, Distributions, and Fieldwork Methods

Definitional Debates & Local Traditions of Rock Art Studies

African rock art has long captured scholarly attention because the use of pigments and the external "storage" of information are thought to be among the earliest material evidence of symbolic thought and behavioral modernity (d'Errico et al. 2001; Henshilwood et al. 2002, 2009, 2018; Henshilwood & Marean 2003; McBrearty and Brooks 2000). The search for origins is certainly important but risks over-emphasizing the study of representational or abstract "art" and diverting attention from other forms of evidence that can provide insight into past and present cultural systems. Definitional debates around the concept of art are useful but the approach employed here takes an expansive view of human activity indexed in, on, and near rockshelters. I argue that expressions of human activity indexed in rock – whether "representational," "non-representational," "symbolic," "utilitarian," "purposeful," or "unintended" – can be usefully studied as archives of cultural orders that guided the construction and inhabitation of meaningful landscapes, especially when placed in conversation with other lines of evidence.

The general term "rock art" includes both pictographs (paintings) and petroglyphs (engravings). Other forms of worked rock that initially appear to be utilitarian or non-symbolic have been documented across Africa and are included here in my notion of the rockshelter assemblage. These features could be dismissed as incidental byproducts of human action or entirely lacking in communicative intent. However, all human activity is culturally inflected, even the most functional, and any trace of such activity can potentially index how humans built and dwelled within the landscape. Metal sharpeners, grinding hollows, pounding cupules, mancala or bao boards, rock gongs, and chutes and slides, for example, may appear practical to some extent, but their frequent proximity to rock art suggests that their location was deliberate and consequential. In addition to pictographs, petroglyphs, and worked rock, the remaining component of the rockshelter assemblage addressed in this chapter is known in the literature as the "cave drum." Like rock art and worked rock, cave drums are frequently found in rockshelters or other efficacious, enclosed spaces, and provide insight into the reuse and re-signification of semiotically dense places within regional politico-spiritual landscapes.

Abundance &Distribution of Rockshelter Assemblage Components

Archaeological research coverage is geographically restricted and sporadic in Tanzania (the "Swahili Coast" and Olduvai Gorge and its environs being notable exceptions). Few intensive or systematic regional archaeological surveys have been conducted in Tanzania (Biginagwa 2012; Fleisher & LaViolette 1999; Kessy 2013; Lane 2009; Mabulla 1996; Mapunda 1991; Masao 1976a; McBrearty et al. 1984; Pawlowicz 2011, 2012; Prendergast et al. 2013; Schmidt 1978; Walz 2010; and Wynne-Jones 2010), and fewer still have focused intensively or exclusively on rock art (Bwasiri 2016; Bwasiri & Smith 2015; Fosbrooke 1950; Grzelczyk 2019; Itambu 2013; Itambu et al. 2018; M. Leakey 1983; Lim 1992; Mabulla 2005; Odner 1971; Saanane 2016; Soper and Golden 1969). Considerable evidence remains unpublished, and many sites reported by earlier generations of scholars have not been revisited using contemporary technology and methods. North-central Tanzania has generated the greatest number of publications concerning pictographs, as well as other elements of the rockshelter assemblage. The Lake Victoria basin and northeastern Tanzania have also produced a number of studies, but most of western and southern Tanzania is virtually unknown among scholars.

Pictographs. Kondoa District contains the densest and most intensively studied concentration of pictographs in Tanzania (Anati 1986; Bagshawe 1923; Bwasiri 2016; Bwasiri & Smith 2015; Fosbrooke 1950; L. Leakey 1950; M. Leakey 1983; Mabulla 2005; Masao 1976a, 1976b, 1979, 1982, 2007; Willcox 1984). The pictographs of Kondoa District are also the most famous in Tanzania, first having been brought to scholarly attention in the 1920s, and to larger public audiences through the subsequent work of Louis and Mary Leakey (Bagshawe 1923; L. Leakey 1950; M. Leakey 1983). Since 2006, many of the sites that comprise this concentration have been included on the UNESCO World Heritage list as the Kondoa Rock-Art Sites.

Anati (1986) and Willcox (1986) provide the most comprehensive syntheses of Tanzanian rock art, but note relatively few pictographs sites (approximately 40) beyond the Kondoa concentration. Anati (1986:24) remarks that central Tanzania was “a fairly autonomous center” and “a sort of island of intensive artistic creativity [by hunter gatherers], in the middle of a very extended territory where no such artistic remains have been detected.” The Kondoa concentration is certainly exceptional in many regards, but I assert that its island-like qualities is largely an artifact of the district’s colonial history and, further, reflects an absence of evidence about rock art from other regions of Tanzania rather than robust evidence of its absence. During European colonialism, Kondoa was an important administrative center and strategic military location. Second, its location on a segment of the Great Northern Road (intended to stretch from Cape Town to Cairo), made Kondoa relatively easily accessible from larger towns, such as Arusha, as well as the archaeological sites of northern Tanzania, such as Olduvai Gorge. Third, the Leakeys' considerable fame, combined with numerous resident enthusiasts, made Kondoa prime ground for sustained collaboration between those enthusiasts and professional archaeologists at the expense of other regions. This situation has been further compounded by the tendency among archaeologists working in Tanzania to revisit known sites rather than to survey new regions due to the logistical and financial challenges of conducting pioneering fieldwork in the country. Other factors have contributed many sites having been effectively forgotten, such as: language (some early accounts are in German); access (some accounts are behind paywalls); and a comparative lack of specialists working in this region of the Tanzanian interior. Even in the case of credible reports by trained archaeologists, many sites have not been revisited to assess their current condition and to obtain accurate coordinates or other contextual information.

A definitive list can be approached but never achieved due to insufficient contextual information in some early site descriptions, but, in contrast to the expectations of Anati and Willcox, hundreds of sites have been reported beyond the Kondoa World Heritage site since the 1990s. This suggests that known sites may represent but a small fraction of extant sites throughout the county. For example, Ten Raa (1974) described approximately 15 sites in the Sandawe homeland. Lim (1992) conducted intensive survey within a 16 km^2 zone surrounding the town of Farkwa in the Sandawe homeland and documented over 100 rockshelters, 35 of which contained pictographs. Grzelczyk (2019) documented over 50 rockshelters in the Swaga Swaga Game Reserve with pictographs. In addition to the two open-air petroglyph sites described below, I recorded 77 rockshelters with archaeological remains during fieldwork, 49 of which contain pictographs (and six of which contained cave drums). The Sandawe once inhabited Swaga Swaga before the creation of a forest preserve and, later, a game reserve. The Sandawe homeland is contiguous with, and was once administratively contained within, Kondoa District. It has been proposed that the ancestors of the Sandawe are responsible for the naturalist rock art of this region (Bwasiri & Smith 2016; Ten Raa 1974), and so it is unsurprising that more rock art would be found in the vicinity of the formally demarcated Kondoa World Heritage zone. However, the trend also holds farther afield. Mabulla (2005), for example, reported 14 rock art sites near Lake Victoria, adding to the 44 previously discussed by Chaplin (1974). Likewise, Itambu (2013) describes four pictograph sites near Iringa Town.

It is beyond the scope of this chapter to provide a comprehensive review of rock art studies in Tanzania or Africa, more broadly, especially because phenomenal diversity exists concerning subject matter, patterns of association, techniques of execution, site location, and other variables. Bwasiri & Smith (2015) describe four, somewhat overlapping, approaches to the study of pictographs in Tanzania. The first approach, from the 1920s to the 1950s, was generally conducted by lay individuals and focused on description with little attempt at interpretation of authorship or meaning. The second approach, from the 1930s to the 1980s, included efforts by professional archaeologists (but few rock art specialists) to categorize pictographs and place them within a chronological framework according to style and color. Bwasiri & Smith (2015) note that a limitation of the frameworks so derived is that they were so idiosyncratic as to be incomparable, a point to which I will return below. The third approach, from the 1960s to the

1990s, generally ignored questions of style and chronology, focusing instead on the meaning of rock art in relation to its physical and social contexts. The fourth approach, from the 2000s to the present, focuses on the management of rock art sites as living cultural heritage resources.

In Tanzania, Bwasiri & Smith (2015) provide the most empirically robust culture-historical phasing based on their analyses of 3,175 pictographs across 204 sites surrounding Kondoa Town (International Council on Monuments and Sites 2006 estimates that as many as 450 sites exist in the immediate vicinity of the World Heritage zone). Three or four major traditions are generally accepted, which appear to correlate broadly with economic activities and the regional culture-historical phases described in Chapter 2 (Anati 1986; Bwasiri & Smith 2015; Willcox 1986). The "Naturalistic" tradition includes schematic and realistic paintings of wild animals, humans, and ideograms and is associated with ancestral hunting and gathering economies. Bwasiri & Smith (2015) include all such paintings within a single tradition, but Anati (1986) argues that earlier and later phases can be discerned. The "White" tradition includes schematic and abstract paintings that emphasize patterns and symbols rather than animals and humans. These paintings are associated with agro-pastoral economies and, as the name implies, most frequently contain white pigments. The "Cattle" tradition includes realistic and schematic paintings and domestic animals and humans. These pictographs are rare in Kondoa and contain black pigments.

As noted in Chapter 1, Sandawe ritual practices, and especially the healing and fertility ritual known as *simbó*, have been used as evidence of cultural continuity between them and southern African groups who have been (rightly or wrongly) categorized as Khoisan-speaking foragers (see Lewis-Williams 1986). "Shamanistic" and "naturalistic" rock art has been used to argue that the Hadza and Sandawe are autochthonous to their homelands and to suggest that the

Sandawe homeland may have once been larger or that they have migrated (see, for example, Lewis-Williams 1981, 1986; Marlowe 2010; Masao 1982; Ten Raa 1971, 1974). Kessy (2011) cautions against assigning any rock art to particular ethno-linguistic groups or food-getting repertoires. He acknowledges that certain chronological shifts can be observed, some of which may be related to changing economies and demographics, but he also suggests that recurring, large-scale similarities in the historical development of rock art across Africa indicate that it was, at all times, produced by groups interacting with diverse others. Bwasiri & Smith (2015) do not necessarily disagree with Kessy (2011), but they counter that the subject of authorship should be pursued as far as possible in order to refine the use of ethnographic analogy and to better link rock art to other archaeological assemblages with which it is found in association, such as materials excavated from rockshelters. Bwasiri & Smith (2015) argue cogently that the Naturalistic tradition should be ascribed to "local hunter-gatherers" rather to ancestral Hadza and Sandawe per se, and that diversity within this tradition may reflect social complexity among foraging communities. They find it unlikely that ancestors of the Hadza and the Sandawe produced all "forager art" in Tanzania. They find it equally unlikely, therefore, that ethnographic analogy derived from these groups is relevant to examining all instances of forager art, even forager art produced by the direct ancestors of the Hadza and the Sandawe, due to these groups' histories of interactions and exchanges with others.

Both lines of argumentation have merits, but, ultimately, the much-debated question of the proper role of typology in archaeological interpretation forms their core. That is, typologies may or may not reflect historical processes or cultural systems "as they really were." Rather, typologies are useful to the extent that they advance problem-based research agendas. "Typology," in this case, is as applicable to the formal traits preferred by Kessy (2011) as it is to the “traditions” delineated by Bwasiri & Smith (2015). As described above, the results of recent surveys suggest that the Naturalistic tradition exists over a much larger swathe of Tanzania than has been typically recognized. A formal approach is, of course, necessary for documenting this diversity, and the clusters of formal traits (Kessy 2011) or traditions (Bwasiri & Smith 2015) identified through systematic, empirical research may, in fact, change along with both increasing sample sizes and the questions under study. It also essential to emphasize that ethnographic analogy is related to but distinct from the direct historical approach. Evidence of cultural continuity between source-side and subject-side analogs is not, in fact, a necessary prerequisite for the use of ethnographic analogy, as Bwasiri & Smith (2015) appear to suggest (see Lane 1994; Wylie 1982, 2002 for a discussion of analogy in archaeological reasoning). Bwasiri & Smith’s (2015) robust empirical approach would be unnecessarily restricted by an insistence on the use of ethnographic analogy only when authorship can be ascertained, especially in the many regions of Tanzania where no straightforward link is likely to be established between past and present populations. Rather, scholars must be explicit about the assumptions made and their applicability to specific comparisons and interpretations.

Bwasiri & Smith’s (2015) point is well taken that the relevance of Sandawe ethnography to all Naturalistic pictographs should not be assumed uncritically, but caution is necessary even in and near the Sandawe homeland. An initial review of the pictographs recorded during my fieldwork suggest that considerable diversity exists even over short spatial scales, including between the Sandawe homeland and Kondoa District, which are geographically contiguous. For example, Bwasiri & Smith (2015) observed that 36% of the sites in their sample house only white motifs, whereas black pigments were exceptionally rare and never occurred alone. In contrast, no sites in the Sandawe homeland recorded during my fieldwork contain only white pictographs, 15% of sites contain only black motifs, and 25% of all sites include at least one black motif (Table 5.1). On one hand, following Bwasiri & Smith's (2015) interpretation of the White tradition, this could indicate that the Sandawe homeland remained isolated as agro-pastoral groups migrated throughout surrounded regions in recent centuries. On the other hand, the large number of black motifs could indicate that other food-producing groups passed through the Sandawe homeland, or that the art produced by foragers in this area diverged from that produced in Kondoa. These interpretations are cursory, of course, and future analyses will be necessary to directly compare data from the Sandawe homeland to that obtained by Bwasiri & Smith. Even so, this intriguing difference reinforces their call to further explore the diversity pictographs in Tanzania.

Table 5.1: Percentage of sites by motif colors present

Color	Sandawe Homeland	Kondoa District [1]
Red Only	62.5	49.02
Black Only	14.5	0
Red and White	10.4	10.78
Red and Black	4.2	0
Red, Black, and White	4.2	0
Black and White	2.1	0.98
Red and Yellow	2.1	1.96
White Only	0	36.28
White and Yellow	0	0.49
Red, White, and Yellow	0	0.49
Number of Sites with Pictographs	49	204

[1] Bwasiri & Smith (2015)

Petroglyphs. Petroglyphs are, indeed, rare in Tanzania, especially when compared to the abundant pictographs, but synthetic reviews have tended to underreport the country's petroglyphs. For example, Anati (1986) reports five petroglyph sites in Tanzania, while Willcox

(1984) describes three. However, at least 15 petroglyph sites had been reported by the 1980s. The sites described by Willcox can be identified based on contextual information, but not those referred to more cursorily by Anati. Of the 15 sites that had been reported by the 1980s, 13 or 14 had been visited by a researcher, 13 had been documented and published in reasonable good detail, and 10 or 11 were deemed to be petroglyphs, and eight or nine appear to be of significant age (Table 5.2). A boulder known as *Jiwe la Mungu*, or "Stone of God," in northeastern Tanzania had been reported through word of mouth only and not confirmed to exist or formally described. Fosbrooke (1950) lists an unnamed site near the village of Kurio in the Sandawe homeland, but it is unclear from the text if Trevor, the anthropologist who reported the petroglyphs to Fosbrooke, had himself personally visited the site. Of the 13 sites described formally, two may have been created in response to the presence of researchers, and three may be natural formations. Concerning recently produced rock art, a site near the village of Motto in the Sandawe homeland contains pictographs and petroglyphs that were apparently made by students who were intrigued by Fosbrooke's local exploration of rock art and imitated what they had seen on a rock face neighboring. Ten Raa (1974:10) somewhat dismissively describes these as "children's drawings." The Kohl-Larsens (1938:37-38) also observed a young person using a small stone to peck shallow animal figures onto a rock face but do not provide additional details concerning motivation or intent. Ten Raa (1974) regarded the purported petroglyph sites of Afuma Dĩ and Erémasa as natural formations, in contrast to the views of his interlocutors. He also describes an engraving of a hoe at Kolose Dĩ that he notes is realistic but could be a natural phenomenon (Ten Raa 1974). I visited Kolose Dĩ in 2005 during ethnographic fieldwork, so the site was not formally recorded or photographed, but I concur with Ten Raa's assessment while noting that it is still regarded by neighboring residents as a petroglyph.

Considering the distribution of Tanzanian petroglyphs, it is noteworthy that three of the ten credible sites are located in the Sandawe homeland, and my own fieldwork brings this number to four out of eleven. An additional five sites were reported during community outreach as containing footprints but have not yet been located or studied in detail (as will be discussed in the following section on fieldwork methods, petroglyphs are frequently described throughout Africa as human or animal footprints). This seeming concentration of petroglyphs in the Sandawe homeland may be another aspect through which this rock art differs from the nearby rock art of Kondoa.

Table 5.2: Reported petroglyphs sites of Tanzania and sites reported to contain human footprints in the Sandawe homeland (ordered chronologically by date of the first published report)

Site Name	Location	Category	Notes	Sources
1. Jiwe la Mungu	Northestern Tanzania	Inscriptions	Unreliable report. Reported via word of mouth to Allen 1929. Inscriptions described as Arabic script, hence the site name, which means "Rock of God" in Swahili	Allen 1929
2. Unnamed	Singida environs	Zoomorphic	Painted and engraved giraffe.	Culwick 1931c
3. Unnamed	Singida environs	Zoomorphic	Painted and engraved elephant.	Culwick 1931c
4. Engaruka	Northern Tanzania	Geometric	"Cup and ring" marks.	Leakey 1936
5. Samunge	Northern Tanzania	Geometric	"Cup and ring" marks.	Fosbrooke 1938
6. Unnamed	Dindima environs near present-day Nkinto in northern Singida District.	Zoomorphic	Giraffes, possibly other animals. The Kohl-Larsens observed some being made.	Kohl-Larsen & Kohl-Larsen 1938, 1958

Table 5.2: Continued

Site Name	Location	Category	Notes	Sources
7. Tambalá	Sandawe homeland, near Mangasta	Geometric, possibly zoomorphic	Spirals, barred and internally divided circles; possibly a beetle or fly. The beetle or fly description is Fosbrooke's, not the Kohl-Larsens'.	Kohl-Larsen & Kohl-Larsen 1938, 1958; Fosbrooke et al. 1950; Present work
8. Unnamed	Sandawe homeland, near Kurio	Zoomorphic	Unreliable report.Animal petroglyphs reported to Fosbrooke by JC Trevor, but not formally published.	Fosbrooke et al. 1950
9. Longoro	Mt. Kilimanjaro	Geometric, abstract	Three boulders within 20 m of each other.	Fosbrooke & Marealle 1952
10. Kilaremo	Mt. Kilimanjaro	Geometric, abstract		Fosbrooke & Marealle 1952
11. Bwiru	Mwanza District, near Lake Victoria	Geometric, zoomorphic	Engraved concentric circles, "gridiron" designs, wavy Iines, and a turtle or aardvark	Soper & Golden 1969; Chaplin 1974
12. Afuma Dī	Sandawe homeland, northwest of Ovada	Likely natural	NA	Ten Raa 1974
13. Eremasa	Sandawe homeland, east of Sanzawa	Likely natural	NA	Ten Raa 1974
14. Kolose Dī	Sandawe homeland, near Banguma	Implements	Possibly natural.	Ten Raa 1974
15. Unnamed	Sandawe homeland, near Mooto	Unclear	Described by Ten Raa as "children's drawings" made by youngsters intrigued by Fosbrooke's earlier fieldwork.	Ten Raa 1974

Table 5.2: Continued

Site Name	Location	Category	Notes	Sources
16. Manomanose	Sandawe homeland, near Mombose	Geometric	Spirals, lines.	Present work
17. Ncinse	Sandawe homeland, near Gungi	Unconfirmed	Described as containing human footprints during community outreach meetings but not subsequently visited. Also called Yenye Nyoka in Swahili, which means "has a snake."	Present work
18. Lets'ema Xhadta	Sandawe homeland, near Gungi	Unconfirmed	Described as containing human footprints during community outreach meetings but not subsequently visited.	Present work
19. Umbulu, Koyoa	Sandawe homeland, near Sanzawa	Unconfirmed	Described as containing human footprints during community outreach meetings but not subsequently visited.	Present work
20. Miragwe	Sandawe homeland, near Gumbu	Unconfirmed	Described as containing human footprints during community outreach meetings but not subsequently visited.	Present work
21. Nawe	Sandawe homeland, near Kurio	Unconfirmed	Described as containing human footprints during community outreach meetings but not subsequently visited.	Present work

Concerning the distribution of petroglyphs more broadly across sub-Saharan Africa, at least 2,000 individual petroglyph motifs have been reported across approximately 80 sites, although, like Tanzania, not all sites have been described recently or reliably. Central and eastern Africa have been considered together in the literature because this sub-region is home to multiple rock art traditions that are distinct from those of northern and southern Africa (Willcox 1984, Namono 2010). Based on my reanalysis of the literature, Tanzania has as many or more verified petroglyph sites than most other nations of central and eastern African sub-region, except Angola and Zambia. However, numerous individual sites in these countries have more engraved motifs than the total number of motifs across all of Tanzania's sites combined, often by orders of magnitude. Particularly rich sites include Tchitundo-Hulu in Angola, Bidzar in Cameroon, the Ng'amoritung'a sites in Kenya, and Chifubwa and Munwa Stream in Zambia.

Cave Drums. Existing accounts of cave drums are restricted to northern Singida and Dodoma Regions, covering a swath of territory of still uncertain extent, stretching from the Iramba Plateau to the floor of the Gregory Rift. The Burunge, Iambi, Iramba, Isanzu, Nyaturu, Sandawe, and Sukuma ethno-linguistic groups are reported to have used these objects at various points between the early 1950s and the present.[1] The earliest account is provided by the Kohl-Larsens (1938:36-38; 1958:46-50), who describe one site in Isanzu territory that housed fourteen cave drums of "great size." They remark that more sites exist throughout Isanzu, Iramba, and, especially, Iambi territory, but they provide no further details concerning the contents or locations of these sites. Hunter's (1953) survey occurred in the same general location as the Kohl-Larsens', but details are scarce concerning how he identified and gained access to the many

[1] The Iambi and Iramba speak closely related varieties of the Nyilamba language, an entity into which the Isanzu language, Nyihanzu, is sometimes also included. Although the Iambi and Iramba are occasionally differentiated in ethnographic and linguistic literature, this may not reflect historical or contemporary self-perception (Andrew Harvey, personal communication).

of the sites. Hunter's (1953) tally includes 14 sites containing 92 cave drums in Iramba, Iambi, and Isanzu territory, although he personally visited 12 sites containing 75 cave drums (the remaining two sites include the cave described by the Kohl-Larsens and an additional site visited by an associate of Hunter's that contained three cave drums). Hunter's discussions with residents pointed to the existence of at least 20 more cave drums in Iramba territory and "many" more sites throughout the area of his opportunistic survey. It is unclear if Hunter himself had previously visited the two cave drum sites later documented by Odner (1971). Based on the names and coordinates provided by Odner and my interpretation of Hunter's occasionally vague phrasing, I believe that they are among the sites listed as existing in Iramba territory but that Hunter seems to have been unable to personally document during his own survey.

Ten Raa (1974) reports two cave drum sites from the Sandawe homeland. Lim (1992) lists three sites used by the Sandawe (one of which had been included in Ten Raa's report), and one site used by the Burunge (known as Ningase). She visited the Burunge site and one Sandawe site, but she was prohibited from entering the other two Sandawe sites due to her gender. Hunter (1953) remarks that the Burunge claim to have only three drums, which they share with the Sandawe and keep near Farkwa, the largest town in the southeastern half of the Sandawe homeland. It remains unclear whether this claim derives from an unknown publication or interviews he conducted. Although Lim notes that the Burunge use the same term for these objects as the Sandawe, it also remains unclear if Ningase is the same site described by Hunter, or whether other sites exist in Burunge territory.

During a series of conversations held in local communities, I recorded fifteen sites reported to contain drums. Two of these sites had been previously reported by Ten Raa or Lim. Of these fifteen, I subsequently visited six, one of which had also been visited by both Ten Raa and Lim. This brings the number of known or reputed cave drum sites in the Sandawe homeland to 18 (including Ningase), eleven of which have been documented reasonably well. Based on absolute numbers and their distribution in relation to those of Singida Region, which contains 22 reported sites in total, the Sandawe cave drum sites do not, therefore, appear to be incidental or isolated occurrences.

Worked Rock. Should manipulations of rock that appear to have more "utilitarian" or "non-representational" functions, such as chutes, grinding hollows, mancala or *bao* boards, and metal sharpeners be categorized along with those for which there is more straightforward evidence of "figurative" or "symbolic" functions? Certainly, these various forms of worked rock would not meet most definitions of "art," but it can be difficult to discriminate between utilitarian and symbolic activities. For example, Fosbrooke & Marealle (1952) and Fosbrooke (1954) describe pockmarks seen on rocks in Chagga territory near Mount Kilimanjaro. In one case, these cupules appear to have been used to pound iron ore for use as currency in market transactions, whereas, in the other case, these cupules were carved in order to receive young, male initiates' spit to mark their oaths upon their entrance into adulthood. Semi-portable grinding stones are also common features of eastern African landscapes (Shoemaker et al. 2017), but have been studied haphazardly and remarked upon sporadically. Upper and lower grindstones are occasionally found in rockshelters but are also much more widely distributed, often marking past homesteads and graves. As these examples demonstrate, many forms of worked rock are critical elements of lived, meaningful worlds. The concept of the rockshelter assemblage addresses the limitations of rock art studies by examining a more expansive set of evidence concerning how people have dwelled in and re-signified landscapes through time.

In Mwanza Region, along the southern shore of Lake Victoria, Soper (1968) and Soper & Golden (1969) recorded a chute, along with many dozens of grinding hollows, rock gongs, and boa boards in proximity to sites containing pictographs and petroglyphs. Saanane (2016) and Itambu et al. (2018) also document multiple bao boards, grinding hollows, and cupules in Simiyu and Singida Regions. During ULAP's community outreach, three sites were reported to contain rock gongs, and one is described as consisting of a chute, but none of these sites were able to be visited during subsequent survey. However, a possible mancala board was observed at Tsege Gele, and several potential rock gongs were observed at Handawaa. Future analyses will be necessary to explore this trend further, but these results suggest that worked rock exists throughout the region between Lake Victoria and the Sandawe homeland, but that its frequency drops as the distance from the lake increases.

