REVOLVING SCALES: EXPLORING LOCALITY DURING THE LATE FORMATIVE PERIOD ON THE TARACO PENINSULA, BOLIVIA

REVOLVING SCALES: EXPLORING LOCALITY DURING THE LATE FORMATIVE PERIOD ON THE TARACO PENINSULA, BOLIVIA

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ABSTRACT

This study aims to identify processes of localization-moments when material practices become shared or diverge and become individualized- and to clarify spatial organization within Late Formative (250 BC – 590 AD) sites on the Taraco Peninsula, Bolivia. The word *local* is a term that can embody many meanings as a noun, an adjective, and a process of transformation, but its meaning is assumed in many archaeological investigations. Its usage, however, heavily influences how archaeologists interpret the material record, from archaeological constructions of boundaries of space, to how we conceptualize the ways in which people lived day-to-day. Pottery has also been used extensively to interpret identities, practices, and geographical boundaries through decoration and production elements. Definitions of locality are dependent on perspective and position, and "local" is dynamic in nature. I seek to open the discussion on understanding different scales of locality may intersect and how this influences the interpretations of the past.

I study the distribution of ceramics from three sites, Kala Uyuni, Kumi Kipa, and Sonaji. My research explores the differences between the production of locality at these sites, and whether this is visible through ceramic production and deposition. I accomplish this using GIS to visualize and analyze the distribution of paste, surface treatment, sherd carbonization, fragmentation, and paleoethnobotanical data. The results show that ceramic production practices generally constituted one localized community of practice. When it came to depositional practices, I identified two separate localized practices in terms of the treatment of ceramic waste and where inhabitants chose to start fire-related activities. The contributions of this thesis include the creation of GIS ceramic point data, opening further discussion on the concept of locality at other relational scales, a better understanding of the daily motions of past peoples on the Taraco Peninsula, and a method for re-examining and incorporating legacy data.

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LIST OF ABBREVIATIONS

ASD = Architectural Subdivision
asw = average sherd weight
GIS = Geographic Information System
KK = Kumi Kipa
KU = Kala Uyuni
LF = Late Formative Period
PSAD = Provisional South American Datum
SN = Sonaji
TAP = Taraco Archaeological Project
UTM = Universal Transverse Mercator

Chapter 1: Introduction

1.1. General introduction

This thesis revolves around the different meanings of locality. What is local? What is non-local? Archaeologists often use such terms to separate and distinguish cultures from one another using ceramic decorative styles (Gifford 1960). This designation (of material culture) has always been vital to the construction of narratives to describe the sociopolitical organization of communities, polities, chiefdoms, and states (e.g. Clarke 1947; Wheeler 1956; Willey and Phillips 1958; Woolley 1977). For example, early models of state formation in Mesopotamia involved the appearance of elites and centralization of power that somehow led to a (sudden) disappearance of local power and autonomy (Yoffee 1977). Locality has often been assumed and has never really described how past peoples perceived and engaged with the world. In many ways, early culture-historical and processual archaeology reduced people to pots or used universal models to describe cultural practices and behaviours (Ford 1954; Trigger 2006). More recently, archaeologists are grappling with the issue of locality, thinking of more relational ways of considering how it is produced not only in space, but also across time (Druc 2013; Hall 2006; Harris 2006; Kosiba 2011; Skiles and Clark 2010). Other scholars are confronting understandings of space and scale (e.g. Smith 2003; Yarrow 2006; Harris 2006). Locality, then, is a long and ongoing intellectual argument involving different ways of thinking about space and its production. It is the product of multiple histories and social processes which are always dynamic and changing (Appadurai 1996; Massey 1994: 136-142)..

The Andes is one of most interesting regions to consider locality because of the diversity of sociopolitical organizations, ethnicities, and ecological terrains (Albarracin-Jordan 1996; Quilter 2014). Several archaeologists in the Andes have attempted to critically engage with the concept of locality. These scholars recognize that locality is not static and exists beyond one definition. Druc (2013: 486-487), for instance, opens the discussion of how locality can be perceived differently in ceramic production, noting differences in how potters on the North Coast of Peru view what is local as the place of production while archaeologists define the local by the origin place of ceramic raw materials. In the southern Lake Titicaca basin, archaeologists have noted that pottery production was generally local, in that they were made on-site domestically (Janusek 2004; Roddick 2009; Stanish and Steadman 1994; Steadman 1997). On the Taraco Peninsula, Roddick's (2009) work found similar production practices, which could be indicative of a single, local community of practice. Recent research in the Andes and elsewhere are thinking of locality through the lens of ceramic production (e.g. Galaty 2008; Gosselain 2017; Michelaki et al. 2015; Peelo 2011). Yet, locality is also produced through other aspects of a ceramic's life history-its deposition and recovery (Bauer 2019; Joyce and Gillespie 2015; Pollard 2001). How are our interpretations of the local affected by post-depositional and taphonomic processes in the recovery of sherds? How might everyday routines and practices, seen in pottery deposition, reflect the local?

In this thesis, I examine the production of locality during the Late Formative Period by exploring ceramic distribution on the Taraco Peninsula, located within the Southern Lake Titicaca Basin (Figure 1.1). The Taraco Peninsula has been the subject of many archaeological investigations (e.g. Bandy 1999, 2001, 2005; Bandy and Hastorf

2007; Beck 2004; Bennett 1936; Browman 1978; Bruno 2008, 2014; Capriles et al. 2008, 2014; Chávez 1988; Hastorf 1999; Kidder 1956; Marsh et al. 2019; Moore et al. 2010; Ponce Sanginés 1970; Roddick 2009; Roddick et al. 2014, Roddick and Hastorf 2014; Steadman 1999). I explore the differences in production and depositional practices at three sites, Kala Uyuni, Sonaji, and Kimi Kipa, through excavated ceramics from the 2003-2005 field seasons (Bandy and Hastorf 2007; Bandy et al. 2004; Hastorf et al. 2005, 2006). Kala Uyuni and Sonaji are thought to have been major political centres, while Kumi Kipa was a domestic site. Inhabitants from all three sites are believed to have interacted with one another, and by the end of the Late Formative, some inhabitants moved from Kala Uyuni to the western tip of the peninsula where Sonaji and Kumi Kipa are located (Bandy 2001). Up until recently, researchers explored locality as defined as scales of practices and sociopolitical groupings.

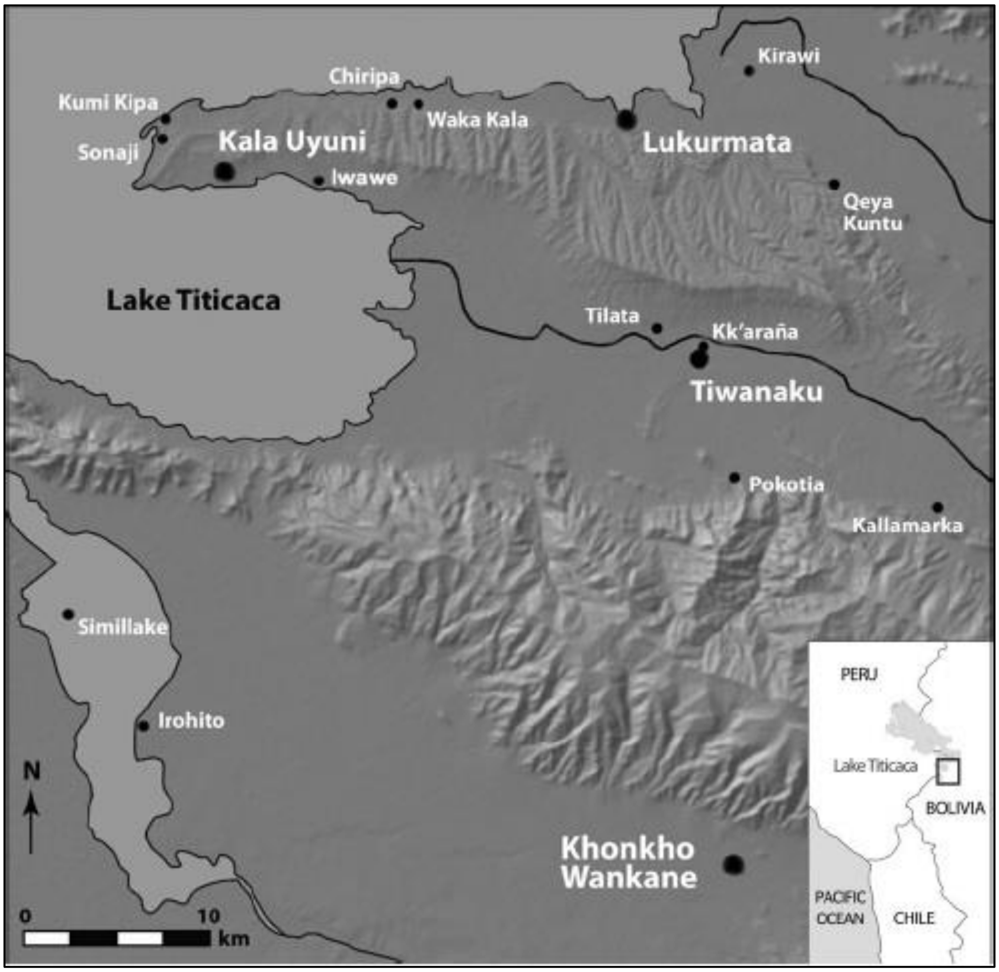


Figure 1.1 Map of the Southern Lake Titicaca Basin. This shows the key Late Formative sites in the region with the Taraco Peninsula in the upper left quadrant. Adapted from Marsh (2016: 306).

Late Formative inhabitants likely viewed what was local or non-local differently from archaeologists. They made choices in how they produced their wares and how they came to use and organize their living spaces. These choices, I argue, can reveal past processes of localization (moments when a practice becomes shared) because they reflect techniques that are learned and routinized in pottery practice. These choices can be visible in ceramic production attributes (e.g. paste, surface treatment), in use attributes (carbonization, fragmentation, and comparisons with other taphonomic data), and their spatial patterning. I ask two sets of questions regarding the production and interpretation of locality among the Taraco sites in terms of ceramic production, use, and deposition: 1) How do site and feature designations impact archaeological interpretations of the local? How might our narratives of Kala Uyuni, Sonaji, and Kumi Kipa change when we focus on the spatial patterning of ceramic attributes? 2) Were inhabitants producing and using distinct pottery types at each site? What might variation or lack thereof say about site organization and understandings of material practice and knowledge sharing?

I conducted a geospatial analysis to answer questions about emerging local practices during the Late Formative Period on the Taraco Peninsula. To examine pottery in space, I used ArcGIS 10.7.1. GIS provides a way to analyze large datasets that vary in spatial resolution and incorporate and query multiple layers of ceramic attributes and other artifact/ecofact classes. This relational approach allows me to explore relationships between attributes and relations to other artifact classes because GIS is a relational database. The use of GIS encourages a connection between different scales of spatial analyses, between more in-depth intra-site examinations and inter-site comparisons which are seldom integrated together in archaeological studies (Bevan and Conolly 2006; Trifković 2006: 259). It is also well suited for the re-analysis of legacy data collections as it reconnects old data to real-world coordinates, which can be joined together with recent data collections (Allison 2008; Evans and Daly 2005; Palmer and Daly 2005). In essence, GIS helps to rectify legacy data and reintegrate horizontal and vertical spatial data into a more cohesive model. It also helps visualize and shift between scales of analyses and connect disembodied sets of loose datasets.

1.2. Archaeology in the Lake Titicaca Basin, Bolivia

Archaeological interpretations and narratives in the Southern Lake Titicaca Basin have long focused on the cultural development of two major ceremonial sites (Chiripa and Tiwanaku) to understand the culture history of this region (Janusek 2004a: 123). While the Early (1500-200 BC) and Middle Formative (800-100 BC) periods were mainly informed by research at Chiripa, the Tiwanaku Period (AD 500-1000) is largely defined by the developments that took place at Tiwanaku (Bandy 1999; Bennett 1936; Hastorf 2003; Janusek 2004a; Kidder 1956; Ponce Sanginés 1970; Roddick 2002). Investigations at Late Formative sites are driven and characterized by the observations made from these earlier and later periods.

The Late Formative Period generated out of an earlier period that saw the first localized polities based on ritually oriented alliances and the development of two regional cultural complexes- Chiripa in the southern basin and Qaluyu in the northern basin (Hastorf 2003, 2005; Janusek 2008). Some of the major processes that occurred include the intensification of agricultural cultivation, increased territoriality, and the introduction of long-distance trade via llama-caravans (Hastorf 2005; Janusek 2008; Smith and Janusek 2014). The end of the Late Formative, better known as the Middle Horizon (600 – 1000 AD) saw the urban phenomena of Tiwanaku emerge. The Tiwanaku Period has been characterized by urban expansion linked to the consolidation of ideologies, economies, and sociopolitical organization (Janusek 2004a: 150).

1.3. The Late Formative Period

Research on the Late Formative has intensified in the last 20 years or so. These include investigations into how regional developments became influenced by trade networks, religious ideologies, and climate fluctuations, as well as identifications into the kinds of polities that emerged, how they rose, and their interactions (Janusek 2004a: 147). Recent efforts have also covered considerable ground on this period to better understand the sociopolitical developments that led to the rise of the Tiwanaku state in the southern basin (Janusek 2008; Kolata 1993; Smith 2016). Nevertheless, the Late Formative Period (250 BC – 590 AD) has been described as a “black hole” (Janusek 2008: 87) in comparison to the Early-Middle Formative and Tiwanaku Periods. My thesis contributes to understanding everyday life during the Late Formative, as the culture history in the southern Lake Titicaca basin continues to be poorly understood.

The Late Formative period is characterized by an expansion in trade and the intensification of herding and farming strategies, particularly camelid pastoralism (Janusek 2008; Smith 2016). Much of what we know of this period comes from work on the northern basin. During the Late Formative I period (AD 120 – 240), the Pukara[1] polity emerged and thrived, replacing Qaluyu and becoming the first political centre in the north (Janusek 2008). Pukara’s influence flowed into the southern basin, as Kalasasaya zonally incised ceramic vessels and trumpets found at Tiwanaku and Lukurmata bore similarities with Pukara style pottery (Janusek 2004b: 116). Ceramic technology shifted from primarily fiber to micaceous tempers, while vessel form and styles shifted towards smaller serving wares with simple, red-painted rims (Janusek 2003, 2008; Roddick 2009). While the Pukara polity emerged in the northern Lake Titicaca Basin, no regional polity emerged on the southern basin until after AD 200 (Janusek 2008:90). The Tiwanaku and Katari valleys, the Taraco Peninsula, and the

[1] Pukara refers to the site, the polity, as well as a type of site (i.e. a fortified site).

Machaca region became major hubs for the emergence of many regional political centres, such as Kala Uyuni, Tiwanaku, Lukurmata, and Khonkho Wankane (Bandy 2001; Janusek 2008). These Late Formative centres were located much more inland than Middle Formative centres, sharing similar architecture like trapezoidal sunken courts, raised platforms and stone monolith iconographic styles (Janusek 2008; Smith 2016). By the end of the Late Formative (AD 420 – 590), much of the Taraco Peninsula, including Kala Uyuni, was depopulated, or was abandoned while Tiwanaku expanded exponentially (Bandy 2001; Janusek 2004b: 116).

1.4. Zeroing in on the Taraco Peninsula

The Taraco Peninsula is considered one of the major areas of cultural development during the Formative Period and the subject of many archaeological projects (Bandy 2001; Bandy and Hastorf 2007; Beck 2004; Bennett 1936; Bruno 2008, 2011; Chávez 1988; Hastorf 2003, 2005, 2008; Janusek 2008; Kidder 1956; Ponce Sanginés 1970; Roddick 2009; Wallace 1957). The peninsula is situated in the southern portion of Lake Titicaca that projects into Lake Wiñaymarka (Bandy 2001: 20; Figure 1.2). This area consists of low, rolling hills and is geologically formed by the Taraco Formation (Bandy 2001: 20). It is also surrounded by various kinds of ecological zones, including a marsh/damp pampa, lake (Lake Titicaca), a dry pampa/dry terrace, and upland hilltops with ravines and rivers (Roddick 2009: 267).

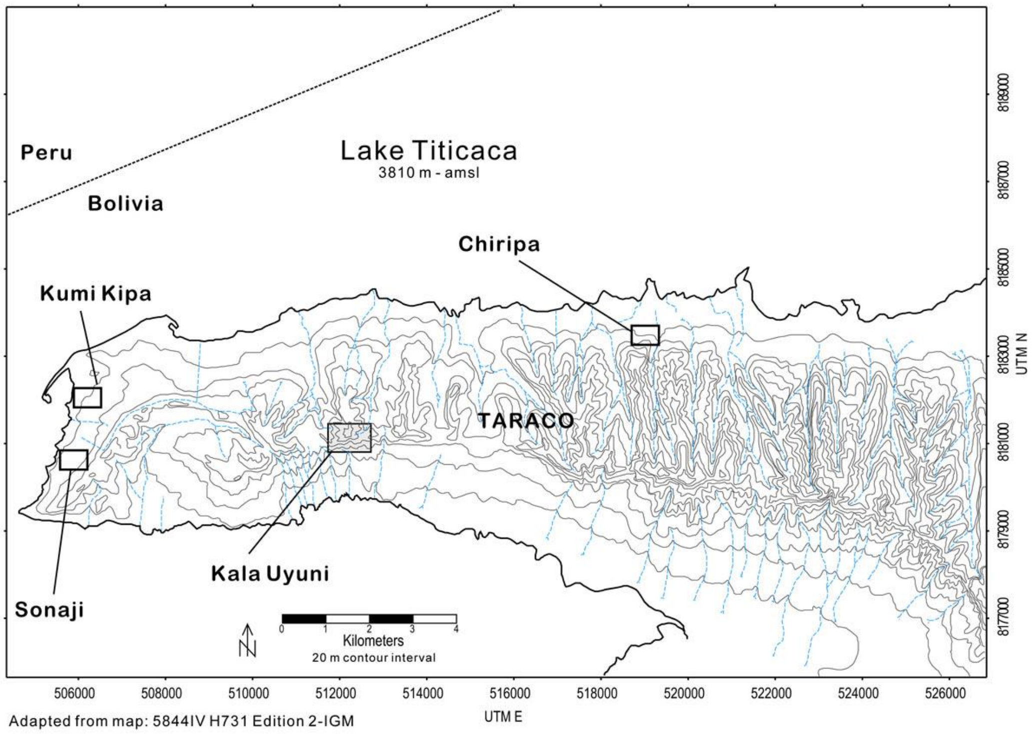


Figure 1.2 Map of the Taraco Peninsula, labelled with sites that were excavated by TAP.

Late Formative research on the Taraco Peninsula mainly comes from the sites of Kala Uyuni, Sonaji, and Kumi Kipa where excavations took place between 2003-2009 and 2016[2] by the Taraco Archaeological Project (TAP) (Bandy 2001; Bruno 2008; Hastorf 1999, 2008; Roddick 2009). Settlement dynamics and narratives on the peninsula are based on Bandy's (2001) survey work of the peninsula, which used decorative ceramic scatters to identify and distinguish sites and chronologies. The terms local and non-local were mainly usedto help define and distinguish cultures from one another in Bandy (2001) and earlier studies in the southern Lake Titicaca Basin. Although ceramics from the Late Formative Period are largely plain and undecorated, only decorated pottery was used to define these cultures and sites (Janusek 2003;

[2] 2016 excavations focused primarily on the Tiwanaku contexts at these sites.

Roddick 2009). Kosiba (2011) has argued that locality has often been characterized as merely an obstacle to sociopolitical development (Kosiba 2011). More recent work by TAP has focused on the daily practices and activities on the peninsula (e.g. Bruno 2008, 2014; Bruno and Hastorf 2016; Moore et al. 2010; Roddick 2009; Roddick and Hastorf 2010). I build on their work by examining the spatial organization of local production and use practices through pottery.

1.5. Research Problems and Contributions

Archaeologists tend to frame grand narratives of human interactions, such as political centralization and conflict, through comparisons between the local and the non-local (e.g. Albarracin-Jordan 1996; Bandy 2001; Covey 2008; D'Altroy et al. 1998; Janusek 2004b; Stanish 2003). For example, the "collapse" of the Moche on the north coast of Peru around AD 800 led to the appearance of smaller, localized communities assumed to be unstable. The fall of the Moche is associated with a failure of sorts and a need to bring back "legitimacy and wealth" through political restructuring (Castillo and Uceda 2008). The example here illustrates Kosiba's (2011: 117) argument that the local is often associated with instability and conflict, while the regional (or non-local) is associated with political centralization and order Yet, localized groups form the basis of any kind of political organization, whether they end up forming into a larger structure or fracturing into smaller, independent structures (Quilter and Koons 2012).

Within the southern Lake Titicaca basin, shifts in sociopolitical organization during the Late Formative Period have been described as moving from a network of local villages to a large, centralized, and unifying state (Marsh 2019: 310). It is a period that saw the development of complex ranked societies (typically called chiefdoms) and the presence of numerous autonomous or semiautonomous polities (according to some authors). Relations between these polities were driven by competition, and the growth and maintenance of such polities have been described as uneven and unstable (Stanish 2003: 137). Polity collapse is linked to simpler modes of political organization and plainer ceramics. For example, Stanish (2003: 159) suggests the lack of elaborately decorated pottery in the northern Lake Titicaca basin after AD 200 may have reflected the collapse of the Pukara polity, one of the two most significant centralized polities in the basin at the time. Processes of localization, defined as actions leading to shared material practices and behaviours) and identifications of locality (i.e. through pottery) have tended to be hindered by assumptions and frameworks applied to fit oldernarratives resulting from past theoretical preoccupations with culture historical and processual paradigms.

At the centre of many of these earlier studies and narratives is the use of (decorative) ceramics as markers of regional-scale developments (Jorge et al. 2013; Roddick 2009). They are often used to build temporal chronologies and define cultures (Rice 1987: 283-284; Roddick 2009: 185; Ramón and Bell 2013: 611). The locality reflected here is that of the final stage of a ceramic’s life history-its recovery from the material record, which is affected by re-use, fragmentation, curation, and other post-depositional processes (Chapman 2000; Chapman and Gaydarska 2007; Schiffer 1996). However, there are different forms of local practices embedded in a sherd’s social life, including the pot’s production, use and deposition, which are seldom considered together as a whole (Bauer 2019; Crown 2007: 686; Joyce and Gillespie 2015). To add to this, the reliance on decorative pottery to track change does not work well for the Late Formative

Period as they only make a small fraction of the pottery assemblages recovered (Janusek 2003; Roddick 2009). I argue that scholars should examine the use lives of pottery to disentangle the different ways of identifying and understanding locality. One way of following these different iterations of locality is by using GIS. GIS allows for the examination of data at multiple spatial and analytical scales (Wheatley and Gillings 2002). This means that it has the capacity to examine archaeological contexts relationally between different artifact classes and cross compare them.

In my thesis, I work to see whether GIS can be a useful avenue for not only visualizing ceramic attributes in space but also whether it is useful for re-examining and joining legacy data with more recent data. Legacy data fits into the discussion of locality because they are the data from which earlier interpretations were made about local and non-local practices, but under a different definition of locality (i.e. as a spatial unit). I re-examine legacy data under a more practice-based definition of locality (where locality is refers to a shared set of material practices and knowledge) to see whether understandings about what material practices may have been local or non-local changed or whether they stayed the same. By plotting pottery in the 12eospacer, I can add another visual to complement Harris matrices and written descriptions. It also provides an opening to combine ceramic data with other classes of archaeological data that exist as GIS data (e.g. plants, faunal and human remains, geological/soil, and lithics). GIS is particularly useful when needing to analyze large samples of sherds, to combine multiple datasets, and when it is not possible to conduct in-person analyses.

1.6. Thesis Outline

In Chapter 2, I review the theoretical approaches to locality and ceramic analyses and detail some of the more nuanced ways of thinking about the local through ceramic production and deposition. I suggest a more relational and multi-scalar approach to locality to better understand relationships between production, use, and deposition in the past. In particular, I follow two versions of locality in this project, one revolving around the archaeologist's definition (i.e. a spatial unit) and one that is rooted in shared practices over time. In Chapter 3, I provide a brief history of the Taraco Peninsula (ecology, geology, and archaeology) and of the Late Formative Period to contextualize my project. I discuss how locality has been conceptualized on the Taraco Peninsula and end the chapter by outlining my research questions. I discuss my sampling and methodologies I used in Chapter 4. I discuss the parameters of my geospatial analysis and choice in employing ArcGIS to examine ceramic legacy data. I present my findings in Chapter 5. Here I show what happens when we deploy a conventional understanding of locality (sensu settlement pattern definition) to excavated data, and then compare it to the other ways of framing locality that consider the diverse kinds of locality embedded in ceramics (i.e. practice). In Chapter 6, I contextualize my observations within a broader anthropological context, and discuss the contributions of my thesis to local/non-local narratives, archaeology in the Southern Lake Titicaca Basin, ceramic studies, and analyses of legacy data.

Chapter 2: Scale and Locality

2.1. Overview

Archaeologists use locality to craft their narratives about past peoples in a variety of ways. In this chapter, I explore how Andean archaeologists and ceramicists have understood and used locality. I highlight three key arguments that are prevalent in geography (e.g. Appadurai 1996; Duncan 1989; Massey 1993, 1994): 1) locality operates at multiple scales and may change spatially or temporally; 2) definitions of locality are not standardized in method or theory; and 3) locality is tied to social boundaries. I start by outlining normative[3] methodological approaches (which focus on decorative ceramics) and interpretations to the local and provide some Andean examples. I then review how (some) ceramicists limit their consideration of locality (as practice) to production steps and raw materials. I argue that examining later stages in pottery lives, including deposition and taphonomy, provide a different interpretation of ancient communities and how they organized their spaces. I explore how selective sampling of decorated vs. undecorated ceramics in archaeological analyses can affect interpretations of locality. I then review how some archaeologists use locality in more critical examinations of the material record, and how archaeologists working in the Lake Titicaca basin use ceramics as a proxy for identifying the local and non-local (Table 2.1). I conclude by outlining the benefits of juxtaposing different versions of locality through plainware ceramics.

[3] For the purposes of this thesis, I focus mainly on more culture-historical and processual archaeological frameworks in the Andes. Locality also exists in the lived space, but this is much harder to detect archaeologically.

2.2. Conceptualizing Locality and Scale

Traditional Approaches

Anthropological archaeologists have long been interested in identifying the local from the material record to understand the histories of social interactions within and between communities, regions, and polities. Early archaeological work focused on examining settlement patterns and tracing the development of complexity. To understand historical interactions between groups of people, archaeologists assigned “local” or “non-local” designations to material culture. This was used to describe the diffusion or migration of ideas and (archaeological) cultures (Trigger 2006: 288). Discussions on the “local” were heavily concerned with the spatial and geographical, often falling in line with Willey and Phillips’ (1958: 18-19) definition of locality. While the size of the local could vary, it generally occurred at the site-scale and was restricted to one community or group that shared cultural homogeneity (Willey and Phillips 1958: 18-19). Defining locality and other spatial units (i.e. site, region, and area) played a significant role in determining spatial identity and broader cultures (Trigger 2006: 289).

Gordon Willey’s (1953) work on the Virú Valley (north coast of Peru) is an important example of one of the early approaches to locality. His team undertook this early, rigorous, large-scale systematic analysis of settlement patterns to understand the Virú Valley in relation to other valleys in Peru (Willey 1953: 1). Willey describes the chronological period and geographic distribution of each site, putting each into a typology. Sites were identified and typed based on observations through aerial photography, and cross-comparison of surface pottery assemblages against Ford’s ceramic typology and seriation of the Virú Valley, and to some extent, excavations

(Willey 1953: 10-11). Willey (1953: 7-9) identified 4 broad site types: living sites, community and ceremonial structures, fortified strongholds or places of refuge, and cemeteries. These were further divided into subtypes based on the spatial patterning (i.e. scattered, agglutinated, compound, semi-isolated) of specific features found (i.e. pyramid mound, platform, etc.) (Willey 1953: 7-9). Site boundaries and occupational histories were based loosely on site and artifact distributional patterning. Locality, in this sense, is a group of interrelated sites with specific functions and perceived cultural or ethnic divisions.

Like others working during the early to mid 20th century, the issue of locality was bound up with a particular view of time. The term "local" was used in reference to a series of temporal phases/subphases that are bounded to a limited geography (Willey and Phillips 1958: 25). In other words, these early scholars use the local to frame the small-scale shifts of change in material culture within a given area. For example, Willey (1953) used a local sequence that only focused on the Virú valley to categorize sites, as opposed to a regional sequence (i.e. the Rowe-Menzel[4] system) that is often used to describe cultural evolution happening at multiple sites covering a larger geographical extent (Quilter 2014: 35-37). While Willey does compare cultural changes in the Virú valley to other valleys in Peru, he treats each valley separately from one another. What this means is that Willey also recognizes locality as a geographic division, where each valley is a distinct locality.

[4] The Rowe-Menzel system is a relative chronological system developed by John Rowe and Dorothy Menzel using ceramics from the Ica Valley in Peru. This system focuses on tracking large-scale changes, defining time through "Horizons" (defined by widespread, pan-regional cultural influences) and "Periods" (characterized by smaller, regional changes).

The shift to processual archaeology in the 1960s and 70s changed the use of locality. Archaeologists focused particularly on the development of chiefdoms and state-level societies and how they were defined spatially. Processual archaeologists believed that settlement patterns (and cultures) could be explained by universal models and systems of human behaviour (Trigger 2006). For example, chiefdoms and states could be defined by the number of hierarchical levels of settlement sizes present across space (Smith 2003: 41). Johnson (1973: 101-103) suggested that political organization could be reflected in site surface variation, and defined chiefdoms as having three levels of settlement sizes and states by four or more levels (i.e. village, small village, small centre, large centre).

One major way in which processual archaeologists define a site as local or non-local is based on a site's location in reference to the closest monumental site/central place. Architecture becomes significant in the rendering of locality because they tend to be more visible and reflects "differing public order and social motives" (Moore 1996: 2-3). Scholars taking this approach argued that power consolidated at a central place (large, monumental buildings like ceremonial or political centres), and that communities built settlements around them. This idea stems from the adoption of Christaller's (1933) central place theory to explain the distribution, size, number, and spacing of settlements using economics. Settlements are ranked based on size, with the assumption that smaller places had low-order goods (things that are easy to find such as food), while larger settlements had high-order goods and services (i.e. transportation vehicles) (Evans and Gould 1982). Central place systems were organized in a hexagonal shape such that each central place would be equally spaced apart from one another, and smaller settlements would gather around the closest central place to obtain goods (Malczewski 2009: 26-27). Locality here focuses on spatial regularity, where there exists a universal generalization or way to explain human behaviour (Smith 2003: 409; Trigger 2006: 406). Unlike Willey and Phillips (1958) and earlier culture historians, this version of locality involves quantification rather than description, and homogenizes the diversity of ethnic cultures that existed.

For culture historians and processual archaeologists alike, ceramics played a central role in early understandings of locality. They continue to be a primary medium for making interpretations about the past due to their ubiquity and durability in the material record. Their attributes are essential for identifying or, in some cases, measuring social boundaries, defining locality and mapping out broader regional interactions. At the basis of all site analyses is the categorization of ceramics into a phase, and explicitly judging whether a potsherd is local or not (Druc 2013: 487-488; Ford 1954). Culture historians, like Willey, tended to collect and only examine decorated pottery as they were presumed to be highly consequential to major shifts in sociopolitical organization, while undecorated pottery was assumed to be inconsequential to political change and thus, associated with the local and mundane (Jorge et al. 2013: 826; Ramón and Bell 2013). Early debates about the local/non-local then, were dependent on variation in decorative style. Decorative style allowed archaeologists to easily compare different site assemblages and reconstruct the nature of socio-political organization, including intra- and inter-group interactions and knowledge dissemination. It is also through the recovery of decorated surface ceramics that survey archaeologists determine the spatial and chronological extent of a site. Researchers plan their excavations and sampling strategies from these survey findings. So, the local is part of a method to separate and distinguish groups, and to understand how they may have interacted.

Going back to Willey's (1953) survey, decorative styles played a role in defining the local ceramic sequence for the Virú Valley, and in contrasting "local" cultures against other cultures in different valleys. For example, the Tomaval Period[5] (1000-1300 A.D.) is marked by a series of decorative black ware pottery, including black ware with relief-pressed images (San Juan Moulded) and red pressed ware (San Nicolas Moulded) (Willey 1953: 234). While there are variants of Tiahuanaco[6] polychrome pottery during this period in the valley, it is minor and infrequent (Willey 1953: 234-235). This contrasts the dominant ceramic styles found on the central coast (i.e. Moche and Chicama Valleys) which include high frequencies of polychrome pottery in a coastal Tiahuanaco style (Willey 1953: 235). The Tomaval Period is a local sequence that describes cultural development in the Virú and does not describe patterns in other valleys. On the one hand, discussions about locality are tied to differences in the frequencies of decorated pottery. On the other, it is tied to the archaeologist's perceived understanding of social boundaries. This is generally in the form of geography and in Willey's case, this is wrapped up in the divisions of valleys in Peru.

I previously mentioned that plainware ceramics were considered "local," and thus inconsequential to political change so they tended not to be analyzed. Plain, undecorated ceramics tend to be assumed to belong to the domestic sphere, associated with being low cost, utilitarian, produced from nearby sources for nearby consumption, and excluded from trade (Druc 2013; Jorge et al. 2013: 826; Ramón and Bell 2013). Conversely,

[5] This time period is better known as the Late Intermediate Period (1000-1500 A.D.).
[6] Another spelling for Tiwanaku.

decorated ceramics were linked to higher costs, ritual practices, and likely presumed to be produced elsewhere and acquired through long-distance trade (Druc 2013; Ramón and Bell 2013). This meant that previous understandings about the local/non-local relied on decorative style because research questions focused on larger, sociopolitical organization. This assumption has led to a sizeable gap in understanding everyday interactions, especially when undecorated ceramics make up the bulk of ceramic assemblages (Ramón and Bell 2013: 595).

Another way of conceptualizing locality through ceramics is through pottery production, specifically the social boundaries created by the landscape of raw materials. A chaîne opératoire approach helps deconstruct ceramic artifacts into various stages of their production. By tracking each component across space and time, it may be possible to see moments of shared or individual ideas and techniques between communities (e.g., see Gosselain 2017). This involves examining paste composition, possible resource areas (and distance to/from such locations), and potter's behaviours (Druc 2013; Jorge et al. 2011; Li 2007). Researchers determine if ceramics are local by the geographic origins of materials for ceramic manufacture from the surrounding ecological landscape (Druc 2013). This is a departure from earlier approaches as production studies take into consideration undecorated pottery. At the same time, these studies retain the idea of locality being strongly associated with space. For example, Galaty's (2008) petrographic study of ceramic production and distribution systems in prehistoric Mississippi takes on a ceramic-ecological approach (Arnold 1993; Matson 1965). In particular, he examined surface geology, hydrography, and physiography to track the availability of water, fuel, clay, and temper resources on the landscape to compare against the different fabrics from the sampled pottery (Galaty 2008). Vessels were classified as "non-local" if the resources were not readily available in the surrounding landscape (Galaty 2008: 249-251). Galaty's (2008) work is an example of a general archaeological trend of moving away from defining groups of people based on the broad geographic distribution of an artifact type or decorative style, and towards understanding human practices and behaviours. He examined the production sequence (chaîne opératoire) to understand economic change in pottery production and distribution. Galaty's (2008) study shows how ecological affordances on the landscape can affect resource procurement. While still strongly rooted in spatial proximity, locality here is also defined by practice through one aspect of the production stage of a ceramic's social life. This contrasts with earlier iterations of locality which were defined by decorative style and finished ceramic products.

Other ceramic-focused scholars explore locality in terms of shared ideas and material practices by particular communities. For example, Michelaki et al. (2015) examined daily potting practices from two sites in Calabria, Italy during the Neolithic Period through a taskscape perspective. They looked at clay sources, particularly their variability, distance from sites, distribution, and location relative to other resources and features in the landscape synchronically (Michelaki et al. 2015: 822). Unlike Galaty (2008), Michelaki et al. (2015) examined the potter's social choices in obtaining raw materials for pottery making at a much smaller scale, focusing on two sites rather than multiple sites. By narrowing the scale of analysis, they expanded their study to a more complex inhabited landscape by considering tasks that would affect choices in clay procurement. Some of these choices include where inhabitants gathered or hunted food, collected water, tended animals, and collected materials for ground stone toolmaking

(Michelaki et al. 2015: 819-821). Michelaki et al. (2015) observed that potters only used material in the immediate surroundings, and the introduction of traded ("non-local") obsidian did not shift potting practices significantly. However, a closer analysis of the use of clays showed variation in material. While the decoration of "Stentinello" pottery was consistent across the landscape, pots were being produced using metamorphic clays, varicoloured clays, or a mixture of the two across space (Michelaki et al. 2015: 815-818, 821). They found both metamorphic and varicoloured clay sources on the same plateau (Michelaki et al. 2015: 821). In terms of understanding locality, these two sites could belong to one local community given their locational proximity or their shared decoration and use of similar materials. Michelaki et al. (2015) argue that while these groups sourced their raw materials and produced similar decorative styles, they may have identified as two separate potting groups at these two sites. For example, potters may have preferred exploiting one type of clay resource over another or obtained other raw materials from places further away (Roddick and Klarich 2013: 113-115). These choices in raw material selection are not always tied to proximity or function (Michelaki et al. 2015: 819-820). Studies like Michelaki et al. (2015) complicate the formation and maintenance of local/non-local boundaries because they consider not only potter's choices in raw materials, but also how they are influenced by other activities and actions on the landscape.

Movement away from the study of only decorated ceramics led to a strong focus on ceramic production and technology where attempts at differentiating the local from the regional became rooted in provenance studies. However, ethnographic studies tell us about a more complicated perspective on local/non-local designations with regards to production. Druc's (2013) study of ceramic production at the Late Formative site of Kuntur Wasi (Department of Cajamarca, Peru) and the modern-day village of Mangallpa revealed differences in production practices that were dependent on distance. At Kuntur Wasi, there was no evidence for ceramic production at the site, but "local" and "non-local" pottery were present (Druc 2013: 500). Mangallpa, a village situated 7 km away, has potters who produce ceramics either within their own villages or in the location where they sell their pots (Druc 2013: 501-503). For long-distance trips, potters brought their tools with them and produced pottery at the location where they sold their wares (Druc 2013: 501). However, if potters sold pots within 3 hours of the village, they would produce ceramics at home before carrying them to sell (Druc 2013: 502). This potentially may have been the case at Kuntur Wasi, where ceramics were made off-site. Druc (2013:502) argues that what is local in this context should be expanded to include production spaces, not just where raw materials came from.

In a similar vein, Ramón and Bell (2013) challenge the assumption of domestic pottery being local. They studied the distribution of ceramics within the Piura Highlands of Peru and saw that only 4 villages produced pottery even though there were over 60 villages in the area (Ramón and Bell 2013: 602-603). This was done by tracking and mapping the distribution of technical styles (Ramón and Bell 2013: 602). Potters from these 4 villages produced domestic pottery for themselves, their community, and for trade with other villages (Ramón and Bell 2013: 609). These pots are not locally produced for many of these villages.

Both Druc (2013) and Ramón and Bell's (2013) studies reveal that it is the place of production that constitutes what is local or non-local for present-day Andean potters and their communities, not necessarily where potters gathered their resources. The problem with defining locality only through paste and its availability by distance is that it does not consider the social choices made by potters, but also the people using these pots (Costin 2000; Livingstone Smith 2000; Gosselain and Livingstone Smith 2005; Roddick 2009; Rice 1987). Social choices could often reflect intra- and inter-community dynamics between potters and those that use pots. They may reveal how technical and social behaviours are shared across space or passed down over time (Gosselain and Livingstone Smith 2005: 44). For example, the transmission of technical knowledge to produce pots can be dependent on kinship or marriage ties, or social position (Bowser and Patton 2008: 121-124; Gosselain 2016: 40-41). Similarly, how vessels are used (i.e. for cooking, storage, ritual), and how or when ceramics are disposed of (randomly or systematically, and degree of brokenness and reusability when dumped) can give insight on refuse behaviour, residential mobility, or abandonment of space (Hardy-Smith and Edwards 2004: 256; Hayden and Cannon 1983: 157-160). By looking at pottery and whether potters are choosing resources and sharing techniques within a tightly bound area (what might be called local), one can explore "locality" in terms of shared knowledge and practice between sociopolitical groups rather than simply locality writ large as political, ethnic, etc.

Lastly, how ceramics are sampled influences the way in which we understand site boundaries and the local. Many studies rely on surface scatters to help phase sites before excavation occurs. The patterning in the surface sherds, however, are affected by numerous post-depositional processes at play that can alter the presence/absence of different kinds of pottery forms, frequency of decorated and undecorated sherds, and fragmentation rates (Banning 2001; Chapman 2000). This includes human and animal activities (trampling, bioturbation), erosion and weathering. Pottery weight, size, form, and paste can also affect breakage susceptibility and variation in fragmentation rates (Varien and Mills 1997: 144). Subsequent or even undocumented surveys also deplete the densities and variability on the surface (Banning 2002: 23, 140, 220). The use life of a ceramic vessel varies but only its final use and location are recorded by the archaeologist (Varien and Mills 1997: 144). A pot may have served multiple functions and may have been passed on for generations, but that information is often lost, leading to earlier-dated pottery types appearing in later phases. Post-depositional variation affects how the local is interpreted because temporal boundaries produced by past actions are collapsed and become distorted in space. Ceramic sampling is another facet that influences how boundaries between the local and non-local are perceived by the archaeologist.

To summarize, there are three overarching issues in ceramic focused approaches to conceptualizing ideas of locality: 1. The tendency to value decorated sherds over the undecorated, 2. The over emphasis on ceramic production, and 3. The role of ceramic sampling in analyses in interpreting social boundaries. These elements are undoubtedly important in defining the local but are limiting if other variables are not considered. These variables include social and technological choices, which can communicate boundaries, while depositional and taphonomic processes can blur boundaries. These issues are highlighted in some of the case studies I briefly summarized, and I argue that we need to consider locality from different angles (i.e. production, use/deposition, and post-deposition) to understand how local or non-local boundaries are formed and how interpretations of the local are affected. It should, of course, be noted that ceramics alone do not and cannot constitute a total understanding of locality and explorations of other materials and features are necessary, though such a synthesis in the Taraco is beyond the scope of this thesis. However, given their ubiquity in the archaeological record and their relevance in both everyday and more occasional, specialized ritual events, they serve as a significant medium.

The Local as a Social Boundary

Locality and social boundaries are intricately tied to one another. For culture historians, boundaries were determined by the spatial distribution of ceramic styles which was a proxy for occupational extent. Processual archaeologists valued function over style and tended to argue that style functioned to create or maintain boundaries between people through its communicative properties (Wobst 1977). The fundamental connection between social boundaries and locality, then, is through style and material culture patterning. Attempts to differentiate the local from non-local is itself an act of differentiating social groups from one another. Social boundaries are highly contextual, with groups using different material culture to signal boundaries (Stark 1998: 8-9). Human actions could also be concealing or crossing boundaries on purpose, or boundaries could be blurred by post-depositional processes affecting the material record (Stark 1998: 9). For example, in 17th century Southern New England, colonialism led to an increase in factionalization among Indigenous tribes (Goodby 1998: 176). Pottery decoration was used as a medium to express tribal affiliation and boundaries (Goodby 1998:171). Some Indigenous women chose not to mark their pottery with any elaborate decoration, potentially as an act of resistance against the effects of colonialism, and as an attempt to express unity among tribes (Goodby 1998: 178-179). This is a case of actively crossing a social boundary. Culture-historical and processual frameworks emphasize how groups of people could be differentiated from one another analytically or inferentially. There is no discussion on how boundaries of space could be affected by human agency, nor any discussion on how taphonomy might affect material culture patterning.

2.3. Nuanced Approaches to Locality

The notion of something (or someone) being local can be driven by other factors that are not always definitively visible nor are they static. This includes understanding kinship ties, social class, gender, and the social life of the pot itself (Peelo 2011: 689). Locality goes beyond the analytical and inferential scales often used in archaeology. Other anthropologists (Table 2.1) have argued that locality speaks to the affective senses where local is relational and contextual, rather than being tied to space or scale (e.g. Appadurai 1996, 2013; Casey 1998). For Massey (1994), it is the social interactions and relationships that define what or who is local. Kosiba (2011) sees locality as both a socially constructed reality and an active political claim. With Blake (2011) and Peelo (2013), local is the result of fluid community dynamics and ideas about the local are tied to both individual and community identity. Druc (2013: 505) believes in the plurality of locality, advocating for a contextual approach that examines its production from seven angles (the physical, statistical, technological, economic, conceptual/representational social, and political) to capture the lived experiences of past peoples. The question then, is whether they all simultaneously exist. Do interpretations about the way people lived in the past change if the analytical category is changed (i.e. from production to deposition)? Are competition-based narratives surrounding local polities preceding state formation still reasonable to use if the idea of locality is no longer bounded by designations of the site, but rather by material practices? I suggest that the Late Formative Period should be examined without relying on evolutionary assumptions about cultural development (see sections 1.5 and 3.5). By framing the Late Formative through an evolutionary perspective, it further narrows down the potential histories and stories that could be interpreted about people of the past, especially given that this time period is still not well understood. By comparing the different modes of possible locality, one can complicate how communities interacted and shared their ideas with one another.