ULAP Research Program

A truly randomized and systematic survey of rockshelters proved to be impossible for a variety of reasons, both pragmatic and political. In response, I developed an opportunistic approach in collaboration with local communities, which is also described in Chapter 3. ULAP team members held meetings in each of the 20 villages that fell within the project's survey universe in order to build collaborative relationships with local community members and to increase familiarity with archaeological practice. Village councils invited approximately 20 adults (divided equally between males and females) known to have deep familiarity with the area, regardless of age, ethnicity, religion, etc. Conversations occurred predominantly in Swahili, with occasional translation to and from the Sandawe language. At these meetings, the survey, analysis, and interpretive strategies employed were explained and situated within the context of the larger project. Participants were shown and encouraged to interact with exemplary artifacts.

This preceded a conversation about locations with archaeological, cultural, and ecological significance in the vicinity, including: notably large artifact scatters; rockshelters (and whether they contained rock art, rock gongs, or other materials); stone quarries; clay, iron ore, and salt sources; permanent and ephemeral water sources and wetlands; and local clans and their sacrificial sites. These meetings were exceedingly productive in terms of building community support, raising awareness of archaeological research, and providing insights into cultural and historical landscapes. For example, these sessions encouraged discussion about more than 200 places within the landscape, many of which were visited in subsequent months, accompanied by community representatives.

Willcox (1984) notes repeatedly that many residents of sub-Saharan Africa associate petroglyphs with human or animal footprints, and this association is also common among my interlocutors. A noteworthy aspect of the community meetings is that five sites were described as having "human footprints." Upon visiting two of these sites, Tambalá and Monomonose, it was observed that they contained petroglyphs but no pictographs or actual or engraved footprints, human or otherwise. Ten Raa (1974) describes a similar experience at two sites, known as Afuma Dĩ and Erémasa. Both sites contain poorly preserved pictographs, but Ten Raa remarks that their supposed footprints appear to consist of natural pitting caused by erosion. In the case of Afuma Dĩ, Ten Raa notes that his interlocutors described them as either the footprints of prehistoric animals or engravings made by prehistoric humans. It would be worth exploring in the future whether the Swahili term for "footprint" used during ULAP's meetings, *nyayo*, has acquired a more general connotation of "sign." However, many participants speculated that the marks were made "while the Earth was still soft," which suggests that the term is meant literally.

To continue investigating this issue, future fieldwork will attempt to gather additional ethnographic information related to these sites.

Part II: *Higoma and Nĩga* (Cave Drums and Cave Beehives)

"Cave drums" or "cave beehives" (known as *higoma or nĩga* among the Sandawe) constitute an enigmatic form of material culture that might not immediately strike one as archaeological were it not for the fact that those who live near and interact with these objects invariably describe them as ancient. These objects are typically found in rockshelters, caves, and other enclosed spaces, such as special huts where ritual objects are stored. Cave drums are associated in a general sense with fertility, either through their role in the ritual inducement of rainfall or the healing of persistent illness, including difficulty in conceiving children. The objects themselves and the spaces in which they are enclosed are frequently subject to proscriptions on behavior and dress, such as who may approach or enter, what they may wear while doing so, and how the objects may or may not be handled. Some sites are located in difficult-to-reach locations or use barriers, such as dry-stone walls, to inhibit entry, yet other sites are quite visible and easily accessible. For example, the Kohl-Larsens (1938) mention that the ceiling of one cave in Isanzu territory was less than a meter from the floor, which meant that the cave drums could only be viewed by crawling into the space on one's hands and feet.

The Kohl-Larsens report that most of the cave drums they saw averaged 2.5 m in length and 30 cm in diameter, but one cave drum reached nearly 3.5 m in length and 1 m in diameter. Several of the cave drums described by Hunter (1953) had equally remarkable dimensions, with at least one measuring nearly 2.5 m, while most others were about 1.5 m in length. Cave drums in the Sandawe homeland average approximately 1.5 m in length. Several sites in the Sandawe homeland contain multiple cave drums (three to five), but the sites recorded by the Kohl-Larsens and Hunter contain more on average (from one to 14, with an average of about seven). In common with the Kohl-Larsens and Hunter, I observed that many of the cave drums are in poor condition and relatively few of the pelts that served as drumheads remain, although the drums at Msembelo 1, a site discussed in more detail below, appear to be relatively young. Most drumheads have a small hole cut into the center, which could indicate that they were used at one point as "lion's roar" friction drums (Zebulon Dingley, personal communication). Numerous drums in Isanzu territory were made of borassus palm trunks (*Borassus aethiopum*) (Hunter 1953; Kohl-Larsen & Kohl-Larsen 1938, 1950), but it appears that a variety of tree species were used to carve the cave drums. No attempt was made to identify the species used in the Sandawe homeland, but it was frequently remarked that few tree species reach the necessary size.

Perhaps the most striking commonality across the region in which cave drums are found is that residents claim little or no knowledge of their origin. The hesitancy to ascribe authorship or ownership to these objects could simply reflect their age and the passage of time. This deferral might also be indicative of a history of significant population movement in the region, combined with the reuse and re-signification of the landscape. Other evidence suggests that this lack or denial of knowledge could derive from the objects' association with a spiritual realm that interacts with but exceeds the human. That is, the inability to attribute their creation to human action serves as evidence of their power. Beyond these broad commonalties, discourse and practice exhibit considerable diversity between groups and through time.

Before continuing this section, it is imperative to note that many of these sites remain in use, while others are relatively disregarded. It must be emphasized that entering these sites should only occur in consultation with neighboring communities, and especially with representatives of groups that claim stewardship of them. Based on the photographs in Hunter

(1953), at least two of the cave drums were removed from a site on Mtingazi Hill for photographs, but it is unclear if these were subsequently returned to the site. At least one cave drum from a site on Samaja Hill was removed for photographs and reportedly taken to a museum, but I have been unable to determine which museum (the most likely candidates are the National Museum of Kenya in Nairobi or the National Museum of Tanzania in Dar es Salaam). Ten Raa (1974) included a photograph of a cave drum at //’o//’á Dĩ, which I also photographed. I photographed sites and cave drums only after explicitly asking for and receiving permission. Although it was acceptable to photograph sites that are no longer in use (or that nobody is willing to publicly admit using), it is not that case that photography is banned at all active sites. For example, I was asked not to photograph the cave drums at Handawaa, but I was encouraged to photograph //’o//’á Dĩ, both of which remain active. Possibly due to regional traditions of Islamic syncretism (Lindhardt 2019; Mackenrodt 2011), Muslim residents are somewhat less derisive toward cave drums than Christians, but the furtive use of these objects by members of both communities was a frequent topic of excited and often humorous, yet nervous, gossip and speculation. Even residents who denounced the objects and their purported efficacy nonetheless approached these sites respectfully, even somberly. In summary, one must not presume that any of these sites can be entered cavalierly, and a research program must necessarily build in time for adequate engagement with local communities.

Terminology

A notable example of both variability and similarity regarding these objects relates to the terminology employed to describe them by the various groups currently residing in north-central Tanzania. These comparisons suggest lines of fruitful inquiry regarding the history and meaning of these artifacts from a regional perspective. Kohl-Larsen & Kohl-Larsen (1938, 1958) describe the sites in Iambi, Iramba, and Isanzu territory as "drum caves," but refer to the objects themselves simply as "drums." Hunter (1953) and Sanders (2002), who conducted extended ethnographic fieldwork about Isanzu rainmaking practices, refer to them as "cave drums." It seems that these scholars' interlocutors called them "drums" (possibly also using a modifier like "cave"). Ten Raa (1967, 1974) refers to them as both "drums" and "cave drums," and Lim (1992) prefers simply "drum."

This seemingly straightforward agreement among scholars becomes more complicated when considering vernacular terminology among the Sandawe and neighboring groups. Ehret & Ehret's (2012) dictionary compiled from Ten Raa's field notes includes the term *nĩga*, whereas Lim (1992) uses *ninga*. Ten Raa and Lim agree that this term refers to cave drums, although they diverge in their descriptions of how the objects are used, a point to which I will return below. Like Lim, I initially recorded *ninga*, and the spelling difference could be due to how the nasalized *ĩ* in Ten Raa's transcription sounds to some English speakers. Lim notes that these objects tend to be referred to as *ninga* toward the southeastern portion of the Sandawe homeland and *higoma* toward the northwest (Lim 1991:190). Lim observed that *higoma* was more commonly used near Kwa Mtoro, and the steward of a site near the village of Sanzawa in the southeastern portion of the homeland considered it to be a term used specifically by the Alagwa rainmaking clan, a group that will be discussed in more detail below. Ten Raa (1986) speculates that the Alagwa descend from a group that spoke a Cushitic language and had once sought refuge among the Sandawe during conflict. These refugees eventually became Sandawe and settled in the northwest. During my fieldwork, *higoma* was not recorded, and these objects were universally referred to as *nĩga/ninga* in Sandawe or *mzinga* in Swahili.

An investigation of this latter point suggests that observers (including myself) have too readily interpolated these objects into a more mundane taxonomic order than is warranted based on their outward appearances. *Mzinga* means beehive in Swahili. The association between these objects and honey among the Sandawe is clear. When describing these objects to me in Swahili, several of my interlocutors stressed that they may look like drums but are actually beehives, and they elaborated on this by describing their occasional inhabitation by swarms of bees that behave in unusual ways. Ten Raa (1974:11) notes parenthetically that a cave drum at //'o//'á Dĩ is "in the shape of a beehive, and honey symbolizes wellbeing and happiness." During a ritual described to Lim (1992:191), the healer beseeched, "Let us get food, let us get honey, let the rain fall without trouble, do not let us have more fever." However, the typical Sandawe term for beehive in use since at least the 1950s is *misiko*. Lim (1992:190) notes that at least one of her interlocutors, a healer at //'o//'á Dĩ, referred to the objects as *warongo misigko*, which can be glossed as "the ancestors' beehives" (other points of Sandawe cosmology will be discussed below).

Ten Raa suggests that *nĩga*, *goma* (the typical Sandawe term for drum), and *misiko* are loanwords from Bantu languages. It is, therefore, likely, that *higoma* is also a loanword from a Bantu root. As seen in Table 5.3, there are intriguing phonetic similarities across regional languages. I would like to suggest the possibility that *nĩga* and *higoma* refer specifically to "cave beehives" and "cave drums" as distinct categories of material culture that are distinguished from their mundane counterparts by their association with a spiritual realm. It is unclear if *warõgo* spirits are understood as remembered personalities, and recall that ethnographic research has revealed a widespread hesitancy to claim these objects as heritage. When describing both cave drums and rock art, my interlocutors commonly stated that these objects were simply "encountered" or "found" (using variants of the Swahili verb *kukuta*). Suffice it to say that the etymological relationships between the Sandawe terms for these objects and those employed by neighboring language communities remain obscure yet evocative.

Table 5.3: Lexical comparison regarding drums, beehives, and cave drums/beehives

Term	Sandawe[1]	Burunge[2]	Nyihanzu[3]	Nyilamba[4]	Swahili[4]
Cave drum/ beehive	*nĩga/ninga, higoma, warongo misigko*	*ninga*	?	?	
Drum	*goma*	?	*kigoma*	*kigoma*	*ngoma*
Beehive	*misiko*	*mariinga*	*milinga*	*mlinga*	*mzinga*

[1] Ehret & Ehret (2012); Lim (1992)
[2] Kießling & Mous (2003); Lim (1992)
[3] Andrew Harvey, personal communication
[4] Johnson (1923)

In the remainder of this section, I follow those who have referred to these objects as cave drums, but I do so with the caveat that my interlocutors did not necessarily understand them as mundane objects. Further, this region contains very few caves with chambers and passageways created through erosion. Rather, many of the hills in this region consist of enormous boulders with spaces and crevices between. I tend to describe these rooms and crevices, along with other, more open spaces protected by overhanging rock as rockshelters. Without visiting, it is usually impossible to derive information concerning site morphology from publications, and, in any case, the words for these hallowed and hollowed spaces in both the Sandawe language and Swahili are interchangeable. My use of cave in this section is to maintain consistency with the literature and is not meant to imply that caves form a distinctive kind of place.

Regional Sub-Traditions of Ritual Use

Although research about cave drums has been sporadic and ad hoc, a comparison of similarities and differences across the region helps to elucidate the contours of a regional rainmaking and healing traditions in which a variety of ethno-linguistic groups have participated. All of the groups discussed below are located within a short distance of each other in the north-central highlands and environs. Some of these groups have relatively centralized political structures, whereas others are more heterarchical. Although the ethnographic literature refers to "clans" as a unit of organization for all of these groups, additional research is necessary to determine the extent to which that term refers to similar forms of sociopolitical organization. This is especially true in light of Kodesh's (2008) suggestion that clans should not be understood as kinship groups writ large but "networks of knowledge." As will be discussed below, not all individuals in all groups understand these objects as being efficacious for the inducement of rain, but all see them as associated with the creation and maintenance of health, wellbeing, and fertility in a general sense.

Isanzu Territory. From 1934-1936 and again from 1937-1939, Ludwig and Margit Kohl-Larsen completed two expeditions through the northern and central highlands of Tanzania. In two volumes focusing on this region's rock art (Kohl-Larsen & Kohl-Larsen 1938, 1958), they include brief notes regarding drum caves that they encountered in Iambi, Iramba, and Isanzu territories. The Kohl-Larsens remark that the particulars are "more or less" consistent across all cave drums sites, and so they describe only one such site in detail. Their Isanzu guides, regardless of rank, would bravely lead the way to drum caves but then divert their paths to avoid passing too closely. At the site with 14 cave drums, the entire group kept their distance because "as luck would have it, a black adder was striving out towards the light from the dusk just as we came" (Kohl-Larsen & Kohl-Larsen 1958:47). Although the Kohl-Larsens perceived this as a chance encounter, it likely caused considerable astonishment and fear among the guides, for reasons I will discuss below.

The Kohl-Larsens describe two of their guides as being more cosmopolitan than the others, less beholden to local customs, and, therefore, more willing to discuss the drums. One of these guides, Hango, stated that the “Wahenge,” a quasi-mythical group that had previously lived in the area, hid the drums. Hango added that Isanzu forefathers forbade anyone from entering without first slaughtering a sheep or cow that had been born at night and scattering the animal’s chyme around the enclosure. Another guide, Hussein, explained that there was a major prohibition against entering the enclosures, and that if one ties a sacrificial sheep to a tree in the area, it will die of its own accord. The Wahenge, he explained, had fought with their neighbors and fled in anticipation of more conflict and eventually disappeared. The first Isanzu inhabitants were horrified to see the drums, which the Wahenge had hidden in advance of their trek. It is unclear from the phrasing of the Kohl-Larsens’ text, but either the Wahenge or the early Isanzu forbade children from entering the shelters and youth, along with livestock, were kept inside while the drums were played during dances for fear that they would go insane from the sound. Hussein reported that a small stool located by itself in another local cave must be rubbed in fat during ancestral festivals. Hunter (1953) and Odner (1971) provide similar accounts as Hussein’s regarding the danger of the drums, although they are likely providing translations of the Kohl-Larsens’ text rather than recounting additional tellings.

Sanders (2002, 2008) conducted extended ethnographic research among the Isanzu regarding rainmaking practices, including extended rituals that can occasionally last over a month. His interpretation of these rituals is that they appeal to ancestral spirits and other supernatural forces through the use of words and deeds that invoke an ideal of gender complementarity, which is necessary for cosmic and social reproduction. This complementarity stands in contrast to the gendered hierarchies (male- and female-centric) that both structure and introduce conflict into mundane, daily life. Two caves on the tallest hill near Kirumi are considered to be the most sacred to the royal rainmaking clan because this is where their ancestral spirits meet (Sanders 2008:148). At one point during the ritual sequence, female leaders of this clan enter one of the cave to anoint the drums contained therein with oil. Sanders (2002:298, 2008:222) asserts that his interlocutors find the caves themselves, not the drums, the most significant element of this portion of the ritual. This may be true, but it would be interesting to know whether the royal clan has a monopoly on rainmaking and whether other sites are used openly or clandestinely for similar purposes.

After anointing the cave drums, the female ritual leaders enter a second, neighboring cave to anoint an enormous ancestral snake, which often described as a python and is the topic of excited conversation after the rituals. Because the snake is the physical manifestation of the royal spirits, it must necessarily live in the caves or visit them occasionally (Sanders 2008:149). Whether the snake is visible in the caves at any particular time is "irrelevant" (Sanders 2008:149). While explaining this seemingly odd fact, one of Sanders' interlocutors described the snake as akin to Jesus for Christians: the python is both are there and not there, yet nobody questions its existence (Sanders 2008:149). On this point, recall the consternation that the Kohl-Larsens' guides experienced in response to encountering a snake upon their arrival at a cave drum site!

Sandawe Territory. Interestingly, one of the two cave drums at the Msembelo 1 rockshelter had two snakes carved in relief running its entire length. This motif has not been observed elsewhere or described in the literature on cave drums, but scholarship from Tanzania and elsewhere indicates that pythons have served as a conceptual metaphor in many African societies through which new forms of kinship and political power were created or balance restored after times of hardship (Huffman 1996; Norman & Kelly 2004; Schoenbrun 2016; Schoffeleers 1992; Shadle 2002; Tropp 2003; Walz 2010). In many of these contexts, pythons are linked to potent places within the landscape, such as earthworks, shrines, and bodies of water. Schoenbrun (2016) argues that python metaphors were particularly efficacious for transcending boundaries and facilitating new sociopolitical forms near Lake Victoria, so their presence alongside cave drums in the Sandawe homeland is especially evocative given evidence of these objects' use in a variety of political projects.

Msembelo 1 is located closer to Isanzu territory than any other cave drum site recorded during my fieldwork, but there is not a large Isanzu presence in the area. As among the Isanzu royal rainmakers, it was reported to both Lim and myself that the Sandawe anoint cave drums with fat or oil during ritual activity, and some individuals avoid walking too closely to cave drum sites. This avoidance extends to not cutting brush near cave drums, although firewood is frequently encountered at these sites and other rockshelters as an offering. At the Sekonse and //'o//'á Dĩ rockshelters, the drums were described as being either male or female, which recalls the gendered aspects of Isanzu rainmaking (Lim 1991:192), although such a distinction was not recorded during my fieldwork and does not appear to be a universally held belief.

Lim (1992) reports that the decision to conduct a rain rite must be reached through consensus among those affected (who must also help fund it). The site at which a rite will be conducted is determined through consultation with a diviner, and the lineage (or lineages) responsible for that site is tasked with preparing and conducting the ritual. This typically entails the sacrifice of a black or white animal (the appropriate color continues to be debated), whose chyme is then distributed throughout the area over which the hill's powers have influence.

Similar details were reported to me during fieldwork, and it was noted that rain rites could be conducted at sites with cave drums, which are anointed with butter or fat during supplications.

As noted above, some Sandawe refer to cave drums as beehives. Bees, honey, and rain are associated with wellbeing and abundance, and so it is auspicious to observe bees in or near rockshelters and cave drums. Cave drums were reported to both Lim (1992) and myself as rumbling to signal that it is time to conduct a sacrifice. *Ninga* can also bring ill fortune on those who would destroy them. A story recounted to Lim and that is still in circulation, recounts how, in the early 1980s, a local government official attempted to destroy some *ninga* and take their owner to court for inhibiting the rains, but he was prevented from doing so because he hit and killed a woman with his motorbike while en route (Lim 1992:191).

Other aspects of Sandawe discourse and practice diverge from the Isanzu example. For example, Lim (1992) notes that women are prohibited from entering some, but not all, cave drum sites in the Sandawe homeland, whereas the participation of females is critical to successful Isanzu rainmaking. If male-led rain rites fail, however, female-led modifications of a ritual meant to celebrate and protect mothers and their twins can be conducted as an alternative (Lim 1992). A much wider range of uses for cave drums has been recorded among the Sandawe than for neighboring groups. Ten Raa's dictionary states explicitly that cave drums are not used for rainmaking as they are among neighboring groups (Ehret & Ehret 2012:97), although Lim and I were told the opposite, and, elsewhere, Ten Raa describes their use in rainmaking by the Alagwa clan (Ten Raa 1986). Rather, Ten Raa's dictionary states that they are used in the ceremonies that accompany the recovery of boys after circumcision and a woman's first pregnancy, but specific details are not provided (Ehret & Ehret 2012:97). Even if the association with rainmaking is not consistent among the Sandawe, these moments resonate with the broader themes of fertility, transformation, procreation, and growth. The smoke from splinters removed from cave drums and burnt is considered to be food for the spirits. In line with the correspondence between rain and wellbeing in a general sense, the steward of the drums at //’o//’á Dĩ informed me that smoke and ash from burnt cave drum splinters is used for medicinal purposes, such as providing assistance to women who have experienced difficulty conceiving children.

Alagwa clan members are considered to be superior rainmakers, even today, although neither Lim (1992) nor I conducted research to determine the extent to which the practices described in earlier ethnographic accounts remain in use. During Ten Raa’s fieldwork, Alagwa rainmaking was conducted secretively, inside special rain huts, and included four sets of material culture or ritual practice. The first is a set of three rain rocks of similar size and arrangement as in a typical hearth. A meal is cooked upon these rocks, which are then washed, anointed with fat, and covered with a hide. Washing the rain rocks is said to ritually associate them with rain, which is associated with rocky hills and remains pooled in their crevices after the surrounding land is dry. The second set consists of kudu or eland horns that are adorned with bells and resemble a phallus. These objects are also used in the *simbó* healing and fertility ritual. The third set consists of relocated cave drums or a drum-shaped beehive. In an oral historical account of the Alagwa clan’s adoption into the Sandawe and their rise as rainmakers, these objects are introduced by a Nyaturu woman who is herself adopted into the Alagwa clan. The drum was understood to be troublesome and was, therefore, kept apart from the homestead in a special hut. Splinters from these relocated cave drums or drum-shaped beehives are burnt because smoke is considered food for the spirits and because it is associated with an object that was once a honey container (recall above that, to many Sandawe, “cave drums” are understood as beehives). The fourth element is ritual intercourse, which, by analogy, symbolizes refertilization of the land.

The secretive nature of Alagwa rainmaking contrasts both with the public nature of royal Isanzu rainmaking and the communal nature of other clan-based rituals among the Sandawe. When performed for the general good, rainmaking is supposed to be free of charge, but Alagwa prowess in rainmaking has been used to assert a higher status and achieve some level of success in consolidating political control. This effort was never hegemonic, which contrasts with the Isanzu case, although it did receive a fillip during indirect rule when a self-proclaimed chief from the Alagwa clan was installed by the German colonial administration.

Iambi, Iramba, Sukuma, Burungi, and Nyaturu Territory. Hunter (1953) notes that residents were reluctant to impart information, but that the Iambi chief revealed the location of two caves on Kilili Hill, which he then entered in the company of tribal elders and the sites’ other “keepers.” His escorts led the way toward the caves, carrying a bowl of medicine and wailing to announce their arrival and peaceful intentions. They then divested themselves of their clothing and entered naked. Although the chief was keen to hear the visitors’ report afterwards, he could offer no account of the drums’ origin. In marked contrast to Chief Gunda of the Isanzu, who personally led a tour of the cave drum sites in his territory, the Iambi chief was forbidden from entering the sites, although he was interested to hear about their contents

Iramba territory lies to the south and west of Iambi territory. Hunter (1953) reports that at least nine hills contain at least one site, but it seems from the text that he visited a single cave on Aangu Hill, although a colleague visited another site. Iramba elders claimed to be ignorant of the cave drums’ origins, but one old man speculated that the Sukuma (who live to the northwest, between this area and Lake Victoria) had created them because some Sukuma individuals make annual pilgrimages to the sites. Additional research would be necessary, of course, but this hints at the possibility that the metaphors and practices recorded by myself and others in north-central Tanzania have historic connections to those investigated by Schoenbrun (2016) in the Lake Victoria basin. Another interesting observation in this regard is that an important drum in Buganda's royal percussion battery is referred to by a term that also means python and is decorated with a bas-relief of the snake (Schoenbrun 2016).

As noted above, Hunter (1953) and Lim (1992) mention cave drums used by the Burunge near Farkwa, but no other details are available, and no surveys have been conducted in Burunge territory, which includes a southeastern extension of the Sandawe Hills.

Finally, Hunter (1953) also mentions sites in Nyaturu territory that contain cave drums and other, possibly ritually efficacious, objects, such as arrows and shields. The Nyaturu homeland is located to the south of Iramba territory and to the west of the Sandawe homeland. Elders there were unwilling to disclose the location of most sites to Hunter, and he was prevented from accessing an underground cavern due to flooding. Jellicoe et al. (1967) provides an extended account of Nyaturu rainmaking practices, and I will provide only the most pertinent aspects below. No accounts have been recorded concerning rainmaking that entails cave drums, but Tita and other Nyaturu shrines are known to thunder, speak, or sing during periods of abundance and duress, which recalls the rumbling cave drums of the Sandawe (Jellicoe et al. 1967). Another similarity to Sandawe practices is that, during the short-lived resistance against the Germans, warriors hoping to become invulnerable left kudu horns as offerings.

Sacrifices of honey, beer, and tobacco can be made at the smaller shrines maintained by individual lineages, but Tita is the central Nyaturu shrine (Jellicoe et al. 1967). In contrast to both relative centralization of Isanzu rainmaking and decentralization of Sandawe rainmaking, rain rites at Tita are available to any lineages impacted by drought, but they must be conducted by hereditary priests (Jellicoe et al. 1967). Three rocks at the center of the shrine are the homestead of beings that control rain. One of these rocks is also understood as the navel of the female aspect of one such being. A passage below her navel leads to a water-filled chasm, understood as the womb of the earth and a portal to the underworld of ancestral spirits. This chasm is protected by a great, black python that allows humans into the shrine but also poses danger to those enter. During rain rites, the priests and affected lineages cover themselves in mud and soot (as a form of abasement and to symbolize rain clouds) and approach Tita with black animals. After sacrificing the animals, they then invoke the python to ask that his children (smaller, venomous snakes) withdraw to allow safe entry. After leaving offerings in the shrine, some of the meat is consumed outside, with the remainder of the meat and chyme distributed at all sites associated with ancestral spirits between Tita and the area suffering from drought.