Technological Style and Production

One potentially significant shift in ceramic-based approaches to locality would be to consider other angles to locality through these objects. This requires us to examine variability at multiple scales of analysis. Examining technological style in space offers a more nuanced, multiscalar perspective on the formation of local identities in the past. Lechtman's (1977: 12-13) concept of technological style refers to the notion that "style" is not confined to the final product/artifact itself, but rather exists throughout the entire production sequence (see also Lechtman 1994). For example, Peelo's (2011) study of the formation of identity at the Mission San Antonio de Padua in California shows how technological style reflects situational identities. She examined how potters gathered their resources and their production steps (forming, shaping, firing, and finishing techniques) to understand the transformation and incorporation of foreign ("non-local") technological traditions into their daily practice (Peelo 2011). These non-local traditions became individualized and began to represent their own social identities (Peelo 2011). "Local" identities were not forgotten or statically maintained, but rather, they were built and transformed through individual and shared material practices. Practices are fundamental to identity making in that they form part and parcel of local tradition making-how things are done, why things are done in certain ways. Shared and differentiated practices form a boundary line in alterity.

In particular, Peelo (2011) suggested local identity formation at the mission was tied to a combination of shared production practices, including the use of similar local raw material resources and ceramic firing techniques, having gendered divisions in primary forming techniques, and similar access to crafting knowledge. While potters all came from different communities, they produced a shared mission-centred colonial identity through ceramic production, as all potters shared knowledge over the appropriate kinds of clays and tempers to use and proper firing techniques, like the use of open fires (Peelo 2011: 654-656). She also saw similar gendered differences in primary and secondary production techniques across communities, with women usually hand-molding pots while men produced wheel-thrown pots (Peelo 2011). Production processes represent cultural behavioural patterns because everyday practices are routinized through repeated and habitual actions over generations of learning (Dobres 1999: 128-130; Gosselain and Livingstone Smith 2005: 42-43). By examining a wide range of attributes associated with production techniques instead of just the finished pot, researchers can trace different local material practices and technological styles. This approach allows us to examine the multiple scales of an artifact’s composition and use to understand processes of localization in ceramic producing communities.

Similarly, Parkinson (2005) suggests modelling the nature of boundary maintenance diachronically at multiple geographic scales to better understand the development of various forms of sociopolitical organization over longer periods of time rather than identifying short-term explanations that imply abrupt change. For example, he suggests that stylistic attributes can be used to measure the number of social interactions to identify boundaries in the Carpathian Basin (Central Europe in present day) between the Late Neolithic to Copper Age. Parkinson (2005) focused on two stylistic qualities- the relative visibility of the attribute, and its social and geographic distribution. He noticed that Neolithic communities "actively maintained clearly defined boundaries created by and also encouraged by in-group interaction" all between the three geographic and social scales (macro-regional, regional, and micro-regional/local) he defined (Parkinson 2005: 53).

Deposition

Examining ceramic deposition is as equally important to conceptualizing locality as production and recovery. Depositional acts are social practices that are part of place-making. This is important to local/non-local discussions. Unlike production, which highlights the actions of a specific subgroup of people (potters) within communities, depositional practices are part of broader identities, marking the boundaries between peoples who may share or differ in their daily tasks (i.e. Fladd et al. 2021; Hitchcock and Bartram Jr. 1998). There is a highly contextualized relationship between style and social boundaries (Lechtman 1977; Roddick 2009; Stark 1998: 8-9). Communities can signal boundaries using different forms of media and one way is through the material culture patterning of ceramic discard (Stark 1998: 8-9). Depositional practices are learned and reproduced over time and can reflect both ideologies and choices people made in organizing the spaces they inhabited (Hardy-Smith and Edwards 2004; Joyce and Pollard 2010).

One example of ceramic depositional variability is seen in Bray et al.'s (2005) study of the mortuary ceramics associated with Capacocha[7] sacrificial ceremonies from the Inka centres of Ampato and Llullaillaco (Argentina). At both sites, at least one of the female children interred was found associated with locally produced pottery (local in the sense of raw material origins) (Bray et al. 2005: 96). In contrast, there was only one burial of a male child at each of the sites, and both were found with Inka vessels produced in imperial centres (i.e. Cuzco or Titicaca) (Bray et al. 2005: 96). The authors used DNA analysis to explore whether the origin of the pottery was linked to the status and ethnicity of the children. The DNA evidence suggests that burials with the non-local ceramics were likely local (Bray et al. 2005: 96). The second possible interpretation – based on the similarities in the diversity of vessel forms found between the female and male children with non-local wares – is that the interred pottery established the sacrificial roles and status of the children (Bray et al. 2005: 97). This case shows that the locality presented through depositional processes may be distinct from the kind of locality associated with ceramic production (based on material sourcing). Attention to ceramic deposition can change how one understands local identity or the dynamics of social boundaries.

While Bray et al. (2005) remind us of special kinds of deposition, archaeological focus on deposition also relates to the more mundane variation of the local, as seen in breakage and fragmentation variability which connects to practices of locality. Fragmentation speaks to locality in the form of waste disposal practices and the frequent/infrequent use of certain spaces (i.e. the care given to keeping spaces clean) over

[7] The Capacocha ceremony was a state event often performed when an important figure was born or died, or after conflict (Bray et al. 2005: 83-84).

others. It is useful in understanding use-histories (of both the intensity of space and pottery use) and the post-depositional processes affecting the recovery and subsequent sampling of ceramics, which can be helpful with phasing a site (Arnoldussen and de Vries 2019; Buko 2008; Chapman 2000; Rice 1987). Tracking the degree of fragmentation can help researchers understand the activities that took place in a space, whether depositional or post depositional (Arnoldussen and de Vries 2019). For example, ceramic fragmentation can be indicative of a ceramic production centre or space if many broken, distorted, or over-fired sherds are found associated with ash deposits and/or related features like remnants of a kiln (Orton and Hughes 2013: 146). Trampling leads to higher fragmentation rates and suggests frequent use of a given space but can also obscure the original spatial patterning of material deposition (Nielsen 1991: 483). Spaces with low densities of fragmentation can be suggestive of intentional deposition (Arnoldussen and de Vries 2019: 204).

Spatial/Attribute Analysis and the Local

Given that locality operates at many scales, of identity (individual, family, community, region), space (locus, unit, site, area), and time, the use of GIS seems to be a well-suited method to examine the local as it uses a relational database (Kealhofer 1999). Its relational database means that it can organize large amounts of data, examine spatial clustering, and even involve multivariate geospatial modelling (Howey and Burg 2017). Several scholars have made similar arguments over a need to examine large artifact datasets at different scales to better understand how social boundaries are created and maintained (e.g. Galaty 2008; Gosselain 2017; Jorge et al. 2013; Parkinson 2005). However, few have explored GIS as a way to start mapping out different vessel attributes across various spatial and temporal scales. When scholars do use GIS, the focus tends to be on tracking production attributes across multiple sites at a broad time scale (i.e. a period). Tracking ceramic use and deposition is crucial to understanding the local because they signal a different kind of social boundary-one that reflects a style of action[8], rather than material style (Dietler and Herbich 1998: 236; Lechtman 1977: 15). Moreover, tracking change in smaller slices of time diversifies our understanding of the rhythms of social change that otherwise would be flattened by periodization schemes (Swenson and Roddick 2018). GIS allows you to split time into multiple layers or collapse time into a single layer to examine the spread of vessel attributes, allowing you to cross scales of time (Aldenderfer 1996; Wheatley and Gillings 2002). It is also useful for data visualization for qualitative assessments on pottery distribution.

There are a handful of scholars who have deconstructed pottery into their constituent attributes and mapped the distribution to see whether any technological and/or social boundaries overlapped (i.e. Galaty 2011; Gosselain 2016; Roux et al. 2017). Gosselain's (2017) production of nine maps of Niger polychrome water jars is particularly striking because it is one of the very few case studies that actually map the distribution of individual ceramic attributes. This includes maps of the study area with all identified sites bounded by three valleys (Niger River, Bosso, and Fogha), maps tracking vessel shapes, location of decoration, ornamental techniques, painting tools, painting materials, tempering materials, shaping techniques, and shaping tools. Gosselain thus identifies the subtle manufacturing attributes and their association to

[8] A *style of action* is distinct from *material style* in that action, or the way of doing things is not necessarily tied to the original purposes of the production of a material object (Dietler and Herbich 1998: 236). A cooking pot, for example, may have been produced for the purpose of cooking, but could end up being used to store other objects or used as a dish to eat directly from.

social boundaries, rather than tracking decorative style exclusively. For example, iron blades are thought to have been exclusively associated with polychrome vessels, but he found that their distribution was isolated (Gosselain 2017: 94-95). He found that these pots were produced outside of the original learning networks as potters replicated the designs using sticks and millet ears instead of blades (Gosselain 2017: 94, 104). This change in technique would not have been seen if only decorative style was mapped as it would have only shown an overall proliferation of the polychrome tradition. Gosselain (2017: 103) argues that the spread of Niger River polychrome water jars is tied to socio-historical factors, including "socio-professional status, marriage prescriptions, temporary or permanent migrations, location of resources or trading places, communication axes, ecological contrasts, climatic crises, etc." While Gosselain explored the many facets influencing social boundaries of ceramic production, these maps do not effectively show temporal change or the intensity of space use. In Chapter 4, I return to this and show a potential way for use intensity to be visualized to help explore persistence or changes in material practices through time.

The idea of using GIS to investigate multiple scales of space and time is not new. From its early uses in archaeology in the 1990s, GIS has been touted as an efficient method for predictively modelling the past while incorporating large amounts of data with varying resolutions (Howey and Burg 2017; Wheatley and Gillings 2002). GIS is well suited to ceramic attribute analysis when combined with a chaîne opératoire approach since it can map out the various technical and social choices involved in the production, use and discard of things (Hacigüzeller et al. 2019: 179-180). By examining pottery attributes in space using GIS, one can compare patterns in material culture between each stage of a ceramic's life history. These patterns may reflect differential boundaries of the local being created by people's choices, or they may reveal the maintenance of local boundaries through shared practices.

2.4. Theoretical Background Summary

This chapter served to outline the historical trajectory of how locality has been theorized, particularly the way locality has been defined as a spatial unit and how archaeologists are recently looking at locality as a form of social boundary and exploring how local can be affected by different kinds of activities and choices potters make (Table 2.1). What is missing from this conversation is how locality becomes affected by how people use and discard pottery, which can reflect local or non-local boundaries. In this thesis, I seek to put three perspectives of understanding locality into conversation with one another: the spatial, the technological, and the depositional. When analytical and technological understandings of locality are juxtaposed together, they reveal how potters are not confined to only ecological restraints that a spatial understanding might suggest. Rather, it highlights the human agency and choice in sourcing and producing pottery based on a variety of social interactions with daily tasks, individuals, and groups. Interestingly, no one has really considered incorporating and juxtaposing patterns of depositional practice against the analytical and technological spheres of the local. However, depositional practice brings pottery users into this complicated dialogue of the local as people's choices and behaviours in pottery use and discard could signal different boundaries than those produced by potters.

I examine locality using two definitions in my thesis. My first speaks to the traditional, analytical and inferential definition where local refers to the geographic/spatial boundaries and divisions made by archaeologists (i.e. the site and unit). This is the approach that was laid out in section 2.2. My second definition revolves around the idea of practice, where shared behaviours and routines may distinguish local from the non-local. Exploring the concept of locality on the Taraco Peninsula is beneficial in four ways: 1) it challenges the idea that local identity or practice is static; 2) it considers the depositional stage of an artifact's life history in understanding how locality is actively produced; 3) it considers the role of plain, undecorated sherds which make up the majority of many ceramic assemblages; and 4) it helps to rectify the gaps in understanding and interpreting sites and their inhabitants by pushing excavation against survey analyses. In the next chapter, I provide a regional background of the Southern Lake Titicaca Basin and describe the previous work on the Taraco Peninsula including Kala Uyuni, Sonaji, and Kumi Kipa.

The conceptualization of the Local	Archaeological Method or Theory	Reference
A spatial unit that begins at the scale of the site, often used to define cultures and time periods	Theory (general archaeological methods and theory) Method: Predominant in survey work via decorated ceramics	Willey and Phillips 1958; many early or traditional settlement pattern studies
Built on the social relations and processes, and will partly involve some sort of difference or conflict; social interactions/processes that define locality, in part, is also dependent on the research question -can be tied to space, but exists beyond it	Theory (gender in relation to space and place)	Massey 1994: 138-139
Relational and contextual; has a complex phenomenological quality linked to ideas of agency, sociality, and reproducibility -not scalar or spatial	Theory (space and place in relation to globalization)	Appadurai 1996: 178-179
Rooted in action and affective sensation (dwelling)	Theory (space and place)	Casey 1998: 305
Knowledge and learning as key to communities of practices, as expressed through technological style	Theory (knowledge and learning)	Wenger 1998: 122-123; Roddick 2009
Culturally and linguistically affiliated; can be situational based on social, economic or symbolic pressures rather than only symbolically meaningful to identity	Ethnography, Focus on Ceramic Production (Technological Style)	Gosselain 2016; Gosselain 2017; Galaty 2011
An active political claim and/or linked to shared socioeconomic practices; a social reality	Pottery Vessel Types (Decorative) and Architectural Styles; Focus on Spatial Distribution	Kosiba 2011
An understanding of identity that is fluid and can be situational, but also influenced by shared and individual practices, geography, and archaeological analyses/interpretations	Pottery and Ethnography; Focus on Ceramic Production	Peelo 2011
Contextual and dependent on seven types of understanding: the physical, statistical, technological, economic, social, political, and conceptual or representational	Pottery and Ethnography; Focus on Ceramic Production	Druc 2013
Tied to practice (taskscapes), but also exists at the analytical and inferential scale	Focus on Ceramic Production	Michelaki et al. 2015

Table 2.1 Summary of the ways locality has been conceptualized mentioned in this thesis.

Chapter 3: The Taraco Peninsula

3.1. Overview

In this chapter I provide a brief overview of the Southern Titicaca basin region to situate my project. I describe the Late Formative Period and the ceramics diagnostic to this phase. I then summarize the ecology, geography, and archaeology of the Taraco Peninsula. I explore how archaeologists have explored locality in their work and show the value in re-evaluating data and interpretations based on ideas explored in chapter 2. Finally, I present my research questions framed around the two definitions of locality I introduced at the end of the previous chapter.

3.2. The Late Formative Period and Ceramics in the Lake Titicaca Basin

Period	Date
Initial Late Formative	250 BC – AD 120
Late Formative I	AD 120 – 240
Late Formative II	AD 240 – 420
Terminal Late Formative	AD 420 – 590

Table 3.1 Late Formative Period phases based on changes in decorated pottery. From Marsh et al. 2019

The Late Formative Period (200 BC- AD 590, Table 3.1) is defined by a set of architectural features and ceramic styles coinciding with the emergence of regional political centres (Smith 2016). In comparison to the Middle Formative Period (800 -200 BC), the region saw an increase in the presence of monumental architecture, of agropastoral activities, of trade, and of the skilled (and standardized) production of crafts (Bruno 2014: 137; Hastorf 2008: 554; Janusek 2004: 2008). The landscape was filled with features associated with the Yaya-Mama religion tradition (Janusek 2004b: 82-83), with characteristic sunken court complexes, earthen platforms, a central plaza, carved monoliths, stelae, ritual paraphernalia (i.e. ceramic trumpets, incense burners), decorated serving ware, and anthropomorphic iconographic styles. Earlier iconography is linked to “power to” (Hastorf 2008 554) imagery and consisted of “human heads or whole bodies, often with two sexes on the same stone, heads at either end of the body or four appendages emanating out of one head” (Bandy 2001:286; Janusek 2004b: 82). These images are interpreted as being associated with generative power and agricultural fertility (Janusek 2004b: 84-87). The later “power over” imagery (Hastorf 2008: 554), in contrast, consisted of disarticulated heads, bodies, front-facing deities, male figures holding knives, etc. (Chavez 2002 as cited in Hastorf 2008: 554). This shift has been interpreted as signifiers of the rise of militarism and the development of social hierarchy, while other imagery (i.e. mythical creatures on monoliths, Camelid Woman, feline man) signified transcendence (into other states of consciousness through mind-altering substances) and mythical ancestry (Janusek 2004b: 97-104). This narrative focus on elite power and monumentality, however, obscures the smaller-scale processes occurring within the everyday realm. Hastorf (2008: 557) notes that there has been less research into domestic architecture and spaces (which may have been temporary).

During the first half of the Late Formative, the Pukara polity emerged in the northern basin with Taraco and Pukara becoming major centres (Janusek 2008; Levine et al. 2010). Although scholars continue to debate whether the Pukara polity was a state, federation, or interaction network, current archaeological evidence suggests that there was no southern regional polity comparable to Pukara until around AD 200 (Janusek 2008). Many Late Formative centres were built in areas with little evidence of Middle Formative occupation or long-term occupation (Smith 2016: 10). These centres are much further inland compared to earlier centres built near lakes or riversides and are at the peripheries of Middle Formative sites (Smith 2016: 10-11). This suggests a possible shift in road or travel networks, as well as an increasing shift towards camelid pastoralism (Smith 2016: 10, 108-114, 192-195). Shared architectural and ceramic styles also suggest more cohesive and interactive networks between communities (Marsh 2016). More elaborate and complex ceramic, lithic, and metal technologies appear during this time (Janusek 2008: 20-21).

Ceramic styles defining this period typically fall under Kalasasaya red-rimmed and zonally incised vessels, or Qeya vessels (Janusek 2003, Figure 3.1). Kalasasaya styles were seen on various pottery forms such as ollas, vasijas, shallow, and pedestal bowls (Marsh et al. 2019). Qeya vessels were typically in the form of flaring-rim bowls, drinking cups, and scalloped annular bowls (Marsh et al. 2019: 802). These decorated ceramic styles appear at low frequencies and are completely absent between 250 BC – AD 120 in the region (Marsh 2016; Marsh et al. 2019). Of the three styles, only Kalasasaya red-rimmed vessels were ubiquitous, but these were dispersed and low in quantity at most sites (Marsh 2016). Use of Kalasasaya zonally incised pottery declines after AD 240, while Kalasasaya red-rimmed vessels continue (Marsh et al. 2019: 813). By AD 420 – 590, all Kalasasaya styles disappear, and ceramics are characterized by Qeya and transitional styles, with an increase in the diversity of decorative styles and the introduction of Tiwanaku Redwares towards the very end (Marsh et al. 2019: 812).

Late Formative pottery is further marked by an increasing presence of mica-infused tempers through time while fibre tempers decrease (Janusek 2003; Roddick 2009). They also primarily have sand or ash tempers added, they are exteriorly wiped/burnished and interiorly wiped with thinner walls in comparison to the Middle Formative Period (Roddick 2009: 261). Common vessel forms from this period include *ollas*, jars (medium to large), *vasijas* (small jars), and bowls (Janusek 2003: 40). Roddick (2009) has observed a high degree of standardization in technological style amongst potting communities in the Taraco Peninsula, suggesting that they were one community of practice. Shifts in ceramic production practices during the Late Formative are much more subtle than previously thought, as changes appear mainly in technological attributes (which are reflective oflearned practices) (Roddick and Hastorf 2010).

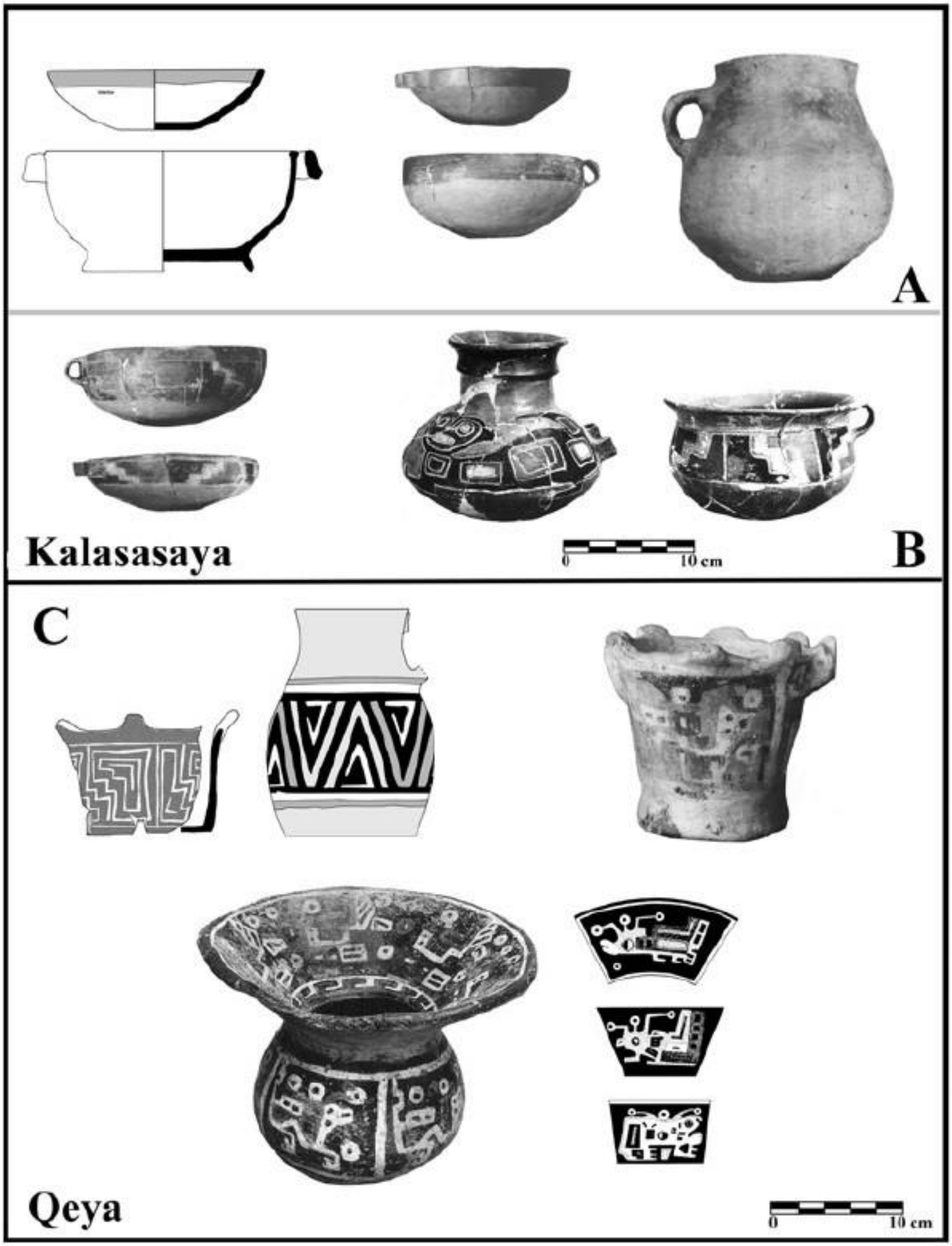


Figure 3.1 Late Formative decorated wares. A) Kalasasaya red-rimmed, B) Kalasasaya zonally incised, C) Qeya incised (top left) and Qeya polychrome (top right and bottom). Adapted from Janusek 2004b: 118.

3.3. The Taraco Peninsula: Ecology and Geography

The Taraco Peninsula is located on the southernmost extent of the Lake Titicaca Basin as a low-lying mountain range between 3810-4000 masl (Bruno 2014: 133). Taraco is in the Taraco district, Ingavi province, and is part of the Department of La Paz, Bolivia. It lies 80 km west of the city capital. The basin is classified as an intertropical climate zone with low humidity and temperatures (Stanish 2003: 33). Climate in the basin has been unstable, with fluctuating lake levels (Stanish 2003: 33-34). Rainfall in the altiplano is periodic and generally drier from June-September and wetter from December to March (Janusek 2004b; Stanish 2003:33-34). At this altitudinal zone (*suni*), crops can still be grown while any altitude beyond 4000 masl (*puna*- 4000-4800 masl) is dedicated to llama herding or cultivating potatoes (and other tubers) to make *chuño* (Janusek 2004b; Stanish 2003: 34-35). Because soil quality in the highlands tends to be poor (lacking nitrogen and phosphorous), camelid dung is often used as fertilizer (Orlove and Godoy 1986 as cited in Bruno 2014: 134). The most important crop in the altiplano is the potato (Stanish 2003: 35).

The modern communities of Coa Collu, San José, Santa Rosa, and Chiripa are located on the Taraco Peninsula. Today there are no active potters in these communities (Roddick 2009). However, the best kinds of clay resources can be found in the Taraco Hills and just outside of the Coacollu community near Kala Uyuni, based on Roddick's (2009) raw material survey and consultation with a local potting family practicing near Tiwanaku. The quality of potting clay is generally much lower near the lakeshore (Roddick 2009: 271).

3.4. Archaeology on the Taraco Peninsula

My research builds upon the work and data collected and generated by archaeologists, student volunteers, and workers of the Taraco Archaeological Project (TAP), a project that began in 1992. TAP has conducted a full-scale survey of the region and has conducted excavations and artifact analyses at four major Formative Period sites. Early research focused on determining the cultural and ceramic chronology in the Southern Lake Titicaca Basin and tracing the social, economic, ideological, and political processes across the Formative Period (Bandy and Hastorf 2004: 3). Excavations at Chiripa, a major Middle Formative political centre was foundational to studies in the region for understanding the Middle Formative Period. Building on earlier work at the site (e.g. Bennett 1936; Browman 1978; Chávez 1988; Kidder 1956; Ponce Sanginés 1970; Wallace 1957), TAP researchers detailed sequences of ritual architecture to clarify religious practices (Bandy and Hastorf 2007). Research focused on the construction of sunken courtyards and ceramics from the Early-Middle Formative, as well as agricultural and subsistence developments in the basin (Bandy and Hastorf 2007: 1).

Bandy's (2001) conducted a full coverage survey of the Taraco Peninsula and studied settlement patterns and the emergence of complex societies. Prior to his large-scale survey, the Taraco Peninsula was covered in a low-density scatter of ceramics (Bandy 2001: 40). He identified close to 500 sites based on the relative density of ceramic scatter (Bandy 2001: 40). For a space to be considered a site, there must be a minimum density of 0.1 sherds/m^2 over at least 100 m^2 and dated to a single time period (Bandy 2001: 41). The site centre was determined based on the highest ceramic density of the area, and the areal extent was determined in reference to this centre point (Bandy

2001: 41). Using a modified version of Lee Steadman's earlier ceramic typologies and analysis on the Northern Titicaca Basin, he phased each site (Bandy and Hastorf 2005: 6; Roddick 2009). His ceramic analysis consisted of identifying the assemblages from surface scatters and interpreting occupation at each site based on presence, abundance, and frequency of "diagnostic" (decorated) pottery types (Bandy 2001: 44-56). He compared the relative density of each ceramic type at each site to understand the growth and decline of village populations. Bandy (2001; 2004: 330) hypothesized that independent villages around the Early/Middle Formative periods fissioned into smaller scale villages as they could not mitigate conflict related to scalar stresses because of a lack of political infrastructure (Bandy 2004a: 330). In the Middle Formative Period, a religious tradition (the Yaya-Mama Religious Tradition) developed in the region and fissioning events ceased, leading to an increased number of permanent villages. This is called the multi-community polity model, which was used to explain the process of power consolidation at politico-religious centres (Bandy 2004a: 331). For Bandy (2001; Bandy 2005: 106), the Late Formative Period is characterized by the introduction of multi-community polities (polities that contain more than one village).

Discussions surrounding the local, including processes of localization, understanding political relations and human interactions, were implicitly framed around occupational histories defined by Bandy's survey work. His approach follows a mixture of at least two understandings of locality, where it is a spatial unit that used to differentiate cultures and periods, and as a way to define sites based on regularities in space (i.e. a minimum density requirement). This version of locality does not consider boundaries created by ceramic production or deposition. Rather, it focuses on geological and politico-administrative boundaries between periods because it is a regional analysis.

Bandy's multi-community model and overall survey results/interpretations later provided the foundation for subsequent excavation plans, methods, and interpretations of the material record on the peninsula. This has led to a plethora of research on agricultural development and intensification, subsistence and mobility patterns on the peninsula. What this also means is that many of these studies have been built on Bandy's version of the local, and interpretations about the past revolve around a more regional scale of understanding when it comes to locality. I return to this issue later in section 3.5 to briefly discuss the major ways local has been understood in the region

Kala Uyuni

Figure 3.2 Photograph of Kala Uyuni in present day from the perspective on the hilltop of the Achachi Coacollu sector of Kala Uyuni. From Roddick 2009: 110.

Kala Uyuni (KU) is a large archaeological site that spans about 15.25 ha (Bandy 2001: 101; Figure 3.2). It is located on uneven ground with variable soil colours, near a spring (Bandy 2001: 101; Goodman Elgar 2003). Occupation at this site began during the Early Formative and grew exponentially by Late Formative I. It became the central political centre in the peninsula after the decline of the Middle Formative political centre of Chiripa. Kala Uyuni is one of the few sites in the Lake Titicaca Basin with an extensive Middle Formative occupation; a feature that is absent in others (Smith 2016: 111). Like other Late Formative centres, Kala Uyuni is situated near mountain/hill bases on the pampas (i.e. Lukurmata, Kallamarka, Tiwanaku) (Smith 2016: 111).

Excavations at Kala Uyuni focused on four sectors- Kala Uyuni Achachi Coacollu (KU AC), Kala Uyuni Ayrampu Qontu (KU AQ), Kala Uyuni Kala Uyuni (KU KU), and Kala Uyuni Siwinka Qontu (KU SK). Only KU KU and KU SK are dated to the Late Formative Period, while the others are dated to the Middle Formative Period. 23 radiocarbon dates were obtained from this site, with the Late Formative occupation beginning at around AD 20 or AD 22-212 (Roddick et al. 2014: 149). At KU KU, there are two U-shaped structures, ASD 2 and ASD 4, with thick walls constructed of river cobble stones (Roddick 2009: 112-116; Figures 3.3 and 3.4). It is likely that ASD 2 and 4 were linked to cooking and preparation (possibly domestic and/or ceremonial) activities based on the presence of ash lenses, fire pits, food storage and/or trash pits (Hastorf et al. 2005: 22). Occupation at ASD 2 does not appear to be continuous through the entire period, there are events (particularly a bell-shaped pit) disrupting the corner walls that could suggest abandonment or periodic use of the structure. There is also a circular, domestic structure (ASD 5) that has thinner walls made with adobe bricks (Figure 3.5).

Excavations revealed series of surfaces and hearths, as well as pits filled with ceramics, middens, occupation zones, and surfaces (Roddick 2009: 357-358; Roddick et al. 2014: 153). While the KU KU sector has been extensively excavated, investigations at the smaller southern sector of KU SK revealed residential middens with high densities of ceramics, lithics, and fauna (Janusek 2008: 94; Roddick 2009:125). Bandy (2001: 176) suggests Kala Uyuni was the main Late Formative I site on the Peninsula but later declined in population around Late Formative II (AD 240 – 420) and was eventually abandoned afterwards (Janusek 2008). Kala Uyuni has been interpreted as a political centre based on the fast population growth during the Middle Formative Period (estimated population size of 900) in relation to the Early Formative (360 people), based on Bandy's (2001) survey work. However, detailed analyses of the occupation sequence indicate that population intensification did not occur until the Late Formative Period, and that growth during the Middle Formative was slower than previously thought (Hastorf et al. 2005: 22).

Figure 3.3 KU ASD 2. This shows the intrusive Late Formative pit inside, viewed from the north. Photograph from Roddick 2009: 113.

Two hypotheses have been put forth regarding the relationship between ASD 2 and 4 (and the uneven soil level difference of 15 cm): first, that they were not contemporaneous in occupation but built around the same period, or second, they were contemporaneous, and the soil difference is the result of the depositional environment at Kala Uyuni. Analysis of ceramics supports the second hypothesis (Murillo and Fontenla Alvarez 2005: 19). There is evidence of abandonment associated with ASD 4 from B204/B205 (a pit fill and cut) that has been interpreted as a major burning event that extended across the entirety of the interior structure. This is based on the high amounts of ash/charcoal mixed with clay lenses and reddish sandy loam with hints of green. This sediment colour can only occur from burning organic matter (i.e. taquia, cattail) at high temperatures (Goodman as cited in Hastorf et al. 2005: 19). Hastorf et al. (2005) suggest burning rituals could be linked to abandonment or structural transformations during the Late Formative at Kala Uyuni. Perhaps the use and treatment of these two structures could signal a localized practice at this site.

While the relationship between ASD 2, 4, and 5 is unclear, the structures are all Late Formative, and their spatial distribution suggests common use (Hastorf et al. 2005: 37). Hastorf et al. (2005: 38-39) suggest that ASD-5 was not a public structure given its smaller size and associated artifact assemblage including domestic, undecorated ceramics and proximity to a dense midden. ASD 5 could be a residential or kitchen space associated with ASD 2 and 4, perhaps used for public ceremonies/events. While the presence of a neonate burial near the entrance might suggest specialized ritual space, it is actually common in the region for burials to be associated with residential spaces (Hastorf et al. 2005: 28). TAP members argue that ASD 5 was built during the same period as ASD 2 and 4, but likely was not contemporaneous in occupation. The structure shares no similarities in architecture or stratigraphic continuity to ASD 2 or 4 (Hastorf et al. 2005: 22).

Figure 3.4 KU ASD 4 from the western view. This structure is poorly preserved in relation to ASD 2. Photograph from Roddick 2009: Figure 4.6.

All sectors of Kala Uyuni have been affected by considerable levels of disturbance, including wind deposition and weathering of sterile levels of the site, and upper colluvium erosion because the site is next to a lake environment (Fernandez Murillo and Fontenla Alvarez 2006: 13). Worm and root activity can be seen in and around all the architecture at Kala Uyuni. TAP’s experimental test at an abandoned compound (Copralabra Pata) to examine the preservation of earthen buildings over time on the peninsula noted high degrees of homogenization in the soil matrix (Goodman Elgar 2003: 92-94). Adobe structures were more likely to preserve compared to earthen structures. Within Kala Uyuni, the area around and within ASD 5 were affected by the presence of many insect holes, though the extent of disturbance is unclear (Hastorf et al. 2005: 28). However, units inside this structure generally contained high densities of cooking and storage vessel fragments. ASD 4 is more difficult to discern due to its poor state of preservation. ASD 2 is the most well preserved Late Formative structure overall, though preservation of its northern extent declined. There is a gradual decline in artifact density overall across the northern sectors, suggesting uneven formation processes at play (Hastorf et al. 2005: 39).

Figure 3.5 KU ASD 5, viewed from the west. This building is circular unlike ASD 2 or 4 which are rectangular. Photograph from Roddick 2009: Figure 4.7.

The growth and decline of Kala Uyuni also remains a mystery. While many of the villages on the peninsula decline in size during Late Formative I, Kala Uyuni doubled in size (Bandy 2001; 2005). Bandy (2001) explained that there may have been a multi-community polity. Economic and symbolic power relations influenced the Taraco Peninsula polity, rather than military power that has been associated with other polities in the region, including the Tiwanaku polity (Bandy 2005). Bandy (2005) suggests that inhabitants may have abandoned Kala Uyuni due to shifting lake levels affecting trade routes. He also suggests that Sonaji inhabitants were linked to two other nearby sites- Kumi Kipa and Kollin Pata- and that by Late Formative II, all three were part of one community.

Investigating production and deposition at all three sites might tell us about any processes of localization and community dynamics, particularly whether inhabitants interacted with one another in a way that may have resulted in shared similar practices from an exchange of knowledge (passively or actively). It can also help clarify the hypothesized population migration from Kala Uyuni into Sonaji by the end of the Late Formative Period by seeing whether there are any Kala Uyuni-specific influences on the practices at Sonaji.

<u>Sonaji and Kumi Kipa</u>

Sonaji (SN) and Kumi Kipa (KK) are two smaller sites located at the tip of the Taraco Peninsula and within the community of Santa Rosa (Bandy 2001: 101-102). Today Sonaji is located behind the church and cemetery of Santa Rosa, while Kumi Kipa is near the town of Santa Rosa (Bandy 2001: 101-102). Sonaji consists of 3 terraced fields, thought to have been stepped platforms in the past, while Kumi Kipa is a large plain used for agriculture (Bandy 2001; Vidaurre and Killackey 2004: 5; Figure 3.6). Researchers believe that Kumi Kipa and Sonaji were likely related given their proximity. These two sites belong to the cluster of sites known as the Santa Rosa Group (Hastorf et al. 2004: 3). Bandy considered the Santa Rosa Group the centre of political formation during the Late Formative Period, with Sonaji eventually becoming a major political centre that replaced Kala Uyuni. There has been some debate on whether these two small sites were part of a larger, single site (Bandy 2001; Roddick 2020, personal communication). Bandy (2001) and Bandy et al. (2004) have suggested that Kumi Kipa and Sonaji are sites differentiated by function during this time and could have functioned as a single community. Examinations of the ceramics from these two sites might give some indication not only if they were one or two sites but also regardless of their spatial distinction as a singular or separate "site," if they share practices that constitute a shared locality or not based on their daily production and deposition habits.

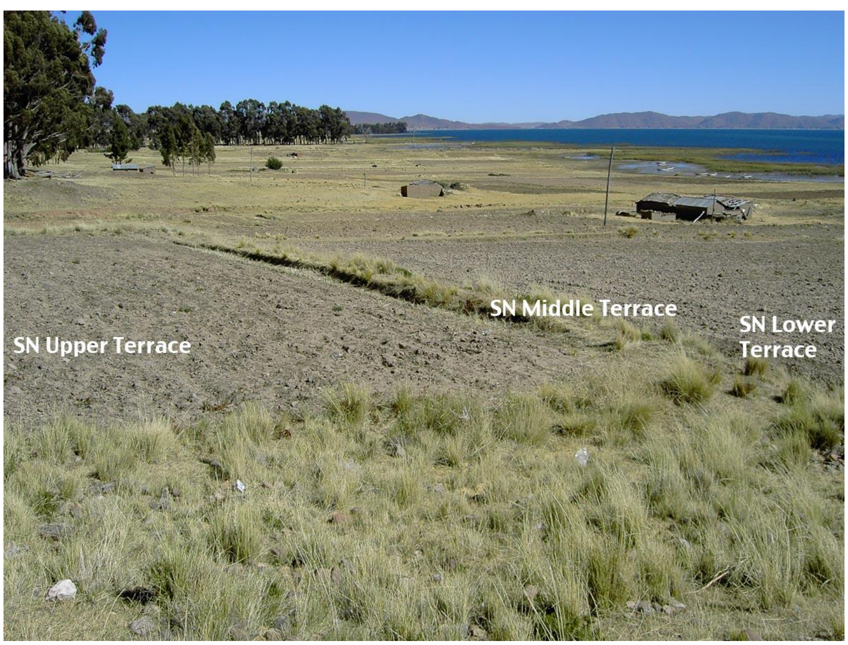


Figure 3.6 Photograph of Sonaji in present day. From Roddick 2009: 128.

Sonaji (SN) was first occupied in the Early Formative, abandoned in the Middle Formative, and re-occupied in the Late Formative after the abandonment of Kala Uyuni (Bandy 2001: 101). Archaeological excavations reveal an extensive Tiwanaku occupation at Sonaji, affected by erosion and modern agricultural plowing activities. This included 22 pit events that varied in shape, size, and content (Bruno et al. 2005: 48). Many were bell-shaped and quite large, between 25-50 cm in diameter and depths of at least 50 cm, and contained dense amounts of ceramics, bones, lithics, and carbon attributed mainly to waste though some are stratigraphically distinct with different filling events (Bruno et al. 2005: 48). While largely considered intrusive and likely a large garbage dump, Bruno et al. (2005: 49) argue that these pits provide important *in situ* depositional information that is absent at Sonaji. Many of these pits contain burnt material, but it is unclear whether they were used to burn material or used to dump burnt material (Bruno et al. 2005: 53). Further analysis of the artifacts here could help clarify what or why these pits were here. Moreover, these pits intrude walls and other pits, affecting how locality can be interpreted as they blur and disrupt the boundaries created by people who lived there earlier (Bruno et al. 2005: 49-50).

Figure 3.7 SN ASD 2 on the Upper Terrace. Much of the interface has been disturbed by intrusive pitting. From Roddick 2009: 136.

Overall, Sonaji has a deep and complicated stratigraphy much like Kala Uyuni (Roddick 2009). Excavators focused on each of the three terraces, the Upper, Middle, and Lower Terraces with a few units west of the Lower Terrace. Bandy (2001) suggests that the Upper Terrace was originally for ritual events because of the large architectural platform and presence of decorated wares (Figure 3.7). Five pits were later cut into the Late Formative surface of A207 on this terrace. Bruno et al. (2005: 53) hypothesize that this space was used for regular waste disposal but could also potentially be associated with the later Tiwanaku IV/V periods. There are also plenty of Tiwanaku IV/V pit events on the Lower and Middle Terraces. SN ASD 1 on the Middle Terrace is the only structure uncovered by TAP that is clearly phased to Late Formative II. Excavations showed that occupation during the Middle Formative was not as intense or important compared to later periods.

Occupation at Kumi Kipa (KK) started during Late Formative I and is described as a larger site with no evidence of monumental architecture and only a small amount of decorated pottery relative to Sonaji. TAP researchers suggest that this was the main residential area for the Santa Rosa Group (Hastorf et al. 2004: 3; Hastorf 2005). Excavations at Kumi Kipa took place on the western extent of the fields and on the large mound in the east (Fernandez Murillo et al. 2005: 27). The 2004 excavations focused on uncovering architectural components and midden deposits (Roddick 2009). Deposits here are much shallower compared to the other two sites, and thus, Kumi Kipa has a shorter occupation period. Past excavations at Kumi Kipa primarily took place in two areas: the Monticúlo (mound) and ASD 1. ASD 1 is the only existing structure uncovered so far at this site. Tiwanaku IV/V deposits and events suggest the mound may have been dedicated to burials, though no Late Formative architecture is associated with these burials (Roddick 2009). The Late Formative contexts primarily date to Late Formative I, and excavators found no Late Formative II phased deposits. The Late Formative occupation at KK Monticúlo also includes a pit with camelid bones, a surface and occupation zone. Excavations in the ASD 1 location revealed a heavily eroded building foundation, along with a series of fills and temporary surfaces (Roddick 2009; Figure 3.8). Although the context is dense, its exact purpose remains unclear. Occupation continued at this site into Tiwanaku IV and V that included the construction of a funerary mound (Capriles et al. 2014: 70).

Figure 3.8 KK ASD 1 excavations from the west. ASD 1 is represented by the remains of a wall in the centre.

3.5. Understanding Locality from Earlier Archaeological Investigations

There are three major ways locality has been shaped and understood on the Taraco Peninsula from past archaeological studies. These include the macro-scale narratives running across the broader Andean region, the arguments made based on settlement patterns (à la culture-historical approaches), and Burkholder (1997) and Roddick's (2009) work on ceramic pastes and technological choices in the southern Lake Titicaca basin. The interpretive, spatial, and technological elements of locality have been explored in the region, but no one has considered other elements of locality, such as deposition.

Many narratives on political processes in the region take a more processual approach focusing on centralization leading up to the development of the Tiwanaku state (Bandy and Hastorf 2005: 7). For example, Bandy's (2004) multi-community model (see also section 3.2) involves the idea that independent, "local" villages could not stably function over long periods of time. These villages would constantly break down from conflict as the result of a lack of political unification, and it is only through the introduction of non-local (outside) forces of power that political stability could be achieved (Bandy 2004; 2005). Locality here is assumed to be an ephemeral or transitory relationship within disorganized communities and is used to drive a narrative of growth towards a more coherent organized level state formation (Kosiba 2011).There is less focus on the the possible power of local, everyday relationships and bonds (Massey 1994; Peelo 2011). This is because the primary goal of his research was to gain a better understanding of the Formative Period on the Taraco Peninsula and the settlement pattern dynamics, given that not much was known about this period at the time.

Bandy's (2001) survey and how he used ceramics to define and categorize sites is critical to this discussion of locality. He used ceramics to created index profiles and assemblage profiles to phase sites into the Early, Middle, or Late Formative, or Tiwanaku IV or V periods (Bandy 2001: 45-47). These index profiles consisted of percentages of three major states of an attribute (e.g. paste) (Bandy 2001: 47-48). An assemblage profile is the relative frequency of all possible attribute states that exist (e.g. all the combinations of paste recipes that exist) (Bandy 2001: 47-50). He used ceramic scatters as a detailed settlement dataset to analyze broad scale population patterns. The "locality" discussed by Bandy (2001) reminiscent of bothWilley and Phillips' (1958) definition of the term and also within a processual framework The assumption here is that the local is not dynamic and is bounded to a single time and space.

From a ceramic production perspective, two aspects of locality have been discussed in this study area, including raw material origins and shared technical practice. Burkholder (1997) argued that micaceous pastes were non-local to the Taraco Peninsula, though there were no raw material surveys undertaken at the time to support this hypothesis. In Roddick's (2009) ceramic study of Kala Uyuni, Sonaji, and Kumi Kipa, he presented locality in at least two ways. Results from his clay survey of the region leads him to suggest the use of mostly local raw materials, but ideal micaceous clays were difficult to locate on the peninsula (Roddick 2009: 317). Here, geography and geology define one aspect of locality from surface observation. The other aspect of locality that Roddick (2009) confronts is defined by practice using primary and secondary forming and finishing techniques, where he observed similar ceramic production techniques at all three sites. His petrographic analysis suggests a shared community of practice given the similarity in paste recipes and production techniques used and shared choices across the landscape (Roddick 2009). Local boundaries are reflected at two scales here-geologically and technologically- and his study shows these boundaries are intersecting and overlapping one another. However, Roddick (2009: 230) also cautiously notes that homogeneity and/or diversity of pastes should not be the sole factor in differentiating the local from non-local. While the results suggest people were maintaining their boundaries of space and technological practice, it is not clear whether this boundary of the local also extends to their use and depositional habits.