Age & Authorship of Cave Drums and Cave Beehives

Regarding the age of these drums, Hunter (1953) interprets the widespread claim that they predate the arrival of extant groups to mean that they must exceed 250-350 years in age (taking into account the half century that has passed since his publication), based on oral histories of when present-days groups migrated into the area. Due to the size of the drums, as well as the report that children and livestock were kept inside while the drums were played, he suggests that the Wahenge were settled, agro-pastoralists. Odner (1971) agrees that, because the drums are difficult to move, a settled agricultural community must have constructed them rather than pastoralists. Even if their interpretations are correct, no direct evidence of farming from the Tanzanian interior currently exists. The earliest evidence of pastoralism comes from the Luxmanda site, approximately 50 km to the east of the Isanzu royal clan’s caves, and dates to

3000-2900 BP (Grillo et al. 2018). Without a more granular understanding of regional history, there is little basis upon which to claim anything more specific about the age of the cave drums of the time depth of their use in rainmaking. If the caves and shelters themselves rather than the drums (or if the spaces together with the drums) are what make them efficacious for making rain, then we should assume neither that portability was desired nor that relatively mobile populations of pastoralists or foragers could not have been responsible for them or incorporated them into a seasonal ritual cycle (contra Odner 1971). Several individuals requested that I take a sample of the wood or leather for radiocarbon dating, but we agreed that this should only be done if clan representatives agreed unanimously. Residents living near Handawaa further suggested that, if consensus could be reached during future fieldwork, the sampling would ideally be done as part of a heritage education event for clan members and other community members.

As I suggest throughout this dissertation, the over-emphasis on establishing Sandawe autochthony diverts attention from evidence of exchange and interaction. One route for countering images of the Sandawe as hermetically isolated foragers is to follow traces of inter-group participation in regional ritual assemblages and cosmological traditions stretching over time and geography. As one example of how this can produce new lines of inquiry and historical narrative, recall the Wahenge of Isanzu cosmology. Descriptions of the Wahenge resemble two groups known to the Sandawe as the N/ini and N/ege. This resemblance is both conceptual and, possibly in the case of the latter term, etymological. N/ini refers to quasi-mythical, foraging first-comers said to have inhabited the Sandawe homeland long ago, whereas N/ege is used to describe people who choose to live in the bush in the present. Ten Raa (1964) suggests that the N/ege were understood as a kind of N/ini, with the two groups sharing a direct genealogical connection. Further to the north, Baumann (1968) relays fragmentary information about peoples known as the Watindiga or Wanege, and his maps suggest that they lived in and near areas described as "uninhabited wilderness." Subsequent scholarship has interpreted Baumann's Watindiga as an exonym for the Hadza used by their neighbors (see Marlowe 2003), but Ten Raa (1964:11) offers an alternative interpretation of the Wanege that links this group to the N/ege of Sandawe cosmology:

> The term n/ege thus appears to be a Sandawe term for any people who live in the bush, leading a hunting existence, and the term would therefore include most of the little hunting groups of which so many peoples of central Tanzania appear to have traditions. If these n/ege are the same as Baumann's Wanege, which seems probable, then his map would merely acknowledge the fact that an extensive area contained, or had contained, an assortment of "little hunters."

Ten Raa goes on to state that it should not be assumed that these groups of hunters formed a single racial or ethnic stock. This assertion, of course, presumes that regional discourse about "little hunters" refers to actual people in the past or present rather than to an ideology of primordiality (or allegorical references thereto – as are known to exist in the oral traditions of many parts of the world). If it is also reasonable to include the Wahenge of the Isanzu into this discursive tradition, then the evidence builds for a local variant of the better-known Twa phenomena of sub-Saharan Africa, in which a ritually significant notion of autochthonous foragers became conflated with extant groups of foraging specialists (Blench 1999).

Whether or not it could be proven that cave drums are of considerable age, they are, nonetheless, material evidence of a regional cosmological tradition and political economy revolving around rainmaking and fertility. The "unity in diversity" among the sub-traditions described above could itself indicate a significant time depth to the constellation of ideas and practices that gave rise to these interconnected landscapes. This further suggests that rainmaking and its material trappings have been a driver of both political struggle and consolidation that transcends ethnological and ethno-historical modes of analysis and categorization.

Part III: Petroglyphs

In contrast to Tanzania's abundant pictographs, petroglyphs do appear to be exceedingly rare. As noted above, however, they are more common than previously recognized due partly to underreporting in synthetic analyses. Although petroglyphs may prove to be uncommon in Tanzania in an absolute sense, we cannot yet determine if our current understanding of their distribution and content is adequately representative of the phenomenon. The petroglyphs of the Sandawe homeland include motifs that have few direct correlates among local pictographs. The diversity of petroglyphs in the Sandawe homeland and elsewhere in Tanzania complicates attempts to generalize about this category of material culture and precludes an uncritical application of culture-historical phasing derived from archaeological and rock art studies in Tanzania and elsewhere on the continent. In this section, I also briefly discuss known threats to the preservation of these sites. Monomonose, in particular, is at high risk of damage or destruction due to the construction of a long-awaited and important dam on the Bubu River.

Site Descriptions

I recorded two open-air petroglyph sites during fieldwork, but constraints on time, money, and logistics precluded visiting all 12 sites mentioned previously in the literature or discussed during community outreach. The first site, known as Tambalá, was first recorded in the 1930s, but significant differences were observed against initial reports of this site (Kohl-Larsen 1938, 1950). The second site, known as Monomonose, had not been previously reported in the literature.

Tambalá. The Kohl-Larsens recorded approximately 50 rock art sites, two of which contain petroglyphs. The first was described as being in the environs of a locality called Dindima, which is near the present-day settlement of Nkinto in northern Singida Region, in Isanzu territory. The Kohl-Larsens observed a number of zoomorphs pecked into an exposed rock face and, during a later trip, stumbled across a boy producing these motifs. The second site, known as Tambalá, was observed in the Sandawe homeland. To increase knowledge of the original report, a partial translation of the original German is provided below. (Kohl-Larsen & Kohl-Larsen 1958:113-116, translation my own). Notably, this site was described during community outreach meetings as containing human footprints, which indicates that this association has existed for at least 80 years.

Discovery of a Gneiss Slab with Ornamentation

> We made the first and only discovery of this kind of art [in the form of] a gneiss slab in the vicinity of Mangasita [a sub-village of Mooto that is now known as Mangasta], in which we had begun a temporary camp. We owed its discovery to our Sandawe leader, who had already quickly realized that we strange people pursued everything that had occurred in a bygone era. He had told us – and, in general, one should always take heed of such reports by native inhabitants – that he knew about a place where prints of human feet could be seen in a rock slab. So we went, doubtingly, after this wonder.
>
> After 20 minutes, on June 13th and following a southwestern course, we reached the dry riverbed of the *!anga* [the ! is an alveolar click consonant]. After another hour of almost pathless advancement through thick bush, which drove out sweat from every pore, and past several small dry streambeds and a few waterholes, we were suddenly in front of a large rock slab. It was inclined at an angle of fifteen degrees from east to west. The length of the full slab from south to north amounted to twenty [meters], the width six meters. The plate-like rock was already heavily weathered on its surface.
>
> And the traces of mankind, the footprints of an early man? True, there were some depressions visible in the slightly uneven gneiss, which were in the opinion of our guide the traces of a human, but in reality were only the erosive effects of the water and the wind that had produced these depressions.
>
> But once we had penetrated so far into the wilderness of the bush, we wanted to examine more closely the rock slabs that, here in a clearing in dense woods, fell before our eyes.

> I was about to give the order to return to camp when, one last time, I scanned one of the sloping rock slabs and was surprised in the highest and most pleasant way when, thanks to a ray of sunshine passing over it, an ornamentation could be discerned on it, which produced our highest admiration. We located eight sculptures altogether, three of which were still in good condition. These were chiseled into the rock plate, primarily spiral patterns. […]
>
> The spiral pattern is sixty-seven inches long and thirty-five inches wide; the second pattern is forty-two inches long and thirty-two inches wide.
>
> Our guide, who wanted to show us the miracle of the footprints on the slab, gave it the name of Tambalá, which means cloth or rags on which there are patterns just like the ornamentations. We found two millstones in the immediate vicinity of the Tambalá slab.
>
> Inspired by this rare find we set off like gamblers who had booked a lucky profit, and we continued our day's work further along the path after a small lunch break in the camp.
>
> Again we divided the work amongst ourselves. While I set off in a west-northwest direction and, as a result of the rest of the day, discovered only two giraffes on a rock face (which were in a red color but nothing special, and, in any case, offered nothing new), my wife was much happier when it came to her artistic discoveries.

Currently, Tambalá is the name of both the petroglyph site itself and the vicinity in which it is located. This term is not recorded in Sandawe or Kiswahili dictionaries and, so, its description as a form of decorated cloth remains obscure. The Bubu escarpment bisects the Sandawe homeland, leading to generally higher elevations in the northwest than the southeast despite otherwise similar topography. Tambalá is located above the escarpment, 10km from the Bubu River in a long, narrow valley between ridges of hills created through tectonic activity. Tambalá is located less then 5km from the "hard clay" sites described by Sutton (1968). These features are smaller than but bear a superficial resemblance to the "brick sites" of Tanzania and the "Sirikwa holes" of Kenya that are thought to have been residences or livestock enclosures, although Sutton's excavations were inconclusive (Chapman 1966; Chittick 1959; Fosbrooke 1957; Kyule 1997; Sutton 1965, 1968, 1987).

Although the Kohl-Larsens mention eight motifs, 16 motifs were recorded on the rock slab in 2017. All of the petroglyphs appear to have been produced through pecking, which is common on igneous and metamorphic rocks, such as those of north-central Tanzania (incision is more frequently employed on sedimentary rock). Six of the eight motifs mentioned in the text appear to be represented across the Kohl-Larsens' illustrations and photographs. Most of the petroglyphs that were observed in 2017 but not mentioned in the 1938 and 1958 texts consist of barred circles and are located at the opposite end of the slab from most of those documented by the Kohl-Larsens. The petroglyphs visible in the Kohl-Larsens' photographs match our sketches in terms of motif, size, and placement, so it is unlikely that the ULAP team inadvertently recorded another engraved outcrop by the same name. The motifs have undergone a similar amount of patination, but some details illustrated and photographed by the Kohl-Larsens are no longer visible. It is possible either that the Kohl-Larsens simply did not observe the additional motifs (if they were, for example, covered by sediment or vegetation) or that they were engraved in the intervening period and weathering has progressed so rapidly as to mask their younger age.

Monomonose. The Monomonose site was first mentioned in 2017 during a village meeting in Mombose. Four to six petroglyphs are located at the base of a small hill in an otherwise flat valley between two ridges of larger hills, through which a tributary runs toward the Bubu River, 5km to the west. Two of these petroglyphs consist of side-by-side spirals. Moving clockwise from the center, the left spiral completes 4.25 circuits, whereas the spiral on the right proceeds counterclockwise from the center, also for 4.25 circuits. To the left of these spirals is an L-shaped marking that could be natural, and, to right, is an additional, incomplete or eroded spiral. This latter motif proceeds counterclockwise, with 1.25 circuits inside of two shorter, disconnected arcs. A neighboring petroglyph consists of several curving lines but no clear spiral pattern can be discerned. Underneath this set of arcs is a long, slightly curved line that could be natural. As with the Tambalá petroglyphs, all of the engravings are heavily patinated and appear to have been produced through pecking. A number of small holes can be found spread across the inselberg above the petroglyphs. Our guides regarded these as the footprints discussed during community outreach meetings. Although several are quite round, they appear to me to be caused by erosion rather than human activity, such as grinding or pounding.

Known Threats

Both Tambalá and Monomonose are open-air sites are at high risk of further degradation due to weathering. Erosion is particularly severe in the case of the Tambalá petroglyphs, which have no protecting from the elements given their location on a nearly horizontal rock outcrop in an open field. The Monomonose petroglyphs are also exposed to rain but are on a more vertical surface among denser vegetation. Within several meters of the Monomonose inselberg are three watering holes excavated to provide relief for livestock during recent droughts. A thin scatter of quartz flakes was observed on the surface between the petroglyphs and the watering holes that may have been brought to the surface during the excavation of the watering holes. More urgently, Monomonose faces additional risks as it may be inundated as part of a long awaited and important dam construction project along the Bubu River. Efforts are ongoing to increase knowledge of these petroglyphs in order to catalyze intensive survey and study of sites in the inundation zone. Protective measures or salvage may be possible, although additional research and consultation will be necessary to determine if this is technologically feasible, financially sound, and, most importantly, agreeable to local residents.

Age & Authorship of the Petroglyphs

Dating and assigning authorship to pictographs, petroglyphs, and other forms of worked rock present a range of notoriously difficult and persistent challenges. For example, parietal rock art (that is, art on walls) is difficult to associate with stratigraphically secure artifactual assemblages. Further, exposure to the elements and mineral deposition can contaminate pigments, such as charcoal, that would otherwise be amenable to radiocarbon dating. Without robust chronologies, it becomes difficult to relate these forms of symbolic expression to other material traces of African pasts. Nonetheless, analyses of formal style and superposition, in combination with ethnographic, archaeological, and oral historical data, have yielded some measure of success in developing culture-historical phasing to bridge these various lines of evidence. These phases correlate broadly with transitions from foraging to food production, but, in some areas, rock art can be shown to reveal finer-grained techno-economic and sociopolitical change through time (Brandt & Carder 1987; Prins & Hall 1994). This level of detail is not currently available regarding Tanzania's petroglyphs given small sample sizes and the diversity of motifs. As discussed in Chapters 2 and 3, ambiguities have emerged in the archaeological periodization of northern Tanzania, including in the Sandawe homeland. An addition challenge, which is discussed in more detail below, is that significant chronological and spatial gaps exists between the petroglyphs of the Sandawe homeland and those they resemble in southern and eastern Africa.

Although the petroglyphs at Tambalá and Monomonose are recognized as being very old, they are not widely or unanimously considered to be the direct cultural heritage of the Sandawe. Upon further questioning, some participants of community meetings remarked that the footprints were created "while the Earth was still soft," which echoes Willcox's (1986) observation that petroglyphs are frequently asserted to have been made by God, or that nearby residents simply claim ignorance of their origins. In the case of the Monomose petroglyphs, some participants stated that they were carved by the neighboring Burunge, who speak a South Cushitic language and are also agro-pastoralists. Similarly, most other forms of worked rock, such as rock gongs, hollows, and the slide are described as old but not necessarily made by ancestral Sandawe. It was commonly stated, using variants of the Swahili verb *kukuta,* that all of these features were simply "encountered" or "found."

Willcox (1986:239-244) notes that the wide, global distribution of concentric circles and related motifs (spirals, rayed circles, etc.) could result from the physiology of human cognition. This makes them difficult to interpret, but Willcox does note their frequent proximity to water in Africa, which could provide some insight into specific cultural meanings. A relatively small number of base forms have been documented across non-representational rock art (concentric circles, rayed circles, spirals, grids), and tremendous diversity exists among both pictographs and petroglyphs. Even so, there appears to be at least three distinct traditions in sub-Saharan Africa that incorporate circular motifs. A geographically restricted tradition of petroglyphs in southwestern Africa appears to be an independent invention of ancient foragers (Scherz 1975; Willcox 1984). In eastern Africa, the geometric rock art of Uganda has been associated with ancestral Twa forager populations (Namono 2010). Finally, circular motifs are a regular component of a broad class of geometric art that has been associated with food producing communities, especially those practicing some level of animal husbandry. This is not to say that there is always a clear and consistent link between these motifs and particular ethno-linguistic or techno-economic groupings. In the case of the third tradition, for example, the cases are united only by some evidence of food production, while other aspects of their authors varied. For example, Willcox (1984) provides cases of non-representational art linked to stone- and metal-using peoples, resident and migrant groups, and speakers of multiple language families.

The following suggestions could change based on the full analysis of local pictographs, but circular motifs are relatively uncommon among this class of rock art in the Sandawe homeland. Concentric and rayed circles are particularly abundant in the pictographs of the Lake Victoria basin. They have also been observed in pictographs at Makolo, which lies to the west of the Sandawe homeland in Singida Region, and a scattering of pictograph sites across southern Tanzania (Chaplin 1974; Collinson 1970; Culwick 1931a, 1931b, 1931c; Soper and Golden 1969; Whitely 1951; Willcox 1984). Some of these sites have been linked through ethnographic and oral historical research to agro-pastoral communities that arrived in these areas during recent centuries, whereas others have suggested that these motifs were produced by both foraging and food producing communities over a much longer period (Chaplin 1974). Only one pictograph out of hundreds from the Sandawe homeland (from Gekuma 1 but not described in detail here) has been observed to consist of concentric or rayed circles, and so it is difficult to link these regions based on pictographs.

The barred circles of Tambalá appear to be unique among the petroglyphs of eastern and southern Africa associated with food producers, but they do resemble a common motif in the "forager" petroglyphs of southwestern Africa (Scherz 1975; Willcox 1984). Such a connection is not entirely far-fetched given linguistic and genetic evidence that suggests a very deep relationship between ancestral speakers of Sandawe and Khoe-Kwadi (Güldemann & Stoneking 2008; Tishkoff 2007b). One interpretation, therefore, is that these petroglyphs provide evidence of migration between these two regions, which has been proposed for over a century.

Namono (2010) argues that the geometric rock art of Uganda was produced initially by ancestral forager populations based on a statistical analysis of form and placement, the nature of archaeological materials recovered at some sites, and the stance toward this art by present-day inhabitants. However, petroglyphs are rather rare in Uganda and the motifs seen in pictographs are not common in the Sandawe homeland, nor do they have direct correlates among the petroglyphs. It seems unlikely, then, that the petroglyphs of the Sandawe homeland are associated with this tradition.

Non-representational art is rare across the Sahara, Sahel, and Sudanic plains, but has been frequently associated with cattle-keepers in a large area stretching from the Horn to Zimbabwe. In some cases, these motifs have been interpreted as cattle brands of groups speaking Afroasiatic and Nilotic languages (such as the Cushitic and Maa languages, respectively). In other cases, they have been interpreted as representing concepts of fertility among groups speaking Niger-Congo languages, namely Bantu (Gramly 1975; Kenny 1976; Prins & Hall 1994; Willcox 1984). Prins & Hall (1994) assert that the iconography of pastoral rock art differs from that produced by Bantu-speaking agro-pastoralists, but two broad cultural areas overlap in northern Tanzania, so caution is necessary when considering authorship.

The Tambalá and Monomonose petroglyphs exhibit similarities to numerous rock art sites across eastern and southern Africa, including Munwa Stream in Zambia and Tchitundu-Hulu and Calola in Angola, while also displaying unique elements (Bauman 1954; Chaplin 1959; Clark 1939; Dart 1931; Ervedosa 1974; Franca 1953; Quick 1931; Redinha 1948; Rudner 1976; Teixeira 1952). Similarities to the petroglyphs of the Namoratunga sites near Lake Turkana are particularly striking. These petroglyphs are located in and near a variety of monumental sites, such as rings of upright pillars and cairns, that appear to have been constructed by groups practicing a mixed economy entailing foraging, fishing, and herding (Grillo and Hildebrand 2012; Hildebrand et al. 2011; Lynch & Robbins 1978, 1979; Nelson 1995; Phenice et al. 1980; Sawchuk et al. 2018; Soper 1982; Soper & Lynch 1977). It is, of course, difficult to know if the petroglyphs were made by the same people or at the same time as the monumental structures, but Willcox (1986:78) argues that it is likely. Drawing on ethnographic research, Lynch & Robbins

(1977) note that many of the petroglyphs correspond with cattle brands of the near recent past, and Lynch & Donahue (1980) argue that spatial patterning suggests these were used to mark patrilineal kin groups. The oldest monumental sites, which lie west of Lake Turkana and often contain petroglyphs, have an uncalibrated range of 4900-3700 BP (Hildebrand et al. 2011). While this brackets the dates obtained from sites on the eastern side of the lake that yielded the earliest evidence of domesticates in the region, it precedes the youngest dated site with petroglyphs, Lokori, by as much as 1300 years (Hildebrand et al. 2011). Sawchuk et al. (2018) argue that monumental sites resulted from efforts to establish cooperative social networks necessary for the successful continuation of animal husbandry in a new environment. They suggest that monumental sites gave way to less labor-intensive modes of codifying social relationships as specialized pastoralism became more feasible, which may explain both the long duration of these phenomena and their decline over time. This scenario from northern Kenya at first appears to offer an intriguing parallel to historical reconstructions of the Sandawe homeland, which have been framed in terms of frontier expansion into lands occupied by foragers. As described above, there appears to be a correlation between historical linguistic analyses of South Cushitic languages, the dates for early pastoralism in Tanzania, and genetic evidence. In this regard, it is notable that some residents attributed the Monomonose petroglyphs to the neighboring Burunge, who speak a language classified within this language family.

In addition to unexpectedly early dates, Luxmanda is the largest, oldest, and farthest south example of the Savanna Pastoral Neolithic (SNP) (Grillo et al. 2017). Inhabitants of this site were heavily reliant upon domesticates and obtained obsidian from central Kenya. This suggests that northern Tanzania did not present as many zoonotic limits on pastoralism as expected (see Gifford-Gonzalez 1998) or, perhaps, connections to groups farther to the north ameliorated an otherwise risky situation. However, survey has not yet identified similarly early pastoral sites in north-central Tanzania, and so it is difficult to determine whether the site is anomalous. Despite the evocative “hard clay” sites mentioned above, no wares or other materials associated with pastoralism have yet been identified in the ULAP assemblages, so connections between Luxmanda and the Sandawe homeland are unwarranted. Further, Luxmanda is considerably younger than the Turkana Basin sites. If the Turkana petroglyphs are of similar age as the monumental structures, then there are considerable spatial and chronological gaps that undermine a potential link between the petroglyphs of the two regions. Finally, the material culture of the earlier Turkana Basin sites (Nderit and Ileret wares) and the Elmenteitan phenomenon of central Kenya that was contemporaneous with the SNP (obsidian lithics and ceramics) were relatively uniform, suggesting well-established and coherent cultural forms. In contrast, SNP is an umbrella term that downplays considerable diversity regarding the dependence on wild versus domestic taxa, burial practices, lithic production, and ceramic styles, despite some similarity in site selection (Ambrose 1984a; Gifford et al. 1980; Goldstein and Shaffer 2016; Lane 2013; Marshall 1990; Odner 1972; Onyango-Abuje 1977). Bower (1991:74) suggests that the southward spread of domesticates beyond Lake Turkana followed a pattern better described as “trickle-and-splash” rather than a “bow wave.” If so, the diversity of the SNP could reflect a wide array of forager and food producer relations, food-getting repertoires, and processes of migration and exchange, some of which may have no historical or ethnographic equivalents. The Tambalá and Monomonose petroglyphs might, therefore, usefully contribute to ongoing investigations of early food production in north-central Tanzania, but, for now, they further complicate an already complex empirical and interpretive situation.

Conclusion

Based on these initial results, I argue that the rockshelter assemblage reveals the distinction between art and non-art to be a false dichotomy. When studied as an assemblage, these forms of material culture can be read as archives of occupation that reveal the contours of lived, cultural worlds (see also Bruno & David 1999; 2002). At a large scale, a renewed effort to broaden research coverage can provide information concerning possible cultural relationships between Tanzania and other parts of central and eastern Africa. At a smaller scale, studies of rock art in combination with other forms of worked rock could allow scholars to test a wider variety of interpretive models and write more nuanced or novel historical narratives about networks of relations than single ethno-linguistic groups.

To close, we can consider yet another historical possibility. It must be reemphasized that certain aspects of discourse among the Sandawe about the elements of the rockshelter assemblage, including petroglyphs, resemble those of food-producers, as described by Prins & Hall (1994). In particular, the ambivalent stance among residents toward petroglyphs resonates with those of food-producing communities who consider themselves to be inhabiting landscapes inherited from and empowered by prior others. As described in Chapters 1 and 2, Sandawe historiography has tended to presume that the group is autochthonous to their homeland and that they have an intimate connection to local rock art. This has had a significant impact on how the group has been studied and, by extension, the kinds of historical narratives produced. Sandawe beliefs and practices related to the rockshelter assemblage could indicate that scholars should consider the possibility that Sandawe lifeways represent a novel cultural form produced through migration and interaction rather than the gradual erosion of an isolated forager adaptation.

Additional analyses across many lines of evidence will be necessary to discern the dynamics of linguistic, techno-economic, and sociocultural innovation in northern Tanzania, and caution will be required as our understanding of the rockshelter assemblage grows. Currently available data suggest that models developed elsewhere in Africa to describe transitions to food production will require significant modification in north-central Tanzania, if they are applicable at all. Tambalá and Monomonose suggest numerous historical pathways that can be tested through additional research. Continued studies of Tanzanian rock art can provide a fruitful avenue for exploring these issues while also encouraging collaborative, interdisciplinary, and community-based research programs. Such efforts, especially if combined with sustained survey and salvage efforts can also serve to protect and promote local heritage while developing new perspectives on the diversity of African pasts.

Chapter 6

Disciplinary Déjà Vu: The Problem Space of Eastern African Khoisan Foragers

"Khoisan" is now widely recognized as a flawed category that, nonetheless, retains utility for scholars of African prehistory and history. The category serves as shorthand for a range of linguistic, sociopolitical, techno-economic, and biological traits of African foragers from the Later Stone Age (approximately 50,000 BP) to the present. These traits were long thought to be more-or-less overlapping, but, in recent decades, numerous Africanists have critiqued the progressive, stage- and race-based evolutionary schema out of which this typological constellation emerged and through which it retains meaning (Ehret 1974; Klieman 2003; Kusimba 2005; MacEachern 2000; Mitchell 2010; Morris 2003; Nurse 1997; Pargeter et al. 2016; Stahl 2001; Westphal 1971; Wilmsen 1989). In a nod to Klieman's (2003) work on the "Pygmy Paradigm" of central Africa, I refer to this cluster of ideas as the Khoisan Paradigm. Given that the Khoisan Paradigm has been destabilized theoretically and empirically, the question I seek to answer is why scholars have been unable to abandon the Khoisan category and its logical entailments in favor of explanatory models more suitable to the increasingly diverse record of African pasts.