In sum, there are three ways locality has been framed. No scholars have yet to explore locality in terms of depositional practices (but see Roddick et al. 2014 for some initial steps). Building on chapter 2, I suggest that processes of localization should be evaluated critically and against one another on the Taraco Peninsula to better understand the sites themselves and in relation to each other during the Late Formative, rather than being restricted by a macro-narrative. Roddick et al. (2014) argue that Kala Uyuni's deep stratigraphy warrants investigation to understand the temporal dynamics during the Late Formative Period instead of only the spatial. These sites were occupied over hundreds of years of time, but site interpretations have been built on assumptions made by surface survey data. By examining the excavation data at these sites spatially, perhaps we can see how material patterns in space compare against survey observations. We can also see how local/non-local boundaries are manifested from use and deposition practices when we examine site stratigraphies, and how social boundaries created by deposition compare against ones produced by technological practices or spatial divisions created by archaeologists. Locality is relational and is enacted at multiple scales. As we saw in chapter 2, ceramics can speak to some of these. I examine these sites through a spatial definition of locality to first break down the ways in which locality exists on the geographical plane, and then using a practice definition, I suggest that locality may be dependent on community dynamics. By considering locality in two different ways here, it allows us to reconsider the ways in which the Late Formative has been characterized and to better understand the period itself.

3.6. Research Questions

Defining the local as an analytical and inferential scale inhibits the way we think about social relationships between communities and how they understood and differentiated themselves in relation to others on a day-to-day basis. In particular, the way archaeologists have framed the Late Formative Period is linear and evolutionary as it is defined as a period of rapid social and political change leading up to the Tiwanaku state (Roddick et al. 2014). To reiterate, such models ignore the interactions within a community or among immediate kinship groups in favour of broad state level or elite forces exerting top-down change and influence (Kosiba 2011).

My research explores local" practices associated with the Late Formative ceramics on the Taraco Peninsula and how they are formed, maintained, or transformed. In other words, localization processes are reflected in pottery production, use, and treatment (deposition/waste) which constitute part of everyday practices. By thinking of local as a shared set of ideas and material practices at a given time and place rather than only as a spatial unit, it allows us to think dynamically about communities. To do this, I investigate the spatiotemporal distribution of ceramic attributes from Late Formative phased deposits at Kala Uyuni, Sonaji, and Kumi Kipa.

How do site and feature designations impact archaeological interpretations of the local? How might our narratives of Kala Uyuni, Sonaji, and Kumi Kipa change when we focus on the spatial patterning of ceramic attributes?

For this question, I define locality per Willey and Phillips' (1958) understanding as a spatial unit. Local here exists as part of the analytical and inferential scale used by archaeologists that is rooted in both stasis and geography. I seek to better understand whether notions of locality transcend site designations, including political centres and domestic settlements.

Here I examine the distribution of total ceramic densities and distribution of decorated and undecorated ceramics. I begin by tracking decorative style to show how sites would be interpreted from traditional approaches to locality. I then track undecorated pottery to show how observations would change when we take into consideration pottery that has often been ignored. The purpose here is to juxtapose the quantity and quality of data in assessing the local. I also compare the distribution of total ceramic densities from excavations to Bandy's (2001) surface scatter distributions. I expect there to be differences in the material culture patterning because of the change in sample selection. If densities are significantly different between survey and excavation data, it would suggest the volatility of locality being understood as only a spatial unit. If ceramic densities are similar, it might suggest that locality is heavily tied to geographical boundaries in this case study.

Were inhabitants producing and using distinct pottery types at each site? What might variation or lack of thereof say about site organization and understandings of material practice and knowledge sharing?

While my first set of questions tackles the issues of using local as an analytical scale to define sites, my second set of questions seeks to challenge the assumption that meanings of the "local" are permanent and fixed at a spatial scale. I conceptualize locality based on a combination of Kosiba (2011), Massey (1994), and Wenger's (1998) definitions. I define locality as a shared set of social, material practices that is bounded by my research questions but has the capacity to exist as a social reality. Here I examine the production of local and non-local boundaries through ceramic production and deposition and incorporate some paleoethnobotanical data to briefly test whether use and boundaries of space can be clarified when juxtaposed against pottery data.

There is much debate over the kinds of activities that took place at these sites. While Roddick's (2009) paste analysis showed that inhabitants at the Taraco sites likely formed one community of practice from a production perspective, it remains unclear how production was organized spatially. Studying the spatiotemporal distribution of ceramic technological attributes can help illuminate whether there were dedicated spaces for producing pottery or not. If there is consistency in similar technological attributes appearing in a specific context, it could suggest ceramic manufacture at that particular point in time and space. Pots produced with the same combination of technological attributes could suggest shared knowledge among communities, building on Roddick's (2009) hypothesis of the existence of one community of practice centred on pottery manufacture and that all potters contributed to production in some way. If attributes differ, this could mean transformations in social choices during manufacture, which may suggest that certain material practices became particular to its local context.

The other major element of locality that has not been explored is deposition. The study of deposition, in addition to production processes may help to better understand the smaller scale shifts and social interactions occurring between the Taraco sites. Recall, the appearance and repopulation of Kumi Kipa and Sonaji (respectively) saw the decline of Kala Uyuni. The narratives between these three sites are focused on larger, macro-scale settlement dynamics which have obscured the study of actual people on the ground and how they moved about their landscapes. By considering ceramics in their depositional contexts, we can understand refuse behaviours and space use patterns, including how spaces were cleaned, where inhabitants deposited their waste, and which activity areas were dedicated for cooking/food processing or perhaps ceramic manufacture. I expect there to be a difference in ceramic fragmentation rates (represented by average sherd weights) across each site due to the variation of contexts in the stratigraphy. If fragmentation rates are similar across the three sites, it could suggest similar intensities of vessel use/replacement within the same contexts and similar care and treatment of surfaces, middens, pits, etc. If rates differ, it could suggest a localized material practice restricted to one settlement or the result of differences in population size.

Wrapped up in this discussion of production and deposition is the role of taphonomy and its effects on what we see, recover, and sample from the material record. As mentioned earlier, taphonomy can alter and blur local and non-local boundaries. Its effects are rarely discussed in defining locality. I briefly examine the role of taphonomy on what we consider to be local or non-local through a pilot study of the distribution of some paleoethnobotanical data juxtaposed against pottery. Comparing these two datasets may also help identify the possible kinds of vessel forms that survived (in the archaeological record) and the activities that took place at each site. My questions here challenge the taken-for-granted assumptions about locality by switching the focus away from studying only space, to space in relation to time. Production and deposition each speak to one part of a ceramic's life history and to different inhabitants (potters and those using pots) who lived at these sites over the 650-year timespan. Taphonomy challenges the idea that local/non-local boundaries stayed the same over time, and the idea that material culture (always) signals some kind of boundary when they may have been distorted and not signal anything in reality (Stark 1998: 8-9).

3.7. Summary

In this chapter, I provided a brief background on what is known about the Late Formative Period in the Lake Titicaca Basin to contextualize this thesis. I summarized the ecology, geography, history of archaeology, and characteristics of Late Formative ceramics. I summarize the excavations that took place at Kala Uyuni, Sonaji, and Kumi Kipa. I focused particularly on how understandings of locality have mainly been defined by survey work, and subsequently been used on an analytical/interpretive scale. I also highlight how previous ceramic studies in the region approach locality from a production perspective but are moving towards relational approaches that examine the effects of community dynamics on the local. I presented my research questions and defined the two ways in which I will be using locality. I outline my sampling selection of Kala Uyuni, Sonaji, and Kumi Kipa and methods of analysis in the next chapter for exploring locality and social boundaries on the Taraco Peninsula.

Chapter 4: Sampling and Methods

4.1. Overview

In this chapter, I present my approach to sampling and discuss the methods I used to track ceramic attributes and taphonomy data. I begin by briefly describing the general sampling strategies I employed and the contexts I focused on at each site. I then describe the state of the ceramic and paleoethnobotanical data collected by the TAP team. The meticulous data collection and previous analyses allow me to investigate the data from a geospatial perspective. I discuss potential of GIS in working with older, extant data and this project and conclude this chapter by outlining the steps for my spatial analysis.

4.2. Sampling Protocols

The datasets used in this thesis come from over a decades' (2003-present) worth of work from the Taraco Peninsula Project. The datasets include all ceramic and paleoethnobotanical data, with paste and paleoethnobotanical analyses conducted by Drs. Maria Bruno, Christine Hastorf, Lee Steadman, and Andrew Roddick. All contexts discussed here are phased from the Early Formative Period to Tiwanaku IV/V. Original data entry was done by various TAP archaeologists and student volunteers with data formats ranging from older and newer GIS files (and file formats), Excel spreadsheets, scanned locus forms and a Filemaker database.

My sampling is both opportunistic (what is available) and then strategic given the limits of what I know and can analyze with certainty. I sampled data from excavations that took place between 2003-2005 at Kala Uyuni (KU sector), Kumi Kipa, and Sonaji with a focus on the Late Formative Period. I considered only events that were phased to either Late Formative I or II and excluded any events that had mixed ceramic phasing (i.e. events coded as generally mixed/Late Formative I, Late Formative I/Tiwanaku IV/V) Many Late Formative events are also disturbed by Tiwanaku IV/V events and for this reason, the sample skews towards mainly towards Late Formative I rather than II. As shown in the previous chapter, TAP encountered few domestic contexts. To explore quotidian, everyday practices, I sampled ceramics based on their technological style, rather than restricting my analysis to decorative style, opening up my dataset to a much larger (and more commonly encountered) plainware assemblage.

I consider my samples at the unit and event level. While I sampled opportunistically in the beginning, I later focused my analysis on units where there were successive events (i.e. long, stratigraphic histories) to track change in the use of space over time. At the scale of a unit, I discuss ceramics that were recovered within those arbitrarily defined sets of space defined by the archaeologists. The minimum dimensions of a unit on the TAP project are 2-by-2 m but occasionally are larger. For TAP, an event is either an action or deposition that occurs homogeneously within a given space and naturally in the stratigraphic matrix. It is the result of natural and/or cultural site formation processes, materialized as a feature (i.e. burial, midden, occupational surface) or architectural subdivision (ASD) and includes practices of removal and deposition (Roddick 2009: 105). An event can be comprised of a single or multiple loci, which are the smallest units of activity identified during excavation, or no loci at all if they are cuts (see Appendix A for examples of events within the Harris matrices).

4.3. Kala Uyuni, KU Sector

TAP researchers excavated and analyzed more material from Kala Uyuni when compared to the work done at Sonaji and Kumi Kipa. Late Formative occupation at this site is concentrated at the KU sector. I focused on five general locations: ASD 2 and associated activity areas, ASD 4 and associated activity areas, ASD 5, and LF Outside of ASD 5, LF West of ASDs 2, 4, and 5 (Hastorf et al. 2005; Roddick 2009) (Figure 4.1). I also created a sixth category, Outside Structures (General), to group all the events that fell outside of the original five groups and are not attached to a structure. My analysis focuses on the events that take place at ASD 2 and associated activity areas, ASD 5, and LF West of ASDs 2, 4, and 5 because they have highest concentration of unmixed Late Formative events and are well suited for my questions as I can track change in the use of space over time (Table 4.1). I do include a few ASD 4 events in my analysis, but as most of the events are mixed, I could not infer much about the activities that took place there.

Late Formative Events Sampled at Kala Uyuni				
Event	**Locus**	**Location/Activity Area**	**Description**	**Phase**
B9	5049, 5160, 5311, 5313, 5317, 5318, 5319, 5321, 5323, 5324, 5353, 5450, 7530, 7531, 7533, 7534	ASD 2 and associated activity areas	wall roof elements?	LF1
B11	5043, 5152, 5159	ASD 2 and associated activity areas	occupation surface	LF1
B12	5045, 5154, 5358	ASD 2 and associated activity areas	floor	LF1
B14	5044	ASD 2 and associated activity areas	surface outside structure	LF1
B16	5150, 5153, 5156	ASD 2 and associated activity areas	pit fill	LF1
B17	5157, 5356	ASD 2 and associated activity areas	pit fill	LF1
B22	5040, 5164	ASD 2 and associated activity areas	clay lens	LF1
B23	5167	ASD 2 and associated activity areas	between clay lenses	LF1
B24	5168	ASD 2 and associated activity areas	clay lens	LF1
B57	5357	ASD 2 and associated activity areas	pit fill	LF1

B61	5363	ASD 2 and associated activity areas	hearth	LF1
B75	5369	ASD 2 and associated activity areas	possible occupation zone	LF1
B76	5370	ASD 2 and associated activity areas	informal hearth	LF1
B77	5371, 7537	ASD 2 and associated activity areas	external occupation surface	LF1
B78	5372	ASD 2 and associated activity areas	pit fill	LF1
B221	7665, 7664	ASD 4 and associated activity areas	pit fill	LF1
B249	7507, 7508, 7578, 7579, 7588, 7590, 7593	ASD 5	internal occupation surface	LF1
B251	7520	ASD 5	burial	LF1
B258	7581	ASD 5	burial	LF1
B261	7506, 7517, 7518, 7519, 7522, 7580, 7593, 7713	ASD 5	external occupation surface	LF1
B262	7506	ASD 5	ash lens	LF1
B239	7702	LF outside of ASD 5	clay cap	LF1
B270	7710	LF outside of ASD 5	mottled clay	LF1
B271=B269	7711, 7709	LF outside of ASD 5	burning clay ash	LF1
B273	7712	LF outside of ASD 5	pit fill	LF1
B34	5272	LF West of ASDs 2, 4, 5	compact clay floor	LF2
B39	5274, 5304	LF West of ASDs 2, 4, 5	medium density midden	LF1
B67/89	5308, 5312	LF West of ASDs 2, 4, 5	possible occupation zone/high-density midden	LF1
B70	5310	LF West of ASDs 2, 4, 5	charcoal dump	LF1
B73	5316	LF West of ASDs 2, 4, 5	burial	LF1
B74	5320	LF West of ASDs 2, 4, 5	high density midden	LF1
B91	5313, 5317, 5318, 5319	LF West of ASDs 2, 4, 5	high density midden	LF1
B92	5321, 5323	LF West of ASDs 2, 4, 5	high density midden	LF1
B97	5322	LF West of ASDs 2, 4, 5	midden ash	LF1
B20	5161, 5350	outside structures	pit fill	LF1
B50	5271	outside structures	pit fill	LF1
B55	5309	outside structures	pit fill	LF2
B231	7691, 7703	outside structures	pit fill	LF1

Table 4.1 Late Formative events I sampled from Kala Uyuni, organized by activity area.

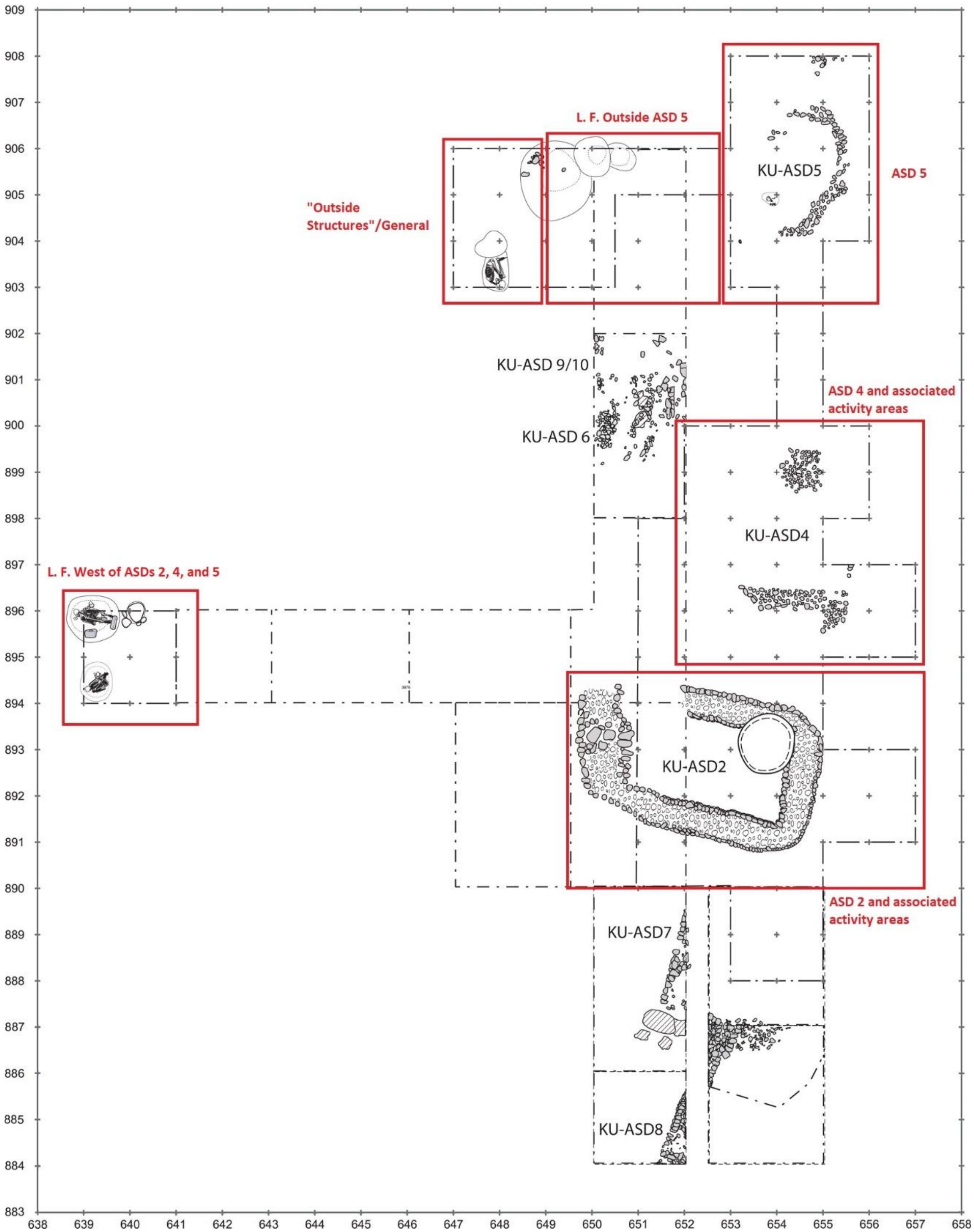


Figure 4.1 Site plan of Kala Uyuni depicting the activity areas at this site.

Events at Kala Uyuni are complicated and variable across the structures. They include 1) internal/external occupation surfaces, 2) occupation zones, floors, 3) clay cap(s), 4) hearths, 5) mottled clay, 6) ash lenses/burning clay ash, 7) pit fills, 8) middens (low, medium, and high densities), and 9) burials. At Kala Uyuni, this could mean that an event could be assigned to one of the following cultural context codes: occupation zone, occupation surface, a possible occupation zone, and then further differentiated between being inside or outside a structure. It is less clear what kind of activities occurred on these occupation surfaces and/or zones. Similarly, there are clay-related events, including those designated as mottled clay, between clay lenses, clay lens, and clay cap that are ambiguous. Some may be associated with a major event (e.g., Event B22 is a clay lens linked to the abandonment of ASD 2), but others are more confusing to interpret. TAP's approach to coding contexts involved pushing the archaeologist as far as they were comfortable with in interpreting these deposits which is why some of these contexts are more generally categorized. The variation in contexts also stems from the difficulty in assessing the kinds of activities that took place due to intrusive pit cuts and from the degree of preservation across the site.

At the intra-site level, I attempt to clarify the use and treatment of spaces by looking at the types of ceramics deposited, carbonization, fragmentation at all three sites. For Kala Uyuni, I also compared the distribution of ceramic carbonization against the types of plants found on surfaces and middens. At ASD 2, I focus on the pit context in greater detail to examine the hypothesized structured deposition (Roddick et al. 2014). Roddick et al. (2014: 151-152) suggest that the contents of the pit were intentionally deposited and may have been a ritual offering associated with the abandonment of ASD 2. In relation to ASD 5, I examined B239 (clay cap), B249 (internal occupation surface), B261 (external occupation surface), and B262 (ash lens), with a focus on B249 and

B261 since they may have been contemporaneous with one another. I examine B249 and B261 to better understand the relationship between cooking spaces and adjacent spaces. This contributes to understanding how inhabitants organized the site spatially by further investigating the types of human activities that could have occurred here, particularly whether people cooked and deposited waste nearby out of convenience or to fertilize soil, or whether waste was specifically collected and deposited further away. The way in which spaces are used for cooking, waste, ceramic production, and ritual, and how they are treated (fully, partially, or not cleaned) can reveal similar material practices that may suggest social interactions between the inhabitants at these three sites leading to similar behaviours or potentially adding to the narrative of possible migration of people between the sites over time. By clarifying these event contexts, it can also help future researchers with understanding the relationship between ASD 2, ASD 5, and the midden components by looking at microscale stratigraphic changes before and during the abandonment of these structures.

At the inter-site scale, I am in interested in any spatial patterns that emerge in pottery deposition and distribution of production attributes to see whether there is a shared, local community of material practice between the Taraco sites or whether each community had their own localized practice. The entire event sequence from LF West of ASD 2, 4, and 5, and all pit fills associated with structures are examined to see if there are any structured deposition/treatment of ceramics (Figure 4.2). I also briefly examine B34, a Late Formative II compact clay floor that caps the series of midden events, and B22, a Late Formative I pit fill event that represents the only ceramic sample from ASD 4. I used the findings here to compare against the middens, pits, and surfaces at Sonaji and Kumi Kipa to see whether certain ceramic forms were also mainly found in these contexts and whether they all shared similar patterns in cleaning and disposing trash through fragmentation. Kala Uyuni also acts as a control site since the depositional sequence and narratives are more developed (e.g. Bandy 2004; Bandy and Hastorf 2007; Moore et al. 2010; Roddick et al. 2014) compared to Sonaji and Kumi Kipa.

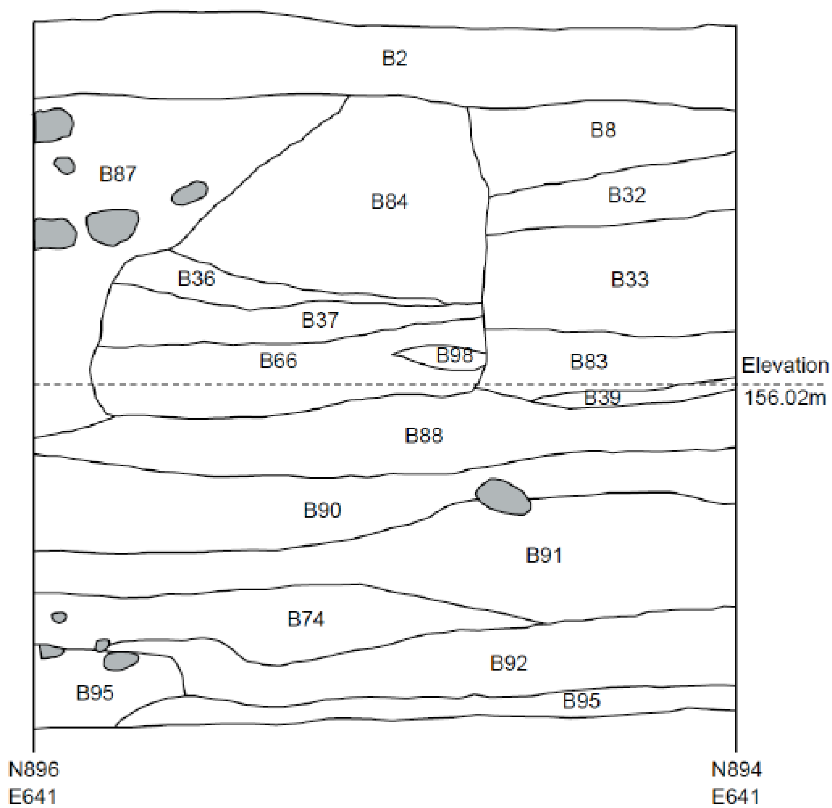


Figure 4.2 East profile of N896/E641, also known as the unit belonging to LF West of ASDs 2, 4, and 5.

4.4. Sonaji

At Sonaji, I sampled from all three terraces (Figure 4.3). Much like Kala Uyuni, events here are very complicated with 35 intrusive Tiwanaku pits found during excavations on the Upper Terrace that intruded into earlier deposits and events (Bruno et al. 2006: 47) (Figure 4.4). Various event contexts were identified, including surfaces, a possible occupation zone, middens, and different fills (i.e. stone, ash, greasy green clay deposit) (Table 4.2; see Figures 4.5 and 4.6). I focused on A206 (bright yellow/orange clay deposit/surface), A207 (orange clay deposit/surface), and A285 (use surface) (Roddick 2009: 132-133). The interpretation of these surfaces has been heavily debated and unclear due to intrusive pit cutting. Some have suggested that they were magnesium deposits or associated with burning activities (Roddick 2009: 133). Looking at surfaces and their use and treatment, as well as pit and midden contexts help answer my second set of research questions about site organization and whether inhabitants at all three sites shared similar waste disposal, cooking, and/or possible ritual practices. I tracked production attributes to first clarify the space use (i.e. Did potters make their pots on this terrace? Where did they cook at the site?), and second, what kinds of techniques were used here and how they compared to the techniques used at Kala Uyuni and Kumi Kipa. I tracked the deposition of fragmented sherds to see where intense human activities took place and how or where people decided to dump ceramic waste. I take an extra step further with my analysis at Kala Uyuni in a limited comparison of the distribution of two plant taxa against ceramics to see which events may have been used for cooking vs. dumping.

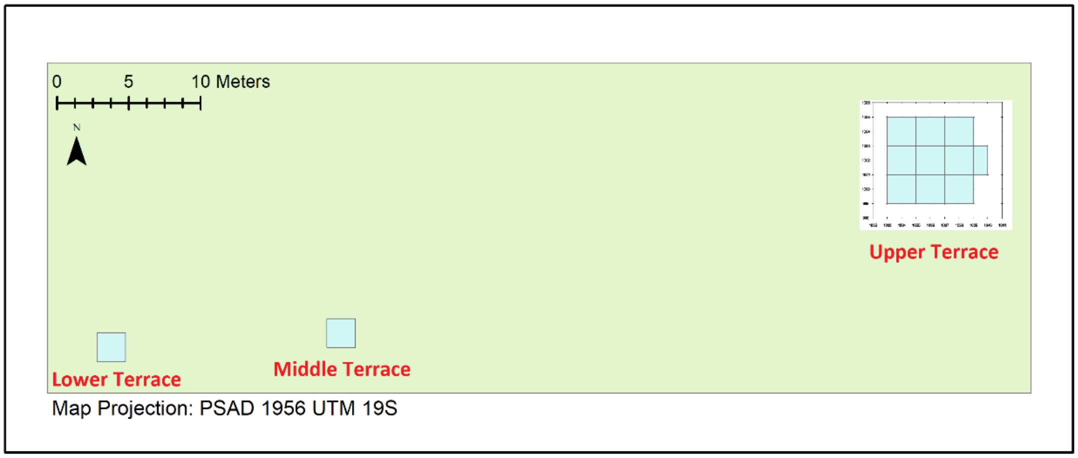


Figure 4.3 Site extent of Sonaji with all excavation units showing the three terraces.

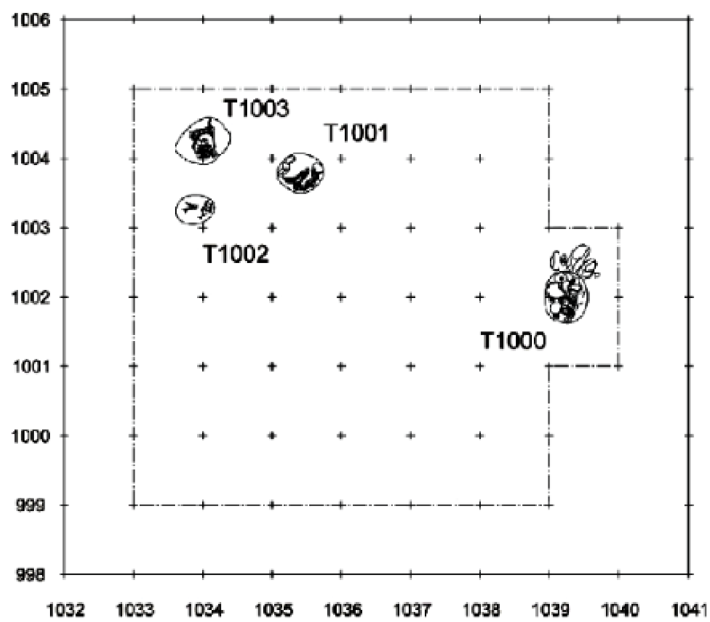


Figure 4.4 Close-up view of the excavation plan of the Upper Terrace, from Machicado Murillo 2009: 145. Burial events (individuals with the "T" designation) are excluded in this analysis as they are not dated to the Late Formative Period.

Late Formative Events at Sonaji				
Event	**Locus**	**Location/Activity Area**	**Description**	**Phase**
A7	6006, 6012, 6013, 6015, 6050	Lower Terrace	Medium Density Midden	LF1
A18	6014, 6052, 6057, 6058	Lower Terrace	Low Density Midden (secondary)	LF1
A19	6053, 6054	Lower Terrace	Medium Density Midden	LF1
A21	6059, 6060	Lower Terrace	Low Density Midden	LF1
A22	6061	Lower Terrace	High Density Midden	LF1

A46	6039, 6040	Middle Terrace-ASD 1	Midden	LF2
A50	6075	Middle Terrace-ASD 1	Mixed Fill (erosional)	LF2
A47	6043, 6076, 6077	Middle Terrace-ASD 1	Adobe Wall Fall	LF2
A48	6045	Middle Terrace-ASD 1	Human Redeposited Matrix	LF2
A49	6048	Middle Terrace-ASD 1	Prepared Clay Floor	LF2
A51	6071	Middle Terrace-ASD 1	Wall of Adobe/Mud Mortar	LF2
A52	6047, 6078, 6080	Middle Terrace	Fill Below Floor	LF1
A60	6084, 6085, 6086	Middle Terrace	Medium Density Midden	LF1
A63	6594	Middle Terrace	Prepared Clay Floor	LF1
A66	6095, 6098, 6099	Middle Terrace	Medium Density Midden	LF1
A67	6125	Middle Terrace	Hearth	LF
A68	6126	Middle Terrace	Hearth	LF
A74	6128, 6134	Middle Terrace	Cultural Fill	LF1
A75	6133, 6135, 6136	Middle Terrace	Mixed Fill	LF1
A206	7020, 7046, 7058, 7062, 7086, 7089	Upper Terrace	Surface	LF1
A317	7051, 7083, 7091	Upper Terrace	Pit Fill Ash	LF1
A207	7046, 7055, 7057, 7059, 7062, 7064, 7074, 7074, 7078, 7095, 7114	Upper Terrace	Surface	LF1
A298	7068, 7116	Upper Terrace	Possible Fill	LF1
A299	7077, 7105	Upper Terrace	Possible Occupation Zone	LF1
A300	7077, 7090, 7105	Upper Terrace	Yellow Clay Surface	LF1
A324	7099,7104, 7107, 7119, 7121, 7176	Upper Terrace	Midden	LF1
A325	7124, 7126, 7127, 7147, 7149, 7166	Upper Terrace	Midden	LF1
A278	7061, 7069, 7081, 7086, 7087, 7090, 7104, 7107,	Upper Terrace	Midden	LF1

	7108, 7108, 7116, 7118, 7119, 7121, 7123, 7127, 7130, 7153, 7164, 7190			
A285	7085, 7092, 7094, 7110, 7111, 7129, 7131	Upper Terrace	Surface	LF1
A268	7117, 7127	Upper Terrace	Midden	LF1
A270	7115, 7125, 7132, 7134, 7136, 7138, 7140, 7141, 7145, 7146	Upper Terrace	Midden	LF1
A272	7154, 7172	Upper Terrace	Stone Fill	LF1
A339	7155	Upper Terrace	Surface	LF1
A271	7134, 7139, 7143, 7152, 7156, 7165, 7174, 7176, 7177, 7178, 7185, 7195, 7196, 7197, 7198, 7200, 7201, 7202, 7216, 7229	Upper Terrace	Midden	LF1
A328	7210, 7213, 7220	Upper Terrace-ASD 2	Rock and Adobe Rock Fall	LF1
A274	7159, 7204, 7233	Upper Terrace-ASD 2	Greasy Green Clay Deposit	LF1
A94	6118, 6119	Upper Terrace-ASD 2	Possible Fill	LF1
Notes: Much of the events within ASD 2, including surfaces, architectural components (walls), fills, and hearths, contain MF/LF mixed deposits				

Table 4.2 Late Formative events I sampled from Sonaji, organized by activity area.

Sampling at Sonaji on the Lower and Middle Terrace are limited to one 2-by-2 m unit each, excavated in 2004 (Hastorf et al. 2006: 44). Late Formative events sampled from the Lower Terrace are exclusively midden contexts that vary in density between low, medium, and high. The current interpretation of the midden (and later pit) contexts is related to levelling events linked to the Upper Terrace (Roddick 2009: 129). Events occurring in the Middle Terrace are less straightforward than the Lower Terrace, consisting of a mixture of midden deposits and floors (Roddick 2009: 129-132). I am particularly interested in the events that take place within SN ASD 1, a structure abandoned by AD 239-426 and the only building securely dated to Late Formative II excavated by TAP (Roddick 2009: 131). Investigations into the activities associated with this building were compared against the structures at Kala Uyuni to see whether inhabitants shared similar local depositional practices and examine the way the building became abandoned.

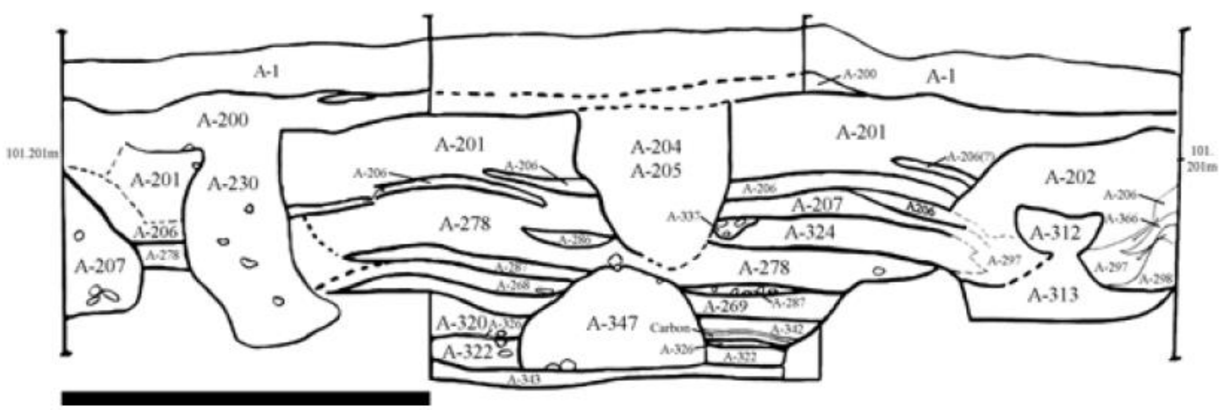


Figure 4.5 Eastern profile of the 6-by-6 m unit on the Upper Terrace, from Hastorf et al. 2006: 49. Note the intrusive pit cuts and fills, as well as the rapid change in events from the identified cultural layers.

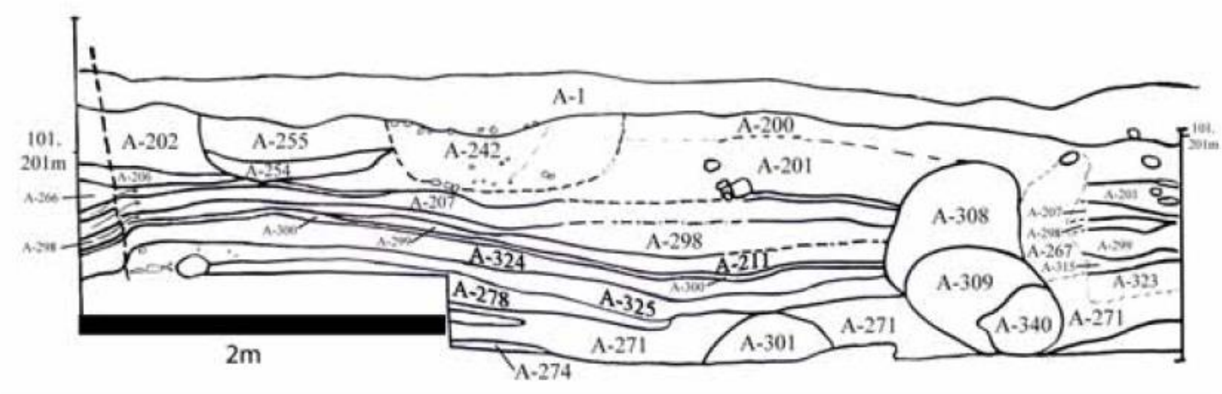


Figure 4.6 Southern profile of the 6-by-6 m unit on the Upper Terrace, from Hastorf et al. 2006: 49.

4.5. Kumi Kipa

All samples from Kumi Kipa are phased to Late Formative I, with the majority coming from ASD 1 (Figure 4.7). One 2-by-2 m unit was placed in the KK Monticúlo sector lying to the east, and 5 other 2-by-2 m units were placed in surrounding study area. Of the five, I sampled three units (2 north, 1 west) which contain Late Formative I components. Three events were sampled from KK Monticúlo, five from the general site (three scattered units designated as "Kumi Kipa"), and 13 from KK ASD 1 (Table 4.3). The original purpose of the placement of three scattered units in the lower area of Kumi Kipa was to provide a more widespread sample of ceramics for the site (Roddick 2009: 140). I focused on events that take place at ASD 1 and the associated activity area because it is the only structure uncovered to date at the site and has a longer depositional history (Figure 3.8). I do briefly discuss the two northern, isolated units in my analysis of carbonized sherd distribution because of the anomalies I observed (section 5.4).

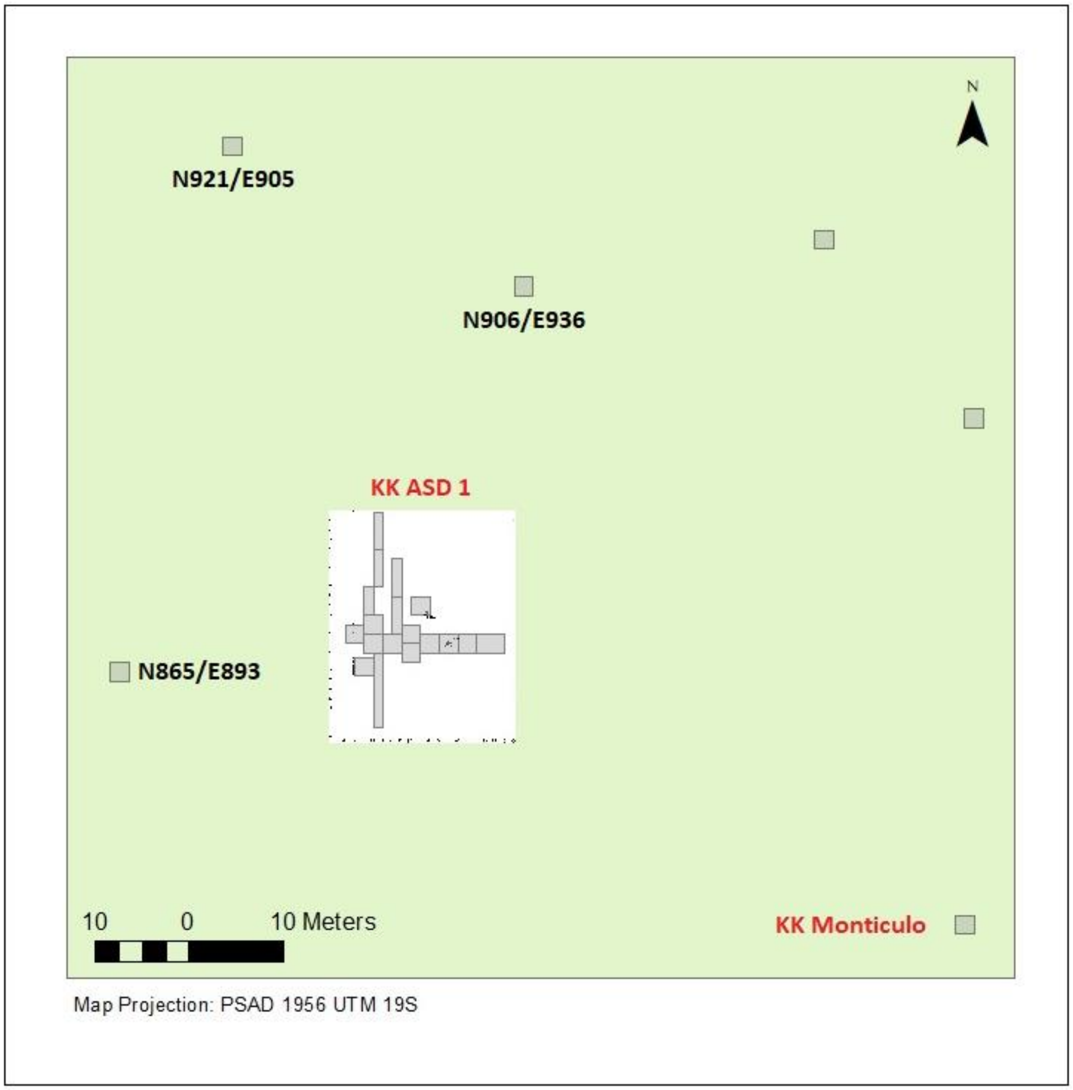


Figure 4.7 Full site plan of Kumi Kipa depicting the general locations of activity areas at this site in red. Units north and west labelled in black belong to the general location of Kumi Kipa. Note that the labelled units are shown with coordinates associated with the local datum rather than UTM coordinates. Unlabelled units are excluded from this analysis as they do not contain Late Formative material.

Late Formative Events at Kumi Kipa				
Event	**Locus**	**Location/Activity Area**	**Description**	**Phase**
A4	6503, 6505, 6563, 6598	Kumi Kipa	Occupation Zone (Deposited during use)	LF1
A9	6532	Kumi Kipa	Occupation Zone (Deposited during use)	LF1

A15	6538	Kumi Kipa	Occupation Zone (Deposited during use)	LF1
A28	6551, 6553	Kumi Kipa	Use Surface	LF1
A47	6577	Kumi Kipa (prior to the building of ASD 1)	Pit Fill (Midden)	LF1
A159	6702	Kumi Kipa	Clay Lens	LF1
A17	6540, 6555, 6556, 6558	KK ASD 1	Occupation Zone	LF1
A41	6568	KK ASD 1	Midden	LF1
A43	6572, 6573, 6698, 6665, 6658	KK ASD 1	Surface Outside of Structure	LF1
A46	6575, 6576	KK ASD 1	Rocky Fill (purple)	LF1
A48	6577, 6560	KK ASD 1	Pit Fill (Midden)	LF1
A50	6588, 6670, 6674, 6686, 6687, 6737	KK ASD 1	Occupation Zone	LF1
A55	6589, 6675, 6696, 6658, 6671, 6688, 6689	KK ASD 1	Compact Surface in Structure	LF1
A64	6595	KK ASD 1	Fill Below Floor	LF1
A85	6697, 6661, 6663, 6664, 6571	KK ASD 1	Surface Outside of Structure	LF1
A98	6628	KK ASD 1	Clay Lens	LF1
A127	6629	KK ASD 1	Clay Floor (Inside Structure)	LF1
A154	6642	KK ASD 1	Occupation Zone	LF1
A160	6702	KK ASD 1	Medium Density Midden	LF1
A72	6609	KK Monticúlo	Surface	LF1
A70	6608, 6607	KK Monticúlo	Pit with Camelid Bones	LF1
A80	6611, 6613	KK Monticúlo	Occupation Zone (Deposited during use)	LF1

Table 4.3 Late Formative events I sampled from Kumi Kipa, organized by activity area.

I sampled ceramics from all 9 units at KK ASD 1, looking at events that take place outside and inside the structure. Surfaces I examined inside the structure were A50, A55, and A127. External surfaces I examined were A85 and A43. This is to compare the space use in and outside of the structure and see how residents treated their spaces (cleaning-wise) when compared to residents at Kala Uyuni. Comparisons with Sonaji are much more limited as there is no distinction between the interior and exterior. The other events I examine here consist of midden and/or pit contexts. The term pit fill and midden are used interchangeably at this site and is less clearly differentiated when compared to literature on Kala Uyuni. Excavators debated the coding of these events, particularly on the Upper Terrace because of the various natural and cultural formation processes that affected the site stratigraphy (Bruno et al. 2006: 47). Although fills were mainly interpreted as "intrusive," they were rich in carbon, bone, lithics, and ceramics and could represent distinct practices if coded as middens (Bruno et al. 2006: 47-49; Roddick 2009: 133). I examined A160/159 (medium density midden and clay lens), A46 (rocky fill), A48 (pit fill/midden), and A47 (pit fill/midden) to see whether there are any differences in ceramic densities or vessel forms which could help clarify the nature of particular contexts.

4.6. Ceramic Attributes and Taphonomy Data

The ceramic data I use in this thesis come from a series of nested analyses conducted mainly by Dr. Andrew Roddick and Dr. Lee Steadman. Three types of analyses in increasing order of detail were conducted: C-analysis, Z-analysis, and A-analysis. C-analysis of ceramics was done to determine the phase and level of mixing within each deposit (Roddick 2009: 202). The Z-analysis was conducted on ceramics in unmixed contexts and involved basic attribute analysis to explore form and style. This included recording information on diagnostic sherds (i.e. rims, handles, bases, decorated body sherds), the count and selective weight of all sherds including body sherds, and phasing if applicable (Roddick 2009: 202-203). The diameter, thickness, shape, colour, finish, rim shape, carbonization, decoration, and specimen number were all recorded in the Z-analysis (Roddick 2009: 203). A-analysis is the most detailed form of investigation and reserved for unmixed Formative contexts. This analysis includes the recording of all attributes listed above, as well as paste, firing, ware, consumption-related attributes (use, residues, pot-use lives), and any qualitative assessments (Roddick 2009: 204). Body sherds less than 1 cm^2 were collected in a separate bag, but not further analysed (Steadman et al. 2004: 28). In all cases however, ceramics were counted and recorded.

The ceramic dataset from TAP is ideal for assessing the local because a) it is a large dataset and b) the information recorded is detailed enough to take a chaîne opératoire approach to track technological style through space and time. The full database includes pottery phased between the Middle Formative Period to Tiwanaku IV/V, with a total of 28321 sherds analyzed between the three sites. Of this, I sampled 18,325 sherds from the Late Formative Period. Researchers recorded over 20 attributes for sherds in the assemblage. Of these, I focused on four kinds of attributes: paste, surface treatment, vessel form, and carbonization. The first three are the most observed characteristics in the data which captures much of the overall sample. Carbonization, while less common, helped to clarify some of the activity areas within sites, particularly whether fire-related activities (i.e. cooking, craft production, or ritual burning) mainly occurred on surfaces, middens or pits, or other kinds of fills and deposits. TAP's classification schemes are meticulous and involved many different categories and descriptions for each attribute. To analyze the data spatially, I needed to re-group and generalize the data into larger classifications.

Major re-classification occurred with paste and carbonization, and minimally for surface treatment (Table 4.4). There are many unique paste recipes and groupings (28) that were recorded. I grouped the paste broadly by temper type, texture, and inclusion size based on the written descriptions. For carbonization, each of the individual classifications had subcategories into the degree of carbonization. For example, carbonized powder or encrustation could be described as light, medium, or heavy. I decided to keep the higher-order classifications (i.e. powder, encrustation, blackened/scorched) as I did not know whether any specific meanings can be interpreted from how much carbonization existed with a geospatial analysis of ceramic data alone. For surface treatment, I kept the original classification because each category had distinctive counts where it became difficult to generalize and re-classify. However, I did examine the exterior finish separate from the interior finish, as they can indicate whether a vessel may have been used for cooking, storage, ritual, etc. from the kind of surface treatment and its location (Rice 1987; Skibo 2013).

At the macro-scale, I analyzed sherds in three ways. First, I examined the distribution of total sherd count densities across all units and then the ratio of decorated to undecorated sherds. This was to set up the foundation of my first, overarching research question on site and spatial understandings of locality. Second, I examined the distribution of the densities of identifiable vessel forms by event (Table 4.4). This was to take the analysis down to a closer spatial level to examine the temporal dimension of the distribution of sherds in space. This helps to explore my second set of questions on whether there were any patterns in the spatial organization within and between each site. Thirdly, I examined sherd weight density and average sherd weight to understand how spaces were cleaned and treated, and the intensity of the use of spaces. In other words, they may help examine the relative amount of human traffic that occurred (i.e. trampling) and waste disposal practices (Arnoldussen and de Vries 2019; Hayden and Cannon 1983; Nielsen 1991). Sherd weight considers the very small and eroded sherds that are generally not studied in the first and second analyses because smaller scale attributes (i.e. paste, surface treatment, firing techniques) are difficult to observe and to reduce the overestimation of vessel forms from fragmentation associated with sherd counts (Arnoldussen and de Vries 2019: 194). The use of average sherd weight helps to compensate the overestimation of larger pottery, which is a limitation of weighing sherds (Rice 1987: 292).

Attribute	**Classification**
Paste-Temper Type	Mineral or Fiber
Paste-Texture	Fine, Fine-Medium, Medium
Paste-Inclusion Size	Fine, Fine-Medium, Medium, Medium-Large, Large
Surface Treatment	Very Fine Complete Burnish (vfcb), Complete Burnish (cb), Incomplete Burnish (incb), Rubbed, Smoothed, Wiped, Grainy Wipe, and Stucco
Carbonization	Powder, Encrustation, or Scorched
Vessel Form	Necked Vessels (no height), Tall and Medium-Necked Vessel, Short and Medium Olla, Bowl, Spindle Whorl, Polishing Tool

Table 4.4 Ceramic attributes I sampled, and the classification I used from scaling up the data.

Post-depositional and taphonomic processes are also vital to the study of the local because they affect the recovery of artifacts/ecofacts and subsequent interpretations about the organization of people and their practices in space. Groundwork has been made towards thinking about and understanding taphonomy at these sites through geomorphological and experimental analyses, as well as studies involving both zooarchaeological and paleoethnobotanical remains (Bruno 2008, 2011, 2014;

Goodman-Elgar 2004; Moore et al. 2010; Petersen 2007). Ceramic data have yet to be juxtaposed with paleoethnobotanical data, which presents an ideal case study to further understand the formation processes occurring on the peninsula. For this reason, I include some paleoethnobotanical data in my study (Table 4.5). I sampled a few major plant taxa at Kala Uyuni to better understand the depositional processes and space usage. I make use of two datasets for this site. The first consists of the count and density of 6 plant taxa: tuber, *Chenopodium sp*. (quinoa), *Maihuenopsis* sp., Echinocactus, Cactaceae, and Ze mays Cupule. They are organized by flotation sample number and by locus. The second speaks to the total count density of crop data and non-crop data, also by locus and flotation. Because my examinations involve working at the event scale, I created a separate column in Excel to reaggregate the densities by event rather than locus. Using Dr. Bruno's work on quinoa at Kala Uyuni and her interpretations, I examined patterns in the distribution of quinoa and tubers (via Parenchyma) in relation to the distribution of carbonized pottery.

With respect to ceramic-paleoethnobotanical data comparisons, I included event contexts that have both currently analyzed plant data and ceramic deposits. Plant samples do exist for many of the contexts based on my conversations with Dr. Bruno and are present in the locus forms but have only been inventoried and not fully analyzed yet. Cross-comparisons at Kala Uyuni are limited to these surface-related events (B12, B14, B24, B34, B77, B249, and B261) and two hearths (B61 and B76) associated with ASD 2. I did not include any plant samples from Sonaji and Kumi Kipa since the plant database only included analyzed plants from either mixed or Tiwanaku Period contexts.[9] not in any of the Late Formative Period contexts I sampled.

Plant Samples from Kala Uyuni for this Study					
Event	**Locus/Slash**	**# of Samples**	**Location/Activity Area**	**Description**	**Phase**
B12	5154/1, 5358/1, 5358/2, 5358/3	4	ASD 2 and associated activity areas	floor	LF1
B14	5044/1	1	ASD 2 and associated activity areas	surface outside structure	LF1
B24	5168/12	1	ASD 2 and associated activity areas	clay lense	LF1
B61	5363/1	1	ASD 2 and associated activity areas	hearth	LF1
B76	5370/1	1	ASD 2 and associated activity areas	informal hearth	LF1
B77	5371/1, 5369/1, 7537/1, 7537/16, 7537/18	5	ASD 2 and associated activity areas	external occupation surface	LF1
B249	7507/1, 7508/1 (x2), 7508/16, 7508/21, 7508/25, 7578/1, 7578/6, 7578/10 (x2), 7588/1, 7590/1 (x2)	13	ASD 5	internal occupation surface	LF1
B258	7582/1	1	ASD 5	burial	LF1
B261	7506/1, 7517/1, 7518/1, 7519/1, 7580/1	5	ASD 5	external occupation surface	LF1
B262	7506/1	1	ASD 5	ash lense	LF1
B20	5161/1	1	outside structures	pit fill	LF1

9 There are plant samples coming from some of the contexts I sampled, but their counts and densities have not been entered in the shared plant database.

B55	5309/1, 5309/2	2	outside structures	pit fill	LF2
B34	5272/1	1	LF West of ASDs 2, 4, 5	compact clay floor	LF2
B73	5316/1, 5316/6, 5316/9	3	LF West of ASDs 2, 4, 5	burial	LF1
B91	5317/1, 5317/6	2	LF West of ASDs 2, 4, 5	high density midden	LF1
B92	5323/1	1	LF West of ASDs 2, 4, 5	high density midden	LF1
B97	5322/1	1	LF West of ASDs 2, 4, 5	midden ash	LF1

Table 4.5 List of events that I sampled containing paleoethnobotanical remains. The individual locus/slash numbers refer to each specific sample.

4.7. ArcMap and Data Visualization/Spatial Distribution

The application of GIS to a materials-based analysis is beneficial in combining macro- and micro-scale analyses and relating attributes to space. This is because traditional databases such as Excel or Filemaker are only concerned with attributes of objects where there is "no explicit distinction between the location of an object and its attributes" (Wheatley and Gillings 2002: 19). By relating attributes to geographic location, we may eventually address questions to do with movement, settlement patterns, space, and sociopolitical organization (Wheatley and Gillings 2002). Although GIS is traditionally used for regional analyses, it can incorporate data at multiple resolutions (Harris 2006: 44). This is significant to my study because of the nature of my research questions and the differences in geospatial resolution between the ceramic and paleoethnobotanical data. My research questions focus on understanding the construction of locality at the event scale, as opposed to being exclusively at the regional scale. While distinctive spatial patterns of technical tradition do emerge at the macro-regional scale in comparison to a site-level comparison, more subtle changes in variation occurring within a site may be missed, including changes occurring at the scale of the event/deposition (Roux 2016: 109).By changing the boundaries of the units (in this case, ceramic attributes) in a spatial analysis, results can be juxtaposed with another to see whether the relationships observed are significant or not (Haggett 1965 as cited in Harris 2006: 46). This is particularly important when discussing locality from my two definitions outlined earlier. Different levels of data resolution can affect the identification and interpretation of social boundaries which can impact how archaeologists perceive locality.

Much of my GIS work involved using proportional symbology to visually compare densities across space, and "peeling" back layers using the Swipe tool to see changes over time between layers (in conjunction with the Harris matrices) (Figure 4.11). Because of the limitations of the spatial resolution, I created a layer for each group of events (a file containing all surface or surface-related events, one for middens and pits, etc). I then created more data layers where each layer corresponded to an event type and one field attribute. For example, 1 data layer would show count densities of vessel forms for midden and pit contexts at Kumi Kipa. Another would show the count densities of vessel forms for surface and occupational contexts. I analyzed each layer separate from one another as well because they could not all be overlayed together without obscuring some density patterns. I also used Harris matrices and site forms to track and understand the depositional history at the site to mitigate the difficulty in seeing some spatial relationships because of the way the coordinates for ceramics were recorded.

4.8. Data Cleaning/Management

For data clean-up and analysis, I used a combination of Excel and GIS. All existing GIS files and site plans and maps I used and modified were created by Dr. Maria Bruno, Dr. William Whitehead, and Dr. Eduardo Machicado. There were no existing GIS files for the ceramic data. Two major factors were considered in data analysis -the state and compatibility of the datasets in terms of spatial resolution, and the issues associated with georeferencing.

Much of the clean-up of ceramic data and re-classification took place within Excel first before incorporating them in GIS. I created new columns to enter data, including activity area/context, UTM N/UTM E (this will be discussed later below), "Paste 1" (Temper Type), "Paste 2" (Texture), "Paste 3" (Inclusion Size), the counts of the three paste categories, "Form Count," "Surface Treatment Count," "Carbonization Count," as well as count and weight densities of the above. Using the scanned locus forms, I added in the volume for entries that were missing values to calculate the density values. No re-classifications or calculations were needed for the plant taxa because densities were already calculated, and because I only focused on two plant taxa.

Each of the ceramic attributes in my dataset had an attribute code (Roddick 2009). For example, a sherd coded with a paste code 1 would be described as having medium size inclusions that are angular and subangular and black, white, or translucent in colour. Sherds coded like this tend to have a lot of mica, subcompact, and be of a medium texture. A fiber variation would be paste 18 and the inclusions in paste 17 are finer in comparison to paste 1 (Roddick 2009: 454). Because of the specificity, it was difficult to analyze ceramic attributes spatially if they were not scaled up to broader categories

(Table 4.5). I chose to simplify the paste attributes based on temper type, texture and inclusion size based on the written descriptions associated with the various paste codes. For surface treatment, vessel forms, and carbonization, I mainly scaled up to more general categories.

The geospatial resolution of the ceramic and paleoethnobotanical data differ dramatically and speak to the issues of engaging legacy data (which I discuss in more detail in chapter 6). The ceramic dataset mainly follows TAP's general recording system. TAP used a local, on-site recording system, where each site had two permanent datum points staked into the ground. At the centre of the datum is a fixed point with arbitrary coordinates (i.e. N1000, E1000, elevation 100m) chosen to: 1) cover the full spatial extent of the site and 2) avoid any negative coordinate values or the use of south or west designations. Coordinates for surface collections and excavation units were recorded based on the southwest corner. The purpose of doing this is to standardize the recording as it is "the same grid system used for surface collection" from the first TAP excavations in 1999 (Bandy and Hastorf 2004: 4). For example, of the 2923 entries (of analyzed sherds) from Kumi Kipa, 2891 of them share 1 of 10 possible x-y coordinates (Figure 4.8). On a map, this means that one would not actually be able to see the spread of all 2891 entries, but rather only 10 dots because those entries overlap on another. For Sonaji, the distribution of sherds shares 1 of 11 possible pairs of coordinates. At Kala Uyuni, 7892 of the 7964 sherds examined share 1 of 14 coordinate pairs. Only some sherds were recorded *in situ,* which applies only to Kala Uyuni and Kumi Kipa (i.e. Figure 4.9). In contrast, all paleoethnobotanical data are point-provenienced (all flotation samples) and has the highest spatial resolution from the entire TAP project. This means one can see the spatial distribution of plant remains in greater detail.

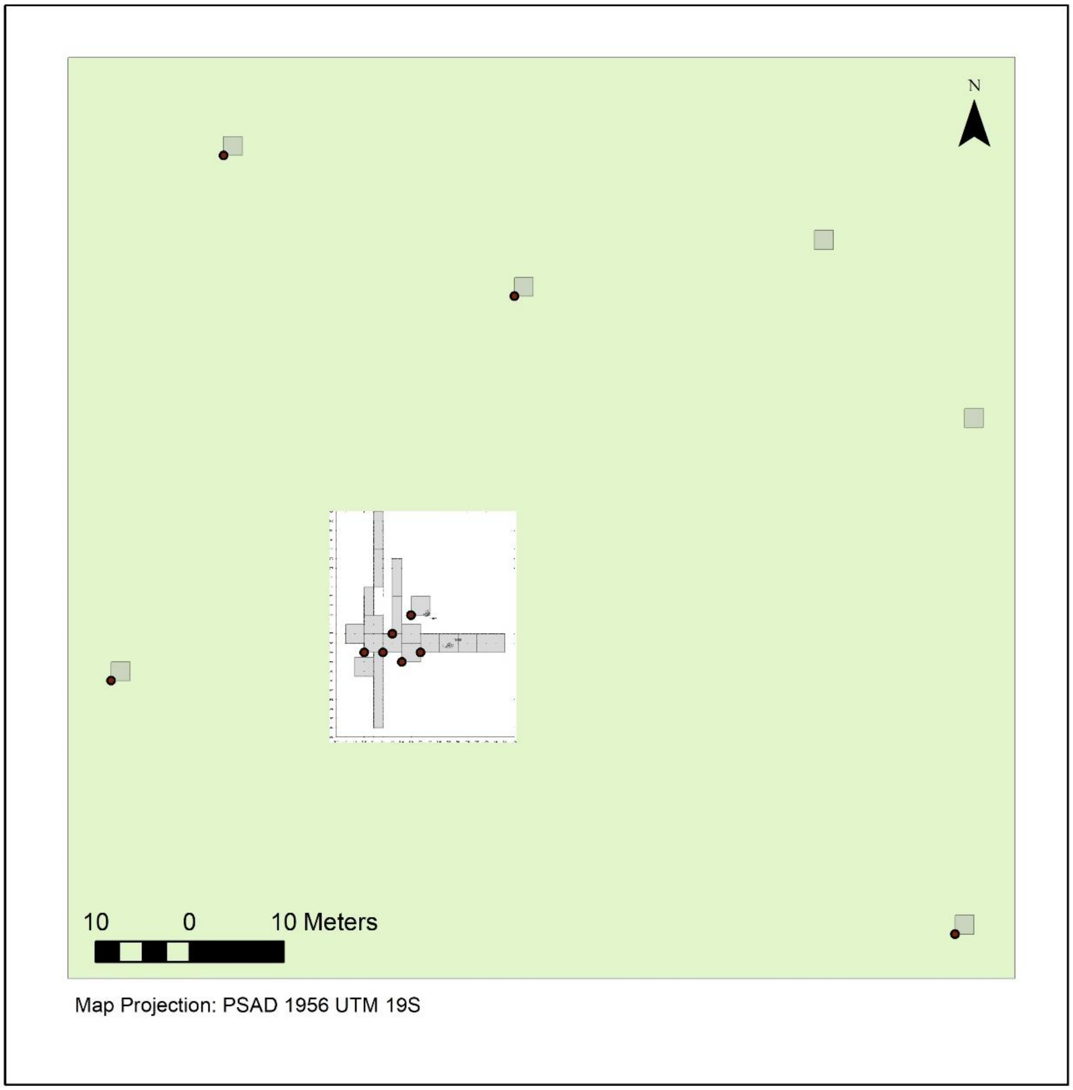


Figure 4.8 All the ceramic data points visualized across the site of Kumi Kipa. Although there are 2891 sherds in this sample, the majority overlap and share one of 10 possible x-y coordinate pairs making any cluster analyses difficult to conduct.

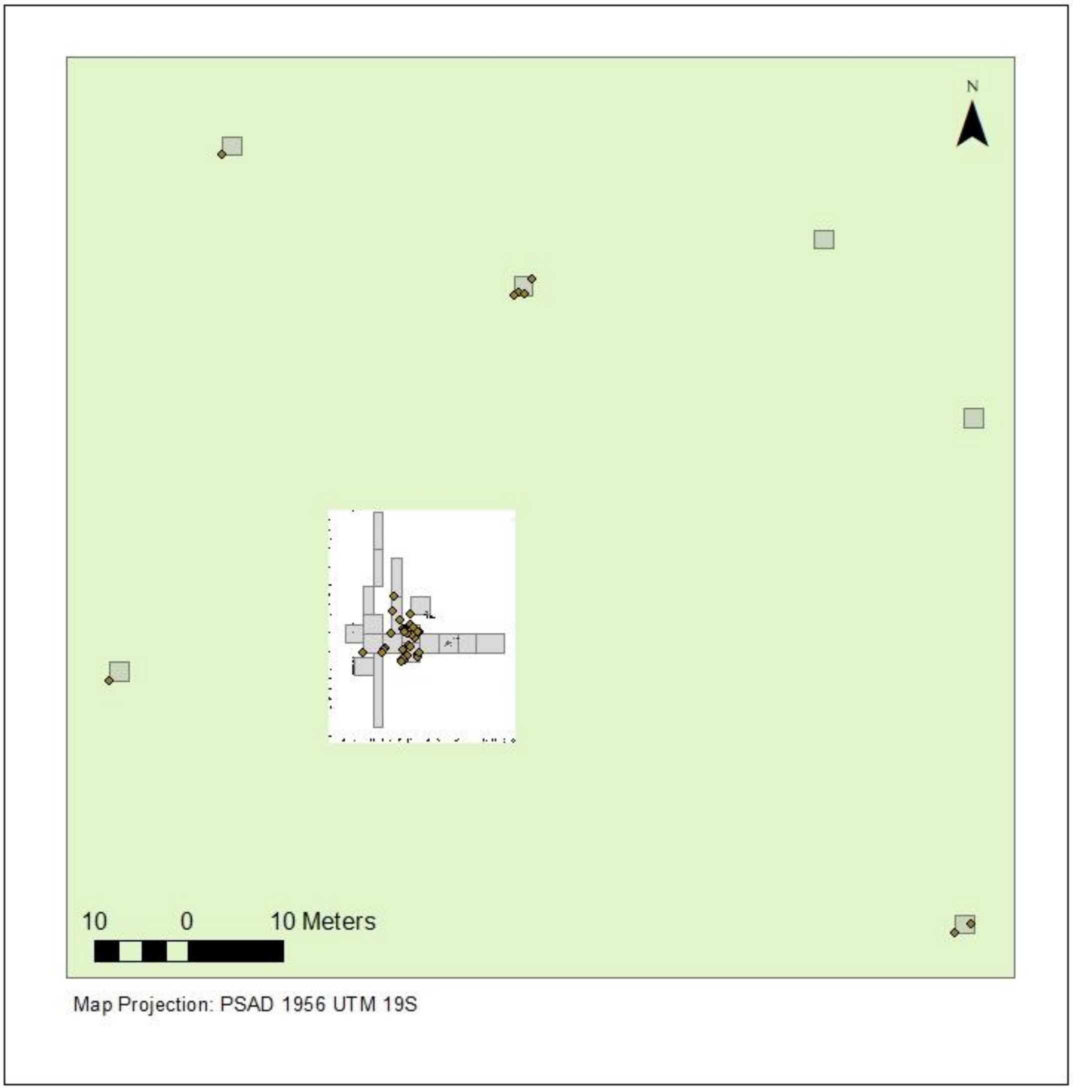


Figure 4.9 Site plan of Kumi Kipa, showing all ceramic data points, including the small sample of point-provenienced sherds. 32 ceramic sherds have point-provenience.

The second factor related to data clean-up was the issue of georeferencing. The old GIS data are mainly raster data and some vector data (i.e. polygons of units) created for excavation planning or map-making purposes (i.e. for publication), given that much of the data consisted of points used to make contour maps, TIN (Triangular Irregular Network), or DEM (Digital Elevation Model) files. These files used a PSAD 1956 coordinate system. The newer GIS data, particularly the plant data for Kala Uyuni, differs because they track points at the site level but are not georeferenced. This is because the paleoethnobotanical research maintained a high spatial resolution of the data. Georeferencing or applying projection (coordinate system) conversions could introduce some spatial transformation error.

In consideration of both issues, I chose to georeference all the material in this project (i.e. maps, ceramic files). I did this because I wanted to make use of the unit polygons created in the older GIS files so I could see the extent of each unit which is not shown on the site plans. This allows me to spatially visualize the actual locations of the points within space. By georeferencing this dataset, I could perform more complicated spatial analyses and use other tools available in GIS software, such as distance-based tools. It also will allow future researchers to incorporate ceramics into multi-artifact studies or other regional analyses. For the cross-comparison of ceramics to paleoethnobotanical data, I did an independent comparison with files that were not georeferenced to preserve the plant coordinate accuracy.

I first georeferenced all the site plans that were available to have a surface to work on with ArcMap. I used the PSAD 1956 coordinate system to match the older GIS files. Because the ceramic (and paleoethnobotanical) datasets have “local” coordinates that are not linked back to “real” world coordinates, I needed to convert the coordinates for them to display on the georeferenced site maps with the PSAD 1956 UTM 19S projection. I used the main topographic map of the Taraco Peninsula, the site plan maps, and the old GIS files with georeferenced unit polygons to manually match the local coordinates to the real-world coordinates for all points. I then went back and entered the local point-provenienced information that was available for some ceramics into Excel, referencing scanned site forms. I performed a linear regression analysis to find an equation to convert any points that had point provenience (Figure 4.10). This involved using the UTM coordinates I manually entered (Y-value), and the local coordinates ("Unit N" or "Unit E") and the point provenience coordinates ("Northpp" or "Eastpp") (X-values). The relationship between these values were either at or near a 1:1 ratio for all. This was done to both the northing and easting fields at each site (total of 4 regression analyses), except for Sonaji as there were no ceramics point-provenienced there. I created an equation for each analysis from this and converted the sherds with local, on-site point-provenience into UTM. I could then transfer the Excel data into ArcMap smoothly so that it would match the older GIS files. For example, Figure 4.10 shows the input and results of my regression analysis on the northings of Kumi Kipa. Based on the results, the equation would be "UTM N = 1.18096(Northpp) + 8181780," where UTM N is the northing in UTM.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.99769
R Square	0.99539
Adjusted R Square	0.99507
Standard Error	0.98609
Observations	32

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	6085.8	3042.9	3129.37	1.3385E-34
Residual	29	28.1987	0.97237		
Total	31	6114			

	Coefficients	*andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	8181780	11.1072	736618	2E-150	8181757.62	8181803	8181758	8181803
Unit N	1.18096	0.22528	5.24213	1.3E-05	0.72020794	1.64172	0.72021	1.64172
Northpp	-0.1785	0.22612	-0.7894	0.4363	-0.64097223	0.28398	-0.641	0.28398

RESIDUAL OUTPUT

Observation	*Predicted UTM N*	*Residuals*
1	8182688.549	0.45140175
2	8182688.566	0.43355208
3	8182688.304	0.69594229
4	8182649.363	0.63684562
5	8182649.379	0.62078091
6	8182649.465	0.53510247
7	8182649.454	0.54581228
8	8182649.19	0.80998745
9	8182649.217	0.78321294
10	8182649.277	0.72252405
11	8182649.411	0.5886515
12	8182649.436	0.56366195
13	8182651.284	-1.28419402
14	8182651.252	-1.25206461
15	8182651.159	-1.1592463
16	8182651.227	-1.22707506
17	8182651.206	-1.20565546
18	8182651.404	-1.40378683
19	8182651.275	-1.27526918
20	8182651.297	-1.29668879
21	8182651.356	-1.35559272
22	8182651.334	-1.33417311
23	8182651.306	-1.30561363
24	8182620.236	0.76370959
25	8182620.233	0.76727952
26	8182650.419	0.58083004
27	8182650.419	0.58083004
28	8182650.419	0.58083004
29	8182650.442	0.55762547
30	8182651.792	1.20777539
31	8182652.069	0.93110545
32	8182652.258	0.74189891

Figure 4.10 Example of one of the linear regression analyses I conducted for Kumi Kipa. "Unit N" refers to the north coordinate based on the local, on-site datum. "Northpp" refers to the column with ceramics that are point-provenienced and refers to the north coordinate; also based on the on-site datum. "UTM N" refers to the UTM northing.

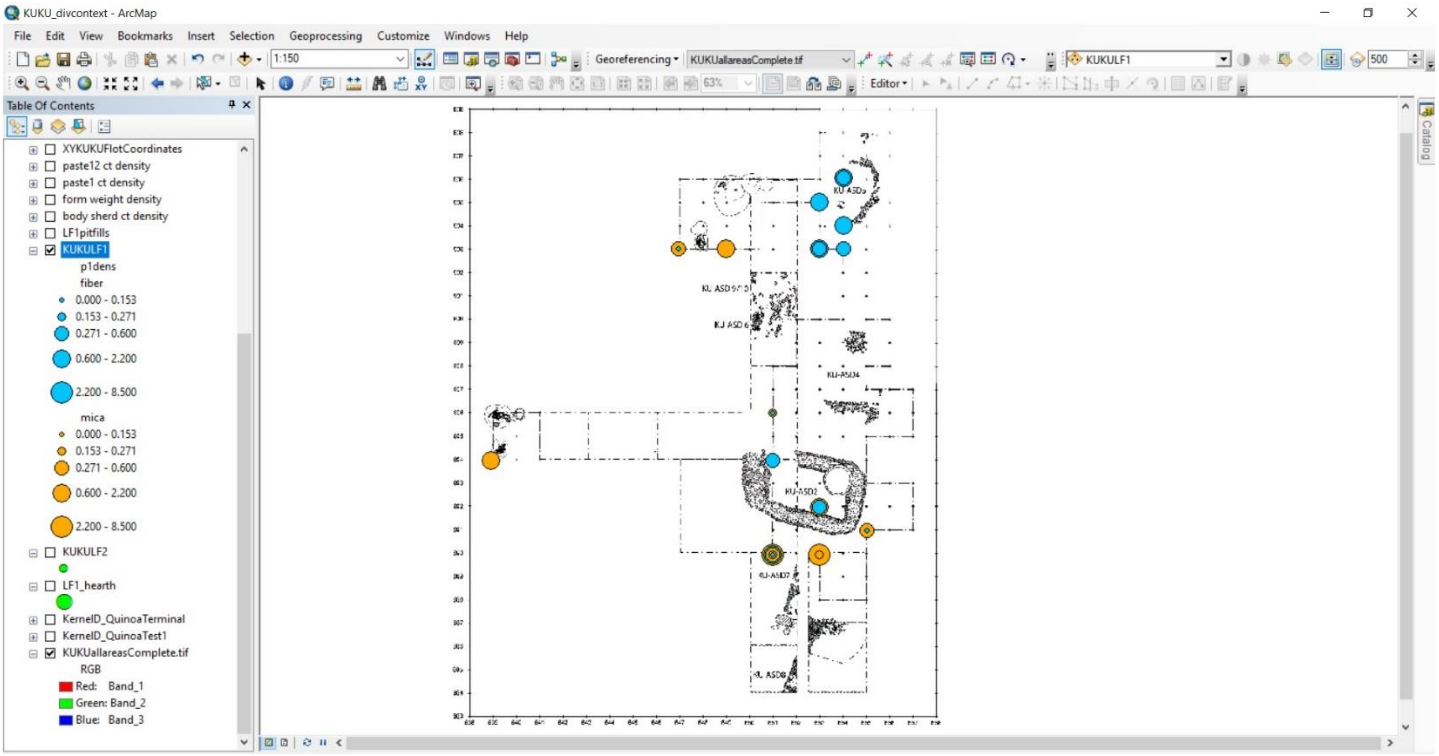


Figure 4.11 View of ArcMap showing the use of proportional symbology to look at the distribution of fiber and mineral (mica) pastes by count density (count/volume in L) for all events. Note the overlap issues on some of the points which occurs due to different events sharing the same coordinates. As a result, each event or group of events is based on an activity area or context code.

4.9. Summary

In this chapter, I presented my sampling procedures and the contexts I sampled from Kala Uyuni, Sonaji, and Kumi Kipa. I discussed how the sampling at each site would contribute to my research questions. I also presented the methods and analysis I conducted on the ceramic and taphonomy data via paleoethnobotanical remains. Archaeologists working in this region have conducted meticulous analyses on both pottery and plant remains. Ceramic data have also not been studied geospatially. I discussed my choice in georeferencing the datasets I used in this study, which provides a method for integrating on-site coordinates into a global recording system. I concluded this chapter by presenting how I will use GIS for my analysis of a collection of databases. This approach results in a more visual, qualitative analysis. In the following chapter I summarize the results of my attribute and geospatial analysis of ceramic attributes and taphonomic data and discuss the major findings I observed in the Kala Uyuni, Sonaji, and Kumi Kipa samples.

Chapter 5: Results and Findings

5.1. Overview

In this chapter I report on my analysis of the spatial distribution of 7964 sherds from Kala Uyuni (and their relationship to 44 plant samples (Tables 4.1-4.3, 4.5), 7438 from Sonaji, 2923 from Kumi Kipa. This analysis was conducted to explore how two different forms of locality are produced at different spatial scales of analysis and made visible through different points in the life history of ceramic vessels. Specifically:

1) How do site and feature designations impact archaeological interpretations of the local? How might our narratives of Kala Uyuni, Sonaji, and Kumi Kipa change when we focus on the spatial patterning of ceramic attributes?

2) Were inhabitants producing and using distinct pottery types at each site? What might variation or lack thereof say about site organization and understandings of material practice and knowledge sharing?

I explore these questions by considering the three kinds of locality that can be explored through ceramics (discussed in sections 2.2-2.3). I explore my first question at the macro-spatial scale by grouping Late Formative Period ceramics regardless of their depositional history or stratigraphic variability. I present total sherd densities, decorated/undecorated sherd percentages, and distribution across sites. This is the common approach to locality vis-à-vis ceramics in the Lake Titicaca Basin, where variation is often homogenized into a phase, and considered in terms of their relationship to architecture and other prominent features (see sections 2.2 and 3.5). In section 5.4, I compare the spatial and temporal distribution of vessel forms (bowls, *ollas*, necked vessel, etc.) to explore how the patterning of ceramic attributes across the occupational history of these sites (including surfaces, middens, pits, and other fills/deposits) compares against homogenizing Late Formative dynamics.

I answer my second set of questions about locality vis-à-vis shared material practices and knowledge by examining a more significant set of attributes afforded by the TAP project. Here I analyze the spatial distribution of ceramic production attributes (i.e., paste, surface treatment) and attributes of use (i.e., carbonization, fragmentation). I pay much attention to fine-grained spatial variation, considering stratigraphic change and archaeologists' interpretation of cuts and deposits at each site. I then examine the distribution of unidentified vessel forms (i.e. sherd fragments where form could not be identified) by weight on surfaces, middens, pits, and other fills/deposits to better understand use intensity, waste disposal practices, and other formation processes at these three sites over time. I include here a brief pilot effort of integrating the spatial paleoethnobotanical data with ceramics at Kala Uyuni to clarify midden and surface contexts, particularly their uses for cooking or refuse (see also section 4.4). I hope to clarify the sense of locality that is produced and maintained through the practice of ceramic production, use of surfaces, and waste disposal. I conclude this chapter by summarizing my major findings.

5.2. Ceramics across space: Decorated/Undecorated Sherds

In the following section I analyze the distribution of ceramics by unit and site to explore how locality is conceptualized through geographical boundaries. I use Willey and Phillips' (1958) definition of the local as a spatial unit that exists and operates at the site level. This version of the local is implicitly used to define and differentiate sites from one another to define time periods (see section 3.5). The reliance on surface sherds in this approach compresses time into a single dimension, for instance the Late Formative Period as an entity. Rather than looking at the diachronic shifts during the Late Formative Period, this means that I look at the ceramic distribution synchronically here. As discussed in chapter 2.3, scholars using this approach tends to prioritize ceramic densities, with particular attention to decorated ceramics. Bandy (2001) used this approach to categorize sites in the process defining locality. Based on the reclassification and data visualization I conducted using Excel and ArcGIS, I summarize the ceramic densities and ratios of decorated and undecorated pottery at Kala Uyuni, Kumi Kipa, and Sonaji. I show how the sherd density distributions look from Bandy's (2001) wide-scale survey of the peninsula, which is a snapshot of the whole period.[10] I then explore the spatial distribution of sherds from the excavated units that contain Late Formative components to examine excavation data at a flattened periodization scheme. I briefly discuss how this flattened version of locality affects the narratives about these sites, and why undecorated ceramics must be studied for this time period.

Total Sherd Densities

At Sonaji, clusters appear in the southeast portion of the excavated units on the Upper Terrace where SN ASD 2 was found (Figure 5.1). There is a very low density of ceramics found at SN ASD 1 on the Middle Terrace, the only structure firmly dated to Late Formative I from TAP excavations on the Taraco Peninsula. I observed a dramatic

[10] Sonaji is the only available distribution map that could be found showing the ceramic density scatters from the survey. Unfortunately, the survey ceramic density maps of Kala Uyuni and Kumi Kipa have not been found.

difference in density distribution among the terraces at Sonaji when I compared the total sherd densities recovered from excavation to Bandy's (2001) survey data. Bandy (2001: 43) collected ceramic scatters starting from the centre point of each site and collected sherds within a 3.99 m radius. From excavation data, the highest densities came from the Upper Terrace, while the lowest came from the Middle Terrace for the entire Late Formative Period (Figure 5.1). However, the spatial distribution from Bandy's (2001) survey data showed an increase in ceramics on the Middle Terrace and dramatic decrease on the Upper Terrace by Late Formative II (Figure 5.2). Ceramic scatters during Late Formative I at Sonaji showed high densities on the Upper Terrace, while there were low to moderate densities of ceramics on Middle Terrace and Lower Terraces. Figure 5.2 seems to suggest some sort of intensification in the use of the Middle Terrace over time, while excavations suggest a smaller role (see sections 3.4 and 4.4). This could be the result of a sampling bias, given the limited excavations on both the Middle and Lower Terraces. The shift in density between Late Formative I and II in Bandy's (2001) maps warrants further investigations at a diachronic scale (i.e. by stratigraphic event) to see whether the density increases from survey could be interpreted in a meaningful way as it stands. Perhaps the differential patterning between LF 1 and 2 on the Middle and Upper Terraces seen in Bandy's (2001) maps represents a shift in space use, where use of the Middle Terrace intensified as activities on the Upper Terrace decreased. However, there is a high degree of disturbance at Sonaji from extensive Tiwanaku pitting and bioturbation which have affected the integrity of Late Formative and earlier deposits (Goodman-Elgar 2010: 113-114; Roddick 2009: 128, 201). For instance, the boundaries of pits at Sonaji are elusive and unclear, and made it difficult to identify and differentiate the extent of some events (Bruno et al. 2006: 49). It is likely that these disturbances also affected the distribution of ceramics on the surface, and thus, also would impact survey observations.

Sherds were the densest around buildings across all three sites, and there were differences between densities associated with the building interiors and exteriors (Figures 5.1, 5.3, and 5.4). There were much higher densities of ceramics outside of KK ASD 1 to the south than inside while ceramic densities within and outside Kala Uyuni structures (ASD 2 and ASD 5) were more evenly distributed. However, there were low to moderate densities linked to KU ASD 2 (Figure 5.3). Beyond this, I did not see noticeable patterns in ceramic density distributions at Kala Uyuni and Kumi Kipa. At Sonaji, it is unclear whether ceramics were deposited in the interior or exterior of ASD 2. The high concentration of sherds on the Upper Terrace may also be associated with the platform Bandy (2001: 101) observed, rather than ASD 2. The contrast in my observations at Sonaji with Bandy (2001) warrants a diachronic investigation. From this angle of locality, all that can be said is that sampling strategies and post-depositional processes affect the patterns seen when we look at all three sites. Bandy's (2001) classification scheme focused on categorizing sites into broad periods to estimate population size and settlement patterns over a larger temporal dimension. While his work was critical for understanding the larger rhythms of sociopolitical, not much insight can be gained about the inhabitants themselves and their daily practices and routines. This, in part, is because of the research questions he was interested in, where the focus was not on the concept of locality, but rather, on larger scale questions about the period itself when it was still a "black hole."

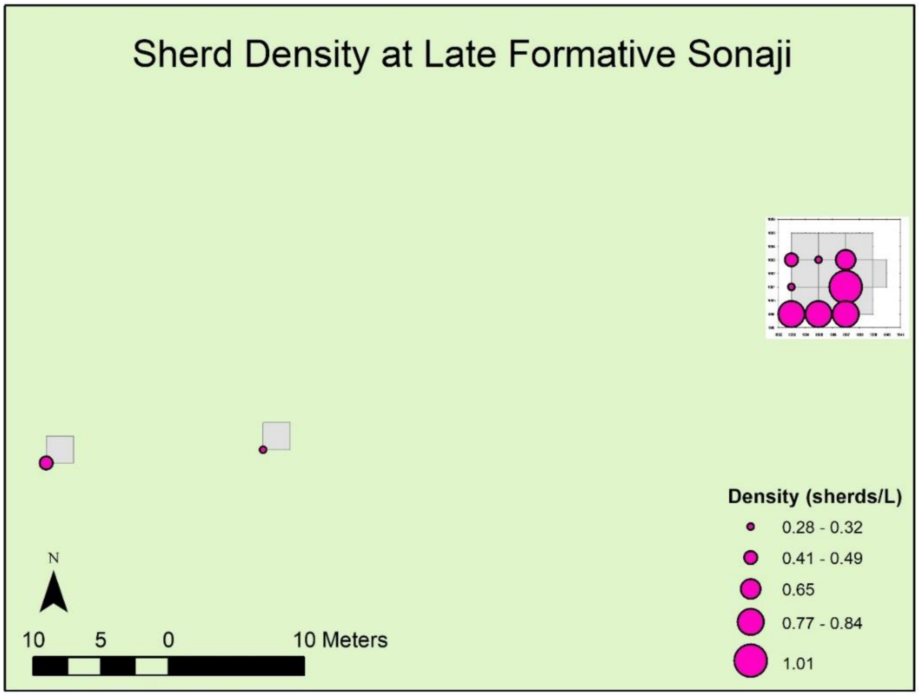


Figure 5.1 Map of Sonaji showing the highest concentration of sherds are all coming from contexts on the Upper Terrace.

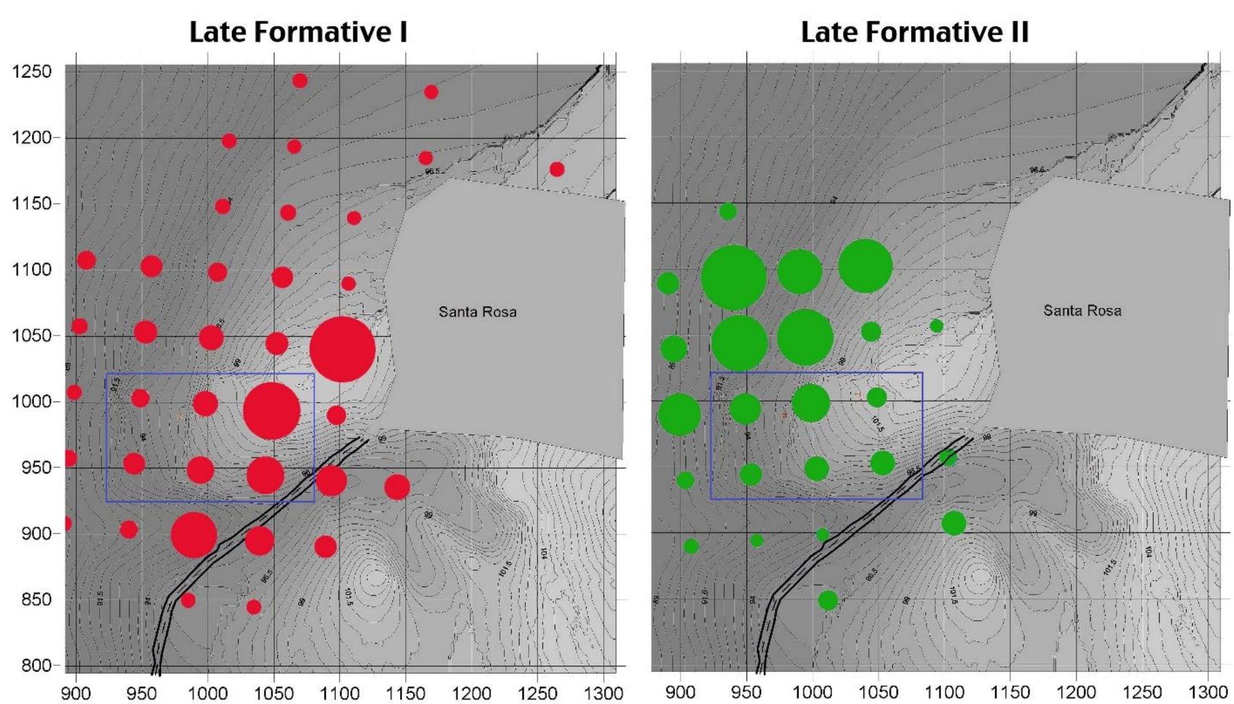


Figure 5.2 Surface sherd densities based on Dr. Matthew Bandy's ceramic index system at Sonaji. 2004-2005 excavations on the terraces are located west of Santa Rosa and are marked with red "+" signs (some hidden under the proportional symbology). Adapted from Roddick 2009: 102.

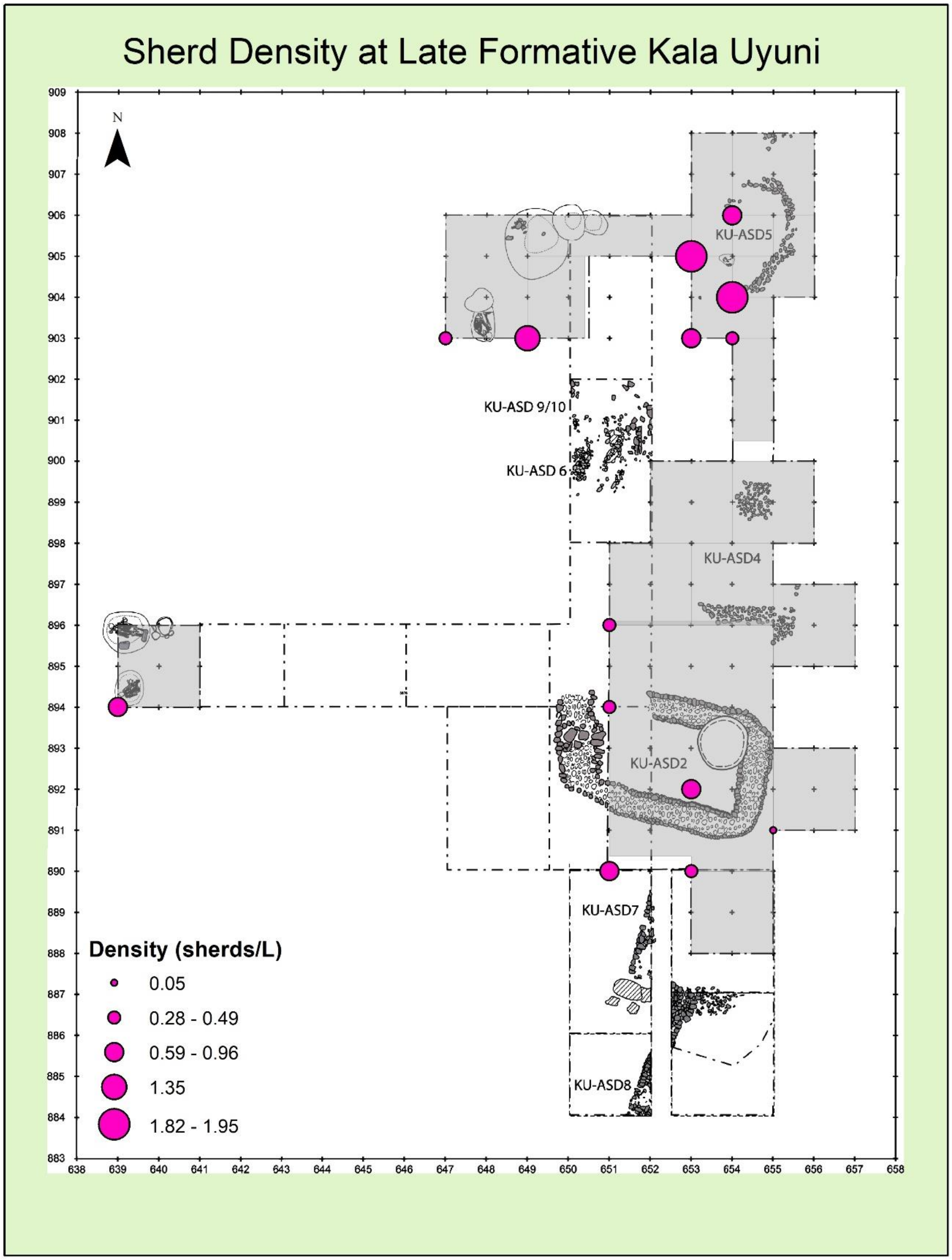


Figure 5.3 Map for Kala Uyuni KU sector showing the total ceramic sherd densities by unit. It appears that space associated with or near ASD 5 has higher densities than everywhere else. Contexts there may have seen more intense use or there were less disturbed contexts there compared to ASD 2 or 4.