Representing an unusual case study when considered in relation to Kuhn's (2000, 2012) classic work on scientific revolutions, Africanist studies of later Pleistocene and Holocene foraging could be described as an "abnormal" science. That is, evidence contrary to the prevailing paradigm has not produced a crisis through which its underlying generalizations, taxonomies, metaphors, and their relations to each other have been transformed. My approach to this seemingly intractable problem adopts an approach that combines science and technology studies with semiotic anthropology to identify how materially distinct entities, such as "click" consonants, genetic sequences, or rock art, came to be seen as "the same," or, more accurately, how these signs came to semiotically index "Khoisan" (see Abu El Haj 2001; Keane 2003; Kuhn 2012). This "bundling" of indexical signs has led to the formation of interpretive habits of thought that lie ambiguously between formal and relational analogies. I argue that the resilience of interdisciplinary discourse about the Khoisan Paradigm against evidentiary anomalies depends not on an inherent robustness but on the uncritical commensuration of analytic units and scales. The apparent confirmation of a category originating in one discipline (in this case, biological anthropology) via the epistemologies of other disciplines (such as linguistics) has been more akin to an echo chamber than "strategies of triangulation" built upon independent, mutually constraining lines of evidence (Wylie 2002:171-178, 185-199). The cumulative effect of scholarship has been to obfuscate these interdisciplinary transfers in a process akin to "blackboxing" (Latour 1987). What emerges is a vague metaphorics of progress increasingly at odds with available evidence rather than "*disciplined* forms of comparison" (Palmié 2006:443, emphasis added to stress the dual sense of "discipline" as both a branch of learning and the rigorous application of technique).

After outlining my analytic approach, I briefly establish the conceptual core of theorizing about African foragers and situate extant communities geographically and contextually. As a case study, I then conduct a critical genealogy of knowledge production about the two peoples of northern Tanzania categorized as Khoisan, the Hadza and Sandawe. This genealogy traces the emergence of the Khoisan category in southern Africa and its subsequent transposition to eastern Africa to document how equivalences were created across a variety of datasets (specifically, linguistic, biological, archaeological, and, to a lesser extent ethnographic). By considering disjunctures within and between these datasets in relation to the larger discursive field, I end with a consideration of strategies and perspectives that may better explain the available evidence while also allowing scholarship to be more “effective” (following Stahl 2020) and accountable to the ecologies of knowledge in which it has or is being called upon to circulate.

Throughout this analysis, I seek to avoid the egregious partisanship that characterized earlier exchanges about the status of Khoisan foragers, exemplified most infamously in the “Kalahari Debate” (see Lee 1990a, 1990b; Wilmsen 1989; Wilmsen & Denbow 1990). Wilmsen (1989) sought to demonstrate that, in their rush to critique Western civilization, anthropologists misrecognized the historical conditions that produced southern African foragers as an economic underclass. I am less concerned with revealing the intent, motivations, or political aims of scholars than with discerning the implicit, and often unintentional, patterns of thought that facilitate the continued deployment of the Khoisan category despite reservations about its usefulness for explaining the archaeological record. This, in turn, of course, invites continued conversation about the category’s troublesome political implications, but that is not the primary focus of this analysis.

The Semiotic Ideology of Foraging

Significant, periodic debate has accompanied the use of analogical reasoning in in archaeological interpretation, but it remains an essential, generative, and, indeed, inescapable method of inferring non-observed behavior from artifactual remains. Wylie (2002:136-153) provides a comprehensive review, a brief outline of which is provided here. Two major forms of reasoning are common in archaeological interpretation and constitute the relatively weaker and stronger ends, respectively, of a continuum: formal and relational analogies. Formal analogies are those in which a comparison of similarities and differences is assessed between a source and a subject. When two objects share some properties, they may be assumed to share others, but such arguments are underdetermined regarding which additional properties are held in common or the causal reasons that produced this similarity. Relational analogies, in contrast, extend beyond the simple presence or absence of properties to consider the determining structures that are responsible for the relations between the properties in question. Deduction based on law-like principles of well-established relationships between phenomena reflects the limit case of relational analogy. Wylie (2002:148) notes that archaeologists cannot escape analogical reasoning because the application of sociocultural theory to archaeological materials always entails an extension to new domains. Similarly, archaeologists cannot directly observe the determining structures or relations of interdependence between properties and must, instead, infer them. It should be added that, in most cases, neither can ethnographers; for example, even if it is held to be law-like, "ecological adaptation," which remains an accepted theoretical framework (or determining structure) in some sub-fields of anthropology, is, nonetheless, an abstraction that can be only indirectly observed through its effects.

As Prendergast (2020) notes, a remarkably rich corpus of ethnoarchaeological studies, drawing upon oral, written, and material evidence, have been conducted in Africa to inform and constrain analogical comparisons between past and present foragers. And yet, as my review below demonstrates, dubious formal and relational analogies remain common in scholarship about the Hadza and Sandawe. Analyzing the nature of analogical reasoning is helpful to delineate better and worse interpretations of these groups and their prehistory, but this tactic alone remains insufficient for addressing why the Khoisan category remains in use despite widespread recognition of the limitations of the determining structures within which it is enmeshed. I argue that a more fruitful mode of entry into this problem is, therefore, not one based solely on an analysis of logical structure of these analogies but on a two-pronged historical analysis. The first element, which consists of conceptual ground well-trodden by others and which will be addressed only cursorily here, is to establish the theoretical milieu out of which Khoisan peoples came to represent the “simple” end of a developmental baseline (see Kusimba 2005). The second element is to consider the process through which extensions have been made across properties (“click” consonants, rock art) thought to have a necessary causal relationship.

In scholarship on the Hadza and Sandawe, datasets have been allowed to stand in for another’s absence, because they are presumed to hold some level of formal or relational similarity to each other. This requires the commensuration of disparate forms of evidence, but any instance of commensuration requires that differences across observable facts be made compatible (Tsing 2005:88). For compatibility to standardize difference, it “must pre-exist the particular facts being examined; and it must unify the field of inquiry” (Tsing 2005:88). Compatibility arises through convergences reached by “disparate knowledge seekers with their disparate forms of knowledge” that “offer legitimacy and charisma to nascent categories” and “give rise to collaboratively agreed upon Natural objects” (Tsing 2005:88). Of note is that:

> The specificity of collaborations is erased by pre-established unity; the a priori status of unity is denied by turning to its instantiations in collaborations. Buoyed by axioms of unity, collaborations create convincingly agreed upon observations and facts that then appear to support generalization directly, that is, without the prior mediation of the collaboration. The contingency of the collaboration, and its exclusions, no longer seem relevant because the facts come to “speak for themselves.” (Tsing 2005:88).

Although Tsing is speaking generally about the tension between ontology (what exists) and epistemology (how we come to know it), I would like to suggest that an *analogous* relationship exists between her analysis of the emergence of “Natural objects” and the materialization of the ground through which interpretations can be made using either formal or relational analogies. I posit that progressivist, stage- and race-based models are one such axiom of unity facilitating compatibility in interdisciplinary accounts of the Hadza, the Sandawe, and their relations to Khoisan peoples more broadly. Prior to the rejection of these frameworks in the mid-1900s, a number of collaborations can be observed across disciplines that gave rise to both the Khoisan category and the inclusion of the Hadza and Sandawe in it.

A key insight of science and technology studies is that categories are entangled in political economic networks of people, institutions, and material objects (Choy 2011, Latour 1987, Tsing 2005). For example, although colonial officials were aware of anthropological theory and occasionally used it to rationalize European control of Africa, the extent to which colonial fortunes (or, for that matter, post-independence governments) across the continent actually depended on the operationalization of anthropological expertise remains an open question (Lane 2004; Tilley and Gordon 2007; Richard 2009). Nor have scholars grappled with how, through time, the Hadza and Sandawe have actively adopted, resisted, or manipulated scholarly representations of them. Even so, certain resonances can be found between political ideology and the development and extension of the Khoisan category.

The collaborations supporting this category have been so successful that they are now nearly impossible to think beyond. In this sense, the Khoisan category functions as a "black box." Black boxes are objects of knowledge about which some level of certainty or stability has been reached. Latour (1987) borrowed this concept from cybernetic theory to describe material or conceptual apparatuses that constitute unquestioned elements of larger, more complex systems. As taken up by social constructivists and advocates of Actor Network Theory, black boxes can be "opened" in order to trace a history of experimentation and collaboration which demonstrates that the certainty of the black box was, in fact, tentative and contingent. Such "unmasking" risks being deconstruction for its own sake if one does not ask what is gained or forfeited by the use of, in this case, a conceptual apparatus and how it could be reconfigured toward different ends. The following sections trace the tacking back and forth between axioms of unity and contingent collaborations characterizing scholarship about the Hadza and Sandawe.

Identifying points of congruence and divergence between various bodies of data and dominant historical narratives can illuminate areas of inquiry that have been simply defined out of existence. This form of generative reconstruction can be assisted by considering the datasets available for historical reconstructions – artifacts, words, genes, etc. – as signs. The Saussurian linguistic tradition asserts a radical break between semiosis and the material world and, therefore, has difficulty accounting for change, whereas the Peircian tradition can processually account for shifts in the relations between signs systems and their referents (Keane 2003). Within Peircian semiotics, signs consist of a sign-vehicle, an object, and an interpretant (Peirce 1955:98-119). The sign-vehicle is akin to a Saussurian signifier (the word "tree"), whereas the object is the signified (a physical tree). A sign-vehicle does not signify all aspects of an object, however (the height of a tree, for example), and the interpretant is the understanding that an observer has of the relationship between the sign-vehicle and the object. Icons are sign-vehicles that we interpret as standing for its object due to a shared quality, such as the image of a printer in the toolbar of a word processing program. Indices are sign-vehicles related to their object through physical proximity, existential fact, or other causal connection, such as a weathervane and the wind. Finally, symbols are sign-vehicles that produce an interpretation due to a conventional relationship, such as that between the word "tree" and an actual tree.

Keane (2003) discusses several factors that open icons and indices to social analysis. For example, qualities must be embodied in an object and are, therefore, contingently "bundled" with other qualities. He uses Munn's (1986) analysis of Melanesian systems of production, consumption, and exchange to illustrate how "any analysis of signs in society needs to provide an account of how entities that are materially different in their qualities or, minimally, in their spatio-temporal coordinates, count as 'the same,'" such as, in the case examined, canoes and yams (Keane 2003:414). Such an account allows one to track how objects fit within an overarching value system and how assessments of them change from context to context. Because icons and indices themselves "assert nothing" (Peirce 1955:111), opening them to social and historical analysis depends on access to the socially and historically specific assumptions about what signs are and how they function in the world, which Keane (2003) refers to as "semiotic ideologies." Keane (2018) uses Pritchard's classic example of the collapsed granary to illustrate why semiotic ideologies are necessary to a full accounting of the ground that links a sign-vehicle to its object. In this case, although all might agree that the proximal cause was the weakening of wood by termites, to the Azande, it can be read as indexical of an occult agent.

Science and technology studies demonstrate that scholarly analysis must be understood to be as culturally specific as more "anthropological" social phenomena despite claims to its universality and objectivity. Wylie (2002) rightfully notes that determining structures that have not taken the form of natural laws gain their coherence through analogical forms of comparison. Although Keane (2003) notes that the bundling of icons and indices can operate below the level of consciousness, they are also open to strategic manipulation. Wylie (2002:150-151) claims that the formal comparisons of "primitive" living societies with prehistoric cultures characteristic of classic evolutionary models were notoriously unsystematic. There was neither an attempt to demonstrate the invariance of particular configurations of these societies' properties nor an attempt to articulate the determining structures that would have caused them to co-vary. Even so, stage- and race-based frameworks constituted a ground that asserted a general, progressive improvement of sociocultural forms. I argue that this unspecified notion lives on in scholarship on the Khoisan. What is at question, then, is how scholars have created links between disparate forms of evidence – "click" consonants, lithics, genetic sequences, or rock art – such that they all come to be understood as indices of "Khoisan." Though my genealogical approach to the literature, we can trace specific instances of conscious equivalence-making and there transfer to other epistemic realms. Through time and professional training, these extensions have become unconscious patterns of interpreting indexical signs.

Situating African Foragers

Scholarship on the Hadza and Sandawe provides a particularly rich case study for the practices of knowledge production because these groups are understood today in virtually the same way as they were at the time of their first ethnographic descriptions 125 years ago. Although it is true that significantly less has been published about the Sandawe than the Hadza, this characterization holds in the contemporary literature, especially among geneticists. An exemplary instance of this conceptual continuity is provided in two descriptions of the Sandawe, published a century apart. The earliest scholarly account of the Sandawe can be found in Oskar Baumann's (1968:111,191-192) memoirs of an 1891-1893 expedition through northwestern Tanganyika. Baumann comments that he was particularly intrigued by the Sandawe, whose language differs drastically from surrounding groups and is "reminiscent" of the Khoikhoi language of southern Africa[1]. Due to their body type Baumann speculates that the Sandawe are "apparently" a primitive people altered by blood mixture with neighboring tribes. The Sandawe "appear" to be a settled hunter folk, in contrast to the Hadza, the "undeveloped branch of the tribe." His Sandawe informants claimed not to have migrated into the area, and Baumann

[1]My own translation from the original German.

remarks that they have few interactions with the broader region, concluding that they are long-term inhabitants of the region.

Newman (1991/1992:159), summarizing the scholarly consensus on the Sandawe, notes:

> It was clear from their very first descriptions that the Sandawe were going to be a difficult ethnographic puzzle to solve. However, some of the basic pieces of this puzzle have finally been shaped, and at least the outlines of what the picture might look like are beginning to come into focus.

One is struck by the extent to which these "basic pieces" follow the contours outlined originally by Baumann (Table 6.1). First, Newman states that the Sandawe language belongs to the Khoisan language family, although its precise affinities to others in that family remain uncertain. Second, the Sandawe exhibit genetic variability from the Khoikhoi, Bushmen (also of southern Africa), and Hadza, suggesting considerable past admixture. Third, the Sandawe were once hunter-gatherers. These observations taken together suggest, finally, that the Sandawe are the autochthonous remnants of a once widespread eastern African, Khoisan-speaking, hunting and gathering population. Newman's description differs mainly in that Baumann's nods to uncertainty ("appear," "apparently") are absent, replaced by a detailed technical vocabulary and evidentiary structure for what previously had been a nascent classificatory scheme.

The notions of identity and change that serve as a backdrop to these accounts of the Hadza and Sandawe rest upon typological hierarchies that were transformed and gained new political valences in the late nineteenth century. These hierarchies emerged from a longer tradition of thinking about social evolution that preexisted and, moreover, did not require a notion of biological evolution (a full accounting of these lineages is beyond the scope of this review, but see Stocking 1987; Trautmann 1992; Trigger 1989). Such models include the transition from savagery to barbarism and civilization, as well as the progression from hunting and fishing to herding, agriculture, and commerce. Over the 1700s and 1800s, a number of novel theories and epistemological practices converged that literally and figuratively naturalized the concurrent rise of European colonial dominance on a global scale (Brantlinger 1985, Pratt 1992). Despite misgivings about the chronological implications in relation to Biblical exegesis, one such theory was Darwinian evolution, which provided a previously absent mechanism to fill the historical void created by Lyell's popularization of the concept of deep geological time. Newer theories of adaptive, biological fitness were melded with older, humanistic considerations of culture as an achievement over savagery, which was now cast as both antithesis *and* evolutionary precursor to civilization, a development that Trautmann (1992) describes as a specifically anthropological "revolution in ethnological time."

Table 6.1: Comparison of Scholarly Descriptions of the Sandawe from the 1890s and the 1990s

1890s (Baumann)	1990s (Newman)
Sandawe is reminiscent of Khoikhoi	Sandawe belongs to the Khoisan Family
The Sandawe have undergone blood mixture	The Sandawe are genetically mixed
The Sandawe are settled hunters, the Hadza are undeveloped relatives	The Sandawe were once hunter-gatherers
The Sandawe are isolated, long-term inhabitants of their homeland	The Sandawe are autochthonous remnants of a once widespread East African Khoisan-speaking hunting and gathering population.

The nature of such thinking is by now well documented, but a cursory summary is useful. This ethnological revolution suddenly brought sociopolitical and techno-economic typologies into the same comparative frame with racial and linguistic typologies. Earlier, "horizontal" categorizations of human difference were, thereby, recast as "vertical" categorizations of biological and social refinement, culminating in the apex of western European civilization. This implies that past and present societies are discrete entities amenable to empirical definition and measurability, allowing them to be ranked along a temporal scale of development (Gould 1981; Lucas 2001). Because the typological categories produced by this mode of thinking necessarily have both descriptive and chronological implications, societies deemed “primitive” served both as a foil for identifying distinctive features of Western societies and as a window into earlier stages of history (for classic examples, see Lubbock 1865; Morgan 1877; Sollas 1915; Spencer 1857; Tylor 1871; and Wilson 1862). Within ethnological models used to categorize African peoples being subsumed into European colonial expansion, “intermediate” groups were viewed as hybrids resulting from the hypothesized migrations of successive waves of more highly developed peoples throughout the continent.

One model, known as the Hamitic Hypothesis, exemplifies the transition from pre-scientific to scientific typologies. Hamites, the hypothesized descendents of Noah’s son, Ham, were previously thought to be black-skinned Africans (their color a reflection of their curse). Following a complex interplay of Biblical exegesis, pre-Darwinian raciolinguistic schema, and later evolutionary frameworks, they came to be thought of as peoples of Caucasian raciolinguistic stock, albeit inferior to those of Europe, who practiced animal husbandry and were early bearers of civilization in Africa (see Sanders 1969 for a comprehensive review). Von Luschan (1912) used anthropomorphic traits and subsistence repertoires to tentatively define the Hamitic racial category. Building upon this foundation, Meinhof’s (1912) linguistic classification expanded the Hamitic category, even in cases for which this extension had tenuous empirical support. Despite frequent accusations of tautology, Meinhof’s work remained the standard for decades. His ideas were popularized by Seligman (1930), who claimed that Hamitic languages were spoken by the descendents of Caucasian cattle-herders who migrated throughout Africa, spurring development among the inferior Negro peoples they encountered.

African foragers came to be placed at or near the simple, primitive, “older” ends of progressive, stage- and race-based developmental scales (Kusimba 2005), and this tendency was reinforced as it has became increasingly clear that hominins first emerged in Africa. As will be seen, Khoisan peoples have been described variously as merely analogical to the primordial condition of modern human existence or the actual physical embodiment of that period – an ancient lineage that has survived for millennia relatively unscathed by successive waves of technological and social change. Differences between the Bushman and Khoikhoi languages were initially attributed to the interactions with Hamitic peoples. In 1863, Lepsius classified the Khoikhoi language and others then known to use grammatical gender as Hamitic. As elaborated by Wilhelm Bleek (1899:ix), “the dependence to a great extent of a nation’s mode of thought on the forms of their language is well-known fact,” and nations using grammatical gender were “distinguished by a higher poetical conception,” which was necessary for progress toward civilization.

It is out of this milieu that the Khoisan category emerged. Rather than a transparent distillation of ethnological reality, the term has accumulated a super-abundance of referents through a century-long web of citation and analogy as it has slid across disciplinary boundaries. Although it may have become possible to assert matter-of-factly that the Hadza and Sandawe “are Khoisan,” one has little guidance concerning exactly what this phrase means in each context it is encountered. Schultze coined “Khoisan” in his 1928 description of Khoikhoi and Bushman bodily forms, in which he argued that the two groups are anthropomorphically identical.[1] This neologism means “the food gathering people” and was formed from the Khoikhoi’s endonym, *Khoi*, or “person,” and the word for their foraging neighbors, *Sā*, or “gather food,” along with a plural suffix, *n* (Westphal 1971:369). The term was popularized soon thereafter by Schapera in a 1930 review in which he suggested that the two groups, previously differentiated predominantly by subsistence practices, also displayed sufficient linguistic and cultural similarities to be considered a single entity. Setting aside the suitability of this new, all-encompassing term for the diversity of the southern African ethnographic context, it is essential to note that, nearly from the moment of its creation, the Khoisan category referred to a broad range of phenomena of interest to numerous disciplines with differing epistemological systems.

By the mid-1900s, most ethnic groups in Africa had been assigned to a particular slot along the Khoisan-Bantu-Hamitic racial and linguistic continuum (from “oldest” to “newest”), with the primary aspect of classification focused so heavily on subsistence technologies that these terms were, and remain, effectively interchangeable with Forager-Farmer-Pastoralist. The Hadza have typically been considered in relation to the Bushmen due to these groups’ higher reliance upon foraging, whereas the Khoikhoi have been of particular interest vis-à-vis the Sandawe because both groups obtain food from diverse subsistence repertoires that include foraging and food production. The ambiguous traits of the Khoikhoi and Sandawe have continually complicated efforts to categorize them since the 1800s. Indeed, the presumed

[1] Terminology for African foragers is complicated and contentious. Unless directly quoting an author, I use the following: “Khoikhoi” instead of “Hottentot,” “Khoe,” “Khoekhoe,” or “Khoi;” “Hadza” instead of “Hadzabe,” “Hadzapi,” “Hatsa,” “Kangeju,” “Kindiga,” “(Wa)nege”, “Tindiga,” or “Wahi;” and “Sandawe” instead of “Sandawi” or “Ssandaui.” With no broad consensus concerning the use of “Bushmen,” “San,” “!Kung,” and other endonyms, I use “Bushmen” despite its pejorative connotations. It should be noted that although “Khoikhoi” and “Bushmen” imply unitary ethnic groups, each is, in turn, an umbrella group subsuming varied languages, dialects, ethnic appellations, and food-getting repertoires. For this chapter, it is sufficient to know that distinctions between these macro-groups typically followed food-getting repertoires; namely, an emphasis primarily on foraging (Bushmen) versus a reliance on both foraging and herding (Khoikhoi).

transition away from a “pure” hunting and gathering past continues to constitute a major focus of research on the Sandawe.

Several additional remarks are necessary at this stage. Scholarship on central African foragers, often collectively referred to as the “Pygmies” or “Batwa,” has a similarly complex conceptual history, and Klieman (2003) provides an excellent reconsideration of what she terms the “Pygmy Paradigm.” Primarily because these groups speak Bantu languages, scholars have had difficulty ascertaining their relationship to Khoisan groups. Delineating the relationship between these two paradigms and the extent to which they may reflect the same intellectual milieu is beyond the scope of this review. Finally, some may object to my heretofore rather imprecise use of the terms “Khoisan” and “forager” by not, for example, specifying “Khoisan-speakers” or describing some groups as “former hunter-gatherers.” As will be seen, I argue that such qualifications do not rectify the underlying conceptual problems. I will generally, however, use the phrase “groups associated with foraging” to call attention to the gaps between these groups’ lived experiences and abstract, categorical reasoning about them. Finally, I employ the admittedly clunky “languages using click consonants” instead of “click languages” to avoid the pejorative connotations of that phrase.

Clicking Prehistory into Place – Linguistic Evidence

It has become common to retain Khoisan as the name of a language family while asserting that it can be defined in the negative: the languages in the family are classified together because they employ click consonants as regular speech sounds and because they have no obvious links to other language families (see Blench 2006; Güldemann and Voßen 2000; Sands 1995, 1998b; Traill 1980, 1986). This latter criterion excludes languages that can be shown to have adopted click consonants through contact, including at least 15 languages and dialects of southern Africa, such as Xhosa and Zulu, and the eastern African Cushitic language of Dahalo. The claim that Khoisan is an unproblematic, default category is misleading in that it downplays the legacy of the evolutionist frameworks out of which it emerged and creates confusion when taken up by other disciplines.

As discussed above, frameworks of progressivist, stage- and race-based evolution presumed that traits cluster together within a temporal scale of development that can be ascertained through empirical observations of living peoples. There has been an uninterrupted tradition of viewing click consonants as inherently “primitive” or “archaic” (Güldemann 2007; Sands & Güldemann 2009; see Pennisi 2004 for a recent example). What was notable to scholars about this assemblage of languages was the rarity of click consonants, their lack of clear ties to other languages, *and* their frequent association with groups relying to some extent upon hunting and gathering. Click consonants, foraging, and primitivity were linked to each other within a narrative of racial progress, and this narrative drove early interdisciplinary scholarship about the relationships among groups displaying this suite of linguistic *and* non-linguistic traits.

The ballooning referential indeterminacy of the Khoisan category can be illustrated by tracing its use through time within the field of historical linguistics. One of field’s goals is to create taxonomic families for groups of languages sharing a common ancestor, which, in turn, have implications for historical reconstructions. This effort generally presumes a monogenetic model of linguistic diversity. That is, even if language emerged more than once in human history, all contemporary languages have equal historical depth and have resulted from changes occurring subsequent to only one of these origin points (the timing of which is debated due to the indirect nature of available data). Further, all contemporary languages could potentially be traced back to this proto-language, although it is acknowledged that current techniques are unlikely to uncover such deep relationships. Models of the geographic spread of these language families have become more nuanced in recent decades, but historical linguistic analyses often lead to the mapping of family tree diagrams, the nodes of which are frequently presumed to represent migration events that created physical, and eventually linguistic, distance.

The identification of potential members of a language family necessarily draws on a wide range of non-linguistic data. Such data must inform analysis because the available methods (mass comparison of basic vocabulary word lists; lexicostatistics to determine the percentage of cognates; glottochronology to estimate the timing of linguistic divergence; the comparative method to reconstruct proto-languages) are based on analyses of entirely linguistic parameters (lexical morphology, grammar, phonology). Evidence that contemporary languages are spoken by groups whose predecessors could have been in proximity to one another serves as a logical check that linguistic correlations confirm relationships of what is termed “genetic” descent rather than “typological” groupings arising through chance or due to contact between otherwise dissimilar languages.

Terminology and representational devices evocative of biological kinship, such as “cognate,” “ancestor,” or “daughter,” risk suggesting to non-specialists that the genetics of a language family extend beyond linguistic similarity to common biological descent. A number of observations trouble the overlap between linguistic and biological descent. For example, due to frequent borrowing across African languages, incomplete awareness of the factors driving linguistic change, and a chronic lack of high quality data, analyses below the level of family, even for probable genetic groupings, remain suspect in many contexts (Nurse 1997; Sands 1995; Westphal 1971). Languages can change in situ or spread to new areas despite limited movement of human populations, so models of language acquisition (and chromosomal exchange, discussed below) must be made explicit (Nurse 1997; Renfrew 1992). An impediment to verifying historical events suggested through linguistic reconstruction, such as migrations, is that, in many contexts, it is difficult to prove definitively what language was spoken by the groups responsible for the archaeological record of seemingly related material culture. Finally, in areas lacking a long literary tradition, such as much of Africa, historical linguistics must rely upon languages documented after the onset of European exploration. Entire language families (and possibly their chromosome-bearing speakers) could have existed across space and time that have gone extinct. For example, Güldemann and Voßen (2000) note that out of approximately 100 Khoisan languages from southern Africa, only 30 are currently spoken. Although partial records exist, these and other languages are forever lost to study, excepting cases in which a linguistic substratum is apparent. Taken together, these observations demonstrate that language trees are often incomplete and will rarely, if ever, map neatly onto other datasets.

A shift in the suite of non-linguistic diagnostic traits used to define a type could lead to vastly differently taxonomic systems, and competing, early linguistic classifications of Bushman and Khoikhoi languages hinged on calibrations of linguistic evidence to biological, sociopolitical, and techno-economic data. Likewise, the same non-linguistic data were used to analogize the relationship of the Hadza and Sandawe languages to a scholar's views on the Bushman and Khoikhoi languages. Dorothea Bleek (1929), for example, viewed the "mixed" traits of the Khoikhoi as essentially Hamitic and incommensurable to those of the Bushman groups, leading her to exclude them from her studies of Bushman languages. Bolstered by parallel structures among non-linguistic factors, she concluded that the Hadza language was related to the Bushman languages, whereas the Sandawe language aligned with the Khoikhoi language (D. Bleek 1931a, 1931b). A divergent perspective stressed overarching non-linguistic commonalities to further support the inclusion of the Khoikhoi, Hadza, and Sandawe languages into the same family as the Bushman languages on linguistic grounds (Dempwolff 1916; Drexel 1921/1922).

Greenberg (1950) provides the best-known synthesis concerning Hadza, Sandawe, and the southern African languages using click consonants as part of his attempt to reclassify all African languages. Deploying a new methodology, mass lexical comparison, he concludes that they form three distinct branches of a single, genetic language family. Greenberg's attempts to more rigorously establish the outlines of language families using non-statistical mass comparison remains controversial, but it is essential to note that his publications provide a linguistic argument against the racial logics of the Hamitic Hypothesis, even as they subtly reinforced existing presumptions about groups associated with hunting and gathering. Greenberg's reclassification undercut notions of a neat one-to-one relationship between language, race, and subsistence, as well as the attribution of all progress in Africa to pastoral Hamites. Greenberg (1963) attributes the longevity of such claims to an ethnocentric misreading of available data and he discusses several methodological tactics, such as numbering rather than naming languages during analysis, designed to limit one's attention to linguistic parameters alone.

Despite his attempts to dispel racial logics from linguistic analysis, one must note ambiguities created by two features of his reclassification. The first is his choice of "Click Language Family" as a moniker for the group in his initial 1950 publication. In this article, Greenberg adopted Schapera's term Khoisan for only the southern African languages. By 1963, however, he stated that "Terminologically, it is convenient to extend the usage of Khoisan to include this entire group of related languages" (Greenberg 1963:66). Although Greenberg questioned the analytic and interpretive repercussions of non-linguistic data and racial tropes, his shift in nomenclature from the "Click Language Family" to the "Khoisan Family" nonetheless created slippages between the terms "Khoisan," "Sandawe," and "Hadza." That is, it became analytically acceptable to say that the Sandawe and Hadza languages "are" Khoisan languages (see Dalgish 1979 for an early example). The second notable feature of his study further reinforces this slippage. Out of the hundreds of languages included in study, it is only during his analysis of the Khoisan Family that he explicitly mentions subsistence. He opens with a summary of Schapera's work on the southern African groups before describing the Sandawe as "a hunting and, to some extent agricultural and herding people of Tanganyika" and the Hadza as "a small hunting, food-collecting group who live some distance northwest of the Sandawe." In other words, regardless of his intentions, he created an indexical bundle spanning these entities that, while rejecting certain aspects stage- and race-based frameworks, nonetheless reinforced their equivalence regarding other qualities (foraging).

The expanded reach of "Khoisan" was adopted by scholars in other disciplines as an umbrella term for non-linguistic features of the Hadza and Sandawe, following Schultze and Schapera's earlier precedent. For example, Lim (1982:101), an archaeologist, states:

> The Sandawe, who form the bulk of the population within this territory, are anthropologically famous for having one of the "click languages" found in East Africa (Greenberg 1966). Even their physical appearance is different from their Bantu neighbors, being more Khoisan in character (see Trevor 1947). These two facts, plus the long tradition of hunting and gathering, suggest that the Sandawe are remnants of a Khoisan population preceding the wave of Bantu expansion (Bagshawe 1925, Newman 1967, Sutton 1968).

This extension of "Khoisan" as both a linguistic and non-linguistic category to eastern Africa is striking given that suspicions arose almost immediately that it had not been constructed to the same standard as other language families (Westphal 1962, 1971). As better linguistic data allowed for increasingly rigorous analyses between 1970 and the 2000s, results suggested that the Khoisan Family could represent a typological grouping in which click consonants are the only common feature, or a hybrid genetic and typological family.

In his synthesis, Greenberg asserts that the three branches of the southern African language complex, Hadza, and Sandawe form a tripartite family, although he does comment that Hadza is an outlier. In the decades since Greenberg's classification, the general consensus has called into question virtually all components of his conclusion. The minority opinion is that Khoisan represents an entirely genetic family to which the Hadza and Sandawe languages belong (Ehret 1986; Fleming 1986; Honken 1977, 1988; Ruhlen 1991, 1994). Others have concluded that Hadza is aberrant or unrelated to the other languages included in the family (Blench 2006; Elderkin 1982, 1983, 1992; Güldemann and Voßen 2000; König 2008; Sands 1995, 1998a; Tucker 1967; Woodburn 1970). The status of Sandawe is more equivocal. Numerous studies have observed similarities between Sandawe and the southern African language complex, especially Khoikhoi, but it has also been considered an isolate (Dempwolff 1916; Drexel 1921/1922; Drexel 1929; Elderkin 1986, 1989, 1991, 1992, 1998; Güldemann and Voßen 2000; Heine & Voßen 1981; Köhler 1973/74; Trombetti 1910, 1922/23). Sands' (1995) dissertation was the first comprehensive and systematic application of the comparative method (considered the most robust analytic technique) to representatives of all branches typically included in the Khoisan Family. She ends with the rather tepid conclusion that Sandawe is "a little more likely than not" to be related through common ancestry to the southern Khoisan languages rather than their similarities arising through chance (Sands 1995:106). Güldemann and Elderkin (2010:48) recall that a relationship between Sandawe and Khoikhoi has been promising for over a century. While they hope that their application of new techniques "has made the fulfillment of that promise a little more likely than it was," evidence for such a grouping "can still only be categorized as promising." Even the coherence of Greenberg's sub-family has been questioned, with an increasing number of scholars suggesting that South African Khoisan consists of three independent lineages and up to two additional isolates (Blench 2006; Crawhall 2006; Güldemann 2003, 2008; Güldemann and Elderkin 2010; Güldemann and Stoneking 2008; König 2008; Westphal 1962, 1971).

If the Khoisan Family as described by Greenberg is indeed genetic and includes only languages sharing a common ancestor, then that ancestor likely existed so long ago that it is now difficult to prove through the use of the comparative method (Nurse 1997). If the Khoisan Family is typological, then a number of processes, including independent innovation, divergence, convergence, and language extinction, will need to be investigated in order to explain the geographic distribution of click consonants across four to seven unrelated families (Güldemann 2007; Güldemann and Stoneking 2008; Sands 1995; Westphal 1971). Of potential interest in this regard are observations that, despite having no apparent genetic relationships, the languages of eastern Africa that include click consonants (Hadza, Sandawe, and a Cushitic language of Kenya known as Sanye or Dahalo) share typological similarities in the patterning of click consonant use that are not shared by the southern African language complex (Maddieson *et al.* 1993; Sands *et al.* 1993; Wright *et al.* 1995; Maddieson *et al.* 1999).

Squeezing History into Their Genes – Biological Evidence

Reconstructing history via its layered corporeal traces exemplifies how imprecision around analytic units and scales can narrow scholarly accounts of the past. This is particularly apparent in studies of peoples defined as "Khoisan," who, as the preeminent "hunter-gatherers" of anthropological thinking about prehistory and sociocultural evolution, have perennially served as a proving ground for new theoretical and technical approaches to biological data. Many such studies cannot be considered apart from the race concept, but Abu El-Haj (2007) urges scholars to consider whether contemporary understandings of the historical import of biological differences are substantively different from those of early anthropology. I argue that, in the case of African "hunter-gatherers," they are not. Biological analysis has typically upheld what scholars have long presumed to be true about these societies, thereby prolonging the belief that they are basal among human groups. This results, however, from an uncritical application of interpretive frameworks and a problematic calibration of disparate datasets and scales.

Although bolstered by the full spectrum of anthropological knowledge, biological data often serve as the keystone for claims that contemporary African groups associated with hunting and gathering are remnants of exceedingly ancient lineages. Racial hierarchies imagined the Forager-Farmer-Pastoralist subsistence sequence as a progressive process of replacement by discrete entities. Melded with the framework of Darwinian evolution, racial analysis sought to empirically delineate human groups using biological markers of inherited traits and capacities. Non-biological traits were considered capable of diffusing from superior to inferior peoples, so an impetus of early physical anthropology was to distinguish superficially (that is, socioculturally) hybrid groups from actual biological hybrids created through admixture. Despite the presence of isolated groups in eastern Africa with evocative similarities to those recorded in southern Africa, only physical anthropology was seen as capable of confirming an underlying unity. Extending the southern foraging type to eastern Africa spurred several interwoven lines of inquiry. First, whether Bushman populations are visible archaeologically in the region, and, second, whether the Hadza and Sandawe show biological affinities to the peoples of southern Africa. A third matter was that of geographic origins and the direction of subsequent dispersions.

Virchow (1895) provides the earliest osteological report of two Sandawe skulls but concludes without a statement on racial affinity. Reid (1915) follows with an analysis of 14 crania collected in the Hadza and Sandawe homelands. He states that the Sandawe are a mixture of the Bantu, Hottentot, and Hamitic races, probably owing to an influence from southern Africa, whereas the Hadza are probably Hamites with Pygmy blood. Skeletal evidence cited as proof of a specifically Bushman presence in eastern Africa includes the following: skulls collected near the Hadza homeland, such Kohl-Larsen's "Eyasi Man" (Galloway 1933); a skull from a relict beach of Lake Nyasa (collected by Stannus and mentioned passingly in Keith 1933); skulls from Homa and skeletons from Elmenteita in southwestern Kenya (Leakey 1935); specimens from Gamble's Cave in Kenya (Galloway 1937); and a skull from Singa in Sudan (Woodward 1938, Wells 1951). Due to similarities between some of these finds and northern African remains, Woodward (1938) and Tobias (1965, 1978) suggest that Bushmen once lived throughout the eastern half of Africa, from the Cape of Good Hope to Egypt. Trevor (1947) failed to obtain skeletal material, relying instead upon anthropometric data from the Sandawe. He concluded that the "linguist evidence, which suggests, but can never prove, kinship, thus receives support from the physical evidence" and that it is now "possible to place, with some confidence, among the Khoisan, or at least the Khoisaniforms, the Sandawe whose physical characters are the prime object of this study" (Trevor 1947:76).

Trevor's use of "Khoisaniform" reflects a process of reification similar to that observed during the extension of "Khoisan" to the Hadza and Sandawe languages by Greenberg. The process began with Seligman (1930), who affiliates the Sandawe with Schapera's "Khoisan" race based on similarities in language, subsistence practices, skeletal materials, and material culture, including the co-occurrence of these groups with rock art. Coon (1962), drawing upon similar evidence, proposes the “Capoid” race, said to include the Khoikhoi, Bushmen, and eastern African “remnants.” Variants of these terms encountered in the subsequent literature include “Bushmanoid,” “Khoisanoid,” and “Khoisanid,” depending on the taxonomic scheme in use. The implication of the dual reification is that Khoisan languages and their speakers constitute an isomorphic natural kind.

As with linguistic studies, doubts about the validity of the category began to emerge almost immediately after scholarly consensus was reached. Morris (2003) observes that the longevity of claims about a Bushman presence in eastern Africa resulted from a context that gave priority to isolated features rather than overall morphology. With the adoption of multivariate analysis and attention to a broader range of features, reconsiderations of eastern African “Bushman” skeletal remains from Tanzania and Kenya demonstrate that they fall within regional variation rather than representing outliers with links to southern Africa (Bräuer 1976; Bräuer 1978; De Villiers & Fatti 1982; Schepartz 1988; Winkler 1984). The Singa skull has unusual (possibly pathological) morphology and may be of significant antiquity, leading later scholars to deny its relevance to the question of eastern African “Bushmen” (Bräuer 1984; Brothwell 1974; Grun & Stringer 1991; Rightmire 1984; Schepartz 1988; Stringer 1979; Stringer *et al.* 1985). Despite representing an early use of multivariate analysis, even Trevor’s (1947) study is dubious due to sampling bias, given that three of the five comparative samples were from southern African groups associated with hunting and gathering. A rather late contribution to this particular tradition of scholarship, Ikeda & Hayama’s (1982) anthropometric study found that, despite some affinities, there was no reason to directly link the Hadza to the Bushmen, with much of the observed variation among the Hadza generally aligning with regional patterns.

As confidence eroded in the ability of osteological and anthropometric evidence to discern racial types, emergent technologies were recruited for the task. In contrast to other moments of interdisciplinary collaboration, this particular effort has occurred mainly external to anthropology proper – a rift that has continued into the present (Marks 1996). Despite the widespread acceptance of Darwinian evolution in the latter half of the 1800s, debate continued concerning the nature of hereditary material and its mechanism of transformation and transmission. Recognition of the role of gradual change and natural selection on chromosomal material came via the rediscovery of Mendelian genetics and the subsequent development of population genetics in the early 1900s. Phenotypic traits linked to single gene loci, such as blood group systems, color blindness, and sensitivity to the taste of phenylthiocarbamide (PTC), became the primary objects of early investigations into genetic inheritance, with blood group systems (discovered by Landsteiner in 1901) being of particular importance. Whereas morphology is multicausal, single-gene traits were considered to be a more direct proxy of heritable material. Early observers noted that the proportions of such traits corresponded roughly to the major prevailing racial divisions (Hirschfeld & Hirschfeld 1919). These factors, taken together, offered the possibility that the quantitative rigor of single-gene analysis would provide clarity where morphological studies had faltered in their attempts to discern racial essence (see Boyd 1950; Krogman 1943; Parr 1935). According to Krogman (1943, emphasis original):

> In both instances we will have groups called races: in the first instance – the present-day method – groups are classified by *what they look like* physically; in the second instance – the emerging bio-genetic method – groups will be classified by *what they are* genetically.

Over this same period, however, physical anthropologists had begun to suspect that the phenotypic (and ethnographic) data used to determine racial affinity are variational spectrums through space and time with elusive causal links in genotype and environment, both cultural and climatic. As the ontology of race came under scrutiny, the renunciation of racial politics, to which anthropology contributed greatly, gained widespread traction. These trends culminated in the publication of "The Race Concept" by UNESCO in 1952, in which most racial differences were reconfigured as resulting from cultural rather than biological processes.

Analyses of single-gene traits among the Hadza and Sandawe first appeared in the 1970s and were positioned as relevant to debates concerning their linguistic and racial affinities. Many of these studies were conducted as part of the International Biological Program (IBP), a ten-year project focused on large-scale ecological data collection in order to ameliorate population growth. Reflecting the overall systems ecology orientation, one goal of the IBP was to understand the physiological and genetic adaptations of humans to natural environments. Suggesting that elements of the race debates of previous decades had started to filter into genetic studies, namely the reversal of the nature-culture binary, the IBP was also tasked with studying genetic changes resulting from "the rapid advance of civilization" (Stebbins 1962).

Godber (1976 *et al.*) found that the Sandawe and their Bantu-speaking neighbors, the Nyaturu, have no significant differences in the frequencies of genes regulating blood group systems. Further, the Sandawe and their neighbors closely resemble other populations sampled from central and eastern Africa, with no serological evidence of an affinity between the Sandawe and southern "Khoisan." This finding was affirmed by Tills *et al.* (1982), which also analyzed gene frequencies among the Hadza. This research team split the Hadza sample into a western group and two eastern groups, on the assumption that the western group's genetic material would be more representative of the Hadza's "original non-mixed" state due to their supposedly more recent and less intensive contact with surrounding groups. Sample sizes and technical issues prevented conclusions about the eastern Hadza, but the western Hadza were found to be similar to the Sandawe and Nyaturu, with nothing to indicate affinity to the southern "Khoisan." A study of color blindness and PTC sensitivity among the Hadza was generally inconclusive as far as racial classification due to the small number of reports from elsewhere in Africa (Barnicot & Woodburn 1975). The high number of non-tasters of PTC was described as attributable to drift or to an affinity with northern, rather than southern, Africa. Identical conclusions were reached in a study of Hadza finger and palm prints (Barnicot *et al.* 1972). Fleming's (1986) article is remarkable in its direct comparison of blood plasma protein to linguistic data. Although the data were inconclusive, the title, "Hadza and Sandawe Genetic Relations," provides an extraordinarily pithy example of the commensuration of datasets within a biological metaphor of descent.

Studies within this tradition ultimately addressed gene products, even if some of those products had a more direct relationship to chromosomal material than did morphology. The development of increasingly efficient DNA sequencing techniques in the 1970s and 1980s was seen as a key step in moving from the analysis of gene products to genetic material itself (Hammer & Zegura 1996). Further, the observation that not all genetic material follows Mendelian inheritance or undergoes recombination offered a particularly compelling line of inquiry that promised to overcome the limitations of earlier genetic studies. Although the XY sex determination system was discovered in humans in the early 1900s, it was first established mid-century that the majority of the Y-chromosome is inherited directly by male offspring from their father. Between the 1950s and 1970s, researchers discovered that the mitochondria of animal cells, including those of humans and other mammals, contain their own DNA (referred to as mtDNA), which is typically passed directly from mothers to offspring (Baeckland 1957; Giles *et al.* 1980; Hutchison *et al.* 1974; Kalf 1964; Nass & Nass 1963; Rabinowitz *et al.* 1965). It was subsequently discovered that animal mtDNA mutates rapidly, suggesting that this molecule is suitable for genealogical research on closely related species, especially those that diverged within the last 5 to 10 million years BP, such as humans and apes (Brown *et al.* 1979; Ferris *et al.* 1980). Research into Y-chromosomal diversity lagged behind mtDNA studies due to technical challenges, lower variability, and uncertainties around causes for the variations that were observed (Ellis *et al.* 1990; Hammer & Zegura 1996, Jakubiczka *et al.* 1989; Malaspina *et al.* 1990; Ngo et al. 1986; Oakey & Tyler-Smith 1990; Roewer *et al.* 1992; Stoneking 1993).

Abu El-Haj (2007) notes that, by focusing on parental ancestry, the use of genetic materials such as mtDNA and the Y-chromosome could decouple genetics from the earlier preoccupation with the evolution of racial cultures and capacities. However, early applications of these discoveries toward understanding intra- rather than inter-species variation quickly targeted peoples long presumed to be relict populations. For example, Cann *et al.* (1987) included an "aboriginal South African (!Kung)" in their consideration of mtDNA mutations and the geography of human evolution and dispersal. Likewise, Underhill *et al.* (2000) sampled two "Khoisan" in their attempt to use Y-chromosomal variation to clarify the relationships between human populations. Finally, Lucotte *et al.* (1989) and Lucotte (1992) targeted central African "Pygmies" in their investigation of Y-chromosome diversity. Given that modern humans likely evolved in Africa, non-random sampling methodologies guided by contemporary racial categories and ethnic labels risk prefiguring a correlation between "ancient" genetic mutations and "ancient" peoples by masking underlying commonalities across the continent (MacEachern 2000; Morris 2003).

A review of studies conducted among the Hadza and Sandawe demonstrates that scholars adopting new technologies continue to rely upon racial frameworks to translate contemporary biological difference into narratives of prehistory. A full review of these studies, including how genetic data do or do not map on to other evidence, is beyond the scope of this chapter, but productive contributions have been initiated elsewhere (Güldemann 2007; Güldemann & Stoneking 2008; MacEachern 2000; Mitchell 2010; Morris 2003). This chapter focuses specifically on claims about the isomorphism of biological and cultural traits, as well as on ambiguities arising from the calibration of disparate scales and datasets.

Geneticists working in eastern Africa have typically relied upon a single model to explain the current distribution of genetic material, the demographic-subsistence (or demic diffusion) model. This model posits that technological changes, such as agriculture and pastoralism, spur population growth and areal expansion (Ammerman 1979; Ammerman & Cavalli-Sforza 1973; Cavalli-Sforza *et al.* 1994; Renfrew 1973, 1987, 1989, 1992). A key feature of this model as interpreted by geneticists is that, with rare exceptions, subsistence repertoires follow a regular sequence (Cavalli-Sforza *et al.* 1994:106). Populations practicing the same subsistence repertoire are considered more likely to mate within the group than without, so while immigrants may mix with existing, numerically inferior populations, genetic gradients reflective of the dominant population's expansion will endure. Variation observed between groups thought to represent particular stages of the universal subsistence sequence become "markers" for each category – a "pastoral mutation," for example, which can be traced through time and space. Linguistic, sociopolitical, and archaeological "markers" of the technological expansion bolster genetic analysis, on the assumption that the in-breeding tendencies of groups with a common subsistence repertoire simultaneously create variances across other phenomena. By assuming that these phenomena covary rather than testing this claim empirically, scholars construct an analytic tautology that tidily integrates the demographic-subsistence model with the Forager-Farmer-

Pastoralist racial hierarchy. For example, Henn *et al.* (2008) argue that the distribution of Y-chromosome mutations common to eastern and southern Africa provides evidence of a southward demic diffusion of a Nilotic-speaking population accompanying the introduction of pastoralism. However, the authors note that the migratory population could have included as few as four males. Further, there are currently no Nilotic languages, a subset of the Nilo-Saharan Family, spoken in southern Africa. Finally, (2010) questions the authors' reading of the archaeological markers for pastoralism in the intervening region and suggests that some, such as ceramics, may be independent innovations rather than introductions. Taken together, it remains unclear how such a migration with would represent demic expansion as typically understood.

It may be countered that the material traces of language, biology, sociopolitical structures, and economic practices do vary across space and time, and that what I have critiqued as tautology is merely a reflection of the clearly identifiable, technologically-mediated, stage-based sequence of human history. Closer inspection, however, reveals that the apparent clarity of this narrative is facilitated by a blurring of the individual specificity of relevant bodies of evidence. For example, variation in subsistence repertoires through space and time is often circumvented in genetic studies by resorting to linguistic affiliation as a proxy for a historically deeper unity of the entities in question. For example, Tishkoff *et al.* (2007a) provide evidence that genetic mutations correlated with lactase persistence underwent strong selective pressure during a period roughly corresponding to the appearance of domestic cattle in northern and eastern Africa. Lactase, an enzyme required to digest dairy, generally occurs in its highest levels during human infancy, and its persistence into adulthood is viewed as an evolutionary adaptation to changing diets. Lactase persistence is often cited as a model example of the coevolution of genes and culture, and a signature of the spread of related technologies. A review of the supplemental materials reveals that the authors overstate in the main body of the article the extent to which language, subsistence repertoires, and lactase persistence are isomorphic. The authors pool all of the samples by language family and country except the Hadza and Sandawe (who are analyzed independently), and downplay the contemporary agro-pastoral food-getting repertoire of the Sandawe. As such, their conclusion that "The frequency of lactase persistence was highest in the Afro-Asiatic-speaking Beja pastoralist population from Sudan (88%) and lowest in the Khoisan-speaking Sandawe hunter-gatherer population from Tanzania (26%)" (Tishkoff *et al.* 2007a:32) fits easily within a stage-based narrative of racial replacement in which linguistic, biological, and sociopolitical phenomena are assumed to covary.

Temporal compression and dilation also facilitate the commensuration of datasets in genetic studies. While a standard error of millennia may not cause alarm among geneticists, it is precisely the broad temporal sweep of genetic studies that prolong the resonance of stage- and race-based narratives of change and prevent the development of more nuanced reconstructions. For example, Tishkoff *et al.* (2007a) note that mutations associated with lactase persistence may have other metabolic benefits unrelated to those amplified by the subsequent onset of dairy consumption, making it difficult to attribute their present distribution through eastern Africa to migration alone. Although age estimates for these mutations (3000-7000 BP) do appear to correlate with the appearance of domestic cattle in the region (2500 to 1800 BP, to be discussed below), the confidence interval for the mutations (1200-23,200 BP) leaves room for a number of explanations that would not necessarily involve mass migration of people or cattle. Another example of temporal compression is Henn *et al.* (2008), who use oral histories as evidence of intermixing between Nilotic-speakers and the Sandawe. The oral histories cited by the authors (Newman 1970) describe the incorporation of refugees into the Sandawe as the Alagwa clan.

Newman cited Ten Raa, who later concluded that the Alagwa had actually spoken a Cushitic language of the Afro-Asiatic Family (Ten Raa 1985). The assimilation of the Alagwa, who claim to have initially maintained social (and, presumably, biological) distance from other Sandawe clans, was projected to have occurred about ten generations prior, complicating the authors' use of this evidence to support their claim that the southward migration occurred 2,700 ± 1,100 BP.