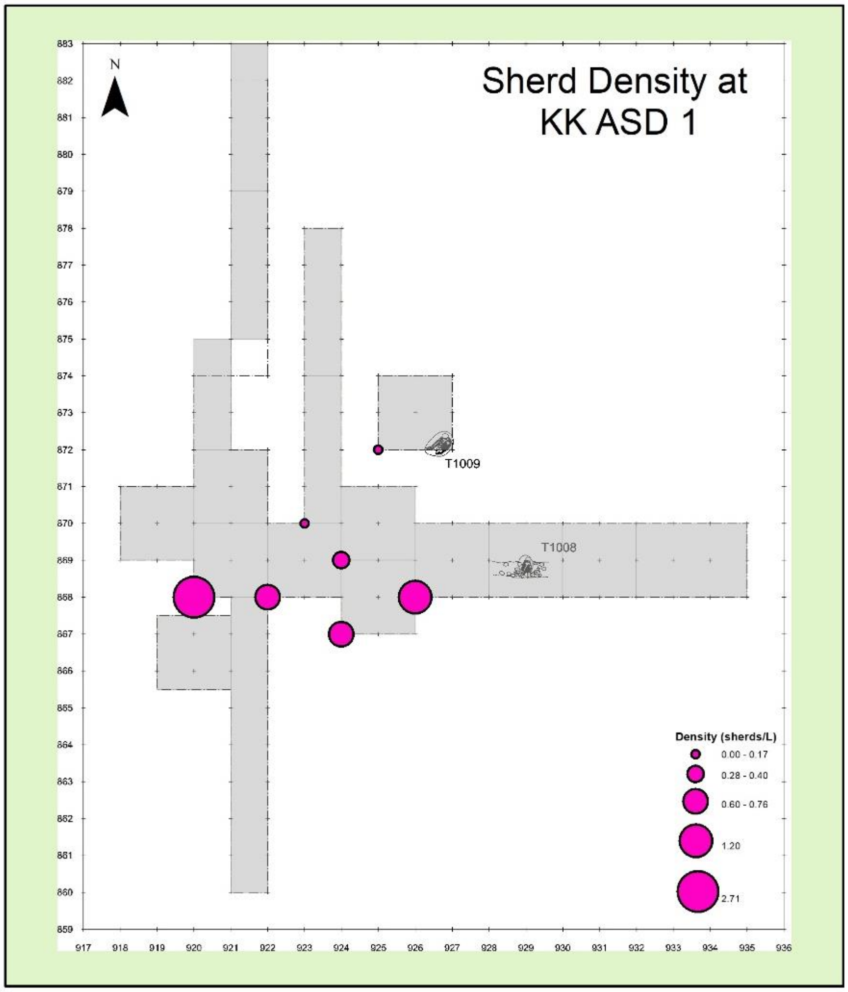


Figure 5.4 Map of the KK ASD 1 activity area of Kumi Kipa. The highest sherd densities are south of the wall of KK ASD 1. The architectural wall spans from N869/E924 to N869/E926, running parallel to the excavation grid.

Decorated and Undecorated Ceramics: Counts and Spatial Distribution

Site identification and interpretations have long been associated with the analysis of decorated sherds, as they are linked to larger, consequential changes and are much easier to sort due to the visibility of decoration and motifs (see section 2.3). Recall in section 2.2, Willey and Phillips' (1958) cultural historical approach focused on using decorative style to type sites. However, most Late Formative ceramics on the Taraco Peninsula are undecorated. Across all three sites, the ceramic assemblages I sampled consisted mainly of undecorated pottery with 98.1%, 94.4%, and 97.8% for Kala Uyuni, Kumi Kipa, and Sonaji, respectively (Figure 5.5). There were very low percentages of decorated sherds at the three sites. The most common decorative style is the Kalasasaya red-rimmed style, a "local style" on the peninsula (Roddick 2009: 254). There are only a handful of Kalasasaya zonally incised or Qeya sherds in the assemblage.

While decorated ceramics have and continue to play a large role in tracking reagional patterns, it is also equally important to examine undecorated, plainware sherds. Bandy (2001: 45-46) had difficulty identifying Late Formative ceramics because earlier scholars created their ceramic phasing based on decoration; a method that does not work as well for the Late Formative which is characterized by plainware pottery. At this scale, local/non-local categorizations are assumed. Artifacts, natural or artificial (human-made) features are considered local if it is in the geographical vicinity although in many cases, what is considered nearby is unclear. I examined the spatial distribution of both decorated and undecorated sherds to see whether there was any significant variation that would differentiate these sites as being political centres or domestic sites, and whether it is possible to define ritual or public spaces from domestic spaces at this data scale.

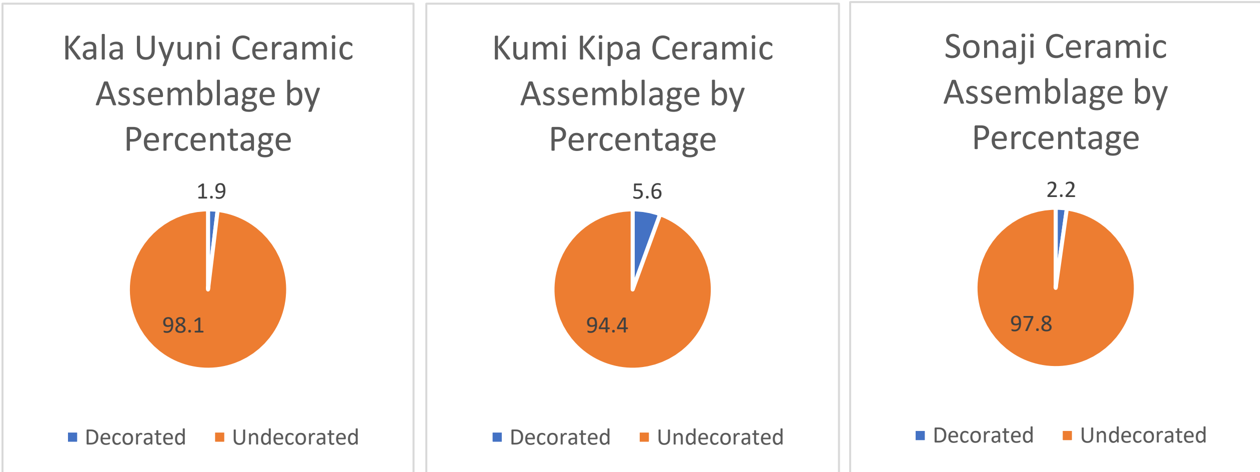


Figure 5.5 Break down of the ceramics I sampled from Kala Uyuni, Kumi Kipa, and Sonaji by decorated and undecorated type.

At Kala Uyuni, decorated sherds are more frequent within and outside of ASD 2, and West of ASDs 2, 4, and 5. The midden out west could have been in use at the same time as ASD 2. This observation is in line with the interpretations made by the TAP project (Hastorf et al. 2004). The low quantities of decorated sherds at ASD 4, ASD 5, and the general location outside of ASD 5 suggests that the building was not used for ritual/ceremonial practices but for more mundane tasks or uses. This is also in line with Roddick et al. (2006: 37-38) and Bruno (2008: 426) who have suggested that ASD 5 was a residential and/or kitchen space. There is a higher frequency of undecorated sherds across all units compared to decorated sherds (Figures 5.6 and 5.7). There are more undecorated sherds found in the units within ASD 2 than outside of the structure, suggesting heavy use of ceramics within the building. The highest frequency of both undecorated and decorated sherds comes from the single unit west of ASDs 2, 4, and 5.

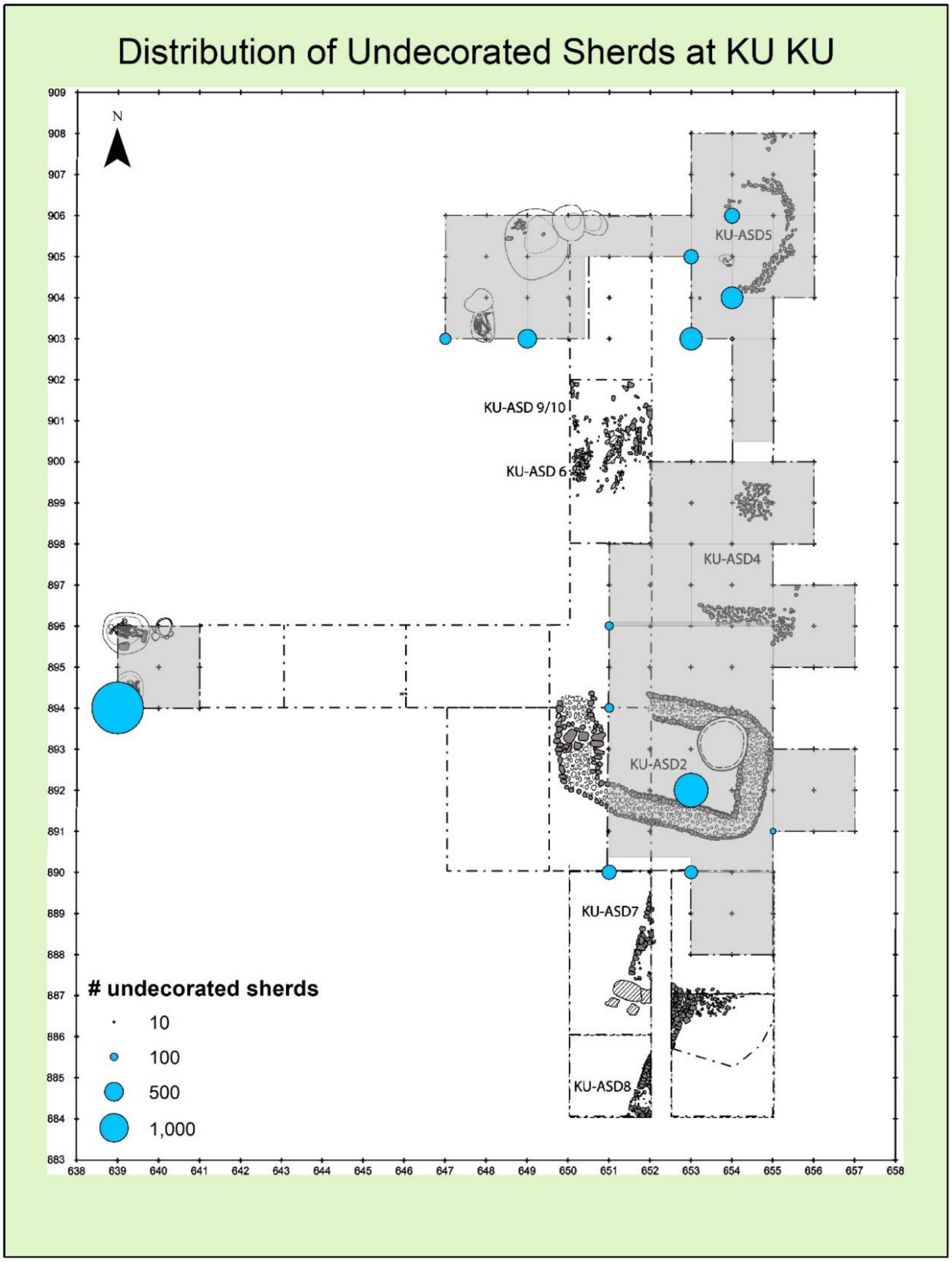


Figure 5.6 Map of Kala Uyuni showing the distribution of undecorated sherds based on the total numbers of sherds recovered from Late Formative contexts. The relatively high number of undecorated sherds inside ASD 2 is peculiar since ASD 2 is interpreted as more of a ritual space which generally is linked to more decorative style.

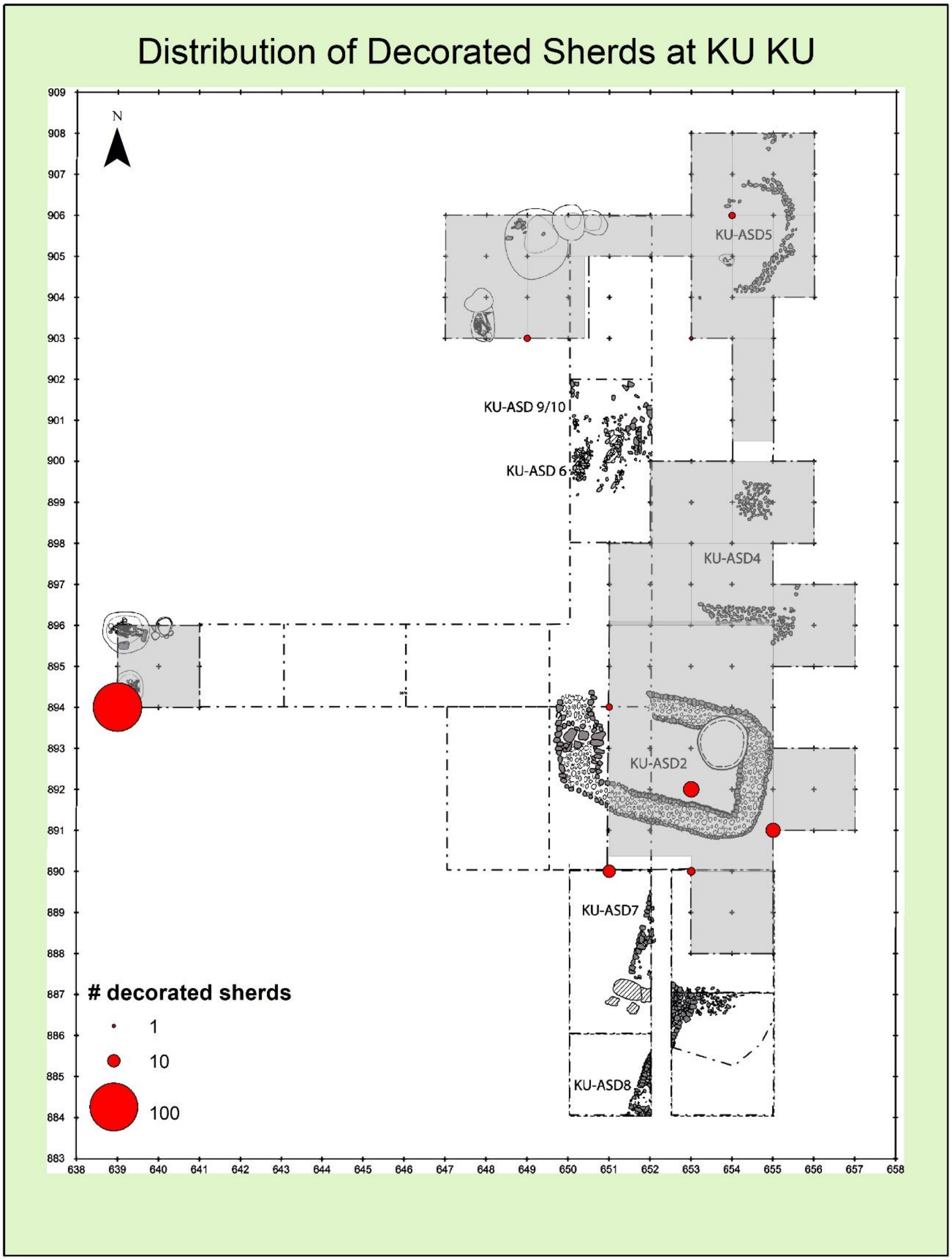
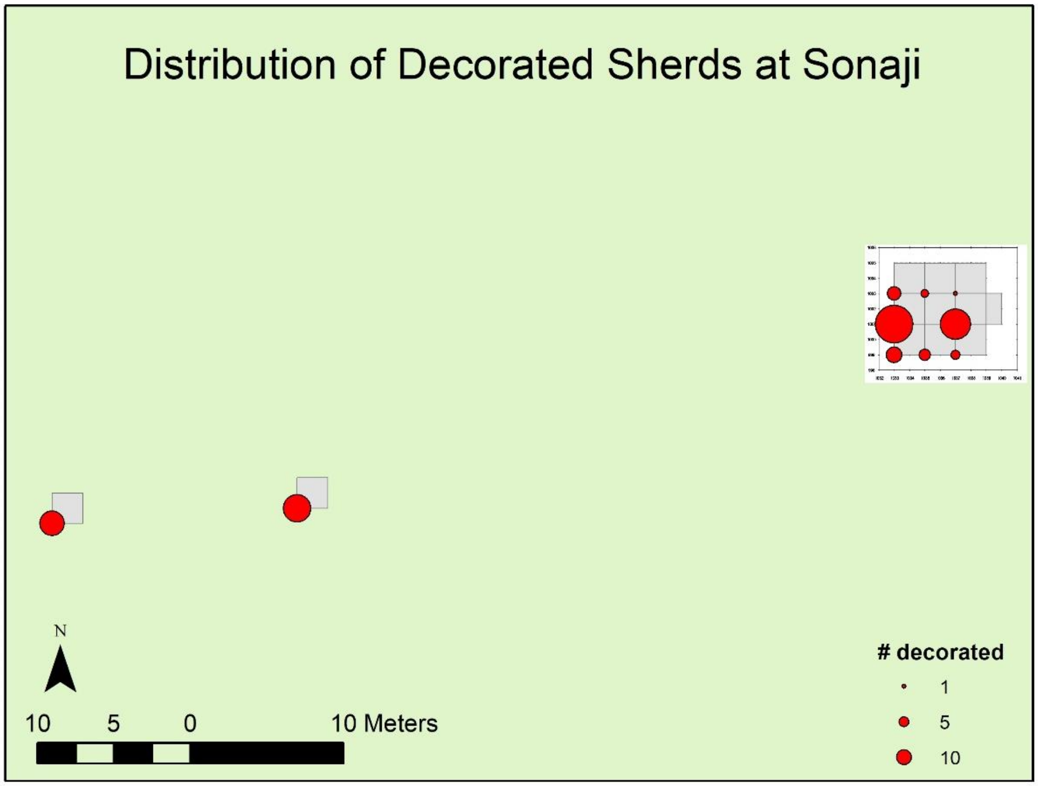


Figure 5.7 Map of Kala Uyuni showing the distribution of decorated sherds based on the total numbers of sherds recovered from Late Formative contexts. Decorated sherds are concentrated either West of ASDs 2, 4, and 5 or associated with ASD 2.



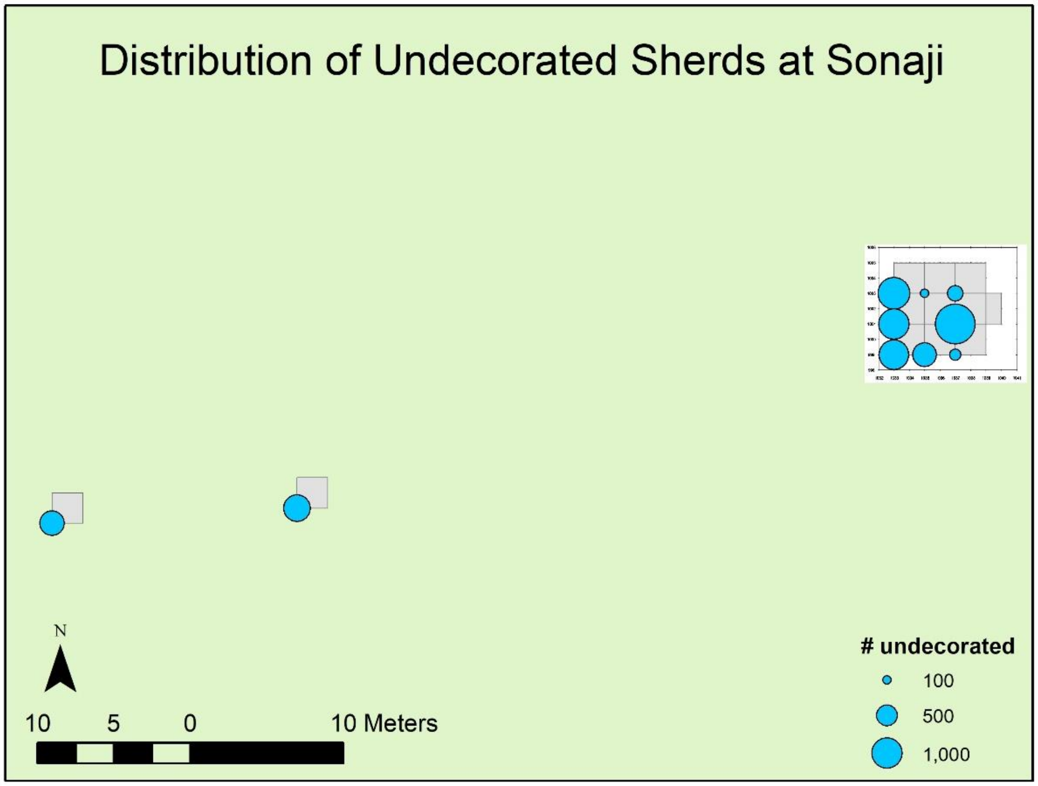


Figure 5.8 Maps of Sonaji showing the distribution of decorated and undecorated sherds among the terraces.

At Kumi Kipa, the distribution of decorated sherds is low across the site (Appendix B). The distribution of undecorated sherds in contrast, shows more disparity between locations. There are high counts of undecorated sherds at KK Monticúlo and KK ASD 1, but the isolated unit west of the KK ASD 1 location has a much lower count. Similarly, three units just west and north of ASD 1 have very low counts in comparison to the southern extent of the building interior and exterior. It appears that most of the activities that took place at KK ASD 1 happened south of the building, either outside or in the southern half of the building interior. I observed a relatively higher count of decorated sherds outside of KK ASD 1, and a lower count in the units within and north of the structure. The exterior surface/midden unit of KK ASD 1 has the highest number of decorated sherds (n=60) out of the excavated units. There are very low undecorated sherd counts within the units of E925/N875 and E923/N870, which cover the northern extent of KK ASD 1. This could mean that the northern portion of the building may have been consistently cleaned or was differentially used in comparison to the southern side.

At Sonaji, the units with the highest decorated sherd counts are E1001/N1037 and E1001/N1037, both of which are near and at the centre of the Upper Terrace excavations (Figure 5.8). The peripheral units surrounding these have lower decorated sherd counts. The spatial patterning of undecorated sherds on the Upper Terrace is different compared to the decorated sherds. Undecorated sherd counts are high on the western portion of the Upper Terrace and in the centre, and moderate within the peripheral units. Although only one unit was placed on the Lower and Middle Terraces respectively, these separate units have similar decorated sherd counts to the middle units (local coordinates above) on the Upper Terrace. Undecorated and decorated sherd counts on the Lower and Middle

Terraces both have high numbers of sherds and share similar spatial patterning. There seems to be a correlation between the high decorated and undecorated sherd counts linked to units E1001/N1037 and E1001/N1037 on the Upper Terrace. This does seem to hint that this space was used intensively and perhaps served a public function due to its elevated position. The high counts of both decorated and undecorated sherds on the Upper Terrace seems to support Bandy's (2001) suggestion that Sonaji was important during the Late Formative Period. Bandy (2001: 192-194) argued that the population at Sonaji increased by the end of the Late Formative Period based on the population indices he created from settlement data. These population indices represent proportional values and are calculated by multiplying the number of households per sector by the average number of people per household (Bandy 2001: 71-72). His observations are tied to ceramic scatters because the density of these artifacts is what determines a sector (see also section 3.4). However, my application of the excavation data here, along with Bandy's survey work, take a synchronic perspective. These observations alone do not necessarily support that there was an increase in Sonaji's population by the end of the Late Formative Period. It may or may not have been a political centre on the peninsula, but these contrasting distributions tell us that we cannot simply rely on one or the other to define a site.

In summary, there were few decorated sherds in all excavated units, suggesting a lack of clear distinction or segregation in the use of pottery for ritual or public, commensal activities. Examining the distribution of decorated and undecorated sherds synchronically tells us very little about whether these sites were domestic or ceremonial if we go by the culture-historical and processualists' notions of locality because most of the sherds are plainwares. Rather, this suggests that undecorated pottery played a larger role in events beyond everyday activities, which may include feasting or public-ritual ceremonies.

In this section, I approached locality from a spatial and analytical definition to examine differences in the distribution of ceramics from excavated vs. survey data, and from decorated vs. undecorated. I saw similarities and differences in the spread of total ceramic densities that could be the result of differing sampling strategies or could be suggestive of shifts in spatial organization at the sites. Locality as an archaeological construct is also tied to the use of decorated ceramics to type sites and construct regional chronologies. I highlighted the issue of applying these ideas to the Late Formative Period where decorative sherds are scarce. I saw a relatively consistent patterning in the high proportion of undecorated to decorated sherds. While Sonaji and Kala Uyuni are typed as political centres, and Kumi Kipa as a domestic, elite residence, the frequency of undecorated and decorated sherds does not suggest this.My findings suggest that two key points: 1) plainware sherds hold much work interpretive weight than previously thought and 2) this framework of locality does not say much about the actual inhabitants who lived at these sites. Plain sherds should be studied in greater detail and not ignored just because they are assumed to be mundane and part of the domestic sphere. In the next sections, I examine how local and non-local boundaries are formed through production and depositional practice at the event scale to better understand these changes taking place during the Late Formative Period.

5.3. Technological Style on the Peninsula: Understanding Production Practices

Examining ceramics geospatially can provide insight on where production practices took place in space over time. On the peninsula, earlier analyses of Late Formative pottery come from Roddick (2009) and Steadman's (1995, 1999) work that focused on defining technological style, refining the local ceramic chronology, and understanding the relationships between ceramic production and practices among Late Formative communities. His work involved analyzing pottery production attributes over time and tracking change stratigraphically with Harris matrices and wall profiles. His approach to ceramics differed from Bandy's (2001) work. Rather than focusing on ceramics to infer settlement patterns, he examined an essential part of the life history of pottery- its production and the associated choices made by potters. Doing so meant a shift in understanding locality itself. While Bandy's (2001) work is linked to Willey and Phillips' (1958) definition, Roddick's (2009) approach to locality is focused on pottery making. Roddick (2009) suggests there was a single community of practice between Kala Uyuni, Sonaji, and Kumi Kipa. However, ceramics have not been analyzed or visualized in detail through geospatial means to help confirm or deny this. To look at ceramics geospatially and diachronically (by stratigraphic event) here means to see whether it is possible to identify spaces of use, and whether there were dedicated production spaces.

In this section, I discuss my analysis of the distribution of ceramic production attributes by event to explore how locality is conceptualized by pottery practice. This differs from my approach in the previous section, where locality was conceptualized only synchronically and did not consider the life histories of the ceramics. Attention to pottery production provides a more complete understanding of Taraco locality and integrates the larger set of undecorated pottery which dominates the ceramic assemblages. I define locality here as a set of material practices that is shared among a group of people or communities, that also may coincide with geographical boundaries (Table 2.1). I use locality to discuss ceramic variation between sites to identify spatial organization, and to track evidence for intra- and inter-site variability. I approach production through the event scale to better understand the microscale changes that occurred during the Late Formative Period (see section 4.2 for discussion of the TAP approach to stratigraphic events). To explore this, I sorted the ceramics in Excel by paste attributes into three smaller categories: temper type, texture, and inclusion size (see section 4.6). I then counted and re-aggregated the ceramics by event and calculated the total volume excavated for each event. I then exported this into ArcMap to see the spread of paste attributes across space and time.

Overall, I did not see much variation, both in the distribution and frequencies of paste and surface treatment types. The ceramic assemblage at Sonaji showed the greatest amount of variation over time. I briefly summarize the major patterns seen across all three sites, and then discuss Sonaji (and to a lesser extent, Kumi Kipa) in greater detail. I suggest that there may have been a localized practice beyond Roddick’s (2009) identification of a single, shared practice among the three sites. I end this section considering how examinations of production compare against the previous section’s analysis of decorated vs. undecorated sherd designations. A practice-based definition of locality is better suited to understanding daily movement and engagement with landscapes, while the earlier, spatial definition of locality did not focus on the different choices made in quotidian rhythms. This comparison helps to develop my understanding on the organization of ceramic production at the sites and across the broader Late Formative region (i.e. local vs. non-local).

<u>Paste Distribution: Temper, Texture, and Inclusion Size</u>

Paste is ideal to explore local engagement with the landscape as it indexes the first steps of the manufacturing sequence (see sections 2.2 and 2.3). By tracing this distribution from an event-based standpoint of locality, we can determine if activities persisted across the same spaces during the Late Formative Period, or whether they changed. If changes only occur at one site, we may be seeing a localization process. If there are no changes, we can expand our scale of the local. The key assumption here is that locality can be identified through raw materials. Kala Uyuni, Kumi Kipa, and Sonaji ceramic assemblages are generally dominated by pastes that have mineral tempers, medium textures, and medium sized inclusions (see Appendix B for all related distribution maps). My discussion below is limited to Sonaji where the greatest temporal variation is seen.

Sonaji is the only site that has some events with higher ratios of fiber than mineral tempers, and the only site where one location (Middle Terrace) contains many stratified events without sherds that have fine texture pastes. This could suggest both a difference in space use and/or a localized production practice. Although most events do have higher mineral to fiber tempers, later events in the stratigraphic sequence show either similar proportional ratios, or higher densities of fiber tempered sherds. For example, one of the latest surface events (A206/A207) on the Upper Terrace contains higher densities of fiber tempered sherds, with a density of 2.142 sherds/L. In contrast, the density of mineral tempered sherds linked to this surface is 0.883 sherds/L. The combined midden event of A324/278 has 2.06 fiber tempered sherds/L compared to 0.36 mineral tempered sherds/L. The higher densities of fiber tempers could be indicative of a continuation of a production practice from the Middle Formative. The events of A324/A278 occur some time after AD 132-381 (C-14 date of A285) but before AD 253-530 (C-14 date of A207). The deposition of fiber tempered material may be correlated with the use of the surface of A285, which would suggest a continued use of this type of temper into at least Late Formative I. Fiber tempers are often associated with pottery used for cooking activities, but it is not clear whether there was an intensification in cooking or other fire-related activities at this site compared to Kala Uyuni and Kumi Kipa (Roddick 2009: 187). My later analysis of carbonization suggests intensive burning on the Upper Terrace (see section 5.4). On the Middle Terrace, there is almost an equal proportion of mineral to fiber tempered sherds. There is also a very low density and even absence of fine textured ceramics in the events that took place. A very low density of fine texture ceramics was found within three events on the Middle Terrace-a fill below the floor of SN ASD 1 (A52), a midden that occurs before the construction of ASD 1 (A54/60), and a mixed fill (A75) during the earliest activities on this terrace (Appendix A). There are no fine textured ceramics found after the construction of ASD 1. By paste only, it is not clear what this could mean, but when combined with carbonization (which I discuss in section 5.4), it appears to have originally been a space for cooking that later disappeared.

This site also has a higher diversity of inclusion sizes compared to the other two sites. Three events stand out in terms of diversity that did not when examining only the temper or texture. A325, A278, and A278/A286 are the only events that have all four kinds of inclusion sizes, all of which are midden events. I observed medium-large inclusions to be spatially restricted to three southeastern units on the Upper Terrace (N999/E1035, N1001/E1035, and N999/E1037). While the spatial extent of A325 and A278/A286 are confined to a single unit, A278 spans 4 excavation units but only one part of the event (one unit) contains sherds with medium-large inclusions. When large inclusions are found among fiber-tempered pastes, they are often identified as serving or cooking vessels during the Middle Formative, and often identified with thick vessel walls (Roddick 2009: 188, 259). However, form could not be identified for any of these sherds with medium-large inclusions. This peculiar distribution of inclusion sizes on the Upper Terrace could mean a greater diversity in the kinds of vessels being made and in the types of food that were being cooked, although this is not possible to confirm at this time. Perhaps people quarried different materials with inclusion variation as there are many kinds of clays that exist on the Taraco Formation (Roddick and Klarich 2013: 104). Inclusion size diversity might also be partially influenced by observation biases since the inclusion size types are qualitatively assessed.

The dominance of mineral temper, medium texture, and medium and fine-medium inclusions in the paste suggest a single, shared local production practice at Kala Uyuni, Kumi Kipa, and Sonaji during this time period. It suggests the consistent and constant use of either the same or a similar kind of clay resources. This is in line with Roddick's (2009) argument for a single community of practice, and that ceramic production was mainly local. There is no evidence to suggest pottery production was non-local, although there is a very small amount of "non-local" ceramics present (i.e. 43 Kalasasaya zonally-incised from the contexts I sampled). The presence of fiber tempers throughout the Late

Formative could be indicative of the continued usage of pots produced during the early years of the Late Formative as fiber tempers were used more during the Middle Formative Period. At the same time, I found that the use or preference of mineral or fibrous pastes seems to fluctuate between events at Sonaji based on their relative proportions during the Late Formative occupation. This instability could reflect changes occurring over local practices in production and use, where there is no consensus of a dominant temper type over another. It could also reflect the expediency of mineral tempered pottery, while fiber tempered pots may have been more durable and did not break as easily. This contrasts with what is seen both at Kumi Kipa and Kaa Uyuni. While Sonaji does show similar material practices as the other two sites, inhabitants at this site may have either begun to produce pottery in a new manner or there was a continued resistance against the use of mineral tempers towards the end of the Late Formative. What this suggests is that there was a single community of practice occurring on the Taraco Peninsula, or potentially, a localized potting practice at Sonaji (or perhaps a sampling bias towards cooking and domestic contexts).

In terms of space use, it is difficult to assess the possible types of activity that took place with only paste. There is no significant distinction in the spread of paste attributes at Kala Uyuni and Kumi Kipa for the most part. The only events at Kala Uyuni with relatively high densities of fiber temper are linked to ASD 5, which is one the most well interpreted contexts and interpreted as a kitchen or domestic space (see section 3.4). There does appear to be a distinct use space on the Middle Terrace prior to the construction of SN ASD 1 that may be related to cooking. On the Upper Terrace, the persistence of fiber tempered pottery among the latest events before site abandonment and Tiwanaku occupation is peculiar. The A206/207 surfaces and A324/278 middens warrant further investigation through other ceramic data or lines of evidence. I examine the surfaces later in this chapter and compare them against their interpretation as a possible production activity space (section 5.4). Tracking production attributes helps to identify possible events of interest that help to understand how inhabitants organized their occupation at these sites.

Surface Treatment

Like paste, surface treatment speaks to another portion of the manufacturing sequence. I saw much more variation in the types of surface finishes than in the paste (Figure 5.9, see also Appendix B for all surface treatment maps). There is an increase in burnishing on the exterior at all three sites and wiped finishes on the interior. There is also variation between the sites over the degree of burnishing (i.e. incomplete, complete, and very fine complete burnish). I found two possible scales of local practices that existed during the Late Formative Period: one that is shared across all three sites (an

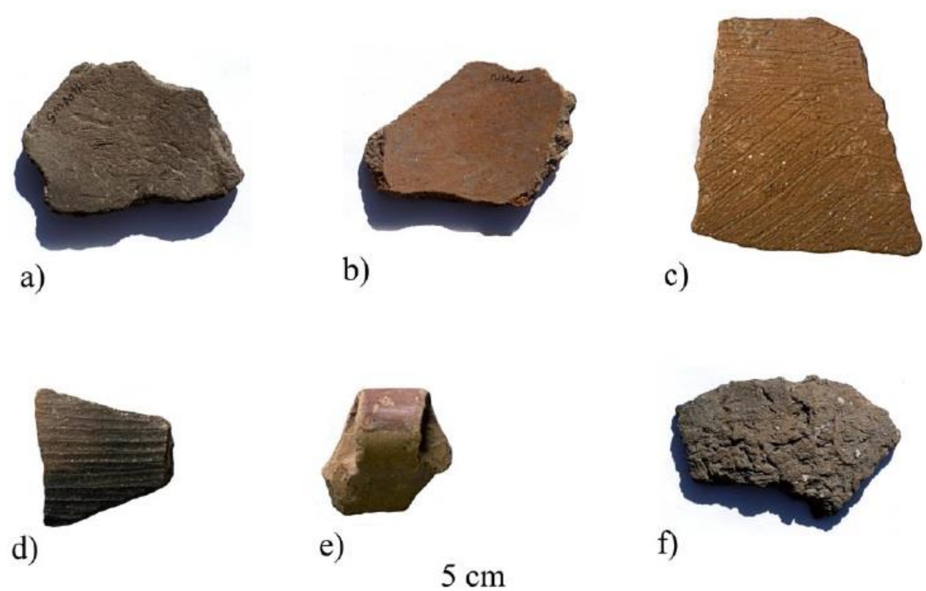


Figure 5.9 TAP major surface treatments: a) smoothed, b) rubbed, c) wiped, d) incomplete burnish (incb), e) complete burnish (cb), f) stucco. Very fine complete burnish and grainy wipe are uncommon finishes and are not depicted here. From Roddick 2009: 193, Figure 6.1.

overall increase in exterior burnishing and interior wiping or smoothing) and one that involves only Sonaji (an increased diversity of other surface finishes which is absent elsewhere).

Ceramics with burnished surfaces at all three sites vary between complete and incomplete burnishing (meaning the surface has been rubbed with a smooth stone or tool such that a glossy look appears; usually done on leather-hard clay). Functionally speaking, burnishing can increase a pot's resistance to abrasion and attrition while reducing permeability but may also be related to pottery being used for serving or eating (Rice 1987: 240, 353-355). At Kala Uyuni, there are more ceramics with incomplete burnishing than complete burnishing and are much more spread out among events. At Kumi Kipa, there are higher densities of sherds with complete burnishing. The increase in completely burnished finishes begins some time around AD 27-224 during the use of A43, a surface outside the structure of ASD 1 and continues until the end of the Late Formative occupation at this site. In addition to A43, increases are also present in A154, A160/A159, and A85. This increase in complete burnishing is associated with events that all take place outside and just south of ASD 1. The diversity and presence of exterior finishes at Kumi Kipa decreases over time and is reflected in the increase in sherds with eroded surfaces. It appears that all sherds with an exterior finish were affected to some degree, but those with rubbed finishes were more impacted by erosion. At Sonaji, burnished ceramics vary in proportion between complete and incomplete burnishing on the Upper Terrace, while events on the Lower and Middle Terrace have similar complete-to-incomplete burnish ratios (see Appendix for distribution maps).

While ceramics found at Late Formative Sonaji share similar trends with Kala Uyuni and Kumi Kipa with respect to the most common surface finishes applied (interior wiping or smoothing, and exterior burnishing), the site does contain a wide variety of other surface finishes that are exclusively found and scattered across the site (Figure 5.11; see also Appendix B). These include rubbed, fine wiped, striate burnish, very fine complete burnish (highly polished), and retocado (a surface that has been retouched). A smoothed finish is like a burnished finish, except that it is done using a soft tool and leaves a matte appearance. A wiped surface finish generally has an uneven coverage that may have traces of the grooves created from a potter's hands, a cloth, animal fur, or patch of grass (Rice 1987: 150). Very fine complete burnish is present only at Sonaji on the Upper Terrace. This finish was found among 4 midden and 3 surface events. In addition, rubbed exterior finishes are found within 4 middens, a surface, and a possible occupation zone. This could suggest a process of individualized changes to the shared practices of smoothed and wiped interior finishing. Some of these types of finishes can be related to fine wares for public or ritual events (i.e. very fine complete burnishing), while others could be related to increasing the effectiveness of heat penetration or grip on a pot (Rice 1987: 231-232).

From examining the density and distribution of the various surface finishes identified, it appears that all three sites shared similar local production techniques in producing ceramics with wiped or smoothed interior finishes and to some extent, exterior burnished finishing (Figure 5.10). These observations on the interior and exterior surface finishes match what Roddick (2009: 231) saw: a shared community of practice and technological style in pottery production at the Taraco sites. However, there also appears to be individual variation among the exterior surface treatment that differs between the sites and between sectors within each site. This follows my earlier observations with paste where I suggest the production of a localized practice at Sonaji.

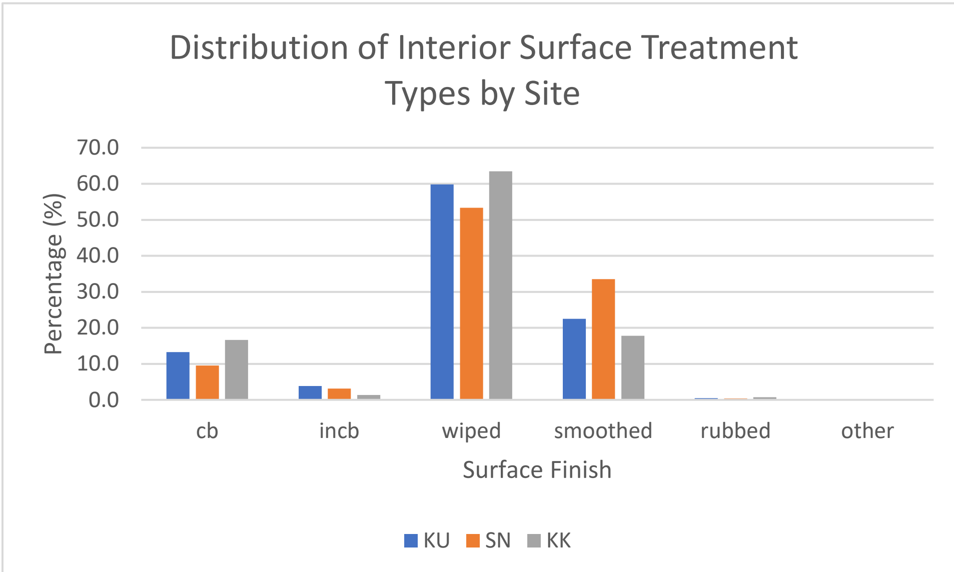


Figure 5.10 Distribution of interior surface treatment types. The category "Other" makes up less than 1% of the assemblage, but contains a variety of surface finishes, including vfcb, striate burnish, fine wipe, retocado. Aside from vfcb, all the uncommon "other" interior finishes are found only at Sonaji.

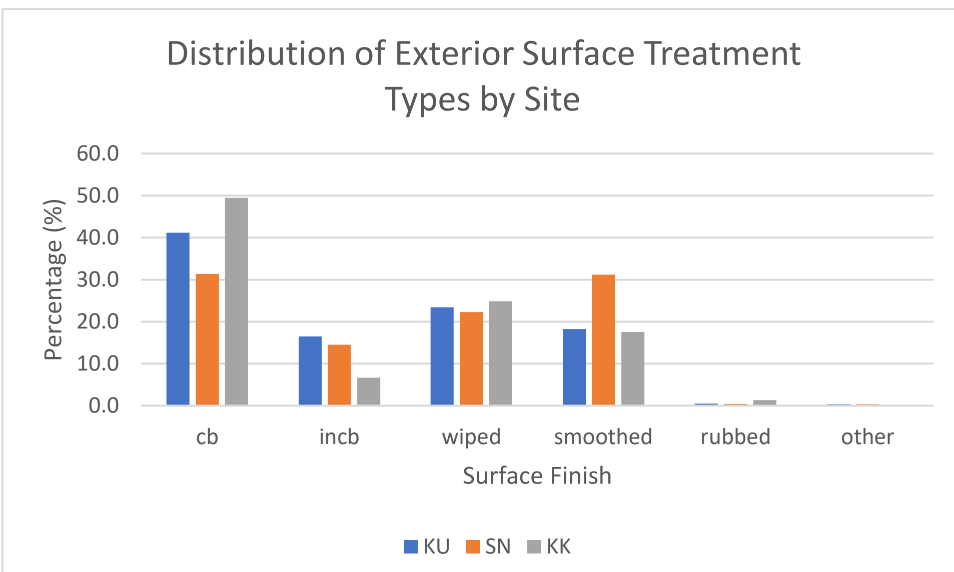


Figure 5.11 Distribution of exterior surface treatment types. The category "Other" makes up less than 1% of the assemblage, but contains vfcb, stucco, and grainy wipe.