An example of temporal dilation is found in a series of genetic studies that have been positioned as relevant to clarifying the emergence of click consonants and the biological relationship of their speakers. Knight *et al.* (2003) and Tishkoff *et al.* (2007b) suggest that, because the speakers of these languages share ancient but not more recent mtDNA and Y-chromosome mutations, click consonants must have emerged at least 15,000 and possibly tens of thousands of years ago. Güldemann (2007) critiques the structure of the argument that click consonants are most likely inherited by in-breeding biological populations (they are rare, they are difficult to learn, they are confined mainly to sub-Saharan Africa, etc.). Not only are click consonants globally widespread as paralinguistic sounds, they emerged independently outside of Africa, and there is evidence from within Africa of various kinds of adoption through contact that were occasionally accompanied by further innovation. This suggests that future research must attend to a far more nuanced series of linguistic and genetic exchange events through space and time, such as those developed by Renfrew (1989, 1992) in response to misguided analogies concerning the compatibility of linguistic, genetic, and sociopolitical temporalities. Although Tishkoff *et al.* (2007b) acknowledge disagreement among linguists concerning the Khoisan Family, they state that the lack of consensus derives from how deep the biological relationship between the languages and their speakers must be. However, this claim comes from the genetics literature (Cavalli-Sforza *et al.* 1988) rather than from linguistics, and it elides the

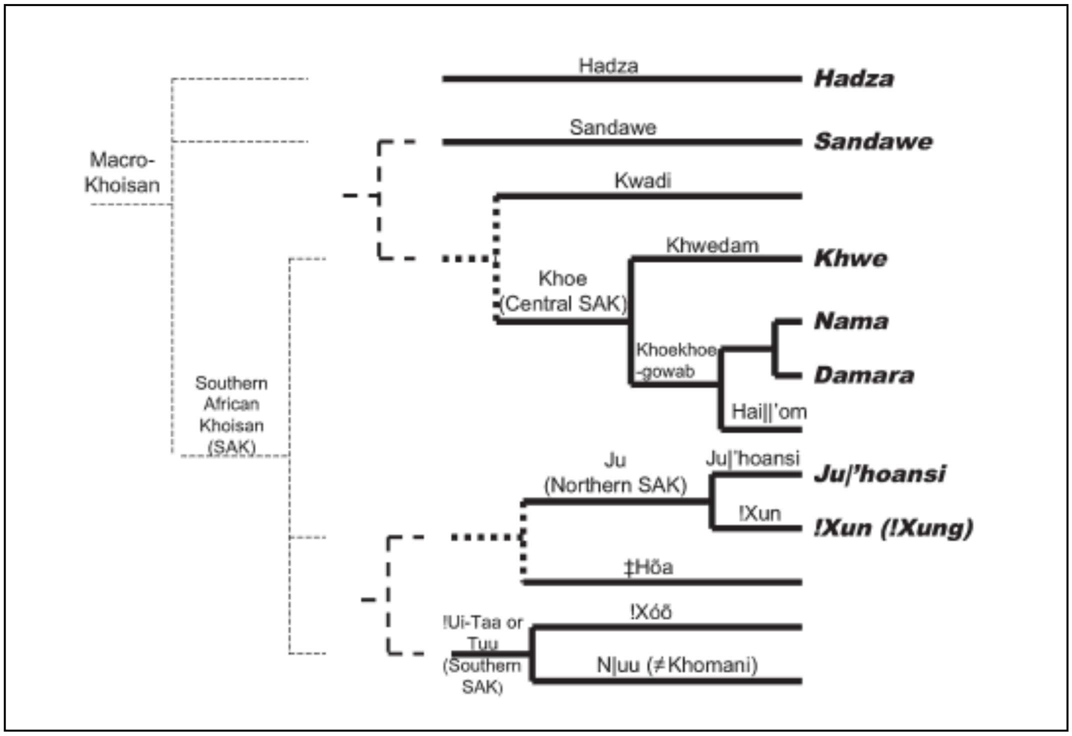

Figure 6.1: A model of historical relationships among African languages categorized as Khoisan. More commonly agreed upon relationships are indicated by thicker lines, whereas dotted lines indicate less accepted relationships. From Tishkoff et al. (2007b).

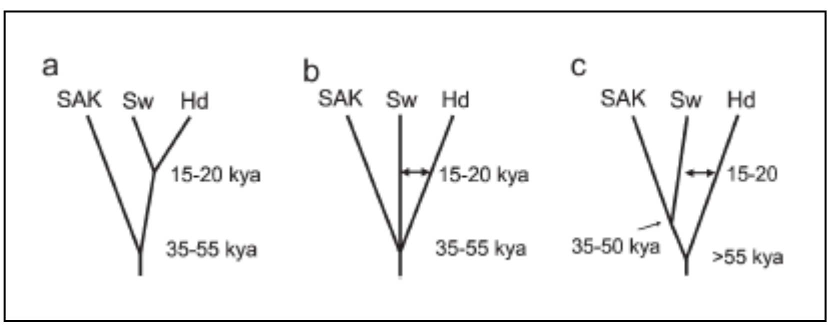

Figure 6.2: Models for the timing of genetic divergences between southern African Khoisan groups (SAK), the Sandawe (Sw), and the Hadza (Hd). From Tishkoff et al. (2007b).

incommensurability of opposing linguistic hypotheses concerning the Khoisan Family. The Cavalli-Sforza *et al.* (1988) study is markedly limited in the sample of languages analyzed, and the languages are widely separated in space, so it is difficult to discern to what extent geographic distance overstated the apparent correlation between genetic distance and language families. Further, the sample only analyzed (presumably southern African) “Bushmen,” so the subsequent presumption that the Hadza and Sandawe are members of the same genetic lineage must come from the aforementioned misreading of the linguistics literature, and its extension to new biological data. In any case, Güldemann notes that even the most ambitious historical linguistic reconstructions fade out after 10,000 years ago. Representational devices (Figures 2 and 3) used to depict members included in the Khoisan Family capitalize on this temporal gap (of at least 5,000 years) by implying that as linguistic granularity recedes, genetic evidence stands ready.

History in Broad Strokes – Archaeological and Ethnographic Evidence

The material traces of past lifeways that comprise the archaeological record are, like other bodies of evidence, fragmentary and incomplete. Even so, the potential to probe this evidence across multiple spatial and temporal scales provides archaeology with the unique opportunity to both mediate and interrogate the (dis)articulations between other sources of information about the past. The construction of historical narratives is complicated by the phenomenon of “equifinality,” in which different social processes leave the same signature. This concept takes on interesting dimensions in relation to the Hadza and Sandawe pasts. Numerous scholars have claimed that the Hadza and Sandawe developed *in-situ*, with variances between their past and contemporary conditions explained through documentable encounters with non-foraging peoples in the near past. From this perspective, the problem of equifinality no longer seems relevant, for “hunter-gatherers” are often described as prior to and outside the flows of history. Indeed, claims about these groups' embedment (understood non-metaphorically) point to the apparent stability of the archaeological record, especially in the case of the Hadza. I counter by suggesting that a second kind of equifinality is at play. Rather than multiple social processes leaving the same trace, multiple traces exist which have been interpreted as evidence of the same social process. In light of the growing appreciation of the spatial and temporal diversity among archaeologically-represented "hunter-gatherers" (Kusimba 2005), investigating this second form of equifinality reveals most explicitly the ambiguities and stakes of claims to continuity.

Few archaeological projects have been conducted in the contemporary Hadza and Sandawe homelands. Publications about these regions can be categorized in two ways: those brought to bear on the question of continuity of habitation by foragers, emphasized below, and those used as a source of ethnoarchaeological analogs, which are generally not addressed in this chapter (Bunn et al. 1988; Lim 1992, 1996; Lupo 1994, 1995, 2001; Mallol *et al.* 2007; O'Connell *et al.* 1988a, 1988b, 1990, 1991, 1992). Deeply stratified sites in the Hadza homeland have been cited as proof of their isolation and conservatism, whereas the data from the Sandawe homeland have cast doubt on a straightforward transition from foraging to agriculture,

The existence of rock art in eastern Africa has long captured the attention of researchers given hypotheses that the use of pigments and figurative art are among the suite of basal traits indicative of symbolic thought and behavioral modernity. Dating rock art is notoriously difficult, and many reports of paintings found in north-central Tanzania are limited to site descriptions and geographic coordinates (Culwick 1931b; Fozzard 1959; Fozzard 1966; Kohl-Larsen 1938, 1943, 1958; Madaroko 1982; Nash 1929; Sutton 1968). The work of others (Culwick 1931c; Fosbrooke 1950; L.S.B. Leakey 1936; M. Leakey 1983; Masao 1976a, 1976b; 1979; Nooter 1986; Willcox 1984) toward developing stylistic categories and chronological sequencing led to the acknowledgement of two distinct traditions. The general consensus is that the earlier, typically red, paintings were made by Later Stone Age peoples, whereas the later, typically white, paintings post-date the introduction of iron-working, pastoralism, and agriculture.

As discussed above, progressivist, stage- and race-based frameworks presumed that linguistic, biological, and sociopolitical traits cluster together within a temporal scale of development that can be ascertained through empirical observations of living peoples. For this reason, the co-occurrence of parietal art in and near the Hadza and Sandawe homelands was particularly evocative because it suggested these groups may be true autochthons of direct relevance for understanding modern human history. Bleek (1931b:429), for example, noted that "To me it seems significant that, in most places where we find rock-paintings, we find near-by either Bushmen themselves or traces of Bushmen language and culture." Ten Raa (1971, 1974) provides the first comprehensive attempt to explicitly investigate possible relationships between rock art and the Sandawe. After listing known rock art sites throughout the Sandawe homeland, he considered them "linked" to the Sandawe if they met at least one of three criteria: the site had been recently used during sacrifices (whether or not paintings were made at that time); the site contained paintings made within living memory; or the site contained paintings which could be interpreted by living Sandawe. His ability to "link" the Sandawe to 10 of the 16 rock art sites included in the study, bolstered by oral histories concerning a foraging past, led him to conclude that the Sandawe "are exceedingly old-established in their present country" (Ten Raa 1974:9). Ten Raa asserts elsewhere (1969) that the Sandawe are the original inhabitants of their homeland and that they possess "quite unsophisticated" material culture. Although he suggests that a sizable portion of the paintings are actually, in fact, quite young, his analysis has been used by others to reinforce assertions of cultural conservatism among this group. Some Hadza presume that their ancestors were responsible for the paintings, although, unlike the Sandawe, they have not been observed to make rock art (Bala 1998; Marlowe 2010). Marlowe (2010) suggests that commonalities between technologies represented in rock art and those used in the near past and contemporary period indicate that ancestors of the Hadza are the likely artists. Because the Hadza have a strong oral tradition, their *lack* of oral histories regarding the paintings is then used as evidence that the paintings are ancient and that the Hadza are long established in the area.

Although it may appear uncanny that rock paintings occur near the Hadza and the Sandawe, rock art sites exist in a nearly continuous band across the southern and eastern regions of Africa (Figure 4 – I can make a better map using a database of site coordinates I've been building). The foregrounding of the Hadza and the Sandawe in discussions of north-central Tanzanian rock art exaggerates the significance of the spatial correlation. Further, inherited landscapes are often re-invested with meanings unintended by their earlier inhabitants (Bradley 2002). Culwick's (1931a) observation that the Gogo, an agricultural group neighboring the Sandawe, also use rock art sites for ritual purposes despite claiming to have no knowledge of the original intent of their creators suggests that this may be a practice with broader regional significance than previously recognized.

From 1934-1936 and again from 1937-1939, Ludwig and Margit Kohl-Larsen completed two expeditions through the northern and central highlands of Tanzania. These expeditions were intended to build upon their ethnographic work among the Hadza in 1933 by focusing on the collection of evidence that could contribute to clarifying the region's role in the emergence of modern humans. Ethnographic details and cursory archaeological results, in the style of a diary, are published in two volumes entitled *Auf Den Spuren Des Vormenschen* (1943), which can be glossed in English as *In the Footsteps of Early Man*. The most significant excavations occurred in the Hadza homeland at and near the Mumba rockshelter, which, despite its rarity as a well-preserved, rich, and deeply stratified site (covering much of the Upper Pleistocene and Holocene), received scant attention for four decades. Excavations at Mumba revealed a sequence spanning from the Middle Stone Age to the present (Kohl-Larsen 1943; Mehlman 1989; Müller-Beck 1978), and human remains from the site that are likely anatomically modern date to 130,000 BP (Bräuer and Mehlman 1988; Mehlman 1989). An early series of papers using materials obtained during these expeditions dealt with a fossil hominid site near Mumba (Leakey 1946; Rafalski et al. 1978; Reeve 1946), and a later series addressed ceramics gathered at Mumba and elsewhere (Bower 1973; Odner 1972; Smolla 1957; Soper 1973; Soper and Golden 1969; Sutton 1968). Even so, Mumba did not come to the fore of eastern African archaeological inquiry until Mehlman's re-excavations began in the 1970s.

As discussed previously, the subsistence spectrum of Forager-Farmer-Pastoralist has frequently been used to parse socioeconomic differences in Africa using a framework of progressivist, stage- and race-based evolution. Some scholars have suggested that a direct link between prehistoric "hunter-gatherers" in the area and the contemporary Hadza is the most parsimonious explanation based on the cultural continuity suggested by the archaeological record (Mabulla 2007; Marlowe 2010; Masao 1976a). Across these studies, continuity is said to be demonstrated by the use of wild food resources from 130,000 BP to the present, observations that the Hadza occasionally occupy rockshelters and have oral histories of the same, skeletal evidence of a long hominin presence in the region, the previously discussed rock art sites, and the fact that the Hadza do not have place names for locations beyond the horizon of their homeland.

Marlowe (2002) reviews ethnographic descriptions and contemporary material culture to argue that the Hadza are a stable entity of direct relevance for modeling the Paleolithic. His treatment of the ethnographic material is commendable in that it treats continuity as a question to be asked rather than assumed, but his use of material culture is more questionable. In order to

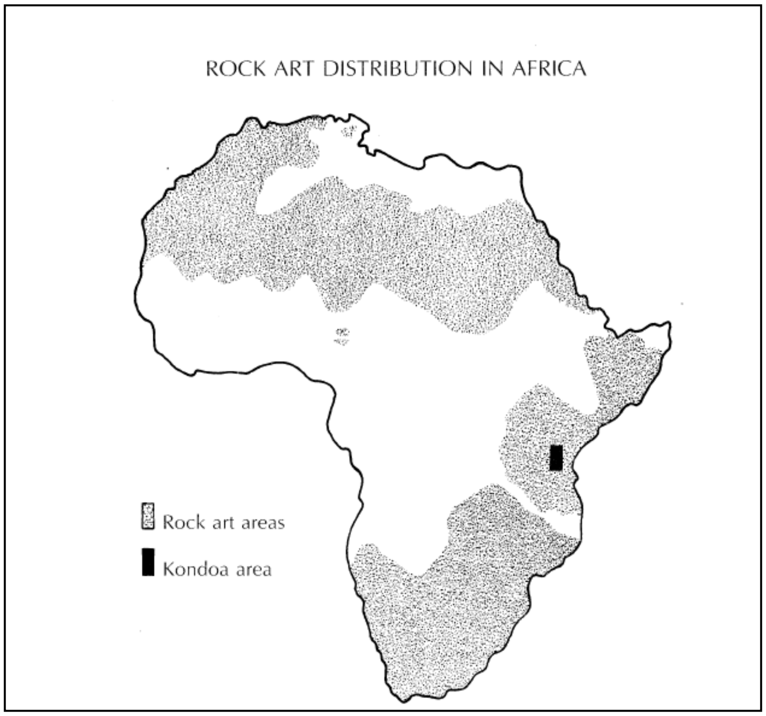

Figure 6.3: Rock art distribution map. The Sandawe live to the southwest of the Kondoa area and the Hadza live to the northwest. From Nooter (1986).

assess change over a long period of time pre-dating European entry into the area, he provides a list of objects used by the Hadza, as well as their first recorded appearance – either in the Hadza homeland, in the case of more recently introduced objects, or anywhere in the world, in the case of the objects with a longer history of use. Additionally, all of the objects are identified as "Pre-Neolithic" or "Post-Neolithic." Historically documented changes to their social structures and their use of "Post-Neolithic" objects are used to counter suggestions that the Hadza have been dealt with by scholars as if frozen in time. Their use of "Pre-Neolithic" objects and the aforementioned continuity of the archaeological record are used as evidence of their conservatism and suitability as an analog for evolutionary ecological studies. Marlowe states that it would not matter if the Hadza were shown to be secondary rather than primary foragers (that is, if they took up foraging after having practiced another subsistence repertoire) because similar constraints on both kinds of foragers are likely to lead to convergences in behavior. On one hand, this claim is a part of the long history of debate concerning appropriate methods for the development of analogical models and their generalization beyond certain contexts. On the other hand, his interest in the co-evolution of genetics and behavior would seem to be critically dependent on tracking and timing these very trajectories given that sociopolitical and economic shifts operate along different temporalities than genetic mutation and transmission.

Despite certain continuities, the archaeological record displays significant diversity and change. Numerous stone tool industries have been identified, with evidence from approximately 65,000 BP for the production of objects of personal ornamentation, such as ostrich eggshell beads, and from 37,000-30,000 BP for burial of the dead (Mehlman 1989). The most reliable dates for the appearance of three apparently overlapping, but distinct, ceramic traditions come from Mumba and cluster around 1700-1800 BP, although less reliable dates provide a range of 4900-1200 BP (Prendergast *et al.* 2007; Mehlman 1989). The earliest evidence of domestic cattle and caprini in the region dates from 2500-1800 BP (Mehlman 1989; Prendergast *et al.* 2007). Climate is known to have changed, affecting lake levels and local biodiversity (Mehlman 1989). Such changes could have influenced the availability, predictability, and proportions of species consumed, with a resulting effect on social organization. For example, some beds at Mumba indicate periods of considerable reliance upon terrestrial snails (Mehlman 1979). Altered exchange and ranging networks are reflected in that obsidian tools dating to 130,000 BP were sourced approximately 320 kilometers away near Naivasha, Kenya (Merrick *et al.* 1994), whereas more recent industries used local materials (Mabulla 1996; Mehlman 1989).

Archaeological practice itself has compounded the sense of continuity. Mabulla (2003) explains that Hadza land use and dietary patterns vary by season. If this also occurred in the past, one would expect that landscape-level analyses may reveal such patterning. However, only very recently has an emphasis been placed on systematic survey extending beyond the rockshelters that have for decades received preferential attention by archaeologists. In her discussion of the growing landscape-level archaeological record for the region, Prendergast (2011) demonstrates that there is no direct correlation between the use of ceramics, reliance upon domestic versus wild species, and spatial practices typically considered indicative of “pastoral” or “hunter-gatherer” economies. Equating wild foods with “Forager” and domesticates with “Pastoralist” (and, further, either of these types with particular sociopolitical forms) risks creating an image of the past modeled after ideal types arising from descriptions of highly specialized contemporary groups. As Kusimba (2005:354) points out, doing so “misses the goal of understanding ancient ways of life in and of themselves and sets up a circularity of interpretation where the nature of the society in question is assumed from the start.” Such reifications can be overcome by acknowledging that typological systems must be problem-based rather than stand-alone explanatory devices. Typological systems developed from contemporary observations must remain sensitive to resistance from the archaeological record and modified accordingly (see, for example, Prendergast 2008, 2011).

Ten Raa (1963, 1964) suggests that an analysis of Sandawe material culture can clarify their past by producing of a timeline for the acquisition of new objects from outside groups. Although the etymological roots of some Sandawe terms for drums and their scarcity in the region would suggest that these instruments had been introduced recently, the overall structure of his claim is tautological. For Ten Raa, cultural development is an accretionary, progressive process. He begins by asserting that the Sandawe are the autochthonous descendents of "hunter-gatherers" as evidenced by their language and body type. He then ranks their instruments along a temporal scale between those that are produced from materials that would have been available to "hunter-gatherers" and those, which are marked as "Bantu" or "Hamitic," that require materials produced through technologies that arose elsewhere, such as metallurgy. By showing that the Sandawe have a number of instruments which could have been produced by "hunter-gatherers" and that not all "Bantu" or "Hamitic" instruments are popular among the Sandawe, he is able to solidify his initial assertion that their essential "hunter-gatherer" qualities are still discernible.

Prior to their adoption of food production, the Sandawe are thought to have been organized in patrilineal and patrilocal bands that hunted and gathered near a clan watering hole and sacrificial hill. Many clan lineages are now widely dispersed across the homeland, but this mode of identification remains salient, especially for organizing the post-birth, healing, and rainmaking rituals conducted in rockshelters on clan hills. Dense associations link human and natural fertility to rockshelters, which are regarded as akin to wombs and beehives. Of particular note is the *simbó* entrancement ritual, which focuses on curing individual illness while also refertilizing the land (Ten Raa 1985). This ritual has been used as evidence of cultural connections to southern African Khoisan-speakers. It has also been used to link the Sandawe to rockpaintings across north-central Tanzania that have been interpreted as representing entranced individuals, further bolstering claims of Sandawe autochthony.

In an interesting contrast to research on the Hadza and Ten Raa's material culture analysis, archaeological data from the Kohl-Larsen expedition has tended to complicate notions of an unbroken foraging tradition in the region. Smolla (1957) conducted the first analysis of ceramics obtained at a site named Lelesu, and designated them as a unique type. Soper (1967, 1971) compares these sherds to a site with early evidence for iron production in southeastern Kenya, the Kwale site. Based on production methods and stylistic considerations, Soper argues that the pottery from Lelesu and Kwale belong to a similar industry. Two radiocarbon dates associated with the Kwale pottery suggest that they date from approximately 1800 BP (Soper 1971a, 1971b), although it should be noted that no dates, relative or absolute, are associated with the pottery from Lelesu, nor was evidence of iron production found. Sutton (1968) returned to Lelesu in hopes of re-excavating the site in order to obtain a representative stratigraphy and additional artifacts. His interpretations supported Smolla and Soper's earlier conclusions, and he also suggested similarities to "dimple-based" wares from the Lake Victoria region, believed to represent early pottery. Sutton also observed hard clay sites measuring 5 meters or more in diameter and consisting of collapsed and irregular clay walls one or two meters thick and approximately one meter high. Although he excavated one such site, Sutton could obtain neither datable material nor artifacts. The sites have superficial similarities to domestic structures elsewhere within the Central Highlands as described by Fosbrooke (1957) and Masao (1976a), but Sutton withholds hypothesizing what purpose they may have served due to a lack of evidence. Given the unexpected complexity of material culture that was emerging, Sutton (1968:173) concludes that the history of the Sandawe homeland will "prove to be yet more complex – leaving aside the problem of who painted the rocks."

Discussion

There may be a sound rationale for continuing research into the assemblage of languages historically categorized as members of the Khoisan Family (to identify legitimate genetic relationships, for typological comparisons, etc.). However, the redefinition of Khoisan in the negative elides the complexity of ongoing debates around tremendous linguistic diversity. There is by now widespread agreement that the Hadza language should not be referred to as a member of the Khoisan Family. Similarly, until more robust data or analyses become available, it is also advisable to categorize the Sandawe language as an isolate. On one hand, the continued categorization of all of the languages as Khoisan prolongs a dubious sense of certainty in the category as an ethnological entity, especially when adopted by scholars in other disciplines who lack a clear understanding of the current status of linguistic research. On the other hand, some non-linguists actively play upon the ambiguity of the term. For example, Marlowe (2010) rightly criticizes the extent to which the "Kalahari Debate" of the 1980s led some scholars to categorically reject analogs derived from ethnographically observed foragers by noting that contact and exchange are essential matters to consider when developing any analog. In a less defensible move, he cites the Hadza language's status as a possible isolate to emphasize their autonomy and conservatism, thereby distancing his work and that of his colleagues from debates about the suitability of the besmirched southern African Khoisan for evolutionary ecologic studies. To counter representations of these languages and their speakers as timeless lineages, linguists should actively engage with deployments of their terms and concepts beyond strictly disciplinary bounds.

Given the increasingly technical nature of genetic analysis, there is a danger that other disciplines will be unable to fully collaborate with geneticists. Beyond rather practical matters pertaining to the structure of productive interdisciplinary partnerships, geneticists must also engage with a worrisome notion of identity, one which owes much to the race concept and is being reinvigorated by contemporary research. In response to a number of theoretical crises in recent decades, social scientists have sought to avoid the essentializing impulse of earlier scholarship by attending to both the dynamic character of group and individual identity, as well as the broader politics of knowledge production. Many biologists, on the other hand, continue an ever-inward quest to identify a material basis of identity and essence. This quest has moved from surface and form to bodily substances to the molecular structure of DNA. The growing public awareness of genetics has created new grounds of sociality, both inclusive and exclusionary, suggesting that geneticists will have more to grapple with than simply accounting for the legacies of evolutionist social theory (Comaroff and Comaroff 2009; Rabinow 1996; Taussig 2003).

Conclusion

Kuhn described normal science as puzzle solving. Our research programs should be open to the possibility of novel discoveries, but it has been quite some time since research about the Hadza and Sandawe told us something that we did not already “know.” Stage- and race-based frameworks in combination with the indexical bundling of disparate lines of evidence have locked historical narratives of these groups into reductive accounts of racial replacement, acculturation, and loss that are increasingly at odds with growing bodies of evidence and broader social theory. In order to demonstrate how scholarly knowledge production has created and preserved a particular discursive field at the expense of others, it has been necessary to first establish the conceptual nexus of contemporary investigations of human origins and development before tracing subsequent disciplinary specialization. My ultimate goal has been to consider alternative interpretations of available evidence and to suggest paths of future inquiry more attuned to the possibilities and pitfalls of interdisciplinary scholarship.