I approached locality from a practice-oriented perspective in this section to understand change and continuity of ceramic production techniques over space and time. Broadly, I did not see any distinct patterns in the distribution of paste tempers and textures, which could suggest that there were no dedicated spaces for production (and other activities) and spaces were multipurpose. It could also suggest that the material culture patterning may have been distorted from cleaning and/or people taking their crafting tools and pots with them when they left (abandoned) the site or structure(s). I observed more variation in paste inclusion sizes and types of surface treatment at Sonaji when compared against Kala Uyuni and Kumi Kipa. My findings suggest two key points: 1) there is a shared local boundary of production practice between inhabitants at all three sites and 2) inhabitants at Sonaji may have been in the process of producing their own localized boundary of practice. Locality from this perspective offers insight into the daily interactions that took place between these communities, the crafting knowledge they shared with one another, and the changes in crafting within each community. In the last section, I examine how local and non-local boundaries are developed through ceramic use and deposition to understand the use of spaces (i.e. cooking, ritual), the intensity of space use, and refuse behaviours.

5.4. Understanding Depositional Practices through the Distribution of Vessel Forms, Fragmentation, Carbonization, and Paleoethnobotanical Data

Looking at deposition and taphonomy provides a fuller picture of the archaeological record as it considers the latter part of the social lives of ceramics, from their use and deposition to the ways in which they are recovered from excavations (see section 2.3). Deposition speaks to the vast and long occupational histories of past peoples at these places, how they interacted with their landscapes and how they thought of themselves and their identities. The kinds of pottery forms and the types of carbonization present can give insight on the practices that took place, including activity areas used for cooking or food preparation, consumption, (craft) production, ritual, or waste disposal. Deposition is where we see processes of localization (see section 2.3). Conversations regarding locality should also be situated on taphonomy because the ways archaeologists define the local are based on ceramic recovery. Fragmentation speaks to the post-depositional and taphonomic processes that influence the ways in which the material record becomes altered, whether through human or natural forces (see section 4.6).

In this final section, I analyze the distribution of ceramic vessel forms and fragmentation to explore how locality is produced through depositional practices at the event scale. The event scale has a much tighter control of time, as an event reflects the relative construction and/or use of a particular space, and its spatial extent is not arbitrarily defined like excavation units. Like the previous section, I use a community definition of locality rooted in material practice. I summarize the vessel form densities at Kala Uyuni, Kumi Kipa, and Sonaji, and aggregate the data by event to understand the micro-scale changes that occur within the Late Formative Period. I then examine the distribution of carbonization and fragmentation to possibly clarify the types of activity that took place (e.g., cooking, ritual burning) and identify patterns of waste disposal practices (Chapman 2000; Deal 1985). I am working with a largely fragmented assemblage where there are more body sherds than identifiable rim sherds. I also conduct a pilot study at Kala Uyuni comparing sherd carbonization against paleoethnobotanical data to clarify the use of space.

Identifiable Vessel Form Distribution: Dedicated or Generalized Activity Areas?

In Chapter 3.3, I briefly summarized two decorative styles that define the Late Formative Period-Kalasasaya and Qeya ceramics and described Late Formative forms and their uses. While the decorative styles are diagnostic, they are also uncommon (and even rare in the case of Qeya vessels) in the ceramic assemblages on the Taraco Peninsula. The most common vessel form across all events at each site is the bowl, making up 51-60% of the identifiable vessel forms at each site (51% at KU, 52% at KK, and 60% at SN; see Figures 5.12 and 5.13). These bowls are very similar across the three sites in their composition (Roddick 2009). Tracking the distribution of identifiable vessel forms like bowls, short and medium *ollas*, jars, and other vessels can help understand what spaces were used for, particularly where consumption, storage, or ceremonial practices occurred (Tite 1999: 207). This includes storage, food preparation and cooking, serving and feasting, and even craft production through specialized tools like spindle whorls, awls, polishing tools, grinding stones, and hammer stones (Costin 1991: 18-19). Here I analyze the distribution of four of the major types of ceramics to see whether there is any patterned deposition among surfaces middens, and other fill/deposits which might suggest dedicated activity areas. While I did not see any significant variation between the sites, I did see changes in vessel form frequencies that could be a sign of a change in space use and an almost uniform and low distribution of forms across all types of contexts. I summarize the general patterns below.

Bowls and Short and Medium Ollas

Examining the distribution of bowls and short and medium *ollas* across surfaces, middens, and fills yielded rather surprising results. When I examined the spatial distribution of bowls at Kala Uyuni, I observed very low densities across these event types (except for B74). Densities of bowls ranged from 0.0005-0.3 sherds/L on surfaces, middens, and other fills/deposits. Similarly, short and medium *ollas* yielded densities between 0.0002-0.8 sherds/L. B74, a high-density midden is the only context from Kala Uyuni that yielded 2.8 bowl sherds/L (Figure 4.2, see also Appendix A). B74 also has the densest number of short and medium *ollas* at 0.8 sherds/L. This event was preceded by an earlier high-density midden (B92) and succeeded by another high-density midden (B91). It is likely that this was a short-term event given the high concentration of pottery relative to the volume excavated (10 L) in comparison to B91 and B92 (1856 L and 918 L respectively). Sonaji and Kumi Kipa, also yield similar low densities of bowls and short and medium *ollas* to Kala Uyuni. I observed almost no variation in the distribution of bowls and *ollas* across the three context types at the three sites. This could suggest that there were no spaces where bowls and *ollas* were exclusively used, and/or spaces were regularly cleaned such that material culture patterning became distorted (which I discuss later in this section).

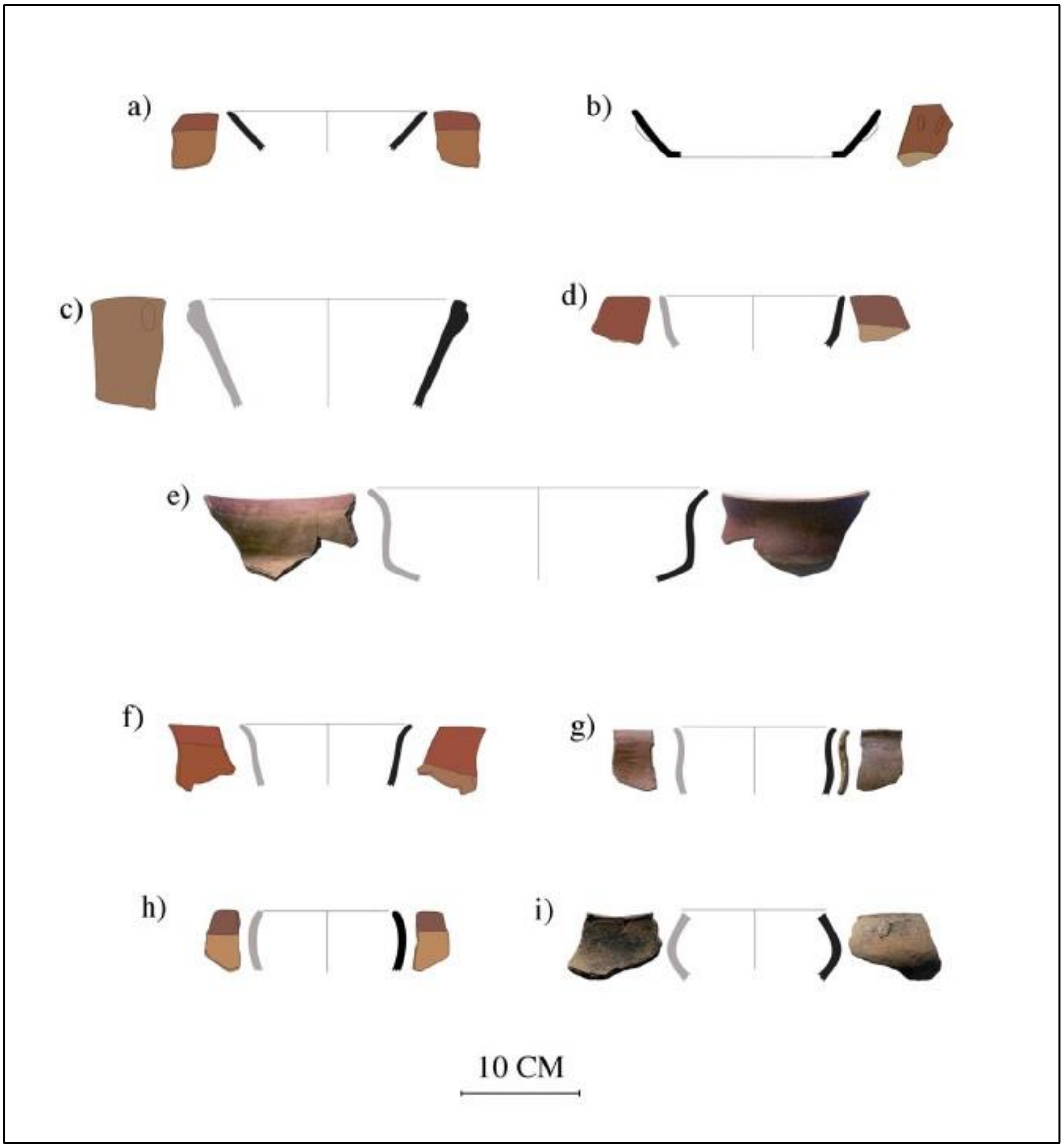


Figure 5.12 Examples of some Late Formative bowls with different rim variations from the Taraco Peninsula: a) flared, b-c) slightly flared, d) vertical, e-g) slightly flared and short-necked, h-j) incurving. From Roddick 2009: 250.

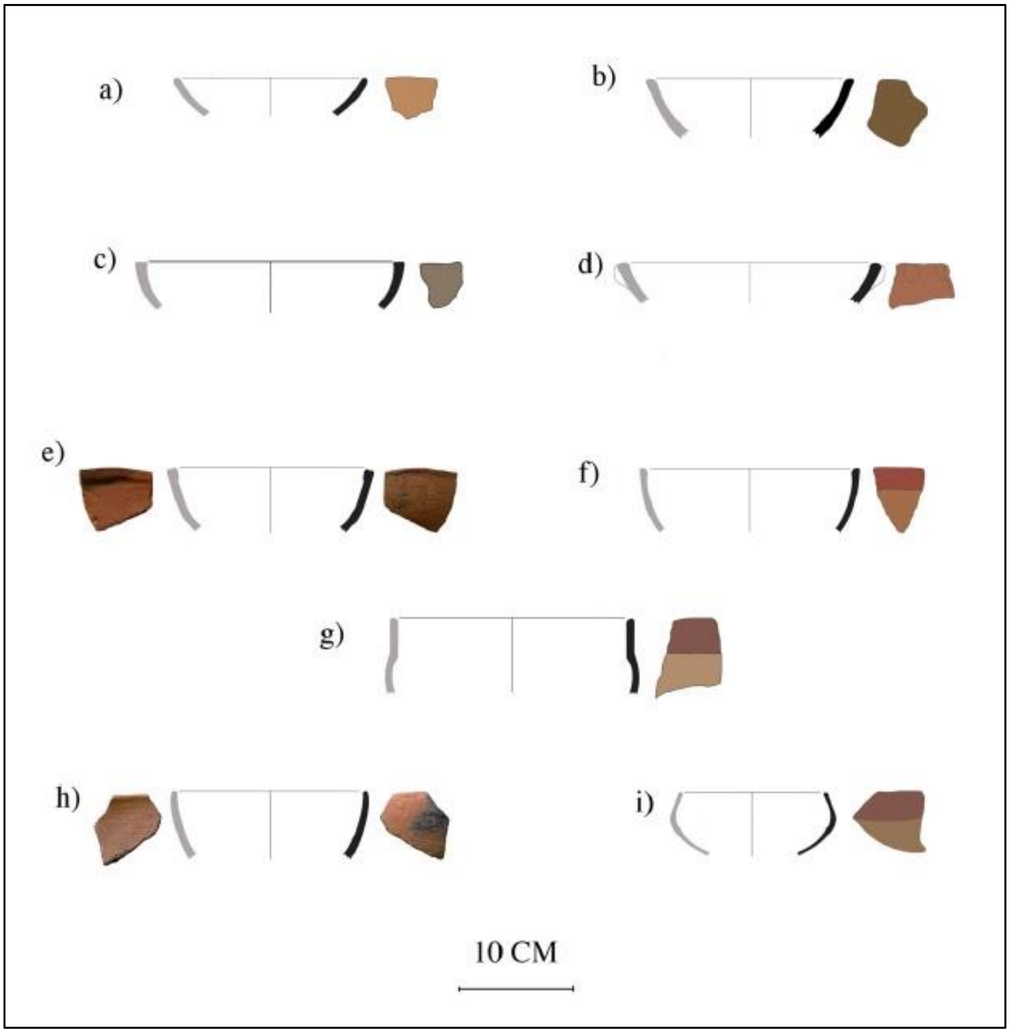


Figure 5.13 More examples of Late Formative bowls and are variations of slightly convex bowls. From Roddick 2009: 251.

Tall and Medium necked vessels, and necked vessels (no height)

Tall and medium necked vessels (jars) are low in density at these sites, representing about 4-5% of the identified ceramic assemblage (Figure 5.14). Sherd quantities belonging to this pottery type range from 1-6 sherds per event, with densities between 0.001-0.4 sherds/L at each site. It is possible that the low density could be attributed to breakage that led to sherds being classified as necked vessels with no height as they could be either *ollas* or jars. Necked vessels (no height) make up 8-26% of the assemblage (18% at KU, 8% at KK, and 26% at SN). I observed no significant inter-site variability in the frequency of these vessels. There does not seem to be any differential deposition between surfaces, middens, and other fills. This suggests that there was no long term patterned behaviour in the deposition of larger and less portable ceramics, but rather one that was more incidental or out of convenience (Hayden and Cannon 1983). I did, however, see some intra-site variability at Sonaji over time.

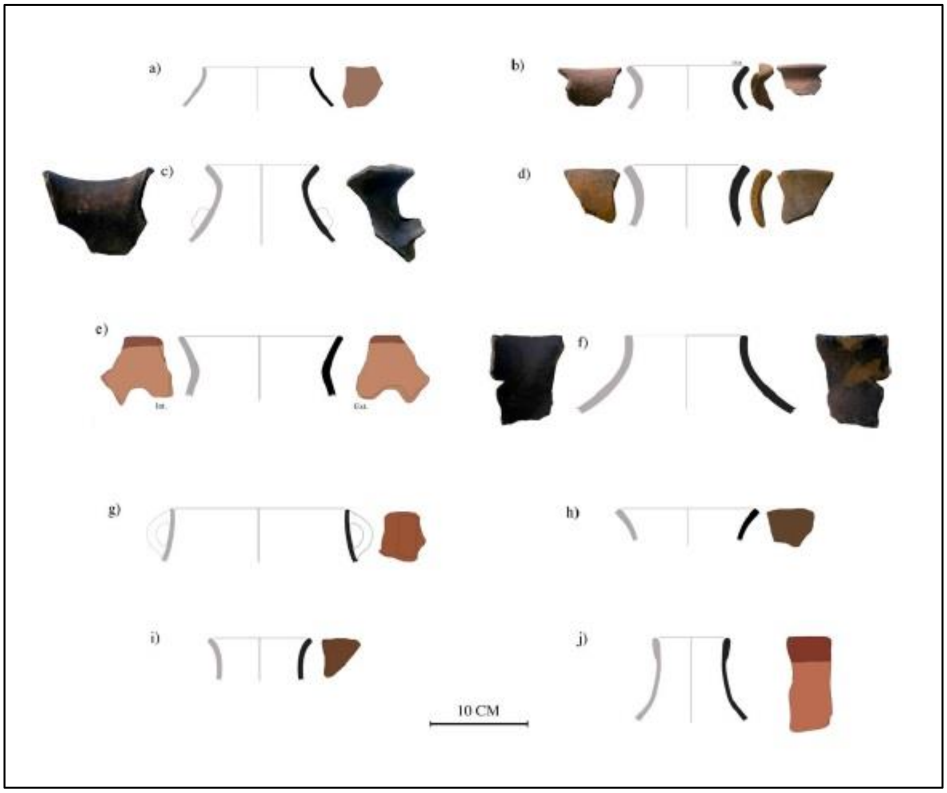


Figure 5.14 Examples of *Ollas* and Jars. a-g) variations of *ollas,* h-j) variations of jars. From Roddick 2009: 241.

Tall and medium-necked vessels are completely absent from the Late Formative II events on the Middle Terrace of Sonaji. These include a midden (A46), adobe wall fall (A47), human redeposited matrix (A48), a prepared clay floor (A49), a mixed (erosional) fill (A50), and a wall of adobe/mud mortar (A51) (see Appendix A). Furthermore, only 1 sherd identified as a necked vessel (no height) was found in A48. While the sample size is small, the shift from having tall and medium-necked vessels and other necked vessels (no height) on the Middle Terrace during LF1 to being almost virtually absent by Late Formative II suggests a change in the use of the space. This could mean a shift in local depositional practice across time where storage, cooking, and fire-related activities ceased to occur when combined with my findings on carbonization (discussed later in this section).

My observations examining the distribution of four types of vessel forms did not yield anything significant about any shared depositional practices present between the three sites. In general, large jars were likely used for storage and thus, would not have needed to be replaced as quickly as *ollas* (Rice 1987: 238). However, this lack of patterning might be due to the fragmented nature of the ceramic assemblage. It might also mean that vessels were used for multiple purposes which would be in line with Janusek's (2003) observation of the difficulty in differentiating use and further specifying vessel forms beyond the broad classifications. I do recommend further investigations of the events on the Middle Terrace, and perhaps an expansion into an analysis of the mixed contexts to better understand the change in function. Examinations into the fragmentation at this site would help to identify spaces where there was an intensification in use (i.e. looking at the amount of human traffic) or disposal patterns to see if waste was disposed systematically, randomly, provisionally, or whether it may have been considered a structured deposition (Hayden and Cannon 1983; Nielsen 1991; Newman 2019).

Carbonization: Spaces used for cooking, ritual, or more waste?

Examining carbonization can help distinguish cooking, storage, and/or ritual vessels based on the type and relative location of the carbonized material (Rice 1987; Skibo 2015). Carbonization could reflect a suite of differentiated practices of use (e.g.

cooking, ritual offerings), deposition (e.g. waste disposal/ burning) and post-deposition (e.g. site destruction, natural disaster). For instance, a pot used for boiling water will likely have more carbonization at the base (Skibo 2015: 191). Fire clouding or sooting on the exterior walls and base are clear indicators of fire-related activities or cooking (Rice 1987: 235-236). Blackened forms of carbonization on a vessel suggest that it was placed in a fire rather than above a fire (Rice 1987: 236). Encrustation or internal carbonization is usually caused from food charring, and its location within a vessel can be inform us about cooking behaviours, including what kind of cooking the pot was used for (Skibo 2013: 96). Examining the distribution of carbonized sherds across all three sites can potentially inform us on whether locality is produced via the use of particular spaces for fire-related activities. I summarize my findings below.

Carbonization at Kala Uyuni is dominated by encrustations on sherds, which are predominantly concentrated in and around the occupations surfaces of ASD 5 (interior-B249 and exterior-B261) (Figure 5.15). Of the 44 encrusted sherds at this site, 40 of them are found interiorly. This implies these sherds were used for cooking food, and that cooking, and/or food processing likely took place both inside and outside of ASD 5 (Skibo 2013, 2015). This observation is in line with previous interpretations that suggest ASD 5 was a residential or kitchen space (Bruno 2008; Roddick 2009). The very small numbers of blackened or scorched sherds could mean that most cooking did not involve directly placing pots into fire (Rice 1987; Skibo 2013: 63-64). I observed a relatively high density of sherds with carbonized powder among most Late Formative events West of ASDs 2, 4, and 5 (i.e. middens and floors/occupation surfaces). If these were broken cooking vessels, they appear to have been systematically tossed far away from the main area of Late Formative occupation. Cross-examinations with paleoethnobotanical data might reveal whether food waste was also being deposited away or near structures as food remains can be used as fertilizer but may also be considered a major hindrance (Hayden and Cannon 1983: 126, 134). In general, things that have a high hindrance value or some potential tend to be stored away from heavily frequented traffic in out-of-the-way places (Hayden and Cannon 1983: 119; Hardy Smith and Edwards 2005: 25). This is known as provisional discard. However, if organic remains attracted unwanted pests or if the buildup of ceramic discard obstructed daily activities, people may have deposited them further away and in middens (known as secondary discard).

Sonaji is the only site where there is almost an equally moderate count of all three carbonization types (Figure 5.16). This site has a high degree of carbonized powder distributed across the three terraces, and a moderate number of encrusted sherds. The presence and moderate abundance of carbonized powder and encrustation on the Middle Terrace are associated with midden or mixed fill events, including A75, A66, A54/60, A52, and A46. While the ceramic assemblage is fragmented here among the events, there were two jars (one with light powder and the other light encrustation, both on the exterior) and a possible short necked olla (interior encrustation) identified. This space might have been used for cooking as there were two contemporaneous hearths (A67 and A68; the former dated to AD 126-391) located here. Even though the sample size representing the Middle Terrace comes from only 1 excavated unit, the relatively high total count of carbonization (n=38) and presence of all carbonization types does suggest some important fire-related activities were occurring. There was also likely a shift in the use of the Middle Terrace after the construction of ASD 1. A46 (a midden event) is the only event with carbonized sherds that occurs after the construction of SN ASD 1. Fragmentation is low (Table 5.2) in the events associated with this structure and carbonized material does not appear until the closure of ASD 1 with A46. It is unclear whether these carbonized fragments were deposited as a ritual closure for this building or deposited incidentally.

Patterns in carbonization on the Upper Terrace support the interpretation that this area served multiple functions, as suggested by previous analyses (see section 3.4). The archaeological traces on the Middle Terrace suggest cooking practices, but I do not think that the carbonization on the Upper Terrace is related to food preparation/cooking. There is only 1 hearth cut event (A99) in the depositional history on the Upper Terrace and occurs very early on in occupation (Appendix A). None of the carbonized sherd deposits I examined (n=70) occur in events near A99. This contrasts against the depositional history of the Middle Terrace, where there were carbonized sherds that could be found in events near the two hearths. Roddick (2009: 210-211) has suggested that surfaces here were likely used for ceramic forming and finishing due to the trampled surfaces and presence of 3 polishing tools in A206/207 and 1 in A285. Polishing tools are only found on the Upper Terrace at this site. Previously, I observed high fragmentation densities in events surrounding these surfaces that suggests high intensity in use. The only ceramic trumpet found from the excavations of all the sites come from this terrace, and Bandy (2001) has considered this to have been a public or ceremonial space. There is also no evidence to suggest large-scale feasting at any of these sites (Roddick 2009: 396). However, I observed a variable distribution of carbonization, and 55 of the 70 sherds have internal carbonization which is typically the result of food charring (Skibo 2013:

63). Perhaps consumption events did take place on the terrace but occurred at a small-scale. The Upper Terrace could have functioned as a public space for ritual, consumption, and/or crafting pottery during the Late Formative Period.

At Kumi Kipa, there are moderate counts of sherds with carbonized powder at the ASD 1 sector, and in the isolated units north. Sherds with carbonized powder were found only in later deposits, particularly surface and occupation events that took place just south of the only remaining wall of KK ASD 1 (Figure 5.17). These include A43, A154, and A85 linked to ASD 1, as well as A15 and A17 which are occupation zones found in the most northern 2 m-by- 2 m units of the site. In terms of the ceramics with carbonization on the surfaces of ASD 1, it is unclear what they might reflect since they are all body sherds. The lack of encrusted carbonization at KK ASD 1 could mean that functionally, this sector was not used for cooking or food preparation. There are much higher counts of encrustation in the units north of this sector. The high counts of encrustation and relatively moderate counts of carbonized powder in A17 and A15 suggest that cooking may have taken place there. In terms of local practices, it appears that cooking did not occur near these particular structures, like at Kala Uyuni, but much further away from them. However, this observation might be due to the small sample size and extent of excavation. Perhaps there were structures north that have not been found yet or were not made of stone and deteriorated over time. This suggestion is similar to Peterson's (2007: 124-125) hypothesis that the three absent walls of ASD 1 may been made of clay and deteriorated so much over time that they became unrecognizable. She does alternatively suggest that the stones may have been taken by Tiwanaku people to be reused since the existing ASD 1 wall foundation is constructed of stone.

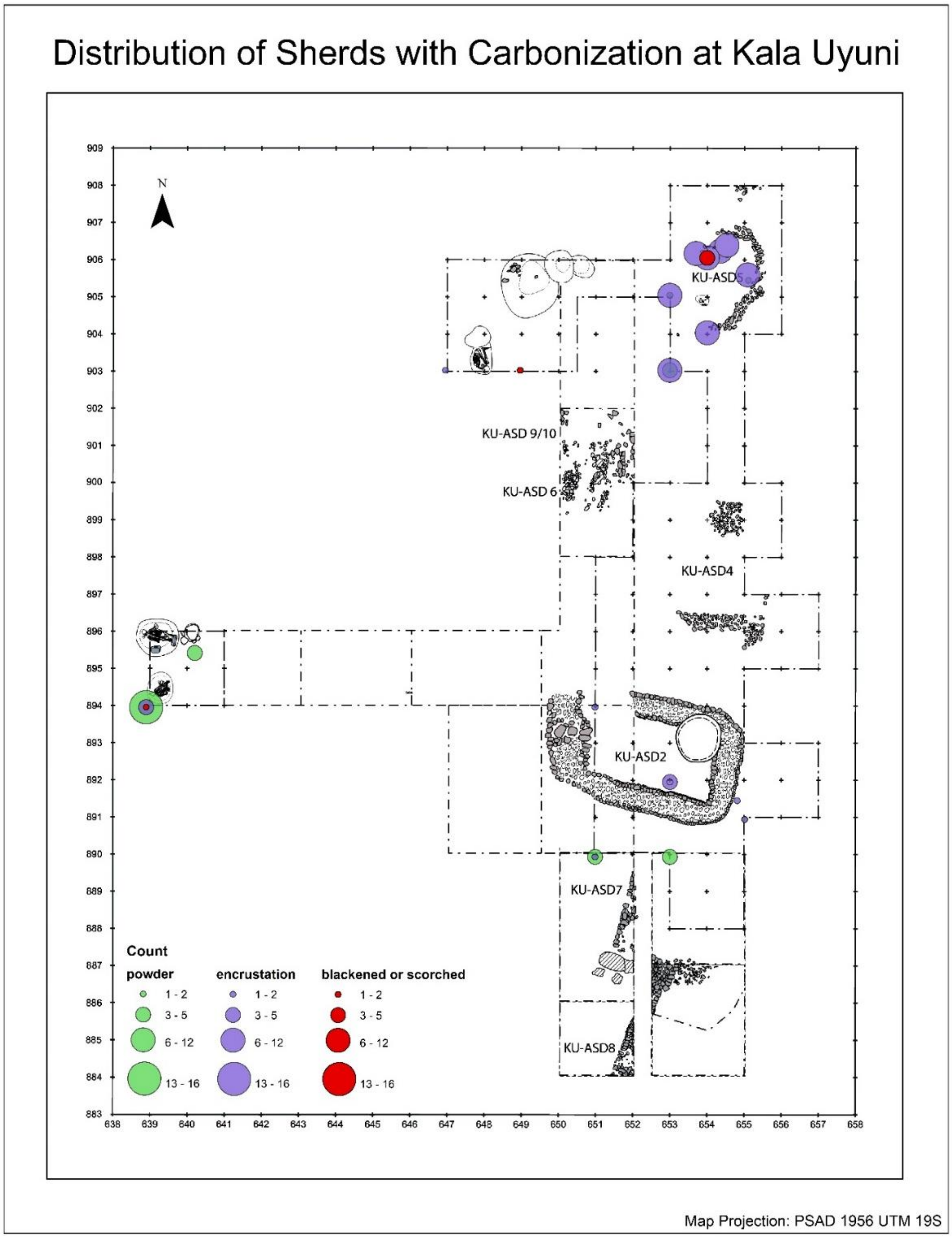


Figure 5.15 Site plan of Kala Uyuni KU Sector showing the distribution of carbonized sherds. Encrustation is concentrated at ASD 5 which highlights the prominence of food preparation/cooking activities. The concentration of carbonized powder in the middens west suggest that broken pots were deposited systematically away from the site.

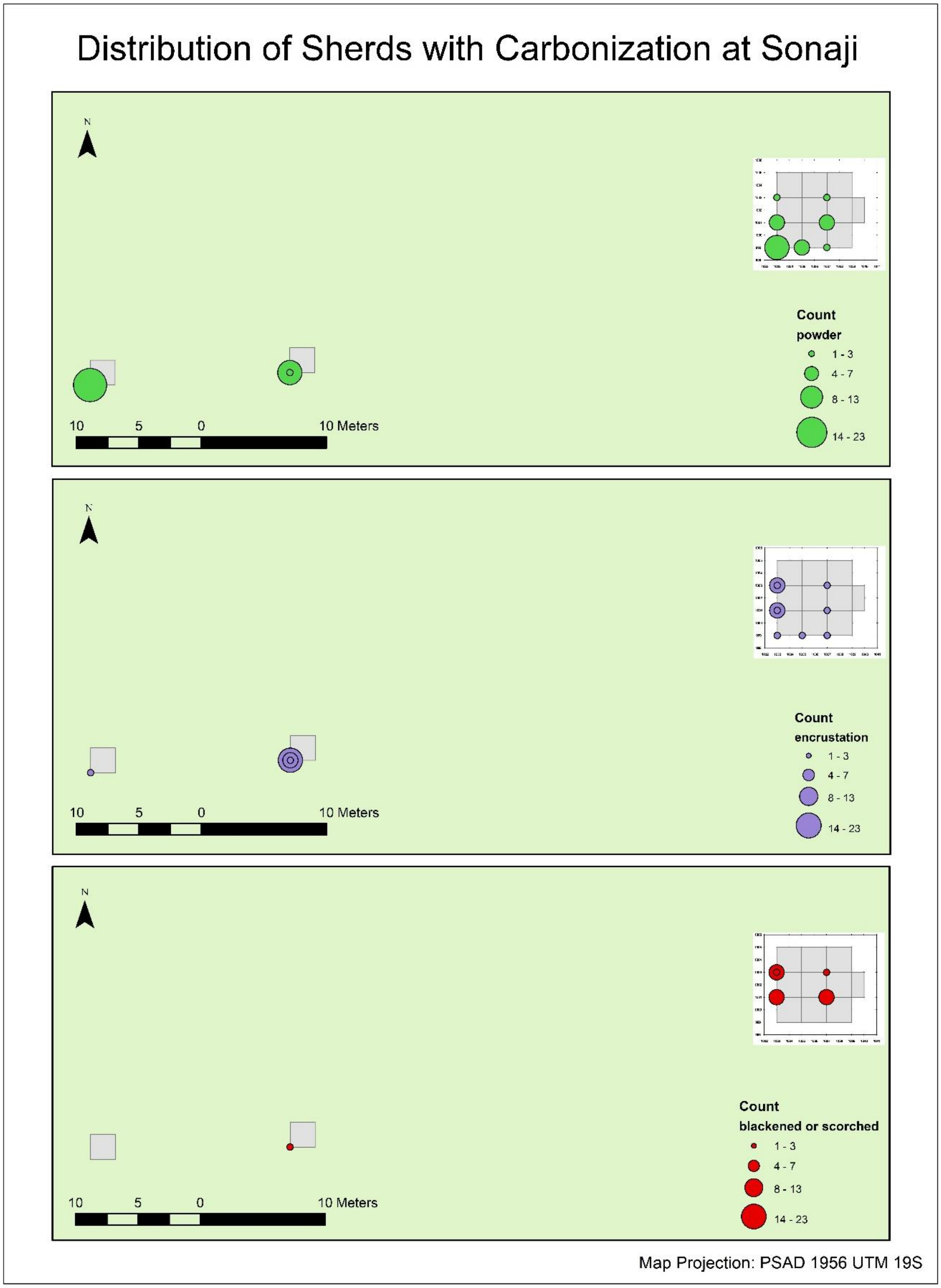


Figure 5.16 Site plan of Late Formative Sonaji showing the distribution of carbonized sherds. The moderate counts of encrustation and carbonized powder on the Middle Terrace suggests that cooking may have taken place (when combined with the distribution of other vessel forms). The moderate to high counts of carbonization on the Upper Terrace appear in surface and midden events.

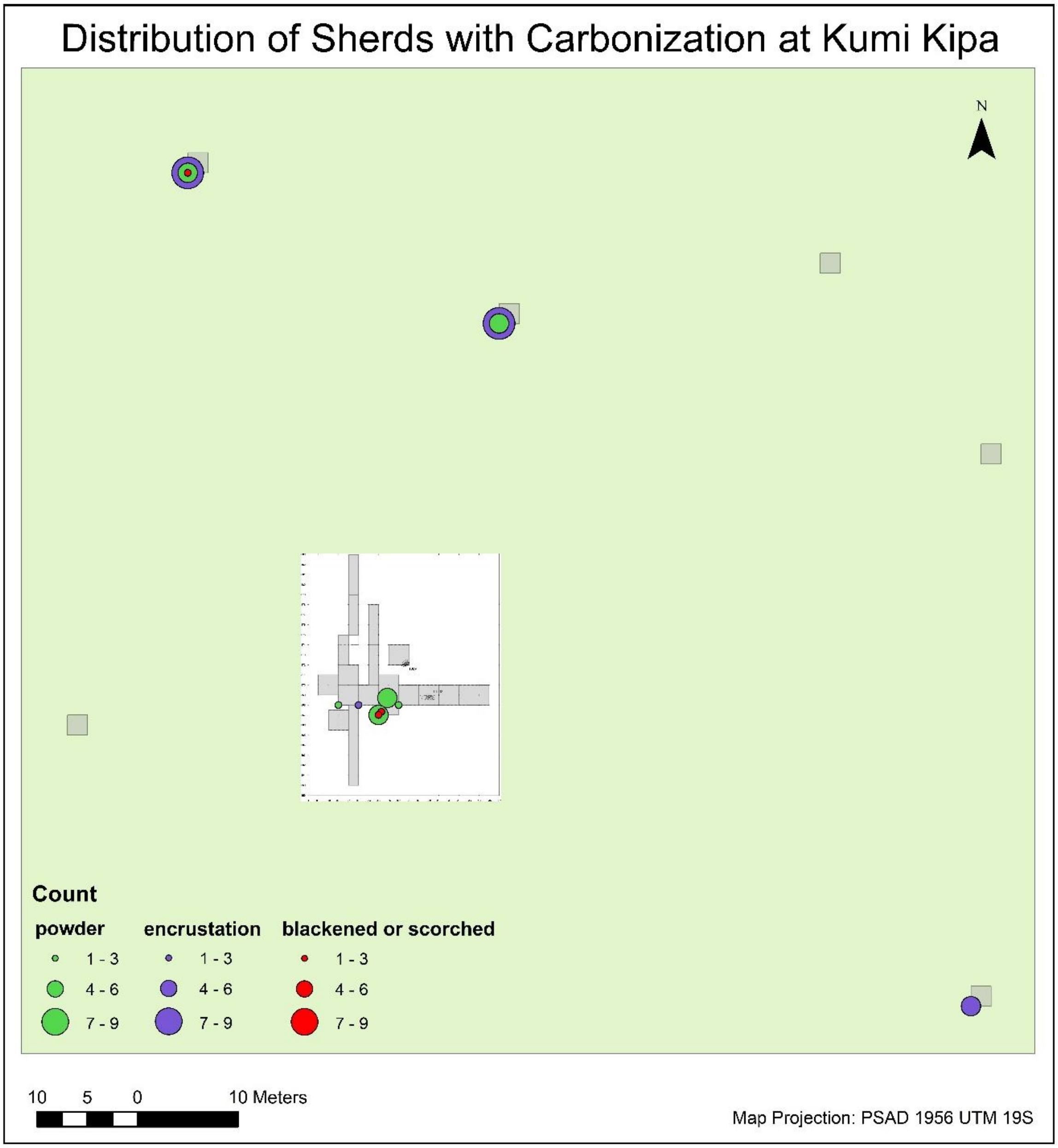


Figure 5.17 Site plan of Kumi Kipa showing the distribution of carbonized sherds. Encrustation is concentrated in the two units north of the KK ASD 1 sector. Perhaps cooking took place away from major structures, athough this could be a sampling problem. Encrustated sherds occur in low quantities at KK ASD 1, while there are moderate amounts of carbonized powder.

Fragmentation: Examining Intensity of Occupation, Use, and Waste Disposal Practices

Archaeologists can draw on ceramic fragmentation to explore use patterns in particular spaces (including waste practices and the degree of human traffic) and to estimate the expediency of vessels (see section 2.3). By analyzing fragmentation diachronically we can explore the long-term, persistent uses of space or changes in spatial practices. In this section, I discuss the distribution of sherd fragmentation from all Late Formative contexts and summarize the broad patterns I observed. I then narrow my focus to a specific set of events from each site that highlight instances of patterned deposition or behaviour and one case of possible structured deposition. At Kala Uyuni, I look at the surfaces linked to ASD 5 and the pit contexts of ASD 2 to examine possible deposition related to ritual. At Sonaji, I examine Upper Terrace surfaces and middens for architectural renovation. At Kumi Kipa, I discuss the "interior/exterior" surfaces linked to ASD 1 to examine whether these spaces were used for ceramic production or the result of low-effort waste disposal.

The ceramic assemblage I examined is highly fragmented, and events vary widely in sherd weight (Tables 5.1 and 5.2) For example, Tables 5.1 and 5.2 show some of the contexts with the highest and lowest average sherd weight, as well as the total sherd weight densities for each event. I used average sherd weight as a proxy for understanding the relative intensity of space use (i.e. fragmentation via trampling) and sherd weight densities to infer treatment of space (i.e. were spaces cleaned? Were they abandoned?). Later in this chapter, I also examine the density of sherd "crumbs" (body sherds smaller than 1cm^2) which were not included in Roddick' (2009) ceramic analysis. Sherds this small are generally excluded from ceramic analyses because they are not considered diagnostic, but they help us to understand how people dealt with their waste and to see whether there may have been structured deposition or not (Arnoldussen and de Vries 2019).

Top 10 contexts with the highest average sherd weight				
Site	Event	Context	Average Sherd Weight	Total Sherd Weight Density (grams/Litres)
KU ASD 2	B14	Surface outside structure	11.1	1.4
KU ASD 5	B249	Internal Occupation Surface	10.3	15.0
KU ASD 4	B221	Pit Fill	9.8	2.8
KU West of ASDs 2, 4, and 5	B67/B89	Possible Occupation Zone/Medium Density Midden	8.3 (B67) 8.6 (B89)	5.0
KK (General)	A28	Use Surface	8.4	0.3
SN Middle Terrace	A51	Wall of Adobe/Mud Mortar	7.7	0.3
KK ASD 1	A55	Compact Surface in Structure	7.7	5.1
KK ASD 1	A127	Clay Floor (inside structure)	7.7	1.4
KU ASD 2	B78	Pit Fill	7.6	9.5

*Table 5.1 Top 10 contexts from all three sites that have t*he highest average sherd weight, as well the ratio of sherds whose form could be identified compared to sherds whose form could not be identified. The high numbers at A249 and contrast between average sherd weight and density with A28 compared to A55 and A127 are particularly interesting (and unusual), which could speak to how space was organized and treated. A28 has a high average sherd weight suggestive of larger sherd fragments, but overall low sherd weight densities which could mean that this surface was being swept throughout most of the occupation. A55 and A127 (argued to be the same event) are higher, along with B249. *All sampled events are those with all sherds analyzed fully (A-analysis) or those with a mixture (A- and Z-analyses).* Average sherd weights come from Roddick 2009.

<u>Broad Patterns</u>

Across all three sites, I observed relatively low sherd weight densities on most surfaces and occupation zones, but higher densities towards the end of the Late Formative occupation (Tables 5.1 and 5.2). About 5 of the top contexts with the lowest and highest average sherd weights occur on a surface (Tables 5.1 and 5.2). Fragmentation on Late Formative I surfaces and middens show patterned depositional practices in terms of frequent cleaning of interior occupation surfaces and centralized trash disposal for both Kala Uyuni and Kumi Kipa (Appendix B). It appears that people at Sonaji did clean occupation surfaces, but interior vs. exterior building designations are unclear and there does not appear to be only one midden used for trash. Deposition at these sites over time gravitates more towards waste disposal methods out of convenience, rather than keeping up with systematic waste disposal (Hayden and Cannon 1983). This is based on the higher densities of ceramics on surfaces and the increase in the presence of pits and pit fills.

Top 10 contexts with the lowest average sherd weight				
Site	Event	Context	Average Sherd Weight	Total Sherd Weight Density (grams/Litres)
KK ASD 1	A48/47	Pit fill/Midden	2.10	-
KK Monticulo	A80	Occupation Zone	2.50	2.2
SN Upper Terrace	A299/A300	Possible Occupation Zone	3.1	3.9
SN Upper Terrace	A328	Rock and Adobe Wall Fall	3.2	-
SN Upper Terrace	A278	Midden	3.3	0.8
SN Upper Terrace	A48	Human Redeposited Matrix	3.4	-
KK (General)	A4	Occupation Zone	3.4	0.05
KK ASD 1	A41	Midden	3.4	-
SN Lower Terrace	A18	Low Density Midden	3.5	0.1
SN Upper Terrace	A206	Surface	3.6	1.7

Table 5.2 Top 10 contexts from all three sites that have the lowest average sherd weight. The low average sherd weight and density with the surface, A206, is an important event in relation to the latest Late Formative occupation at Sonaji. All the sampled events are those with all sherds analyzed fully (A-analysis) or those with a mixture (A- and Z-analyses). Average sherd weights come from Roddick 2009.

Although pits and middens are present at all three sites, Sonaji is the only site that has a higher ratio of middens to surface events. Sonaji has 17 middens ceramically phased to the Late Formative and only 6 surfaces. In contrast, Kala Uyuni has 6 middens, 7 surfaces and 8 pits and Kumi Kipa with 3 middens, 11 surfaces, and 2 pits (1 of which is also coded as a midden). Almost all the top contexts with the lowest average sherd weights are from the Upper Terrace (Table 5.2). This suggests high fragmentation on the surfaces of Sonaji, which could be indicative of intense trampling and heavy use. It also suggests that these surfaces likely were swept, since low sherd weights often mean there are no or very few, large sherd fragments. This is correlated with the high presence of midden contexts surrounding and/or intruding these surface contexts.

Moreover, the middens at Sonaji contain relatively low to moderate sherd weights when compared to many of the events at Kala Uyuni and Kumi Kipa, which seem to have designated locations for trash deposits. Trash middens at Kala Uyuni and Kumi Kipa are also generally away from structures while middens are very close to ASD 2 at Sonaji. This may be a sampling problem given that TAP excavators occasionally found it difficult to differentiate fills and middens, and interior from exterior spaces of SN ASD 2 due to intrusive Tiwanaku pitting (Roddick 2009: 136). However, it seems that there is less care taken of the space and of ceramics when it comes to “cleanliness” at Sonaji. The difference in depositional practice could reflect differential site function when compared to Kala Uyuni and Kumi Kipa during the Late Formative Period. Perhaps the Upper Terrace functioned as a public or ceremonial space as two decorated ceramic trumpets were found within two midden events that occur after the occupation of SN ASD 2 (A271 and A278/286). These are absent in the ceramic assemblages at Kala Uyuni and Kumi Kipa. The trumpets and distribution of fragmentation towards the peripheries suggests that the Upper Terrace may have indeed been a public space and may have been in an elevated position to suggest the presence of a platform (Bandy’s 2001:101; Hayden and Cannon 1983). I would argue that this kind of depositional patterning is local as it is clearly different from the practices at the other two sites.

Sonaji's midden and surface interplay: A206/A278, A324/A278, A270 and A285

It appears that ceramic waste deposition at Sonaji primarily involved middens that have relatively low to moderate average sherd weights. I observed relatively high fragmentation in A206/A278, a combined surface and midden event spanning the northwestern extent of the Upper Terrace (Table 5.2). The other midden events with a moderate amount of fragmentation on the Upper Terrace are A324/A278 (average sherd weight (asw) 5.1 g) and A270 (5.2 g). It appears that high concentrations of fragmentation were focused on the northwest and southeast/east peripheries. This could suggest inhabitants mainly cleared ceramic waste away from the central space, as the centre contained remnants of a structure (SN ASD 2) that collapsed prior to the placement of these middens (Figure 3.7). A surface (A285) appears later in the sequence and was constructed in the middle of this space, which had low to moderate average sherd weight (3.8 g).

Interpreting the depositional practice at Sonaji is difficult, given the amount of intrusive pitting taking place and the lack of consensus among TAP excavators over what constituted a midden or fill (Roddick 2009: 133; Figures 3.7 and 5.18, but see also Appendix A). The overall sequence suggests a complicated interplay between the construction and placement of surfaces and middens on the Upper Terrace over a long period of time. Although I cannot clarify the particular use of these surfaces or the logic in the sheer number of middens and pits, it does appear that trash was being deposited away from SN ASD 2 and A285 when they were in use. I observed the highest densities of too small body sherds among the middens of A270/278 and A324/278, and the surfaces of A206/A207 (Table 5.3). This suggests two things: 1) people were possibly sweeping and cleaning A206 and A207 and depositing waste in these middens, and 2) the A206/A207 surfaces were used so frequently enough that sherds became embedded into the ground from trampling. I return to these observations in Chapter 6 to discuss the possibility of ritual renovation in this public space.

Figure 5.18 A206 surface showing Tiwanaku intrusive pitting. Photographs from Roddick 2009: 133.

Site	Event	Weight (gram)	Volume (Litre)	Weight of too small body sherds (grams)/Volume Excavated (Litre)
SN	A206/A207	121.7	120	1.014
SN	A324/278	147.6	169	0.873
SN	A206/278	37	48	0.771
SN	A299	16.4	50	0.328
SN	A54/60	144.7	1000	0.145
SN	A46	8.6	75	0.115
SN	A325	13.7	134	0.102
SN	A7	184.3	1853	0.099
SN	A52	30.4	306	0.099
SN	A268	25.5	280	0.091
SN	A285	116.3	1692	0.069
SN	A298/278	23.6	350	0.067
SN	A278	106.6	1963	0.054
SN	A206	1.9	48	0.040
SN	A317	10.7	316	0.034
SN	A270	40.8	1733	0.024
SN	A271	30.3	1504	0.020

SN	A207	21.7	1690	0.013
SN	A278/286	13.7	1963	0.007
SN	A278/269	4.4	1963	0.002

Table 5.3 Weight Density of too small body sherds (<1 cm²) at Sonaji, ordered from highest to lowest.

Kala Uyuni Surfaces: B249 and B261

At Kala Uyuni, three events stand out from the distribution of sherds on surfaces and in fills or deposits: B249, B261, and B57. B249, an interior occupation surface associated with ASD 5 produced a date of AD 356-550 (Table 4.1). This surface has one of the highest average sherd weights (i.e. large fragments) when compared to all other Late Formative surfaces (Table 5.1). Excavators suggested ASD 5 was a cooking or food preparation space based on the high density of quinoa (mainly domesticated) and from the large numbers of cooking vessels on B249 (Bruno 2009: 425-426; Roddick 2009: 119). TAP excavators observed wall collapse at ASD 5 associated with high densities of ceramics, fish and plant remains (Fernandez Murillo and Fontenla Alvarez 2006: 28-30).

Related and contemporaneous to B249 is the external occupation surface of B261, which has a moderate average sherd weight of 6.4 g and has a C-14 date of AD 140-390. While B261 is coded as a surface, it has also been discussed as a midden (Roddick 2009: 116, 173). The sherd weight for B261 is similar to the midden events west of ASDs 2, 4, and 5, but also to the other external occupation surface (B77 with an average sherd weight of 5.9 g) linked to ASD 2. B261 contained high amounts of carbon, ceramics, lithics, and bone (Roddick et al. 2006: 30-32). B261 is contemporaneous with B39, the latest midden event before the space is transformed into a clay floor (B34). B39 has a slightly higher average sherd weight (7.4 g). The similar weights might suggest a lack of distinction in the use and treatment of B39 and B261 spaces in terms of refuse disposal.

The spatial extent of B261 covers both the northern and southern exteriors around ASD 5. Roddick (2009: 343) found high numbers of sooted ceramics here and suggests that they were transported here through taphonomic means. Perhaps human traffic between the use of B249 and ASD 5 with other southern structures led to some accumulation on the southern side.

When I examined the distribution of too small body sherds (sherds < $1cm^2$), I found that both B249 and B261 were two events containing some of the highest weight densities of such "crumbs" (Table 5.4). What this could suggest is that prior to the abandonment and/or structural collapse of ASD 5, surfaces were swept and cleaned during the earlier periods of occupation and use. I argue that the condition of the ceramic deposits could have been the result of both taphonomy and convenient trash dumping towards the end of the occupation and use of the space. I suggest that the northern portion of B261 was originally a surface that was cleaned and later turned into a midden, while the southern portion of B261 was more the result of post-depositional processes. The northern extent of B261 would not have had as much human traffic as the southern extent as many of the structures and activity spaces are to the west or south of ASD 5 and this space would be of low hindrance to daily routines and movement (Hayden and Cannon 1983). There is very little plant material on the northern extent to suggest that food preparation took place here (Bruno 2008: 426 and see below). Ceramic densities at B261 are either similar or much higher than in the midden components. In this regard, B261 north is reminiscent of a midden, and less of a surface. It appears that inhabitants may have been throwing parts of their trash from ASD 5 onto the surface of B261 out of convenience even though there was a centralized midden out west; an observation similar to those made by TAP excavators in 2005 (Fernandez Murillo and Fontenla Alvarez 2006: 29-30).

Site	Event	Weight (gram)	Volume (Litre)	Weight of too small body sherds (grams)/Volume Excavated (Litre)
KU	B249	182.8	575	0.318
KU	B77	31.8	110	0.289
KU	B261	296.2	1042.5	0.284
KU	B67/89	99	495	0.200
KU	B92	181.9	918	0.198
KU	B78	99.5	580	0.172
KU	B70	8.8	70	0.126
KU	B73	7.6	74	0.103
KU	B91	167.8	1858	0.090
KU	B24	0.8	10	0.080
KU	B22	21	360	0.058
KU	B23	11.5	210	0.055
KU	B12	36.8	820	0.045
KU	B57	6.2	200	0.031
KU	B89	10.6	495	0.021
KU	B270	4.2	265	0.016
KU	B14	4.5	670	0.007
KU	B16	0.2	740	0.0003

Table 5.4 Weight Density of too small body sherds (<1 cm^2) at Kala Uyuni, ordered from highest to lowest.

Kala Uyuni ASD 2 Pit

The third context is a sequence of pit events in the northeastern corner of ASD 2 associated with the structure abandonment (Figure 3.3). This pit includes the pit fill events of B16, B17, B57, and B78 (Appendix A). The presence of this pit is peculiar, as it is an intrusive Late Formative pit established likely after abandonment but before the structural collapse of ASD 2 (Roddick 2009: 113). Roddick et al. (2014: 151-152) argue that this was an intentional deposition as there are uncommon and rare material remains within the depositional history of this pit. This pit included 30 whole artifacts (stone hoes, hammerstones, pestles, *cubo*[11] fragments, etc.), and what has been interpreted as intentionally broken red-rimmed and zonally incised Kalasasaya pottery (i.e. two large *vasijas* and some bowls) (Paz and Fernandez 2004: 27; Roddick at al. 2014: 152). Paz and Fernandez (2004: 27) suggest that this may have been an offering associated with the closure or abandonment of ASD 2, or a storage pit.

I observed moderate to high average sherd weights in the earliest pit fill events, B78 (7.6 g) and B57 (6.5 g). This was followed by B17 and B16 which have slightly lower average sherd weights (5.5 g and 6.3 g respectively), implying a mixture of large and small sherds in these events. If vessels were being deposited intentionally, I would assume that even if they were fragmented, they would be able to form complete vessels (Chapman 2000; Gordillo and Vindrolla-Padrós 2017). However, attempts at re-fitting sherds were not possible and they may have been deposited elsewhere (Roddick at al. 2014: 152). Only 2 of 241 sherds from B16 and B17 are decorated; the rest are all undecorated and fragmented. The density of too small body sherds from B16 and B17 are also interesting. B16 has the lowest density of too small body sherds, while there are none in B17 (Table 5.4). Although there are 241 sherds in theses two events, there is very little to no heavy fragmentation. This lends support to the idea that the ceramics deposited here may have been a structured deposit. The presence of 4 sherds with interior encrustation in these two events may be food remnants tied to the use of the hearth (B61) outside. Cross-comparisons against paleoethnobotanical or zooarchaeological data in this pit might be useful in seeing whether there were any non-local food-related offerings to further suggest a ritual closure.

[11] *Cubos* are rectangular objects made of either calcium carbonite or quickline that produces heat when in contact with water and are often associated with ritual and burial contexts (Roddick et al. 2014: 151).

Kumi Kipa ASD 1: A85/A43, A55/A127, and A160/159

There is some debate over the surface designations at Kumi Kipa, particularly whether each of these two sets of events (A55 + A127 and A48 + A43) constitute the same event. A55 (compact surface) and A127 (clay floor) are events that take place on the “interior” of KK ASD 1 while A48 and A43 (both coded as surfaces) occur outside. Peterson (2007: 117) suggests that A55 and A127 should be collapsed together because they share similar chemical composition and sediment texture, were well maintained, and saw intense use. The spatial extent of A55 is much more widespread than A127, but the average sherd weight for both these events is 7.7 g. The same sherd weight values lend support to Peterson’s idea that they were the same event.

The “outside” surfaces of KK ASD 1 include A43 and A85, which have similar average sherd weight values (5.4 g and 6.3 g respectively). While both events overlap in space at N867/E924, A85 extends a bit more to the east (E868/E926) compared to A43. Peterson (2007: 117, 125-126) suggested that the interior surfaces were better maintained compared to the outside and showed signs of trampling the soil compaction. If surfaces were being well maintained and trampled, I would expect higher levels of fragmentation (lower average sherd weights). However, this was not the case. The medium amount of fragmentation (moderate average sherd weight) suggest that these ceramics may have been abandonment discard, given that these surface events take place towards the end of the Late Formative occupation at this site. The density of too small body sherds for both A85 and A43 are also similar, which is in line with Peterson’s (2007) hypothesis that these two are the same event (Table 5.5). It is not clear what kinds of specific activities took place in these latest events, but several polishing tools and spindle whorls were found in earlier contexts at Kumi Kipa. Roddick (2009: 210-212) has argued that pottery forming and finishing likely occurred at the site from the presence of trampled clay surfaces and relative density of smoothing tools.

Site	Event	Weight (gram)	Volume (Litre)	Weight of too small body sherds (grams)/Volume Excavated (Litre)
KK	A160/A159	142.7	105	1.359
KK	A154	53.5	65	0.823
KK	A43	57.5	90	0.639
KK	A85	138.2	240	0.576
KK	A80	166.2	582.5	0.285
KK	A55	30	170	0.176
KK	A17	169.3	2210	0.077
KK	A127	8	220	0.036
KK	A50	18.5	3560	0.005

Table 5.5 Weight Density of too small body sherds (<1 cm^2) at Kumi Kipa, ordered from highest to lowest.

A160/159 is a combined medium-density midden and clay lens event that appears stratigraphically after A43, but before A85. It is located to the west around N868/E920 with an average sherd weight of 6.6 g. A160 is associated with the use of KK ASD 1, while A159 occurs some time after the abandonment of the building. Excavators have suggested the ASD 1 wall may have continued west into the N868/E920 unit, and surfaces extended downslope based on the presence of clay lenses (A159) (Hastorf et al. 2005: 37-38, Figure 3.8). There were no considerable post-depositional or natural processes that compromised the stratigraphic integrity around these events and around KK ASD 1 (Peterson 2007: 124-126). While there is evidence of bioturbation from earthworms and other insects and erosion from sitting on a natural slope, they seem to have mainly affected the latest or top-most layers (from A5, a mixed midden context) of excavation at Kumi Kipa (Peterson 2007: 113-114). It is possible that the sloping led to an easier accumulation of ceramics with A160/159. A160/159 also has the highest density of too small body sherds at Kumi Kipa (Table 5.5). This is like the other midden events at Kala Uyuni and Sonaji (Tables 5.3 and 5.4). Perhaps A160 was used alongside the surfaces of A85 and A43, and the high density of small ceramic waste was both the result of active use (from cleaning A85 and A43) and natural down slope accumulation.

Ceramic Distribution and Paleoethnobotanical Remains at Kala Uyuni

I end this chapter with a preliminary analysis of the deposition of paleoethnobotanical remains compared to ceramics. Such an effort may help clarify whether sites were occupied and used seasonally/permanently, or whether spaces were used for cooking, consumption, ritual, or even perhaps to indicate post depositional processes (Dark 2004; Popper and Hastorf 1989: 11-12). In the previous sections, I observed instances of carbonization which could relate to cooking, craft production, or ritual burning. However, it is unclear what specifically took place. Examining the distribution of botanical remains in space against the distribution of potsherds could help specify whether spaces were used for preparing or cooking food based on the type of plant taxa (crop vs. wild plant species). It could also be indicative of other processes like direct burning of plants for fuel or the indirect introduction of wild plant taxa (i.e. cacti and grasses) through camelid dung that is often used as fuel in Andean pottery production (Bruno 2008; Hastorf and Wright 1998; Sillar 2007). Only carbonized plant remains survive in the archaeological record within the Lake Titicaca Basin, making it one of the ways to examine possible, intentional acts of burning (Bruno 2014: 137). This might be important for exploring aspects in the production of locality through food preparatory/dietary, ceramic firing, or organic waste disposal practices.

I conducted a limited case study between the distribution of carbonized sherds against the distribution of plant remains for Kala Uyuni. This was to test whether it would be useful for future endeavours to overlay more than one type of archaeological evidence at different data resolutions to better understand both site formation processes and space use during occupation. As I mentioned in chapter 4, coordinates for botanical data are at a much higher resolution than ceramic data points. Because of this, I made only minimal changes to the plant GIS files and used attribute tables and associated GIS files that were compiled by Dr. Maria Bruno and Dickinson College undergraduate student Justin Burkett. I examined the distribution of two types of plant taxa in space by seed count density: quinoa (*Chenopodium*) and tubers (via parenchyma tissue). I focus on the distribution of quinoa and tubers as they are two of the more ubiquitous and traditional crops during the Late Formative Period in the region and are indicators of cooking/food processing (Bruno 2014: 136). Overall, I observed high concentrations of quinoa and tubers in three locations at the site: West of ASDs 2, 4, and 5, ASD 5, and ASD 4 (Figure 5.19).

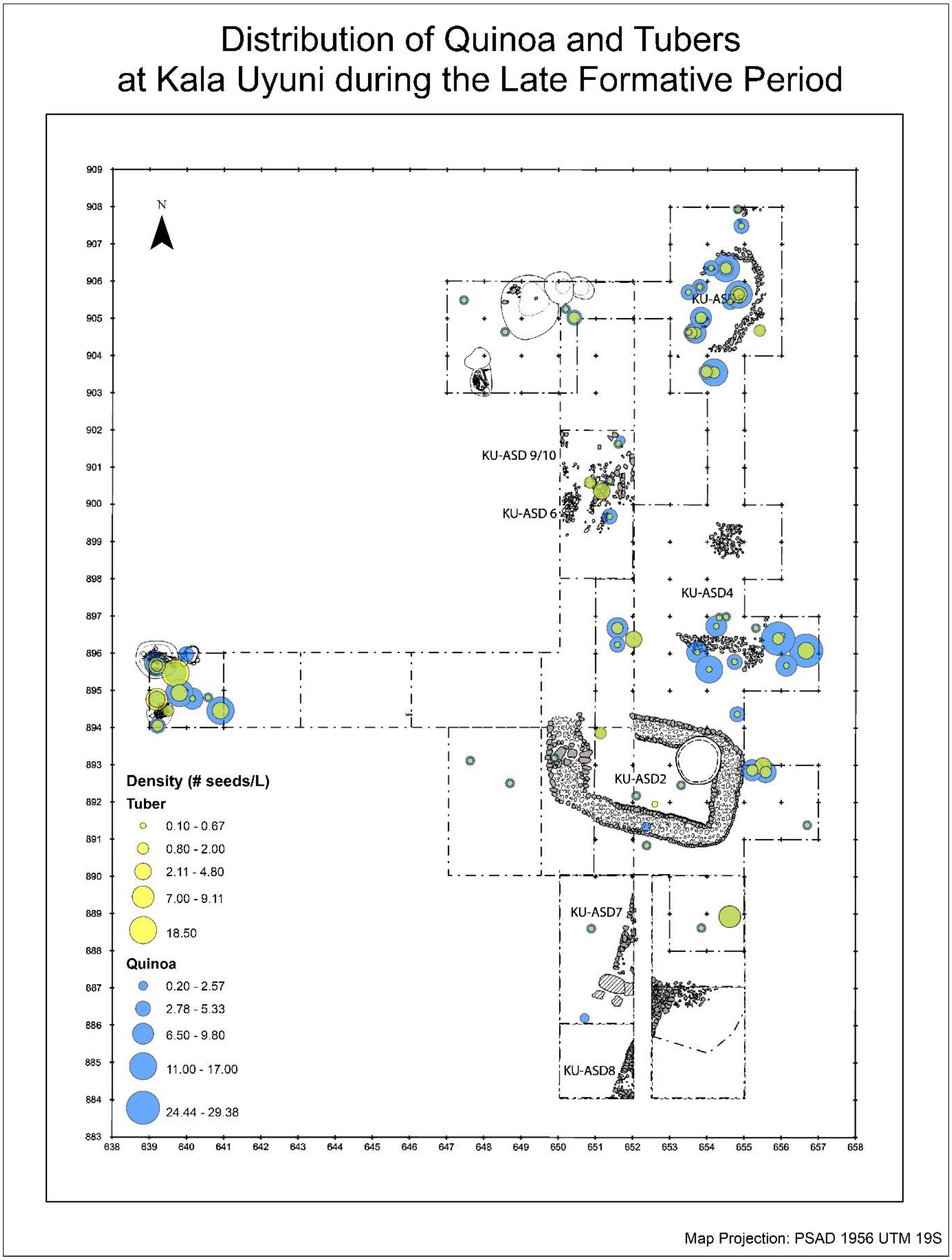


Figure 5.19 Site plan of Kala Uyuni showing the distribution of both quinoa and tubers. Events where both are present overlap and are in green. High concentration of plant remains are found associated with the midden complex, ASD 5, and ASD 4.

The overall high concentration of plant remains in LF West of ASDs 2, 4, and 5 likely suggest some sort of systematic deposition of food waste during the use of the midden complex, particularly with B92, B91, and B39, when combined with the relatively moderate number of carbonized sherds (Figures 4.2, 5.15 and 5.19). There is a high density of quinoa within B92 (11.63 seeds/L) and low-moderate density of tubers (2.88 seeds/L). B91, a midden succeeding B92, has a high density of tubers (9.11 seeds/L) and moderate amount of quinoa (4.56 seeds/L). B39 is the latest Late Formative midden of the sequence with high densities of tubers (18.5 seeds/L) and quinoa (9.13 seeds/L). This is very interesting in terms of deposition across time at the site. B39 is dated to AD 70-234 (Late Formative I), and the use of this space for garbage disposal seems to end temporarily (Appendix A). Its disuse could mean that inhabitants turned to disposing their garbage outside of the structures themselves out of convenience. This would help explain the high densities of quinoa and tuber remains outside of ASD 5 and ASD 4, both of which were constructed either towards the end of Late Formative I or the beginning of Late Formative II.

The high concentration of plant remains and high counts of ceramic encrustation at ASD 5 confirm that this was primarily a cooking space (via spatial visualization), while the concentration near ASD 4 is less clear. The plant deposition at ASD 5 seems to have been deposited either around the edges of the building interior or exterior. This kind of pattern may be the result of high traffic causing the displacement of lighter objects/materials into spaces less frequented such as edges and corners (Hayden and Cannon 1983; Nielsen 1991). Alternatively, plant waste may have been dumped just outside the building either out of convenience since the middens out west were not/less used or could have been re-used as fertilizer (Hayden and Cannon 1983). For ASD 4, I cannot discuss much, in part because of the poor preservation of the structure which resulted in only the analysis of 1 event (recall in Chapter 4, there was only 1 pit fill event firmly phased to the Late Formative). Much of the events associated with ASD 4 are also mixed and disturbed by later Tiwanaku contexts (Roddick 2009: 116). However, there are two sherds within B221 which are encrusted, and all 6 sherds from B204 (a mixed Late Formative and Tiwanaku pit fill) are carbonized (4 fire blackened and 2 with encrustation). In addition, there are signs of cooking and food processing on the outside surfaces south of ASD 4 from the carbonized plant material (i.e. quinoa and tubers) found in several pits that have been interpreted as potentially outdoor cooking spaces were several pits filled with carbonized plant material (Bruno 2008; Roddick et al. 2014). The deposition of carbonized plants at ASD 5 and ASD 4 seems to suggest a change in local waste disposal practice during the later occupation of the site with a shift from perhaps caring to dump waste in a centralized space away from buildings and towards dumping them nearby, either to fertilize soil to grow crops or out of ease. Alternatively, perhaps there was a new space dedicated for trash disposal but has not yet been found because of limited excavations.

Much like the previous section, I examined the local through a practice definition here. I looked at ceramic deposition over time to understand how local or non-local boundaries are maintained and transformed through daily use of pottery and refuse activities. I saw a rather uniform or lack of material culture patterning when I examined the distribution of identifiable vessel forms across space and time. This would suggest no distinct uses of space or that boundaries became distorted from cleaning or were taken away (i.e. i.e. taken with inhabitants when they abandoned the structure or site). From macro-scale perspective, there seems to be no local or non-local distinctions in site organization using vessel forms. However, when I examined fragmentation using average sherd weight, ceramic weight densities, and 'crumbs," I saw instances of structured deposition, either tied to ritual, waste disposal, or frequency in the use of certain spaces over others. I saw similar practices between Kala Uyuni and Kumi Kipa where people mainly threw their trash further away from their activity spaces and buildings. In contrast, Sonaji does not share this similarity. When it came to carbonization, I saw that Kala Uyuni had dedicated spaces for cooking near a building (ASD 5 and to some extent, ASD 4), while cooking at Sonaji (Middle Terrace) and Kumi Kipa (possible scattered cooking spots) appear to not be linked to a building and may have occurred on an open surface. My findings here suggest that there is a difference in the local and non-local boundaries interpreted when the scale of analysis changes from looking at the deposition of macro-scale changes reflected in vessel form, to looking at fragmentation, carbonization, and taphonomic data: 1) refuse patterns suggest that Kala Uyuni and Kumi Kipa shared one local practice while Sonaji maintained their own; 2) carbonization and plant data reveal that the location of cooking spaces differed at all three sites and inhabitants may not have shared similar ideas of spatial organization (i.e. ways of doing things). The local presented through practice shows a much more dynamic understanding of how boundaries are created or maintained by people living at these sites. There is a shared locality between Kala Uyuni and Kumi Kipa when it comes to waste practices, and possibly three distinctive boundaries of practice when it came to organizing their activity spaces (i.e. cooking, food preparation).

5.5. Chapter Summary

In this chapter, I presented the major results and findings of the spatio-temporal analysis of ceramics and paleoethnobotanical remains I conducted with samples from Kala Uyuni, Kumi Kipa, and Sonaji. This work was done to explore three distinct views of locality. In section 5.2, I explored a spatial approach to locality, that uses ceramics to identify and categorize sites based on decoration and broad temporal phasing. I summarized the total sherd densities, and composition of the ceramic assemblage by decorated or undecorated classifications. In section 5.3, I examined the distribution of ceramic production attributes, including paste (temper, texture, and inclusion size) and surface treatment, to see whether similar pots were being produced across the three sites, and whether there were any patterns in the way people organized their living spaces. I examined ceramic use and deposition in section 5.4, looking at fragmentation densities of unidentified vessel forms, carbonization, and limited paleoethnobotanical data to investigate use intensity and where people deposited their trash.

When I examined vessel forms across event contexts through time in Ch. 5.3 and 5.4, I did not see any significant differences in densities across these event types. I saw similar low densities of bowls, *ollas*, jars, and other necked vessels. In terms of my first question, analyzing identifiable vessel form distribution across space and time did not yield any information about whether spaces were used for any specific activity. The uniform distribution suggests that these kinds of vessels were either used everywhere and were multipurpose, or that the overall fragmentation in this ceramic assemblage disrupted the ability to see any meaningful patterns if we were only looking at identifiable forms. In terms of general site function and definition, the only indicators that would suggest some sort of ceramic production or ritual activities would be the two trumpets at Sonaji, two figurines at Kala Uyuni, and several polishing tools and spindle whorls present at all three sites. However, the low quantities of vessels traditionally associated with ritual suggest that perhaps there was no clear distinction between ritual or domestic spaces.

In section 2.3, I questioned whether interpretations about how people lived change when we shift the scale of analysis from production to deposition. From examining material practice to answer my second set of questions, I observed that inhabitants shared major pottery production methods, but varied in their treatment of space when it came to cooking spaces and waste disposal patterns. Cooking took place away from any structures at Kumi Kipa and Sonaji, while cooking at Kala Uyuni took place within and just outside of ASDs 4 and 5. While this could be the result of the sampling choices made during excavation, this pattern could also suggest different functions between the two sites with Kala Uyuni, and perhaps a manifestation of a localized material practice. From looking at the spatial and temporal distribution of sherd fragmentation, carbonization, and paleoethnobotanical remains between these sites, there likely were different material practices occurring at the three sites based on the varying levels of fragmentation among surfaces, and middens and pits. At all three sites, surfaces were being kept clean until the latest and last surfaces phased to the Late Formative Period, which saw an increase in sherd weight densities of unidentifiable form. While the middens at Kumi Kipa continued to be used until abandonment, the same cannot be said of Kala Uyuni and Sonaji. Both sites saw a decrease in weight densities among middens and pits at the time densities rose on surfaces. However, both Kala Uyuni and

Kumi Kipa originally had designated middens and pits away from structures with relatively moderate to high densities of ceramics. At some point during either the end of Late Formative I or beginning of Late Formative II, occupants at Kala Uyuni stopped systematically disposing both ceramic and botanical waste and appear to have been dumping them near structures instead. At Sonaji, patterns of waste disposal are much less clear because there were higher numbers of midden and pit events than there were surfaces. What this could possibly suggest is that Kala Uyuni and Kumi Kipa shared overall similar waste disposal practices during Late Formative I. Kumi Kipa was abandoned after this phase while there was a shift towards convenient dumping at Kala Uyuni, perhaps because inhabitants had planned to abandon the site. Sonaji as a site was clearly different in use from the other two but did share similar care in sweeping surfaces that were heavily used.

My findings here expand on the idea of a single, shared community of practice that was presented by Roddick (2009) from a production perspective. The different spatial organization of activity spaces between these three sites marks a difference in perhaps what inhabitants shared in their interactions with other communities. While they likely shared their production techniques with one another, they did not share similar ideas of how they organized their living spaces. I suggest there is more than one local practice present at any given moment when it comes to use and deposition. These local boundaries are dynamic and may overlap with one another depending on the type of practice that we look at. In the next chapter, I discuss and explore my research questions further and connect my findings to the larger narratives surrounding the three Taraco sites and to the region.

Chapter 6: Discussion and Conclusions

6.1. Thesis Overview

Many narratives on the sociocultural, economic, and political relationships of past polities hinge on what is deemed local or not local (Druc 2013). Archaeologists have often assumed processes of localization are the result of conflict and a decentralization of power (Kosiba 2011: 117-118). The term "local" was used as a foil to regional developments and limited in spatial scale. Archaeologists working in the Lake Titicaca Basin continue to focus on larger sociopolitical processes (e.g. the development and fall of the Tiwanaku state), and at the time scale of the period and horizon. However, such approaches homogenize the vast occupational histories that take place and assume that processes operating at a smaller "local" scale are inconsequential. Yet, locality operates on multiple scales of understanding: the physical, statistical, technological, economic, social, political, and conceptual/representational (Druc 2013: 505). It is everyday practice that leads to the production or maintenance of locality. The concept of the local should not be assumed to be static nor should it only be defined by Cartesian space (Kealhofer 1999: 58-60). Locality is a historical process.

In this final chapter, I discuss my findings within the broader picture of the culture history of the Lake Titicaca Basin, the anthropological narratives driven by debates on the local, and the use of GIS towards legacy data collections. I address both my research questions in relation to past research on the peninsula and to the region:

1) *How do site and feature designations impact interpretations of the local? Do current narratives over what Kala Uyuni, Sonaji, and Kumi Kipa were as sites differ when we examine their occupational histories through ceramic attributes?*

2) *Were inhabitants producing and using distinct pottery types at each site? What might variation or lack thereof say about site organization and understandings of material practice and knowledge sharing?*

I consider how scales of analyses and practice contribute to understandings of locality. I studied ceramic production and deposition at three sites to explore the implicit notions of the local at a regional/survey scale and how local boundaries are produced and maintained through material practice at an event scale. I discuss the implications of tracking production and deposition through space and stratigraphic time on the current and larger narratives characterizing the Late Formative Period, and the possibilities of combining different artifact/ecofact classes to clarify event contexts. Lastly, I consider the applicability of GIS to legacy collections, specifically whether they can be re-worked and transformed to compare with more recent and/or future data.

My research is important in understanding occupational histories at these sites about the everyday rhythms of past peoples, which are not discussed at length, despite affecting and being affected by regional developments. Many past ceramic studies describe and interpret local or non-local traditions based on where raw materials come from, rather than where they are produced or used. I argue that use and deposition are just as important as production since locality is always in flux (Blake 2011; Crown

2007). Depositional practice can tell us how people used and organized the spaces they occupied, revealing processes of localization that may differ from solely examining pottery production practices.

6.2. Scaling Sites: Production and Depositional Patterns on the Taraco Peninsula

Site Understandings

Our understanding of Kala Uyuni, Kumi Kipa, and Sonaji emerge from Bandy's (2001) initial survey and demographic interpretation of the ancient Taraco Peninsula. As discussed in chapter 2, designations of space and of sites tend to be characterized by visible, macro-scale evidence of human material culture, often using features (e.g., architecture) to define sites and their importance (McCoy 2020; Moore 1997). Artifact scatters are used to determine the extent of a site geographically, to phase a site to a period or a broader horizon, and in some cases to categorize a site by function (McCoy 2020; Willey 1953). Sites, however, are difficult to define and become much more complicated when considering both depositional histories and post-depositional processes (McCoy 2020; Willey and Phillips 1958: 18). In this study, I analyzed ceramics from three sites at two different spatial scales of analysis - the first being at the site scale and the second at an event scale. In other words, the site scale involved a compression of time and an analysis that was strictly spatial, while the event scale involved both spatial and temporal dimensions to understand changes occurring during the Late Formative.

When it comes to site designations, my analysis of the spatial distribution of ceramics at the site scale suggests that at some point, there may have been public-related activities at Kala Uyuni and Sonaji based on the more uncommon and rare decorated sherds found. However, inhabitants do not appear to have used only specialized vessels for ritual activities, or these spaces were not used specifically for long term ritual and public events. When I examined ceramic deposition by event, there were much lower proportions of decorated pottery than undecorated, suggesting that if public activities did occur, then undecorated ceramic vessels were being used for the most part. The current interpretation that Sonaji and Kala Uyuni were once ceremonial centres is still possible when considering the site occupation during other phases (i.e. Middle Formative and Tiwanaku). My findings suggest that decorated vessels generally are not ideal in examining the segregation between ritual and domestic activities as these vessel forms were likely used for multiple functions and people did not produce or use that many decorated forms of pottery (although see the structured deposit in ASD 2). At Kumi Kipa, specialized vessels were absent, a finding that supports Bandy's (2001:215) understanding of the site as domestic that focused on craft production.

When it comes to the distribution of vessel forms at these sites, it appears that inhabitants were producing and using similar forms throughout the entire Late Formative Period. Each site had similar proportions of the different identifiable vessel forms among the different contexts. When I examined the vessel form distribution over time by event, I observed a lack of patterning in vessel form distribution which could suggest that inhabitants may never have had dedicated spaces for producing, using, or dumping sherds, or that such middens have not yet been excavated. However, what is more likely is that at the event scale, the ceramic patterning is hazy because of the high degree of fragmentation at these sites. There might have been a uniform distribution of identifiable vessel forms, or that whatever pattern there might have been has been greatly disturbed.

Inhabitants at one point, shared similar production and use practices, but it is not clear whether this persisted throughout the entirety of the Late Formative occupation at these sites.

<u>Production Practices</u>

Inhabitants at the three sites were likely producing the same or similar kinds of pottery in terms of paste and vessel forms but differed in finishing techniques. I observed a rather uniform distribution of mineral pastes across all events, with a lot more ceramics with mineral tempers than fiber tempers. The increased use of more micaceous tempers is a regional trend seen elsewhere on the southern Lake Titicaca Basin during the Late Formative (Janusek 2003: 51; Stanish 2003: 158). My observations on paste distribution support Roddick's (2009) interpretation of a possible single community of practice where there is an increase in production standardization. All inhabitants at the three sites shared common surface finishes, including complete and incomplete burnish, smoothed, and wiped. Kumi Kipa and Sonaji residents had a wider variety of finishes than Kala Uyuni, sharing very fine complete burnish and rubbed with each other while Kumi Kipa residents also applied stucco or grainy wipe finishes. This suggests some sort of close interaction between the residents, which is in line with Bandy's (2001) grouping of the two sites as being part of the Santa Rosa Group.

There is, however, a more distinct variation occurring at Sonaji. Here, Late Formative pastes shift back and forth in terms of mineral and fiber pastes. Recall, Roddick's (2009)) survey work that did not find any clay resources on the peninsula rich with mica. It is possible that inhabitants at Sonaji used more fibrous clays because they were more readily available, or perhaps this was a form of localization where inhabitants actively chose to continue to produce and use ceramics with fiber tempers alongside mineral ones. In addition, while medium textures and medium inclusion sizes are typical across the Taraco sites, I observed a greater diversity in inclusion sizes at Sonaji. Sonaji is the only site of the three to also have variation in the interior surface finishes, applying retocado, fine wiped, very fine complete burnish, and rubbed finishes to their pottery. This variation could suggest Sonaji inhabitants were distinguishing themselves in practice from Kala Uyuni and Kumi Kipa residents.

The stability and rise in similar paste recipes among potters on the Taraco sites suggest that there was some degree of maintenance in local boundaries through practice. There likely was some sort of knowledge sharing or migration between the residents of each site to cause this high degree of standardization in secondary forming techniques. At the same time, I argue that the changes observed at Sonaji could be a resistance against a reduced use of fiber tempered ceramics that is seen at the other sites or reflective of functional variation in pottery production and use. Inhabitants were transforming their production practices and producing more localized pottery with different surface finishes. It is unclear whether there was a distinct production of a new local practice between Sonaji and Kumi Kipa from my findings, but the similarities suggest inhabitants likely were interacting with one another based on proximity (the sites are about 1 km away from one another). The possibility of at least two local material practices operating at different scales complicates the relationship and degree of interactions between Taraco inhabitants as they shifted from sharing similar production practices to diversifying them.

Use of Space and Waste

I examined whether people from the Taraco sites organized and used their spaces differently from one another as a separate or shared local practice. I addressed this question by examining depositional variation of fragmented sherds and carbonized sherds and plants. The way in which ceramics are used and the location and condition of sherds indexes everyday, repeated behaviours. These can inform us about any discrete patterns in fire-related activities or waste disposal practices. I expected there to be similar treatments of waste and cooking spaces based on the previous analyses of Kala Uyuni, Kumi Kipa, and Sonaji (see Bandy 2001 and Roddick 2009). These efforts suggest that the three sites heavily interacted with one another based on geographical proximity and hypothesized population dynamics and migration and may have been part of the same community of practice based on similar crafting techniques.

Residents of the Taraco sites seemed to have cooked in a wide range of spaces. A significant concentration of encrusted sherds, quinoa, and tubers were associated with ASD 5 and ASD 4. Kala Uyuni inhabitants mainly cooked within ASD 5 and on the exterior surfaces outside of both ASDs 5 and 4 on the southern exterior of their respective structures. This observation is in line with Bruno's (2008), Roddick's (2009), and the TAP project's suggestion that ASD 5 was primarily a residential or domestic structure used for food preparation and cooking. The purpose of ASD 4 is less clear as the structure is poorly preserved, and I sampled very few events because the majority have been intruded by later Tiwanaku activities. At Kumi Kipa and Sonaji, it appears that inhabitants did not cook near buildings, but further away from the high concentrations of encrustation. I saw very little presence of encrusted sherds linked to the KK ASD 1 activity area, and much of the encrustation on the Middle Terrace of Sonaji took place prior to the construction of SN ASD 1. There may have been two distinct organizations in cooking between these two sites compared to Kala Uyuni. However, the patterns at these two sites could be a sampling issue since the contexts associated with encrusted sherds are from isolated, single 2 m-by-2 m units. Perhaps cooking did occur within dedicated buildings that are no longer visible because of deterioration or have not been excavated yet.

People may not have directly shared similar waste disposal practices during the Late Formative. This may be due to the length of occupation, site function, and/or the degree of excavations at the sites. Throughout most of the Late Formative Period, inhabitants at Kala Uyuni were consistently throwing their trash away from where they lived in the far midden complex to the west. This is seen in the high densities of fragmented sherds and plant remains. They did not use pits to deposit trash or store any objects until the transition into the Tiwanaku Period. People kept the central interior and exterior spaces and activity areas very clean, although high densities within some events linked to ASD 2 (i.e. B22) suggest ceramic discard may have been re-used for levelling floors and/or outside surfaces, or heavily trampled on. Most of the sherds recovered from the floor of ASD 2 were fragmented and some could be representative of provisional discard that inhabitants may have saved for later use (Deal 1983: 193, Hayden and Cannon 1983). This may have been the case depending on how the large pit of ASD 2 is interpreted, as there are finely made ceramic and *cubo* fragments that could have still been used (Roddick et al. 2014: 152). By the end of the Late Formative Period, inhabitants likely planned to abandon the settlement as floors and surfaces were no longer swept as clean as before, pits began to appear with trash, and the midden complex became disused.

In direct contrast, Sonaji inhabitants did not deposit their trash in a centralized location, but rather, the entirety of the Upper Terrace becomes riddled with trash deposits that span across the excavated units. Midden deposits that seem somewhat contemporaneous with surfaces seem to generally surround the surfaces, suggesting that people just swept them off to the side during use. If, as is believed, the Upper Terrace had an architectural platform, then is highly possible that this is why the trash collected just around the surface (Bandy 2001). My findings suggest that people casually cleaned the central surfaces (i.e. A285) with the intention of continued use around AD 132-381, but final surfaces prior to Tiwanaku occupation could imply some sort of an unplanned or immediate abandonment of this portion of the site as the final Late Formative surfaces (A206 and A206/207) have moderate to high densities of sherd fragments (6.75 sherds/L and 2.93 sherds/L respectively). However, Roddick (2009: 210-211) has suggested these surfaces may have been used for pottery forming and finishing as there is evidence of trampling and two polishing tools that were recovered from these events. The entire sequence of overlapping midden and surface events may also suggest that they constantly renovated the terrace, perhaps each renovation corresponding to some sort of public event or was part of a ritual renovation (Moore 1997: 141; Swenson 2011). Most of the carbonized sherds on the Upper Terrace show signs of only interior carbonization, implying these pots may not have been used for cooking, but rather to burn offerings. Inhabitants may have placed certain materials, plants, or hair and burned them within vessels. Ritual burning of offerings, including human hair has been observed at sites elsewhere in the Andes, archaeologically and ethnographically (Vogel 2012). Perhaps inhabitants had offered food as part of a ritual offering each time a midden or surface was decommissioned and renovated. In either case, Sonaji's complicated depositional history on the Upper Terrace suggests that inhabitants held a variety of public events here that served multiple functions over the course of its use.

6.3. The Applicability of GIS to Legacy Data

GIS helped answer my questions about the organization of space at these sites. As discussed in Chapter 4, GIS can be used to visualize and analyze the distribution of ceramic technological attributes within and between site because it uses a relational database. Generally, archaeologists have traditionally used GIS for regional scale analyses to examine settlement or migration patterns. Most GIS-driven projects in the Andes (and beyond) are used for regional kinds of analyses, including viewshed or hillshade analysis, cost surfaces, least-cost pathways, and remote sensing (i.e. Bongers et al. 2012; Lasaponara and Masini 2014; Llobera et al. 2011; Kosiba and Hunter 2017; Stanish et al. 2010; Vining and Williams 2020). These involve large, multi-site study areas and are useful for understanding larger sociopolitical processes. Using GIS to perform intra-site analyses is much less common (but see Taylor 2016). This project was built on the work done and generated by TAP project members, from the ceramic and paleoethnobotanical analyses to the generation of GIS map data files to explore how past and present legacy data can be combined and further analyzed in a meaningful manner and at a much smaller site and event scale.

Archaeologists studying ceramic technology and production currently favour the use of bulk chemical (neutron activation analysis), spot chemical (LA-ICP-MS), and *in* *situ* mineral (petrography) analyses to trace potters' choices and decisions in relation to resource procurement and paste recipe making (Stoner 2016: 31). The graphs and tables presented in these studies tend to be less spatially focused and often exclude maps showing the spatial distribution of ceramic attributes. Current uses of GIS showing pottery distribution focus mainly on broad patterns in ceramic vessel form and decorative style to track stylistic shifts occurring over large time spans (e.g., phases). My project is one of the few studies that have attempted to track ceramics in space based on their technological attributes, and the first in the region involving Kala Uyuni, Kumi Kipa, and Sonaji. I georeferenced map plans and converted local datum coordinates into UTM coordinates to connect the ceramic data to the "real" world. This will be valuable for future researchers who are interested in conducting inter-site analyses within and beyond the Taraco Peninsula. It also means that more complicated spatial analytical queries involving distance can be conducted in GIS.

This is where GIS can contribute to not only this region of the world, but also to both ceramic analysis and applications to legacy data in general. Many archaeological projects rely on georeferenced data. However, projects that focus on reusing and analyzing legacy data with GIS software tend to create "pseudo-GIS" kinds of environment, where data can be analyzed without needing to be georeferenced (Allison 2008). These work well for standalone intra-site analyses, but it also means that they cannot be related to other projects that do use georeferenced data as they are not linked to a global referencing system. Artifact classes traditionally tend to be examined separately in provenance studies or do not take advantage of geospatial means of analysis (Craig et al. 2006; Lazzari et al. 2009).By linking the data, it opens up new possibilities of combining and comparing different artifact classes and other kinds of data (e.g. ceramics, lithics, paleoethnobotanical, faunal, hydrological, or geological data) to help characterize activity spaces, sites, and to investigate affordances and social interactions on the landscape.

My study demonstrates the limitations and possibilities of applying GIS to legacy data. I show one way to visualize and compare data qualitatively with data that has lower spatial resolution through proportional density. I georeferenced site plans and converted local datum coordinates attached to ceramic records into real-world coordinates to link them to geographic space. This would allow future researchers to compare sites on the same plane and use the Spatial Analyst tools for more complicated queries (i.e. distance-based analyses). Using ArcMap, I displayed the spatial distribution of ceramic data using proportional and graduated symbology to visually compare ceramic and plant densities across each site. While my use of GIS was restricted because of limited spatial resolution, I have produced a foundation for future analyses that can involve integrating both larger, regional analyses with smaller, site level investigations.

Of course, there are limitations to working with GIS and with legacy data. Although GIS can store and display temporal data and allow the user to see changes interactively or through the Effects tool (or time slider), its use is dependent on the quality of the user's data. Much of the legacy data I worked with for ceramics involved entries that share a fixed possible combination of Cartesian coordinates tied to the southwest corner of each excavated unit. As a result, differences and changes in densities or counts are difficult to see as they directly overlap. While I could compare two layers at any given time using the Effects tool, I needed to create multiple data frames to display these distributions rather than a singular map with multiple ceramic attribute types. Another issue is that ArcGIS software is expensive and while I was able to obtain a free student license, I suggest moving towards open-sourced GIS software like QGIS or gVSIG because they are more accessible to researchers globally. Despite these limitations, the use of GIS in this study produced a different kind of narrative and understanding about Taraco practices and inhabitants compared to earlier investigations.

6.4. Contributions to the Region: Past and Current Narratives

Bandy (2001) argued that the Late Formative I saw the exponential rise in population at Kala Uyuni and Kumi Kipa, and the development of the first multi-community polity on the Taraco Peninsula (the “Taraco Peninsula polity”). He suggested that Kala Uyuni’s population peaked in the first half of Late Formative I and declined towards near abandonment by the end of the phase (Bandy 2001: 191-192). At this time, Kumi Kipa became populated, though quickly decreased after Late Formative II. Bandy (2001) has suggested a relationship between Kala Uyuni and the Santa Rosa Group (which includes both Kumi Kipa and Sonaji). When Tiwanaku’s influence expanded into the peninsula by the end of the Late Formative, the overall population declined. Sites in the southern valleys, including the Tiwanaku and Katari valleys to the south, saw an influx of population around this time (Janusek 2004b: 117). The Santa Rosa Group on the peninsula was one of the only areas where growth slowed but population did not decline (Bandy 2001). Bandy (2001) hypothesized that some part of the population at Kala Uyuni migrated towards the western tip of the peninsula during this time. My findings preliminarily agree that some sort of interaction did occur between these communities from the spatial organization of refuse. I saw that Kala Uyuni and Kumi

Kipa shared similar waste disposal practices, and both had dedicated spaces to dump trash. Conversely, Sonaji does not have designated trash disposal areas, but this may be a sampling issue as excavations were limited.

Perhaps inhabitants from Kala Uyuni may have slowly migrated over to Kumi Kipa during Late Formative, but it was only temporary because they moved elsewhere (i.e. Sonaji or the other sites of the Santa Rosa Group). There are similarities in production practices that are shared between Kumi Kipa and Sonaji which are not shared with Kala Uyuni. The variation in surface treatment absent in Kala Uyuni but present at Kumi Kipa and Sonaji could have been the result of migration from other sites on the peninsula into the Santa Rosa Group or could have been produced exclusively within the group complex between Late Formative I and II. They also suggest some degree of interaction between Sonaji and Kumi Kipa which became reflected in similar applications of ceramic finishing techniques. While my findings here cannot prove the movement of different peoples from other sites (i.e. all the smaller sites Bandy identified in his survey), they do suggest some degree of localization occurring at the three sites.