Chapter 7

Conclusion

> Contrary to what I and others have generally believed to be the case, the Sandawe would not be recent converts to the methods of cultivation and animal husbandry. We were trapped into this interpretation by the early categorizations of the Sandawe as hunters and gatherers, by the Sandawe's own view of themselves as such, and by their rather desultory approach to agriculture. Of course, they were once "pure" hunters and gatherers, but that was a very long time ago…
>
> Newman 1991/1992:166

The Sandawe represent something of an enigma in anthropological scholarship. On one hand, the group is often cited in long-term histories of Africa. On the other hand, we have little evidence concerning their past and present lifeways and whether and how they have changed in relation to historical, regional milieus. This is due, in part, to their categorization as a remnant population of Khoisan-speaking foragers. Contemporary ethno-linguistic classification has been used as a proxy for reconstructing long-term socio-political and techno-economic histories of Africa. As the only location where all African language families exist side-by-side, north-central Tanzania has been described as one of the most ethnologically complex on the continent. Based on ethnographic, oral historical, linguistic, and genetic evidence, the Sandawe homeland has been characterized as an isolated social and ecological refuge for a relict population of Khoisan-speaking foragers. Khoisan-speakers are thought to be related branches of a deep-time lineage, ethnographic observations of which have contributed to an anthropological archetype: that of the low-latitude, immediate-return, egalitarian band. This social form has been described as stable and conservative baseline from which later complexity emerged. Thus, a dominant concern of scholarship on the Sandawe has been to "peel back" the effects of their interactions with food-producers to reveal the Khoisan cultural core, which is then projected into the past. Categorizing the Sandawe not only as Khoisan foragers but as having emerged in place has led to historical reconstructions of the group that are, in effect, timeless.

Oral histories describe a foraging past, but the Sandawe were engaged in a diverse food-getting repertoire that included agriculture and herding at the time of their first ethnographic descriptions, and foraging contributes significantly to present-day Sandawe identity. The adoption of food production by ancestral Sandawe (and their cultural survival) has been described as resulting from forager experimentation on the margins of expanding food-producing societies. Proposed historical reconstructions of their homeland suggest that contact with migrant food producers was minimal, intermittent, and localized, such that the Sandawe remained relatively unaffected by broader political and economic changes in the region. Eric Ten Raa and Jim Newman (who is on the call today) have offered a variety of scenarios that place the onset of this process at various moments between 3000 years ago the later 1800s.

These factors make the homeland an ideal case study for examining interdisciplinary models concerning the spread of food production and the subsequent relations between foragers and food-producers. Drawing on ethnography and history, frontier theory asserts that extant foraging communities survived through a small set of adaptations, ranging from deliberate and mutual isolation in geographic or ecological refugia to assimilation into complex societies as specialist producers of wild resources or as caste-like ritual specialists. (As an aside, the latter scenario is referred to as the symbiosis model, but I do not address it in the dissertation because nothing suggests that Sandawe have experienced lower social status vis-à-vis their neighbors.) In contrast, recent archaeological work shows that the spread of food production entailed complex processes of migration, technological diffusion, and exchange, with considerable geographic and historical variation. This led to collaboratively constructed, integrated regional milieus that facilitated the circulation of patchy resources. These landscapes have been referred to as "political economic mosaics."

Frontiers and mosaics should leave distinct archaeological traces. By synthesizing existing accounts of the Sandawe and their homeland, I devised a set of questions that allow me to examine the suitability of both models for explaining the archaeological record.

1. Was the onset of food production and extra-regional exchange in the area early, intermediate, or late (before 1500 AD, between 1500 AD and 1850 AD, or after 1850 AD)? Was the adoption of food production gradual or rapid? Is evidence of food production associated with specialization or was it incorporated into existing food-getting practices?
2. Are exotic goods incidental occurrences or does spatiotemporal patterning suggest well-established networks? Did these networks vary spatially over time? What do changes suggest about shifting political and economic relations between inhabitants of this region and elsewhere?
3. Does the evidence indicate the existence of a northwest to southeast moving frontier, as hypothesized by Ten Raa (1970)?

Investigating these questions requires multi-scalar, landscape-level artifactual assemblages. Toward that end, I conducted two seasons of fieldwork between 2015 and 2018 that entailed semi-systematic surface and sub-surface sampling, opportunistic survey of rockshelters, and excavations at open-air and rockshelter sites. Over 375 open-air and rockshelter sites were recorded that yielded a remarkably diverse assemblage ranging from the Early Stone Age to the present. As one example of this diversity, the Merebu 1 rockshelter contains some of the oldest ostrich eggshell beads recorded in Africa. Portable artifactual assemblages include:

lithics; ochre; ceramics objects such as vessels, pipes, and tuyères; domestic and wild fauna; beads made of avian shell, marine shell, glass, and plastic; slag and metal (including an iron nail possibly dating to the early Iron Age and a bullet casing from a German colonial outpost); vessel glass; and plastic objects. Non-portable assemblages include: objects known as "cave drums;" pictographs; petroglyphs; grindstones; and other forms of worked rock, such as bao boards and cupules ground into in massive rock. After a review of the regional literature, the following chapters describe the results of material and spatial analyses as they relate to the preceding questions.

In chapter 3, I provide a site inventory and propose a chronological framework encompassing a variety of activities indexed by the archaeological record. Food production may date to 550 BC but was certainly established by 350 AD. Food production likely entailed both metallurgy and herding in combination with foraging, but I obtained no direct evidence of agriculture. I then describe analyses that suggest the existence of three to four time-sensitive ceramic traditions, which are then used as proxies for changing occupation patterns through time. This reveals a trend that counters Ten Raa's hypothesis concerning a northwest-to-southeast moving frontier and suggests that food-production may have first occurred in the region of the homeland that he described as the most culturally conservative. However, sites appear to grow in size through time and to become more widely distributed, which resonates with the frontier model. The "Later Iron Age" ceramics are particularly diverse, and there are multiple clusters of stylistically similar ceramics, so future analyses will be designed to gain greater spatial and chronological control changes in this assemblage.

The fourth and fifth chapters consider how meaningful landscapes have been constructed and contested. Chapter 4 compares scholarly accounts of isolation, Sandawe oral histories of interaction and exchange, and archaeometric analyses of exotic goods, such as obsidian, glass beads, and vessel glass. These objects were neither common nor incidental, and so the intensity of trade remains an open question. However, as with food production, it appears that residents of this region had well-established access to multiple exchange networks both internal and external to the continent. For example, obsidian was likely sourced from the Lake Naivasha basin in central Kenya, and it is possible that this network lasted for 2,000 years. This represents a 30% increase in the distance over which obsidian is known to have been transported in eastern Africa (or anywhere in Africa outside of dynastic Egypt). Glass beads were recovered that were produced in Europe, southern Asia, and other unidentified sources. Up to a third of this assemblage could date to the latter half of the 1600s. Vessel glass was a more recent addition to the trade landscape and these objects, together with beads, tend to be found together with "Later Iron Age" and "Historic" ceramics, which further supports the proposed ceramic periodization.

In the fifth chapter, "Rockshelter Assemblages and Political Cosmologies," I examine archaeological, ethnographic, and linguistic evidence of regional cosmological traditions and political networks. This investigation is based on analyses of cave drums, as well as pictographs, petroglyphs, and other forms of worked rock. As one example of how inhabitants of the homeland have participated in yet modified regional traditions, discourse and practice related to cave drums point toward participation in a regional political economy of significant time depth that was (and to a certain extent remains) organized around prowess in and the control of rainmaking.

With reference to the questions raised above, my data suggest that the onset of food production in the Sandawe homeland was “early,” and likely began by at least 350 AD, but possibly as early as 550 AD. Residents have continuously relied upon wild resources in addition to domestic crops and livestock throughout this time It appears that several centuries were required before settlements by those practicing food-production were common features of the landscape, but patterns of landscape occupation do not suggest that this occurred through the advancement of a moving frontier. Exotic goods are not common but neither are they incidental, and inhabitants of the Sandawe homeland interacted with trade networks that spanned from eastern Africa to the Indian Ocean world and Europe. The exchange of obsidian may have lasted over 2,000 years, and beads become a consistent presence over the last 500 years. Similarly, past and present inhabitants of the Sandawe homeland have participated in a political and spiritual landscape animated by widely shared beliefs about rainmaking and fertility.

Reading across these lines of evidence, I argue that the region is better described as a political economic mosaic than a frontier (although I do have concerns with the mosaics concept). The region’s characterization as a hinterland refuge does not reflect isolation, domination, or the conservatism of foraging as a mode of production, but is, rather, a misrecognition of how its inhabitants have engaged with networks extending beyond the homeland through time rather than their actual remoteness from these networks. This case study, therefore, contributes to but also profoundly challenges the regional literature. My hope is that it will serve as a conceptual and material basis from which to think more broadly about interdisciplinary reconstructions of African history, especially the task of historicizing the continent’s diverse past and present foraging communities.

Appendix A: Discussion of Fieldwork Logistics & Finances

The decision to narrate financial and logistical details is inspired by Robertshaw (1994), who likewise contended with difficult survey conditions. My fieldwork pushed the limits of what can be supported using standard graduate fieldwork funding given the high cost and complicated logistics of large-scale research in rural Tanzania. That said, my hope is that this description does not dissuade others from conducting survey but help them to more effectively plan for and address challenges that may arise in order to increase the chances of success. Despite the many difficulties encountered, especially during the first season of fieldwork, this project was ultimately an overwhelming successful due to the goodwill and generosity of community members and government officials. This should reinforce the need for archaeological projects to conscientiously allot sufficient time for the cultivation of positive relations with communities impacted by our research.

The permitting process can require several months in its entirety, and it is wise to reserve the first month in country for finalizing paperwork. The application for research clearance from the Commission on Science and Technology (COSTECH) should be submitted at least three months in advance of arrive in country (preferably online and in hard copy, with the assistance of a courier service or a local collaborator). The research permit can be collected soon after arrival in Tanzania and is necessary in order to begin processing a residency permit from the Immigration Department (Ministry of Home Affairs) and a survey and excavation permit from the Antiquities Division (Ministry of Natural Resources & Tourism). Significant delays obtaining a residency permit have been known to occur (including for myself in 2017). Once all permits have been obtained, they must be presented at the Regional (*mkoa*) and District (*wilaya*) Commissioners' offices, and letters of introduction will be prepared, usually within hours. These letters are then presented to all division (*tarafa*), ward (*kata*), and village (*kijiji*) offices that have jurisdiction over the areas in which fieldwork will be conducted. It is helpful to ask officials at these levels of government to help distribute copies of the permits and letters of introduction because it can take several days to weeks to visit each office, and some offices may not have a secretary should the officeholder be unavailable. It is also especially helpful to ask village leaders to provide copies to representatives (*balozi*) of sub-villages and neighborhoods. It is customary for all team members to sign a logbook at least once for each of these last three levels of government, usually during these initial visits. If village leaders approve of the tentative research schedule, it is not typically necessary to sign every day, but it is polite to sign at the beginning of each stint of fieldwork. It is also best practice to formally introduce any team members who join after fieldwork has commenced, although this can occur on a slightly more ad hoc basis to align with the daily schedule, especially if you alert officials to the possibility of late arrivals.

In 2013, I traveled throughout the Sandawe homeland mainly by rented motorbike, with occasional trips using a rented government vehicle and by bus. I quickly realized that a personal vehicle would be the most efficient and safest option during subsequent fieldwork (during ethnographic fieldwork in 2005 and 2006, I purchased a used, manual transmission, four-door Suzuki Escudo, which performed admirably). Automobile and motorbike rental in Tanzania is quite expensive, and so purchasing a vehicle actually provides a significant cost savings despite the large initial investment (presuming that it is already in good condition or requires minimal repairs). Due to limitations on expenditures allowed by the grants and fellowships that I received, funds for this vehicle were cobbled together from personal savings and assistance from my family. The increased availability of newer model vehicles, spare parts, and familiarity with automatic transmissions in rural Tanzania meant that I could purchase a used, automatic transmission, four-door Toyota Land Cruiser Prado (which had a roof rack for carrying large tools).

The size of the core fieldwork team was limited to the number of people (nine) who could safely be transported in the vehicle. During the first season of fieldwork (2015-2016), I drove the vehicle, and the core team consisted of myself, Emmanuel Bwasiri of the Antiquities Division, and six individuals who reside in and near Kwa Mtoro (Selestin Afa, Degera Chima, Joseph Chima, Juve Gregor, Marselin Deo Leba, and Beatus Tamba. We were joined in April 2016 by Henriette Rødland, a graduate attaché of the British Institute in Eastern Africa, which is headquartered in Nairobi. During the second season of fieldwork (2017-2018), I hired a driver with significant experience as a member of archaeological teams (Shabani Pingu). Amon Mgimwa served as the Antiquities representative. Joseph and Juve had moved to pursue opportunities elsewhere in Tanzania, and so Raymond Mateye and Rukia Dihigo, two recent graduates of the undergraduate archaeology program at the University of Dar es Salaam, took their place on the team.

Because diesel is not readily available locally, we made an arrangement with the owner of a local bus company that made regular trips to Dodoma to deliver fuel once per week. It was typically necessary to fill the tank twice every week to week and a half. We attempted to maintain a small surplus, but diesel was typically available locally in small quantities if our fieldwork schedule and the delivery schedule became misaligned.

Given the generally poor condition of roads beyond the major arterial routes, the limited availability of housing, the low number of dependable water sources, and the sensitivity of providing a large crew with adequate food in a region of chronic food insecurity, I decided to live in the administrative center of Kwa Mtoro. Kwa Mtoro is centrally located in relation to the Sandawe homeland as a whole and is contained within the originally planned survey universe (described below). The trade-off for the logistical stability, security, and respectful community relations that could be achieved in Kwa Mtoro was increased travel times and fuel costs to reach outlying areas.

I lived in a rented room at a guesthouse that had secure parking for the vehicle. The Tanzanian students and representatives from the Antiquities Department lived in rented rooms in another guesthouse. When in Kwa Mtoro (usually the mornings and evenings on weekdays and all three meals on weekends), the team ate our meals with the Chima family at their household. The Chimas had previously served as my hosts in 2005, 2006, and 2013. During the second season of fieldwork, I helped the Chimas connect to a recently installed, small-scale solar power grid. Prior to this, or when the solar grid was offline, I would pay to charge electronics at local salons (many of which installed solar panels to power hair clippers and now provide charging services as a secondary business).

When time allowed, the team and I would use the vehicle to carry water from local wells to the second guesthouse and to the Chima residence. Otherwise, I paid for water delivery. Purchasing bottled water for the team every day would have been expensive, and boiling enough water used an excessive amount of time and fuel. We constructed a device using two 100 L plastic drums that had been stacked on top of each other. Small holes were drilled through the base of the upper drum and the lid of the lower drum. Ceramic filter candles were attached using washers and nuts to prevent leakage and could be removed for regular cleaning and sanitization. Small plastic bottles are highly desired storage containers in rural Tanzania but occasionally wear out, go missing, or get repurposed, and so I would occasionally purchase a case of 1.5 L bottles of water in order to ensure that every team member could carry water during the day.

We found that it was overly complicated to keep the team's supplies separate from the Chima family's, and so we devised a number of strategies to simplify meal planning and other tasks. Every two to three weeks, I would drive to Singida or Dodoma to purchase fresh fruits, vegetables, dried beans, coffee, tea, sugar, and laundry detergent in bulk. Less frequently, I would purchase 100 kg of rice. The Chima family contributed maize meal, other locally available produce, honey, and milk. Every week, I provided them cash to cover the costs of cooking and laundry service, cooking oil and charcoal, and other incidental expenses.

During provisioning trips, I would either withdraw cash from ATMs or, when larger amounts were needed (between $750 and $5000), wire myself funds for pickup at local banks. For security purposes when dealing with particularly large amounts of cash, I would visit different banks, discretely inquire about their funds on hand before completing the transfer (which I asked to do in a private room), and return immediately to Kwa Mtoro. I kept cash in a locked box in a secure location (some projects in Tanzania have stored cash in safes at police stations).

I paid for the food and housing for students and the Antiquities representative. The students received a monthly stipend, although I tried to cover most of their incidental expenses. The Antiquities representative received a per diem (paid monthly and minus the cost of food and housing). The rest of the core team, as well as residents hired to assist with fieldwork in their communities, received a weekly wage that was double the current rate for day labor. Receipts for weekly wages are not necessary, but it is best practice (and generally considered to be respectful) to have each team member sign a logbook upon receipt of their pay.

We worked Monday through Saturday and attempted to leave Kwa Mtoro just after dawn and to return just after noon. Eating and drinking in the field proved to be a significant challenge. During the first season, we decided that it would be too much of a hassle to cook lunch in the field, and so we initially attempted to leave in the morning with prepared food for breakfast and lunch. Unexpected delays meant that would arrive in the field after the temperature had risen. We also found the experience messy and unpleasant. The local crew eventually asked if they could eat at home and receive the money I would have spent on food as wages instead, and this arrangement was agreeable to me. We also found that eating breakfast at home caused delays. For the sake of civility, we drank tea and coffee at home, but we began purchasing food that was delivered to the Chima residence or along our route (usually fried dough, hardboiled eggs, and other items that we could eat by hand during the drive). The problem with this system during the remainder of the first field season is that we were often late arriving back in Kwa Mtoro, which made for a hungry and cranky team. To remedy this during the second field season, I purchased snacks (usually fried dough, biscuits, or peanuts) for the entire team each morning, and, if it was clear that our return would be delayed, I bought lunch for everybody at the nearest restaurant.

After fieldwork, we could eat lunch and rest briefly before cleaning artifacts and tools and entering fieldwork forms into a spreadsheet. We tended to dry artifacts inside for security. The remainder of the afternoon and evening were free time. On Saturday evenings, I purchased the core team, the Chima family, and the owner of my guesthouse and her employees a beverage of their choosing as a token of appreciation.

Regarding equipment, nearly everything can be purchased locally, with certain exceptions. It is advisable to bring small trowels, line levels (which was a rather surprising discovery), flagging tape, north arrows, GPS handheld devices, and scientific instruments, such as geological sieves. Shovels, buckets, and other basic equipment are best to purchase locally, but it is worth shopping around and paying more for higher quality items in major cities. Sturdy mesh with a reasonable aperture can usually be acquired with sufficient time and effort, especially at Kariakoo Market in Dar es Salaam, and it is quite easy to have sieves built anywhere in the country. Cameras and laptops can be purchased and repaired, especially in Arusha and Dar es Salaam, but are generally more expensive than in the United States. Mobile phones, in contrast, are quite inexpensive to purchase throughout Tanzania, including smartphones. Most equipment was (and remains) stored in a rented room at the second guesthouse mentioned above.

I originally proposed focusing survey on a 35 km by 35 km area (or 1,225 km^2) near the center of the Sandawe homeland that straddled the "line of acculturation" between the two proposed sub-regions identified by Ten Raa (see Chapters 1). This zone was also relatively accessible on good roads. The survey universe was to be stratified into "unacculturated" and "acculturated" sectors of equal size in the northwest and southeast, respectively. Newman (1970) identified six vegetational zones that correspond in large measure with five sediment types. The most accessible portions of the homeland are comprised *Brachystegia* woodland, which dominates on hill ranges, and *Acacia-Commiphora* woodland and thicket, which dominates in low-lying areas and valleys (Newman 1970). The survey universe could not be stratified such that every vegetational community and sediment type was represented proportionally because rarer communities were located at considerable distance from Kwa Mtoro, but each of the two sectors (northwest and southeast) was further stratified into upland and lowland sub-sectors in order to account for possible differences in occupation and food-getting repertoires related to elevation.

Within each of the four categories within the survey universe (northwestern upland and lowland, southeastern upland and lowland), five randomly selected 1 km^2 transect blocks were to be targeted for pedestrian survey (for a total of 20 km^2, or a 1.6% of the survey universe), with the crew spaced at 10 m increments. The initial plan was to have the field crew survey both flat expanses and hillsides in this manner in order to locate open-air and rockshelter sites. Three to five rockshelters were to be selected within the survey universe for excavation with the goal of providing chronological control to surface collections. Finally, I had proposed using pedestrian survey and shovel test pits at archaeological sites reported by others and relocated during exploratory fieldwork in 2013, salt production sites recorded during ethnographic fieldwork in 2005 and 2006, and sites known to have been occupied during the early colonial period in order to identify areas with the highest potential for the excavation of "modular," 1 m^2 excavation units that could be expanded as necessary to explore spatial patterns.

Due to a number of weather-related logistical challenges, the survey universe and sampling strategies had to be modified extensively through an iterative process that attempted to balance research goals with constraints on time, money, and the crew's goodwill. Full details of the final research program can be found in Chapter 3.

Appendix B: Site Inventory

I have attempted to align site names and numbers with those reported in the literature (see Kohl-Larsen & Kohl-Larsen 1938, 1958; Lim 1992; Ten Raa 1974; Sutton 1968). However, due to the inherent ambiguities of this process, site names in this dissertation should be understood as referring solely to those recorded by the ULAP crew until a fully cross-referenced site inventory can be completed. I am especially grateful to Imogene Lim for providing scans of the paper maps on which she recorded sites during her doctoral fieldwork. It must be reiterated that no sites, especially those that are ritually active, should be visited without first obtaining the legally mandated research and residency permits, as well as letters of introduction from host institutions and all levels of government. Once permits have been obtained, visitors should access the sites only after consultation with and approval from local communities. Coordinates for rockshelters have been removed from this appendix in order to protect this sensitive and vibrant cultural heritage. Authorized researchers may obtain these coordinates by contacting Antiquities or me.

Table B.1: Site Inventory

Site Name	Lat. (DD)	Long. (DD)	Type	Time Period	Notes
Agoo 1	-5.402928	35.469134	Open-air	Early IA	-
Agoo 2	-5.399196	35.475477	Open-air	Early IA	-
Agoo 3	-	-	Rockshelter	LSA - Hist.	-
Bage 1	-	-	Rockshelter	LSA - Later IA	Pictographs
Baranse 1	-5.191302	35.337305	Open-air	Later IA	-
Begerase 1	-	-	Rockshelter	LSA	Pictographs
Begerase 2	-	-	Rockshelter	Ind. IA	-
Begerase 3	-5.169910	35.199982	Open-air	LSA	-
Bereko 1	-5.393071	35.342528	Open-air	Later IA	-
Bereko 2	-5.391257	35.341709	Open-air	Later IA	-
Bereko 3	-5.387640	35.335111	Open-air	Later IA	-
Birise 1	-5.445220	35.168060	Open-air	Ind. IA - Hist.	Salt production
Bonk’olo 1	-5.393876	35.629647	Open-air	Later IA	-
Bonk’olo 2	-5.394564	35.627369	Open-air	Later IA	-

Table B.1: Site inventory (continued)

Site Name	Lat. (DD)	Long. (DD)	Type	Time Period	Notes
Boseto 0	-5.437277	35.522709	Open-air	ESA	-
Boseto (Walangio) 1	-	-	Rockshelter	LSA - Hist.	-
Burungesu 1	-	-	Rockshelter	LSA - Hist.	Pictographs
Burungesu 2	-	-	Rockshelter	LSA - Later IA	-
C'asko 1	-	-	Rockshelter	LSA	Pictographs
C'asko 2	-	-	Rockshelter	LSA	Pictographs
C'asko 3	-	-	Rockshelter	LSA - Hist.	Pictographs
Chanche 1	-5.344965	35.398824	Open-air	Mid. IA	-
Chanche 2	-5.344726	35.399743	Open-air	Mid. IA	-
Chanche 3	-5.348670	35.405827	Open-air	Mid. IA	-
Chanche 4	-5.347719	35.406230	Open-air	Mid. IA	-
Chanche 5	-5.349388	35.397958	Open-air	LSA	-
Chatia 1	-5.215521	35.232223	Open-air	Later IA	-
Chatia 2	-5.214746	35.231544	Open-air	Later IA	-
Chidowa 1	-5.405427	35.498986	Open-air	Hist.	-
Chooroo 1	-5.316072	35.381434	Open-air	Ind. IA	-
Chooroo 2	-5.316608	35.385332	Open-air	Ind. IA	-
Chooroo 3	-5.316072	35.381434	Open-air	Ind. IA	-
Chooroo 4	-5.316767	35.386352	Open-air	LSA - Hist.	-
Cs'umase 1	-5.155352	35.232246	Open-air	Early - Mid. IA	-
Cwemse 1	-	-	Rockshelter	Early - Mid. IA	-
Cwemse 2	-5.237074	35.418776	Open-air	Early - Mid. IA	-
Cwemse 3	-5.238505	35.420513	Open-air	Early - Mid. IA	-
Cwemse 4	-5.238119	35.419601	Open-air	Early - Mid. IA	-
Doyo 1	-5.208059	35.366751	Open-air	Ind. IA	-
Doyo 2	-5.200403	35.359573	Open-air	Later IA	-
Doyo 3	-5.208382	35.367338	Open-air	Later IA	-
Dulee 1	-5.234892	35.173281	Open-air	LSA - Later IA	-
Dulee 2	-5.234720	35.173380	Open-air	Later IA	-
Dulee 3	-5.231786	35.172161	Open-air	Later IA	-
Dulee 4	-5.234158	35.173829	Open-air	Later IA	-
Dulee 5	-5.240863	35.174501	Open-air	Later IA	-
Dulee 6	-5.238687	35.171419	Open-air	Later IA	-
Dulee 7	-5.240268	35.171640	Open-air	Later IA	-
Dulee 8	-5.240995	35.173023	Open-air	Later IA	-
Dulee 9	-5.239805	35.174750	Open-air	Later IA	-

Table B.1: Site inventory (continued)

Site Name	Lat. (DD)	Long. (DD)	Type	Time Period	Notes
Farkwa 1	-5.410119	35.601619	Open-air	LSA	-
Ganua Dĩ 1	-	-	Rockshelter	LSA	Pictographs
Gawe 1	-5.380282	35.441285	Open-air	LSA	-
Gekuma 1	-	-	Rockshelter	LSA	-
Gekuma 2	-	-	Rockshelter	LSA	-
Gekuma 3	-	-	Rockshelter	Later IA	-
Gekuma 4	-	-	Rockshelter	LSA	-
Gekuma 5	-	-	Rockshelter	LSA	-
Gekuma 6	-	-	Rockshelter	LSA	-
Nyumba ya Bwana Ringi 1 (German Boma)	-5.224924	35.414690	Open-air	Hist.	Colonial-era
Gingiosusu 1	-	-	Rockshelter	LSA - Hist.	Pictographs
Gingiosusu 2	-	-	Rockshelter	Hist.	-
Gongá 1	-	-	Rockshelter	LSA - Hist.	Pictographs
Goulee 1	-	-	Rockshelter	Ind. IA	Cave drums
Guguse 1	-5.312408	35.209932	Open-air	LSA - Mid. IA	-
Guguse 2	-5.311889	35.208424	Open-air	Mid. IA	-
Guguse 3	-5.312460	35.207930	Open-air	Mid. IA	-
Guguse 4	-5.312694	35.208229	Open-air	Mid. IA	-
Guguse 5	-5.312866	35.208094	Open-air	Mid. IA	-
Guguse 6	-5.313426	35.208186	Open-air	Mid. IA	-
Guguse 7	-5.313570	35.208485	Open-air	Mid. IA	-
Guguse 8	-5.313921	35.208774	Open-air	Mid. IA	-
Guguse 9	-5.313159	35.209547	Open-air	Mid. IA	-
Guguse 10	-5.312797	35.209699	Open-air	Mid. IA	-
Guguse 11	-5.312898	35.209375	Open-air	Mid. IA	-
Guguse 12	-5.312366	35.209003	Open-air	Mid. IA	-
Guguse 13	-5.312418	35.209527	Open-air	Mid. IA	-
Guguse 14	-5.312498	35.209815	Open-air	Mid. IA	-
Guguse 15	-5.312841	35.209979	Open-air	Mid. IA	-
Guguse 16	-5.312452	35.210032	Open-air	Mid. IA	-
Guguse 17	-5.312523	35.210411	Open-air	Mid. IA	-
Guguse 18	-5.312784	35.210754	Open-air	Mid. IA	-
Guguse 19	-5.311611	35.210317	Open-air	Mid. IA	-
Handawaa 1	-	-	Rockshelter	Ind. IA	Cave drums
Holowa 1	-5.335022	35.382463	Open-air	Ind. IA - Hist.	Salt production

Table B.1: Site inventory (continued)

Site Name	Lat. (DD)	Long. (DD)	Type	Time Period	Notes
Holowa 2	-5.333654	35.383297	Open-air	Ind. IA - Hist.	Salt production
Humbá 1	-	-	Rockshelter	LSA - Hist.	Pictographs
Hurumia 1	-	-	Rockshelter	LSA	Pictographs
Iramba 1	-5.360356	35.362063	Open-air	Ind. IA - Hist.	Salt production
Iyase Dudu 1	-	-	Rockshelter	LSA	Pictographs
Iyase Dudu 2	-5.392609	35.483873	Open-air	Early - Mid. IA	-
Iyase Dudu 3	-5.392240	35.483601	Open-air	Early - Mid. IA	-
Iyase Dudu 4	-5.391726	35.483184	Open-air	Early - Mid. IA	-
Jenguu Tongo 1	-5.392251	35.323070	Open-air	Hist.	-
Kagera 1	-	-	Rockshelter	LSA	-
Kagera 2	-5.432215	35.466060	Open-air	Ind. IA	-
Kagera 3	-5.434976	35.465116	Open-air	Ind. IA	-
Kanisani 1	-5.415822	35.603654	Open-air	Later IA	-
Kh’adima 1	-	-	Rockshelter	Hist.	-
Khanda C 1	-5.399744	35.588941	Open-air	Hist.	-
Khuru’e 1	-	-	Rockshelter	LSA - Later IA	Pictographs
Kikambe Gawe 1	-	-	Rockshelter	LSA	Pictographs
Kilimba 1	-5.169668	35.240600	Open-air	Later IA	-
Kilimba 2	-5.168476	35.242796	Open-air	Later IA	-
Kimau A/B (1)	-	-	Rockshelter	LSA - Hist.	-
Kitobo 1	-5.410905	35.489854	Open-air	LSA - Hist.	-
Kitobo 2	-5.410621	35.490782	Open-air	Hist.	-
Kitobo 3	-5.412579	35.491629	Open-air	Hist.	-
Koga 1	-5.375750	35.305259	Open-air	Ind. IA	-
Koga 2	-5.374285	35.310042	Open-air	Ind. IA	-
Koga 3	-5.366198	35.580179	Open-air	Ind. IA	-
Koga 4	-5.374136	35.296802	Open-air	Ind. IA	-
Koga 5	-5.372198	35.293160	Open-air	Ind. IA	-
Kolikolimase 1	-	-	Rockshelter	LSA - Hist.	Pictographs
Kolikolimase 2	-	-	Rockshelter	LSA - Hist.	Pictographs
Kolikolimase 3	-	-	Rockshelter	LSA - Hist.	Pictographs
Kolonka 1	-	-	Rockshelter	LSA	Pictographs
Kongwa 1	-5.390093	35.317561	Open-air	Ind. IA	-
Kongwa 2	-5.391733	35.316719	Open-air	Ind. IA	-
Kongwa 3	-5.390664	35.433066	Open-air	Ind. IA	-
Kongwa 4	-5.389782	35.316306	Open-air	LSA	-

Table B.1: Site inventory (continued)

Site Name	Lat. (DD)	Long. (DD)	Type	Time Period	Notes
Kongwa 5	-5.388663	35.315724	Open-air	Ind. IA	-
Kongwa 6	-5.388939	35.314463	Open-air	Ind. IA	-
Kunkuna 1	-5.194161	35.353788	Open-air	Later IA	-
Kwa Mtoro 1	-5.225091	35.418360	Open-air	Hist.	-
Kwa Mtoro 2	-5.223123	35.417505	Open-air	LSA - Hist.	-
Kwa Mtoro 3	-5.227413	35.425447	Open-air	MSA	-
Kwa Mtoro 4	-5.236949	35.423013	Open-air	Hist.	-
Kwa Mtoro 5	-5.237772	35.422962	Open-air	Hist.	-
Kwa Mtoro 6	-5.238519	35.423894	Open-air	Hist.	-
Kwa Mtoro 7	-5.238365	35.423803	Open-air	Hist.	-
Kwa Mtoro 8	-5.235260	35.427434	Open-air	Hist.	-
Kwa Mtoro 9	-5.228231	35.421880	Open-air	LSA - Hist.	-
Kwa Mtoro 10	-5.228229	35.420203	Open-air	Hist.	-
Kwa Mtoro 11	-5.227591	35.419127	Open-air	Hist.	-
Kwango 1	-5.230213	35.397769	Open-air	Mid. - Later IA	-
Kwango 2	-5.229199	35.398324	Open-air	Mid. - Later IA	-
Kwango 3	-5.228583	35.398610	Open-air	Mid. - Later IA	-
Kwango 4	-5.231029	35.397213	Open-air	Mid. - Later IA	-
La’e Dī 1	-	-	Rockshelter	MSA - LSA	-
Lahoda 1	-5.073925	35.360766	Open-air	Ind. IA - Hist.	Salt production
Lahoda 2	-5.095004	35.360716	Open-air	Ind. IA - Hist.	Salt production
Lahoda 3	-5.093752	35.366959	Open-air	Ind. IA - Hist.	Salt production
Lelesu 1	-5.407933	35.438212	Open-air	Early IA	-
Lelesu 2	-5.409766	35.438860	Open-air	LSA - Early IA	-
Lelesu 3	-5.409921	35.438481	Open-air	Early IA	-
Lelesu 4	-5.407573	35.437895	Open-air	Early IA	-
Lelesu 5	-5.407682	35.437922	Open-air	Early IA	-
Lelesu 6	-5.407973	35.437328	Open-air	Early IA	-
Lelesu 7	-5.408600	35.436456	Open-air	Early IA	-
Lelesu 8	-5.409350	35.436612	Open-air	Early IA	-
Lelesu 9	-5.409431	35.436604	Open-air	Early IA	-
Lelesu 10	-5.406671	35.439821	Open-air	Early IA	-
Lelesu 11	-5.408087	35.438366	Open-air	Early IA	-
Lelesu 12	-5.408679	35.439496	Open-air	Early IA	-
Lelesu 13	-5.409993	35.438563	Open-air	Early IA	-
Lelesu 14	-5.411117	35.439920	Open-air	Early IA	-
Lelesu 15	-5.406667	35.442888	Open-air	Early IA	-

Table B.1: Site inventory (continued)

Site Name	Lat. (DD)	Long. (DD)	Type	Time Period	Notes
Loyie 1	-	-	Rockshelter	LSA - Later IA	Pictographs
Loyie 2	-	-	Rockshelter	LSA - Hist.	-
Mafunde 1	-5.422220	35.630870	Open-air	Later IA	-
Mafunde 2	-5.422270	35.629688	Open-air	Later IA	-
Magera 1	-5.190378	35.160161	Open-air	Later IA	-
Makonkoma 1	-	-	Rockshelter	LSA	Pictographs
Makonkoma 2	-	-	Rockshelter	LSA	Pictographs
Malagwee 1	-5.188226	35.333354	Open-air	Early - Mid. IA	-
Malagwee 2	-5.189293	35.333214	Open-air	Early - Mid. IA	-
Malagwee 3	-5.188855	35.331941	Open-air	Early - Mid. IA	-
Malando 1	-5.430867	35.336017	Open-air	Ind. IA - Hist.	Salt production
Mambu 1	-5.393743	35.341764	Open-air	Later IA	-
Mambu 2	-5.391499	35.337705	Open-air	Hist.	-
Mambu 3	-5.393485	35.335909	Open-air	Hist.	-
Mambu 4	-5.393739	35.335667	Open-air	Later IA	-
Mangasta 1	-5.349393	35.431008	Open-air	Early - Mid. IA	-
Mangasta 2	-5.348707	35.430834	Open-air	Early - Mid. IA	-
Mangasta 3	-5.348796	35.431087	Open-air	Early - Mid. IA	-
Mangasta 4	-5.349058	35.431115	Open-air	Early - Mid. IA	-
Mangasta 5	-5.347883	35.431146	Open-air	Early - Mid. IA	-
Mangasta 6	-5.327468	35.435025	Open-air	Early - Mid. IA	-
Mangasta 7	-5.326067	35.435127	Open-air	Early - Mid. IA	-
Mangasta 8	-5.327334	35.434745	Open-air	Early - Mid. IA	-
Mangasta 9	-5.346038	35.429309	Open-air	Early - Mid. IA	-
Mangasta 10	-5.347480	35.428079	Open-air	LSA - Hist.	-
Mangasta 11	-5.347508	35.427727	Open-air	Hist.	-
Mangasta 12	-5.349687	35.427519	Open-air	LSA - Hist.	-
Mangasta 13	-5.350627	35.427658	Open-air	Hist.	-
Mangasta 14	-5.352989	35.435946	Open-air	Hist.	-
Mangasta 15	-5.358431	35.435670	Open-air	Hist.	-
Mangasta 16	-5.358411	35.436292	Open-air	Hist.	-
Mangasta 17	-5.358918	35.435979	Open-air	Hist.	-
Mangasta 18	-	-	Rockshelter	Ind. IA	-
Mangasta 19	-5.330050	35.431130	Open-air	Ind. IA	“Portuguese home”
Mangasta 20	-5.329477	35.429965	Open-air	Ind. IA	“Portuguese home”

Table B.1: Site inventory (continued)

Site Name	Lat. (DD)	Long. (DD)	Type	Time Period	Notes
Mangasta 21	-5.328602	35.429510	Open-air	Ind. IA	“Portuguese home”
Mangasta 22	-5.327316	35.427765	Open-air	Ind. IA	“Portuguese home”
Mangasta 23	-5.326067	35.428283	Open-air	Ind. IA	“Portuguese home”
Mangasta 24	-5.326596	35.429268	Open-air	Ind. IA	“Portuguese home”
Mangasta 25	-5.327739	35.430409	Open-air	Ind. IA	“Portuguese home”
Mangasta 26	-5.328359	35.433811	Open-air	Ind. IA	“Portuguese home”
Mangasta 27	-5.327876	35.434693	Open-air	Ind. IA	“Portuguese home”
Mangasta 28	-5.326203	35.434821	Open-air	Ind. IA	“Portuguese home”
Manomanose 1	-5.354892	35.586849	Open-air	LSA	Petroglyphs
Marats’usu 1	-5.165451	35.267283	Open-air	Hist.	-
Marats’usu 2	-5.161884	35.263880	Open-air	Ind. IA	-
Masega 1	-	-	Rockshelter	LSA	Pictographs
Masonga 1	-5.193402	35.161524	Open-air	Hist.	-
Masonga 2	-5.192706	35.166797	Open-air	Hist.	-
Mbuta 1	-5.194736	35.373878	Open-air	Ind. IA	-
Mbuta 2	-5.193217	35.376514	Open-air	Ind. IA	-
Menakwa 1	-5.340074	35.401213	Open-air	Later IA	-
Menakwa 2	-5.339560	35.401031	Open-air	Later IA	-
Merebu 1	-	-	Rockshelter	LSA - Later IA	Pictographs
Merebu 2	-	-	Rockshelter	LSA - Later IA	Pictographs
Merebu 3	-	-	Rockshelter	LSA	Pictographs
Merebu 4	-	-	Rockshelter	Later IA	-
Merebu 5	-5.209290	35.204564	Open-air	Later IA	-
Merebu 6	-5.211321	35.202840	Open-air	Later IA	-
Merebu 7	-5.211231	35.202722	Open-air	Later IA	-
Merebu 8	-5.236228	35.204784	Open-air	Later IA	-
Merebu 9	-5.210123	35.204395	Open-air	Later IA	-
Merebu 10	-5.208528	35.202938	Open-air	Later IA	-
Merebu 11	-5.207866	35.206047	Open-air	Later IA	-
Merebu 12	-5.207422	35.203701	Open-air	Later IA	-
Merebu 13	-5.206653	35.203905	Open-air	Later IA	-

Table B.1: Site inventory (continued)

Site Name	Lat. (DD)	Long. (DD)	Type	Time Period	Notes
Methõ 1	-5.432129	35.478280	Open-air	Mid. IA	-
Methõ 2	-5.433546	35.476528	Open-air	Mid. IA	-
Methõ 3	-5.434290	35.473563	Open-air	LSA - Mid. IA	-
Methõ 4	-5.433996	35.470451	Open-air	LSA	-
Methõ 5	-5.436545	35.470281	Open-air	Mid. IA	-
Methõ 6	-5.435192	35.465099	Open-air	Mid. IA	-
Methõ 7	-5.435105	35.464467	Open-air	LSA	-
Methõ 8	-5.434332	35.463390	Open-air	Ind. IA - Hist.	-
Methõ 9	-	-	Rockshelter	Ind.	-
Mikere 1	-5.236274	35.415401	Open-air	Ind. IA - Hist.	-
Mikere 2	-5.232136	35.414988	Open-air	Later IA	-
Mikere 3	-5.232803	35.415261	Open-air	Later IA	-
Mindiga 1	-	-	Rockshelter	LSA - Hist.	Pictographs
Mindiga 2	-	-	Rockshelter	LSA - Hist.	-
Miomboni 1	-5.391411	35.313372	Open-air	Hist.	-
Miomboni 2	-5.391411	35.313272	Open-air	Hist.	-
Miomboni 3	-5.393819	35.310134	Open-air	Ind. IA	-
Mkoroshoni 1	-5.168341	35.247926	Open-air	Hist.	-
Msabaa 1	-5.409573	35.338659	Open-air	Hist.	-
Msabaa 2	-5.405118	35.336008	Open-air	Hist.	-
Msabaa 3	-5.409743	35.339074	Open-air	Hist.	-
Msembelo 1	-	-	Rockshelter	Ind. IA - Hist.	Cave drums
Msembelo 2	-	-	Rockshelter	LSA	Pictographs
Msembelo 3	-	-	Rockshelter	LSA	Pictographs
Msembere 1	-	-	Rockshelter	LSA - Hist.	Pictographs
Msembere 2	-	-	Rockshelter	LSA	Pictographs
Msembere 3	-	-	Rockshelter	LSA	-
Msembere 4	-	-	Rockshelter	LSA	Pictographs
Msembere 5	-5.226564	35.233218	Open-air	MSA - LSA	-
Msembere 6	-5.226882	35.232741	Open-air	ESA - LSA	-
Msembere 7	-5.226852	35.233336	Open-air	MSA - LSA	-
Msembere 8	-5.226183	35.233370	Open-air	Later IA	-
Msembere 9	-5.226808	35.233201	Open-air	ESA - Later IA	-
Msera 1	-5.186419	35.383800	Open-air	Hist.	-
Mtakuja 1	-5.018074	35.724858	Open-air	Ind. IA - Hist.	Salt production

Table B.1: Site inventory (continued)

Site Name	Lat. (DD)	Long. (DD)	Type	Time Period	Notes
Mtoro Tongo 1 (Mtoro's Homestead and Grave)	-5.224694	35.415798	Open-air	Hist.	Colonial-era
Nana 1	-5.197077	35.214945	Open-air	Later IA	-
Nana 2	-5.197581	35.215506	Open-air	Later IA	-
Nana 3	-5.198023	35.215868	Open-air	Later IA	-
Nana 4	-5.196019	35.214950	Open-air	Later IA	-
Nana 5	-5.196576	35.218730	Open-air	Later IA	-
Nana 6	-5.197846	35.217229	Open-air	Later IA	-
Nana 7	-5.199282	35.217631	Open-air	Later IA	-
Nana 8	-5.196208	35.220307	Open-air	Later IA	-
Nana 9	-5.197662	35.212990	Open-air	Later IA	-
Nana 10	-5.197616	35.216056	Open-air	Later IA	-
Nangare 1	-5.331304	35.392747	Open-air	LSA	-
Nangare 2	-5.332434	35.392490	Open-air	Hist.	-
Nangare 3	-5.334178	35.392623	Open-air	Hist.	-
Nangare 4	-5.332720	35.388839	Open-air	Hist.	-
Nangare 5	-5.334833	35.389208	Open-air	Hist.	-
Nangare 6	-5.335771	35.389933	Open-air	Hist.	-
Narase 1	-	-	Rockshelter	LSA - Later IA	Pictographs
Nauu 1	-5.395929	35.606274	Open-air	Mid. IA	-
Ngaya 1	-5.215478	35.398434	Open-air	Later IA	-
Ngaya 2	-5.216555	35.397907	Open-air	Later IA	-
Ngurengure 1	-5.205478	35.380130	Open-air	Later IA - Hist.	-
Ngurengure 2	-5.206330	35.379439	Open-air	Later IA - Hist.	-
Nxopelo 1	-5.404157	35.491270	Open-air	LSA	-
Nxopelo 2	-5.406774	35.490054	Open-air	Later IA	-
Ovada 1	-5.178834	35.243482	Open-air	MSA - LSA	-
Ovada 2	-5.180027	35.233252	Open-air	LSA	-
Ovada 3	-5.178972	35.234917	Open-air	LSA	-
Ovada 4	-5.178126	35.236474	Open-air	MSA - LSA	-
Ovada 5	-5.176015	35.245600	Open-air	MSA - LSA	-
Pomboo 1	-5.223354	35.202728	Open-air	Later IA	-
Qacine 1	-	-	Rockshelter	LSA	Pictographs
Qekaa 1	-5.421379	35.635221	Open-air	Mid. IA	-
Qoqa Dī 1	-	-	Rockshelter	Ind. IA	Cave drums
Qoqa Dī 2	-5.362767	35.320172	Open-air	Later IA	-

Table B.1: Site inventory (continued)

Site Name	Lat. (DD)	Long. (DD)	Type	Time Period	Notes
Qukusa 1	-	-	Rockshelter	LSA - Hist.	Pictographs
Qukusa 2	-	-	Rockshelter	LSA - Hist.	-
Qumbuko 1	-5.223807	35.204975	Open-air	Ind. IA	-
Qumbuko 2	-5.224005	35.205093	Open-air	Later IA	-
Rurukuse 1	-5.321887	35.361780	Open-air	LSA - Later IA	-
Rurukuse 2	-5.322590	35.360087	Open-air	Later IA	-
Rurukuse 3	-5.322821	35.358808	Open-air	LSA - Later IA	-
Rurukuse 4	-5.409368	35.363578	Open-air	Later IA	-
Sakhamu 1	-5.167068	35.267703	Open-air	Later IA	-
Sanzawa 1	-5.421469	35.331453	Open-air	Mid. - Later IA	-
Sanzeke 1	-	-	Rockshelter	LSA - Hist.	Pictographs
Sanzeke 2	-5.327532	35.502537	Open-air	Ind.	-
Seng'abaase 1	-5.391480	35.323636	Open-air	Hist.	-
Sengere 1	-	-	Rockshelter	LSA	Pictographs
Serya 1	-4.960303	35.700878	Open-air	Ind. IA - Hist.	Salt production
Serya 2	-4.954153	35.695464	Open-air	Ind. IA - Hist.	Salt production
Seya Tongo 1	-5.392661	35.322143	Open-air	Hist.	-
Songoa Qaku Kombe 1	-	-	Rockshelter	LSA - Hist.	Pictographs
Songoa Qaku Kombe 2	-5.212032	35.249713	Open-air	Hist.	-
Songolo 1	-5.407756	35.642286	Open-air	Later IA	-
Songolo 2	-5.403448	35.641600	Open-air	Ind. IA	-
Songolo 3	-5.422616	35.641638	Open-air	Later IA	-
Songolo 4	-5.407408	35.641265	Open-air	Later IA	-
Songolo 5	-5.404292	35.640846	Open-air	Later IA	-
Sorovea 1	-5.393262	35.323462	Open-air	Hist.	-
Sweki 1	-5.196194	35.234508	Open-air	Later IA	-
Sweki 2	-5.196518	35.235033	Open-air	Later IA	-
Sweki 3	-5.208512	35.230548	Open-air	Later IA	-
Sweki 4	-5.208023	35.230709	Open-air	Later IA	-
Takwa 1	-	-	Rockshelter	LSA	Pictographs
Takwa 1	-5.149642	35.136364	Open-air	Ind. IA - Hist.	Salt production
Takwa 2	-5.154374	35.135225	Open-air	Ind. IA - Hist.	Salt production
Takwa 3	-5.167538	35.126730	Open-air	Ind. IA - Hist.	Salt production
Tambala 1	-5.337669	35.410591	Open-air	LSA	Petroglyphs
Tasa 1	-5.409588	35.643006	Open-air	Later IA	-
Tasa 2	-5.409789	35.642331	Open-air	Later IA	-

Table B.1: Site inventory (continued)

Site Name	Lat. (DD)	Long. (DD)	Type	Time Period	Notes
Tasa 3	-5.383066	35.657183	Open-air	Later IA	-
Tebeku 1	-5.428531	35.611509	Open-air	Later IA	-
Tebeku 2	-5.428986	35.610772	Open-air	Later IA	-
Tebeku 3	-5.429236	35.611386	Open-air	Later IA	-
Tebeku 4	-5.430690	35.609426	Open-air	Later IA	-
Tl'angase 1	-	-	Rockshelter	Ind. IA - Hist.	Cave drums
Tl'angase 2	-	-	Rockshelter	LSA	-
Tl'angase 3	-5.167789	35.283484	Open-air	LSA	-
Tl'angase 4	-5.167913	35.284134	Open-air	Ind. IA	-
Tl'atl'akwa 1	-5.423445	35.615157	Open-air	Later IA	-
Tl'aya 1	-5.371179	35.651604	Open-air	Hist.	-
Tl'aya 2	-5.363205	35.662750	Open-air	Hist.	-
Tl'utl'u 1	-5.378537	35.594424	Open-air	Ind. IA	-
Tl'utl'u 2	-5.377972	35.604016	Open-air	Ind. IA	-
Ts'apoo 1	-5.350817	35.393111	Open-air	LSA	-
Ts'apoo 2	-5.351771	35.394170	Open-air	LSA	-
Ts'apoo 3	-5.358053	35.403258	Open-air	LSA	-
Ts'ela 1	-	-	Rockshelter	Hist.	-
Ts'ikimba 1	-	-	Rockshelter	LSA - Hist.	Pictographs
Ts'inki 1	-	-	Rockshelter	LSA - Later IA	Pictographs
Ts'inki 2	-	-	Rockshelter	LSA - Later IA	Pictographs
Ts'inki 3	-	-	Rockshelter	LSA - Later IA	Pictographs
Tsege Gele 1	-	-	Rockshelter	LSA - Hist.	Pictographs
Tubiye 1	-5.192363	35.216191	Open-air	Later IA	-
Tubiye 2	-5.193790	35.216566	Open-air	Later IA	-
Tubiye 3	-5.194069	35.216774	Open-air	Later IA	-
Tubiye 4	-5.194792	35.217029	Open-air	Later IA	-
Umbage 1	-5.395798	35.432969	Open-air	Ind.	Quarry
Uyase 1	-5.232478	35.403548	Open-air	LSA	-
Wakoma 1	-	-	Rockshelter	LSA	Pictographs
Walambo 1	-5.379784	35.337769	Open-air	Ind.	-
Walambo 1	-5.373489	35.355115	Open-air	Ind. IA - Hist.	Salt production
Walambo 2	-5.378904	35.338478	Open-air	Hist.	-
Walambo 3	-5.378357	35.339657	Open-air	Hist.	-
Walambo 4	-5.378256	35.340171	Open-air	Hist.	-
Wambago 1	-	-	Rockshelter	LSA - Hist.	Pictographs
Wanzara 1	-	-	Rockshelter	LSA - Later IA	Pictographs
Waransese 1	-5.383446	35.636112	Open-air	Early - Mid. IA	-

Table B.1: Site inventory (continued)

Site Name	Lat. (DD)	Long. (DD)	Type	Time Period	Notes
Waransese 2	-5.386288	35.633041	Open-air	Early - Mid. IA	-
Waransese 3	-5.390950	35.625018	Open-air	Early - Mid. IA	-
Warimba 1	-5.328168	35.394818	Open-air	Later IA	-
Warimba 2	-5.327532	35.395763	Open-air	LSA - Later IA	-
Warimba 3	-5.327426	35.397430	Open-air	Later IA	-
Warimba 4	-5.324599	35.394651	Open-air	Later IA	-
Warimba 5	-5.325071	35.393958	Open-air	Later IA	-
Xankase 1	-5.399037	35.593772	Open-air	Hist.	-
Xankase 2	-5.397738	35.593171	Open-air	Hist.	-
Xankase 3	-5.396657	35.592400	Open-air	Hist.	-
Xankase 4	-5.397090	35.592618	Open-air	Hist.	-
Xasiko 1	-5.407261	35.459340	Open-air	Later IA	-
Xomta 1	-	-	Rockshelter	LSA - Hist.	Pictographs
Xomta 2	-	-	Rockshelter	Ind. IA - Hist.	Cave drums

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