Connected to Bandy's (2001) multi-community polity model is the narrative surrounding the Late Formative Period as a time of rapid sociopolitical change that led to the rise of the Tiwanaku state. Decorative styles were used to help support this as they were (implicitly) considered to reflect larger, consequential changes. However, ceramic production on the southern Lake Titicaca Basin was largely a "local" affair, and undecorated ceramics are much more ubiquitous than decorated sherds (Janusek 1999, 2004b: 134, 2008; Roddick 2009). Roddick's (2009) analysis of ceramics from Kala Uyuni, Kumi Kipa, and Sonaji noted higher ratios of undecorated sherds than decorated sherds. Similarly, Rivas-Tello (2017: 99) identified more undecorated and domestic forms of pottery at the Late Formative sites of Iruhito and Khonkho Wankane on the Upper Desaguadero Valley, Bolivia, to the south of the Taraco Peninsula. Furthermore, Roddick (2009: 363-364) did not see any indication that supported specialized serving based on the distribution of decorated sherds. He also observed an increase in the degree of standardization in ceramic production during the Late Formative Period, suggesting the presence of "skilled" potters (Roddick 2009: 383-384). I would argue that this standardization among all vessels, and the low numbers of decorated sherds meant that people were using "domestic" and undecorated vessels simultaneously for everyday, public, and ceremonial events. Across all stratigraphic events I sampled, I saw higher densities of undecorated than decorated sherds. Spaces and events that had high amounts of decorative styles also had high amounts of plainware ceramics. The presence of very few "non-local" ceramics like Kalasasaya zonally incised, Qeya incised, or Qeya polychrome pottery at these sites might mean that they were commodities, used infrequently and/or reused and passed on for generations at Kala Uyuni, Kumi Kipa, and Sonaji. What this suggests and highlights, is the value of examining ceramics across time and of undecorated ceramics in understanding the tempo of social change. By including undecorated ceramics and examining technological style, it becomes clear there was no dramatic rise in decorated and "non-local" pottery that would suggest rapid sociopolitical change as Bandy hypothesized.

Another aspect my study adds to the narratives about the Late Formative Period is through a focus on ceramic and plant deposition over time. Instead of a narrative on population dynamics (which does not explore how people lived day-to-day) or one on production which focuses on the lives of potters, ceramic use and plant deposition shifts the focus onto not only potters, but all the other inhabitants who used pots. This perspective offers a look into the everyday habits of people, in the way that they organized their spaces, from preparing or storing food to ritually depositing pots and throwing away trash. Deposition and use signal different local and non-local boundaries from craft production. I saw more variation between sites when it came to the treatment of spaces in ceramic and plant deposition. I suggest that there were localized practices at each site by where they chose to dump trash, and perhaps by where they decided to cook and/or hold fire-related events. From this standpoint, there could be more than one community of practice. This is a distinction from Roddick's (2009) narrative of there being one community of practice on the peninsula (which was based on a ceramic production perspective). Our interpretations about how people interacted and the ways in which relationships between people are formed or maintained transform when we switch from examining production to deposition.

For example, structured deposition of broken sherds (i.e. KU ASD 2 pit) and whole vessels can be seen elsewhere in the Andes, like the Moquegua Valley in Peru (Sharratt et al. 2015). Using LA-ICP-MS (Laser Ablation Inductively Coupled Plasma Mass Spectrometry), Sharratt et al. (2015: 406) found that complete vessels interred in Tiwanaku graves were produced from locally available clays based on geochemical signatures or were local based on style. More significantly, they found sherds associated with these whole vessels which were determined to be non-local geochemically, rather than style alone (Sharratt et al. 2015: 408). These sherds also likely came from multiple places based on the heterogenous geochemical signatures (Sharratt et al. 2015: 409). The authors suggest two things: 1) these sherds (originally imported vessels) were interred with the individual already broken; and 2) these sherds may have been curated and perhaps signalled personal kinship ties or long-distance social ties (Sharratt et al. 2015: 408). While Sharratt et al.'s (2015) study noted differences in the geochemistry, they also saw that potters crafted similar vessels even though they used different materials. I suggest that non-local pottery from trade and exchange may have become local through practice. People would not have easily been able to differentiate a locally produced pot from a non-local one if they looked so similar externally. Or perhaps they could recognize the work of specific potters locally if the communities were small enough. However, the distinctions are clearly blurred rather than clearly or obviously delineated. Sharratt et al.'s (2015) study makes us rethink how local and non-local boundaries are formed over time through pottery deposition and how locality from a raw material-based definition (Table 2.1) may not be the same as locality produced through depositional practice.

My research contributes to understanding the smaller scale shifts occurring during the Late Formative Period. It adds nuance in the form of practice to a time that is not well known and defined by decorative style and architecture. It also continues to challenge the narrative that decoration is a sign of monolithic cultural ideologies or ethnic divisions, and elaborate styles were used in ritual events only. Competition-based narratives like Bandy's (2001) multi-community polity model becomes less convincing when we consider production and depositional practices because choices and habits are involved. These choices and habits reflect local and non-local dynamics within and between communities and are signifiers of social boundaries. That is not to say that larger narratives are wrong to assume that locality exists spatially (in differentiating sites from one another), but rather, locality is not static. Local/non-local boundaries are created and maintained in multiple ways (e.g. geographically, technologically, depositionally; see also Druc 2013), but to understand which iterations of locality existed in the past, it requires an understanding of the lives of people at the household and community level in addition to larger scale sociopolitical events.

6.5. Theoretical Implications: Exploring Multiple Localities

The overarching theme surrounding my two sets of research questions focuses on the concept of locality and how we critically define and use them to alter our interpretations of the material record. There were several challenges I faced when exploring what is considered local:

1) *Defining the locality of past research.* An issue I faced when taking on the question of locality is how scholars themselves perceived the local compared to how I perceived their versions of the local. I found it challenging to decipher and understand the ways in which authors used local or non-local to describe practices, people, or objects. Objects (and by extension, people) do not easily sort into "local/non-local" or "mundane/exotic" categories (Scarlett 2020; Tripcevich 2010). The problem is that explicit definitions of locality are uncommon and while researchers likely did presume an understanding of the local, the implied distinctions were not necessarily clear. Applications of this ambiguous term are also not restricted to a particular body of theory or method.
2) *Cohesion in the conceptualization of locality*. In attempting to move away from the passiveness and analytical scale of locality, I found myself trying to deconstruct the kinds

of local that are manifested. Yet, the more I pursued this, the more questions were opened than answered as to whether we can separate and parse out the scales in which localization exists or whether it is worth the endeavour. Locality operates on multiple scales and meanings are constantly in flux. This search for more nuanced perspectives is not new. A common issue in identifying and analyzing relationships is whether these relations impact and change the grand narratives entrenched in our understanding of the past.

3) *Geographical boundaries.* Although I set up different versions of locality to compare with and critique that "geographical boundaries" are often reduced to arbitrary, etic constructions created by archaeologists, geographic social boundaries are still very much real. I could have engaged with the political and environmental context here. I found this challenging to do in part because of the time constraints and scope of my project. There were contemporaneous sites that Bandy (2001:174-180) identified as belonging to the Santa Rosa Group that would have been interesting to compare with these three sites to see divisions or crossovers between social boundaries (of knowledge and practice). Changes in caravan and trade routes between the Middle and Late Formative Period due to alternating lake levels on the southern Lake Titicaca basin likely affected access to sites which would have affected geographical boundaries (Bandy 2001; Smith 2016).

Despite these challenges, my study allowed me to see instances where localization could have occurred or been maintained at and between Kala Uyuni, Kumi Kipa, and Sonaji. I focused both on potters and pottery users by analyzing the spatiotemporal distribution of technological attributes and the deposition of sherds. I could then consider at least two scales beyond the analytical and inferential to understand locality- the technological and social realms. Some sense of local material practice was maintained in ceramic production and waste disposal, but there were some differences evident in the finishing techniques at Sonaji and Kumi Kipa, and in the refuse behaviours at Sonaji compared to Kala Uyuni and Kumi Kipa. I demonstrated these differences through my spatial analysis results that were summarized earlier, and I briefly discuss the broader implications below.

Juxtaposing different iterations of locality opens up a dialogue about issues surrounding past narratives that have relied on a singular definition to distinguish local/non-local boundaries in the interpretation of larger sociopolitical processes (e.g. conflict between communities/polities, state formation and collapse, and power relations). This discussion on the variable definition of locality goes beyond my thesis, and other anthropologists have questioned and challenged the use of this term as an a priori category (see section 2.3 and table 2.2). On the Taraco Peninsula and in the southern Lake Titicaca Basin, locality tends to be used as a spatial unit to define sites and drive a linear narrative of growth and state level organization under assumed hierarchies of governing subjects based on ethnographic analogy. There is little attention paid to the other versions that may exist. In this thesis, I looked at two versions of locality to show how considering different definitions can both change and add to the current narratives about Kala Uyuni, Kumi Kipa, and Sonaji. Some of the ceramic material culture patterning was not similar when sherds were aggregated by stratigraphic event compared to unit and when technological style was taken into account, rather than just decorative style. This means that local and non-local boundaries can overlap or shift when ceramic production, deposition, and taphonomy are considered. I demonstrated the dynamic nature of locality here and suggest that the use of the term requires a more contextual and multi-scalar understanding to interpret the rhythms of everyday life and how people bound their relationships with one another.

6.6. Future Directions

From the results and experiences from this thesis, I recommend several potential avenues for future research either in this region or methodologically elsewhere. I recommend future excavation projects to take points of the extent/outline of each event and feature if possible. In doing so, this can increase the spatial resolution of excavated sherds that can be linked to the event extent rather than the southwest corner of the unit. Working with this set of data with GIS was challenging because a lot of the visual tools available on ArcMap could not be used since I could not see the spread of ceramics across the site in greater detail. A potential solution I thought of while working with this data would be to find and digitize map sketches from the field increase the spatial resolution of past datasets. Unfortunately, because of health and safety concerns (and travel bans) from the pandemic, my options were limited from not being able to access oversized physical maps that were in Bolivia. There were also delays in accessing files on hard drives because they were physically located in buildings that were closed due to lockdowns. I do think that one can gain much higher spatial resolution by going through the locus forms and reports and digitizing all map sketches that show the extent of each event or locus. These map sketches can provide better visualization of the activities taking place at these sites. They could also provide a better sense of control over time when it comes to deposition, rather than the maps I created which blurred and seemingly flattened time.

An analysis of the intrusive contexts, particularly ones phased between Late Formative and Tiwanaku could be undertaken to better understand the processes that led to site abandonment and changes in the use of space. By the end of the Late Formative Period, the Taraco Peninsula faced a significant decline in population and many villages were abandoned. It does not appear that the Tiwanaku lived or lived extensively at any of these three sites, yet there is a significant amount of pitting here that mirrors other parts of the region. This is a Tiwanaku phenomenon that has not been extensively investigated, and it is unclear what happened to the Taraco inhabitants. Did they migrate elsewhere, were they folded into Tiwanaku? For the ones that did stay, they concentrated around the northern edges of the peninsula. The entire Santa Rosa Group slowed in growth but did not decline like the rest of the other villages. I believe it is worthwhile to see what can be understood about Sonaji, a major site of the Santa Rosa Group that remains underexamined and raises more questions than it so far answers. The relationship between these three sites, potters, and other inhabitants are complicated, sharing similar production practices and yet differing in their treatment of space in some ways. What is clear is that practices were influenced locally over time, gradually and constantly transforming in small ways. It is in these small moments of time where one can see critical nuances in local practice without simply subsuming all interpretations to grand changes brought about only by “non-local” influences or major watershed moments. It is essential to recognize the building towards new patterns and phases emergent from relationships, tensions, or ideas of everyday practice that come from the inhabitants themselves.

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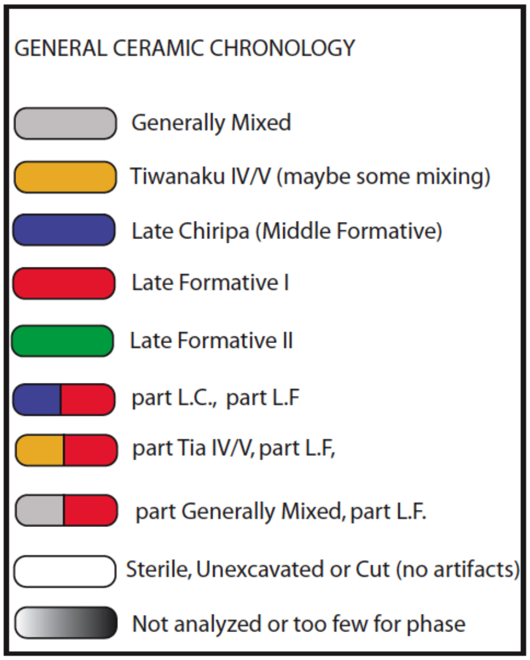
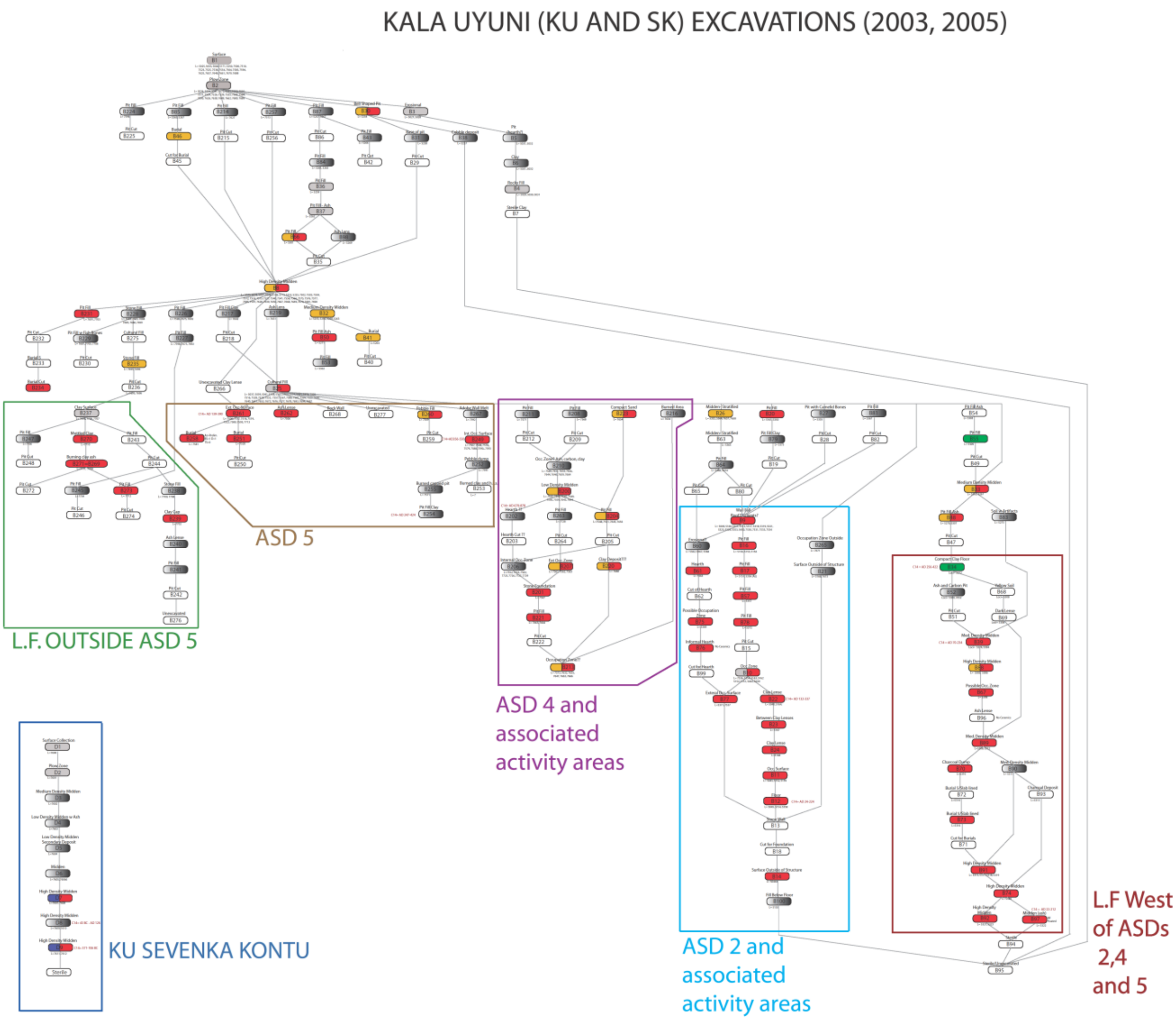
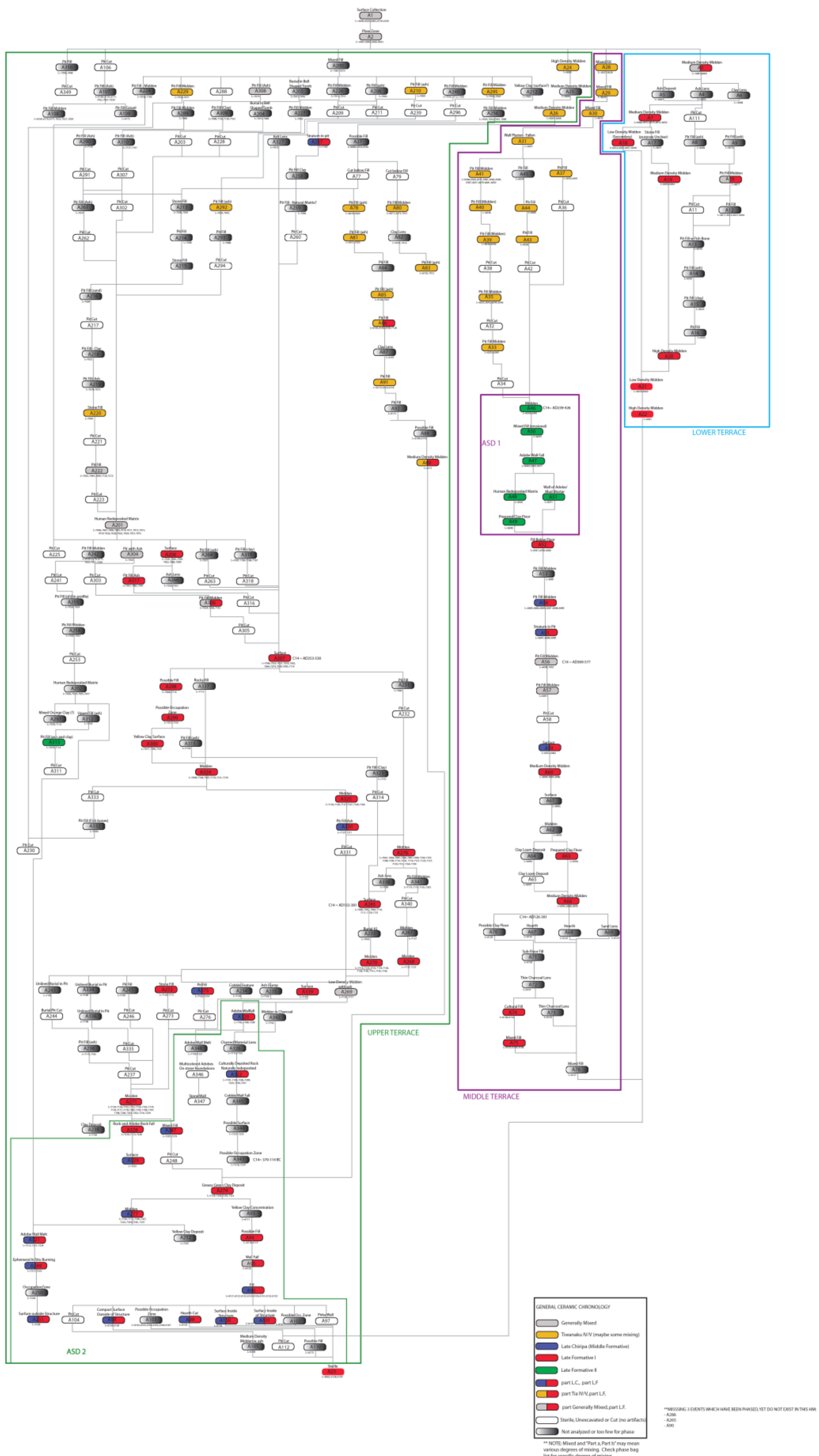
Appendix A: Harris Matrices



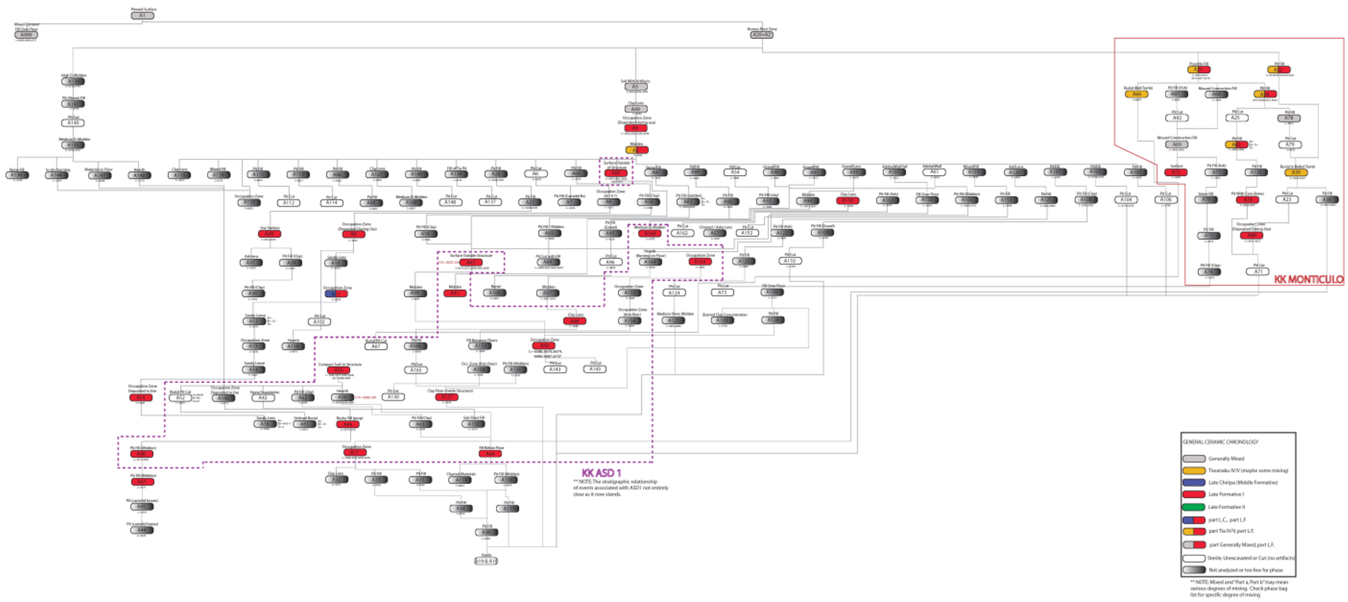


Kala Uyuni Harris Matrix. Event numbers and specific loci can be seen if zoomed around 300% in.

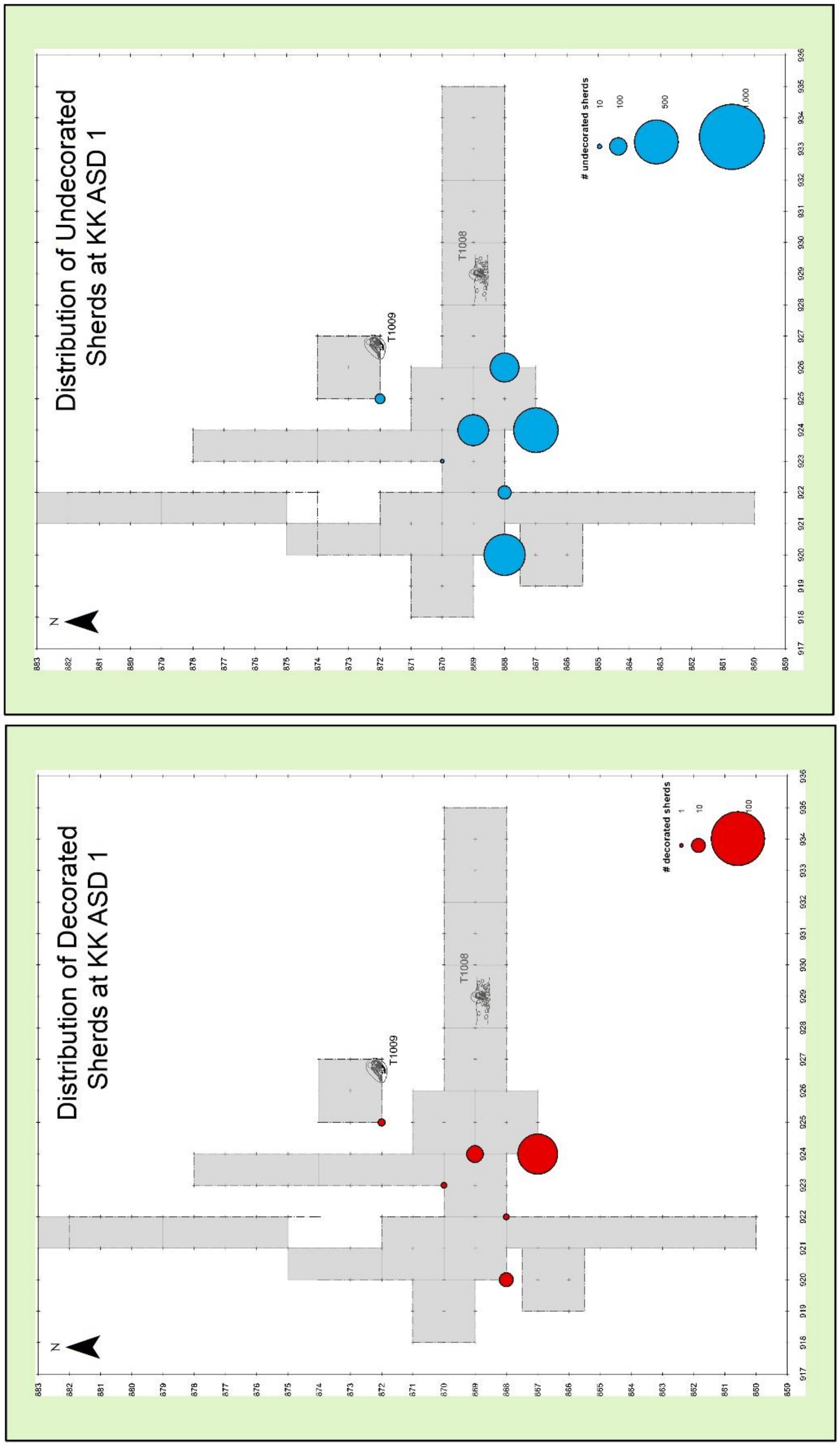
SONAJE EXCAVATIONS (2004, 2005)



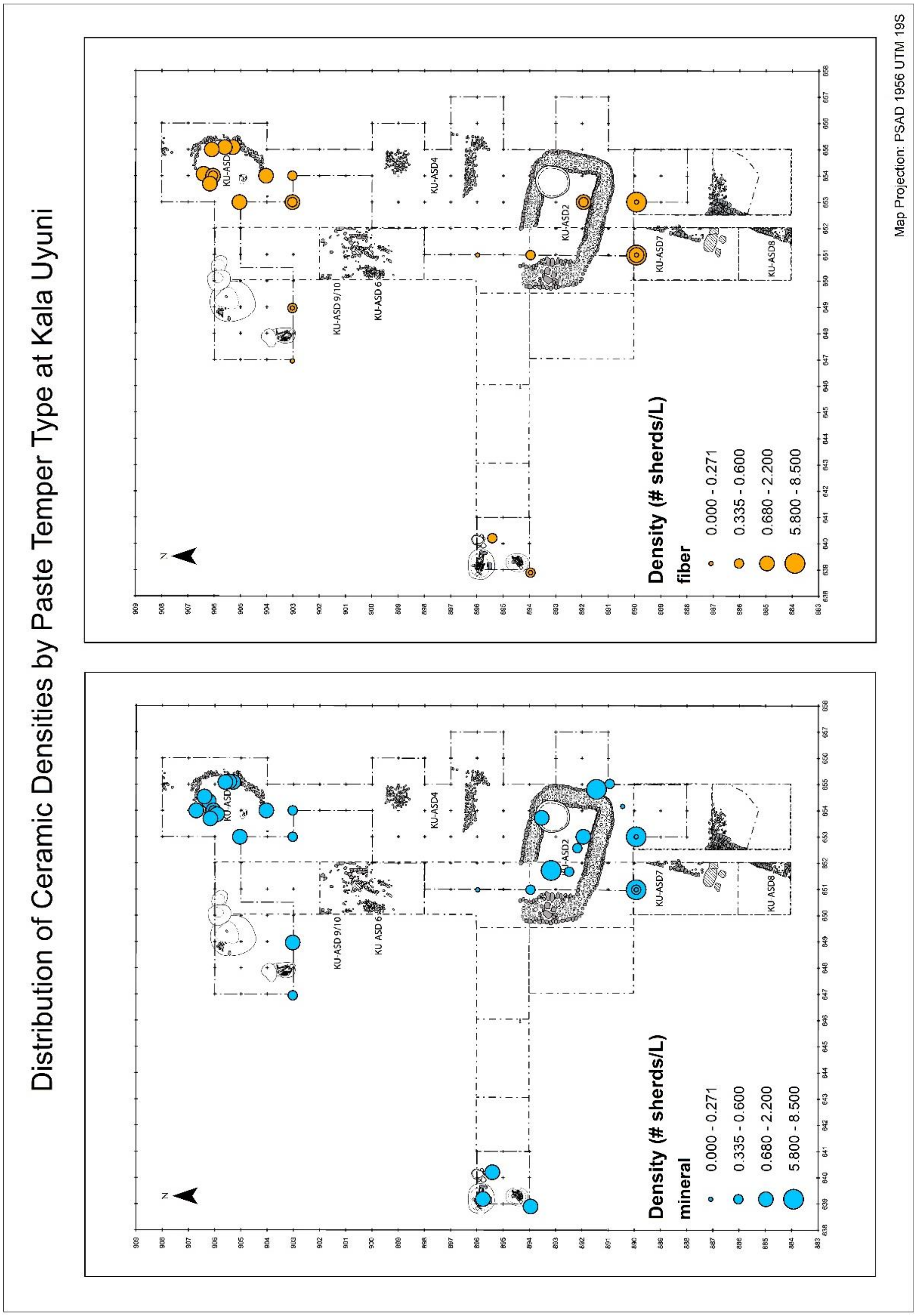
KUMI KIPA EXCAVATIONS (2004)



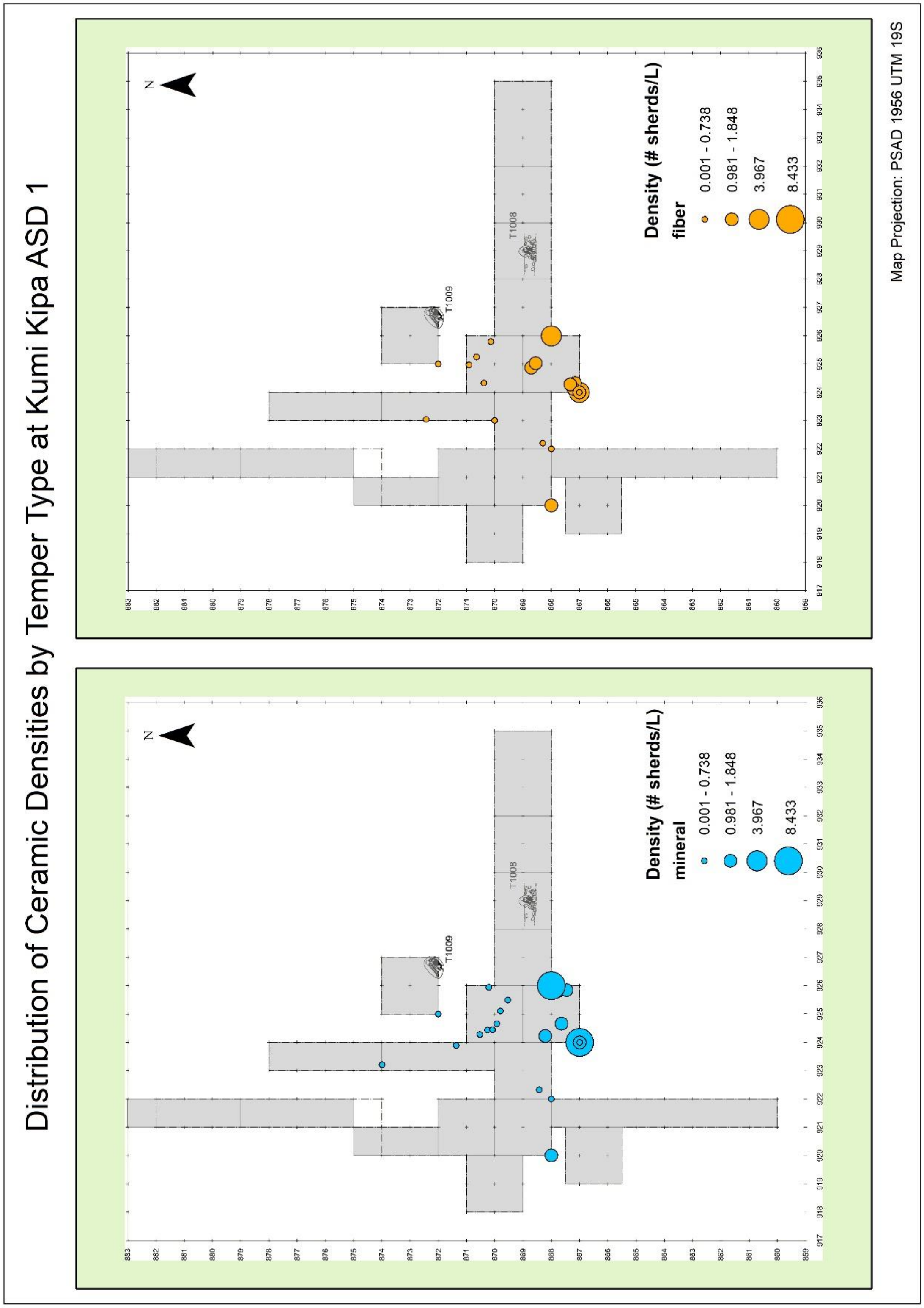
Appendix B: Maps



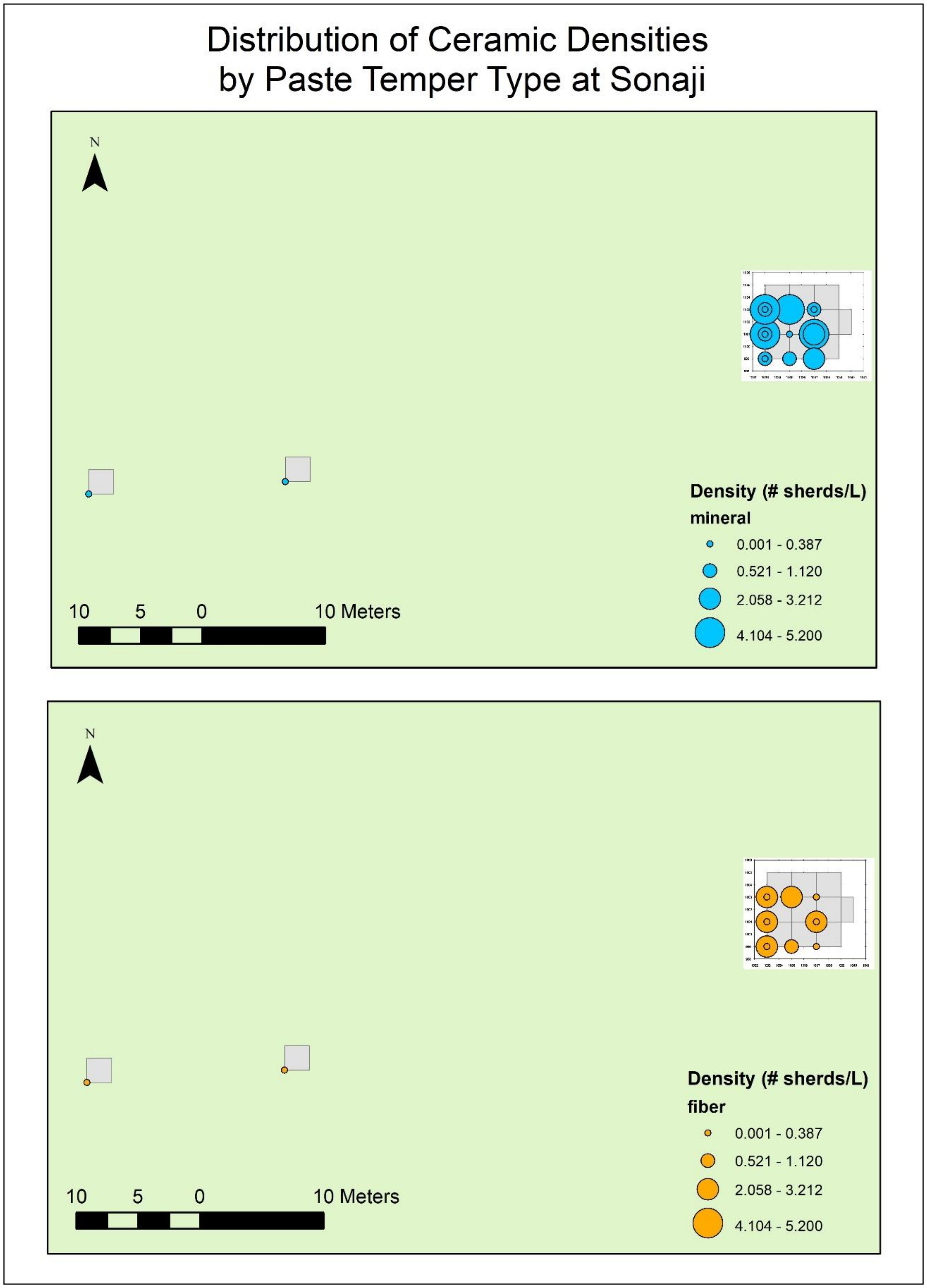
Map of the Kumi Kipa ASD 1 area, showing the distribution of decorated and undecorated sherds by proportional symbology.



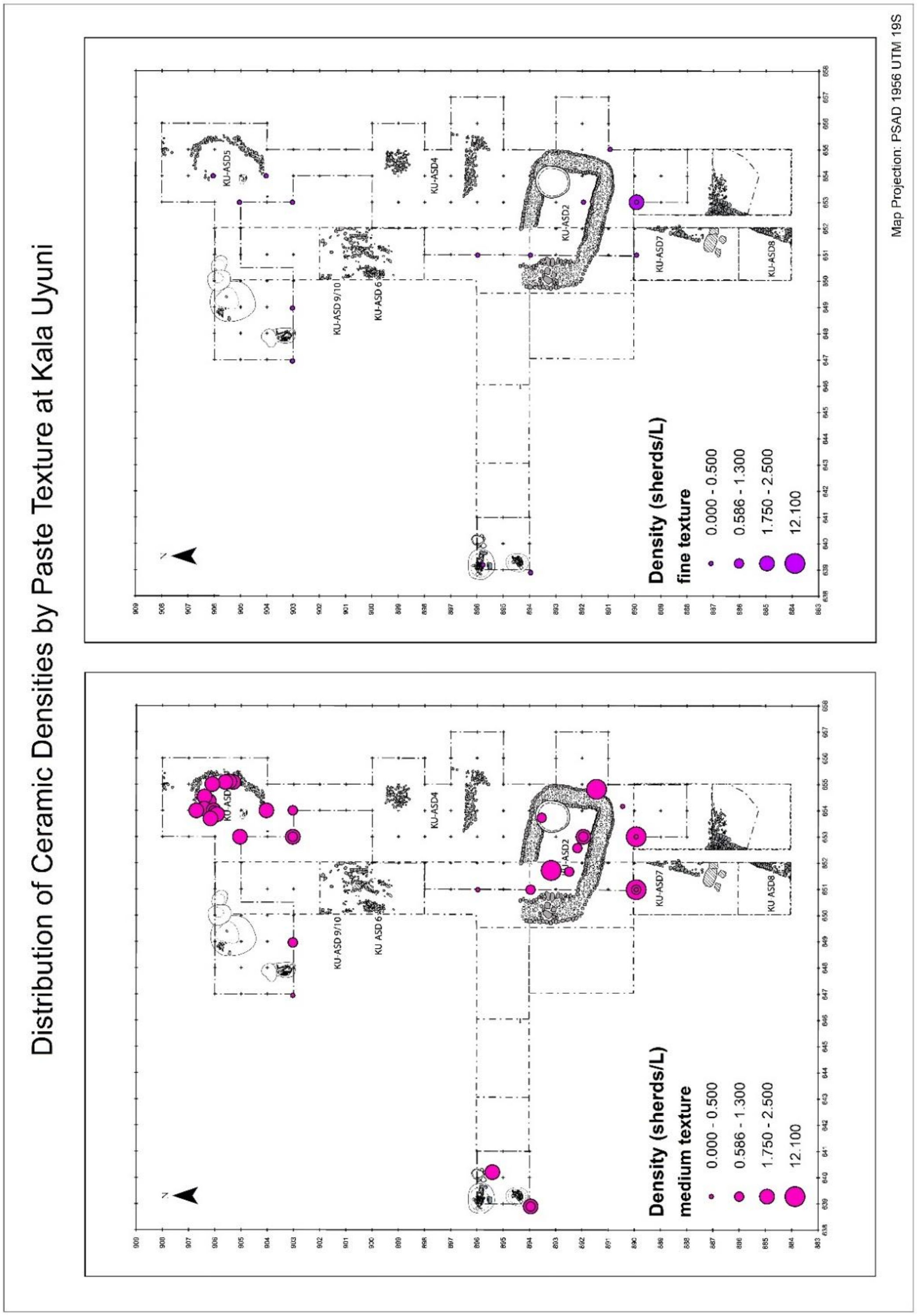
Map of the Late Formative occupation at Kala Uyuni (KU sector) depicting the distribution of the two main paste tempers present in the ceramic assemblage here. Distributions are grouped together by stratigraphic event. At ASD 5, there were similar ratios of ceramics with fiber and mineral tempers, but at ASD 2, there were more mineral than fiber.



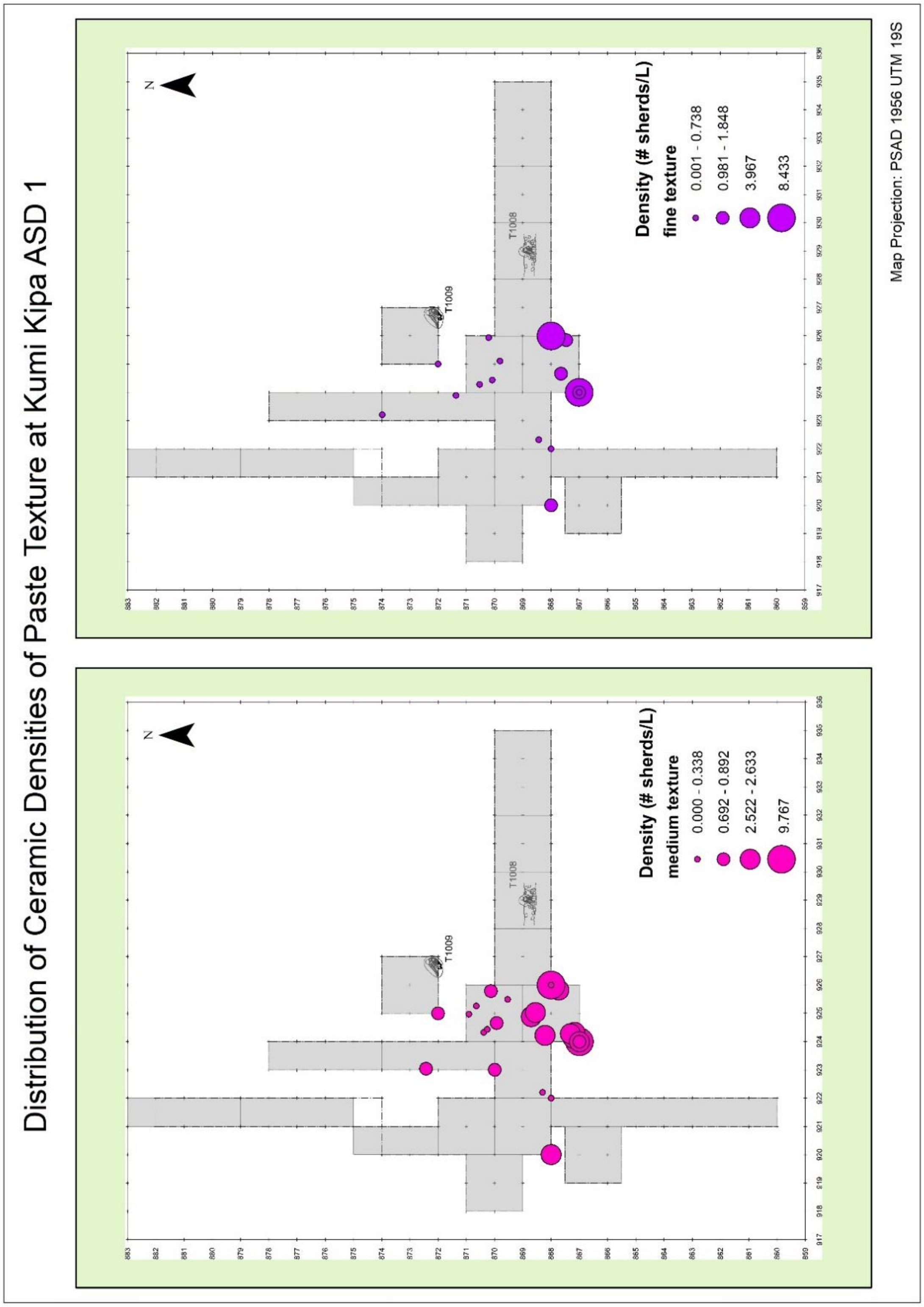
Map of Kumi Kipa ASD 1, the main sector excavated, as well as the distribution of the two main paste tempers used in the ceramics found at this site by event. Densities are concentrated in the events linked to N867/E924 and the adjacent unit to the east.



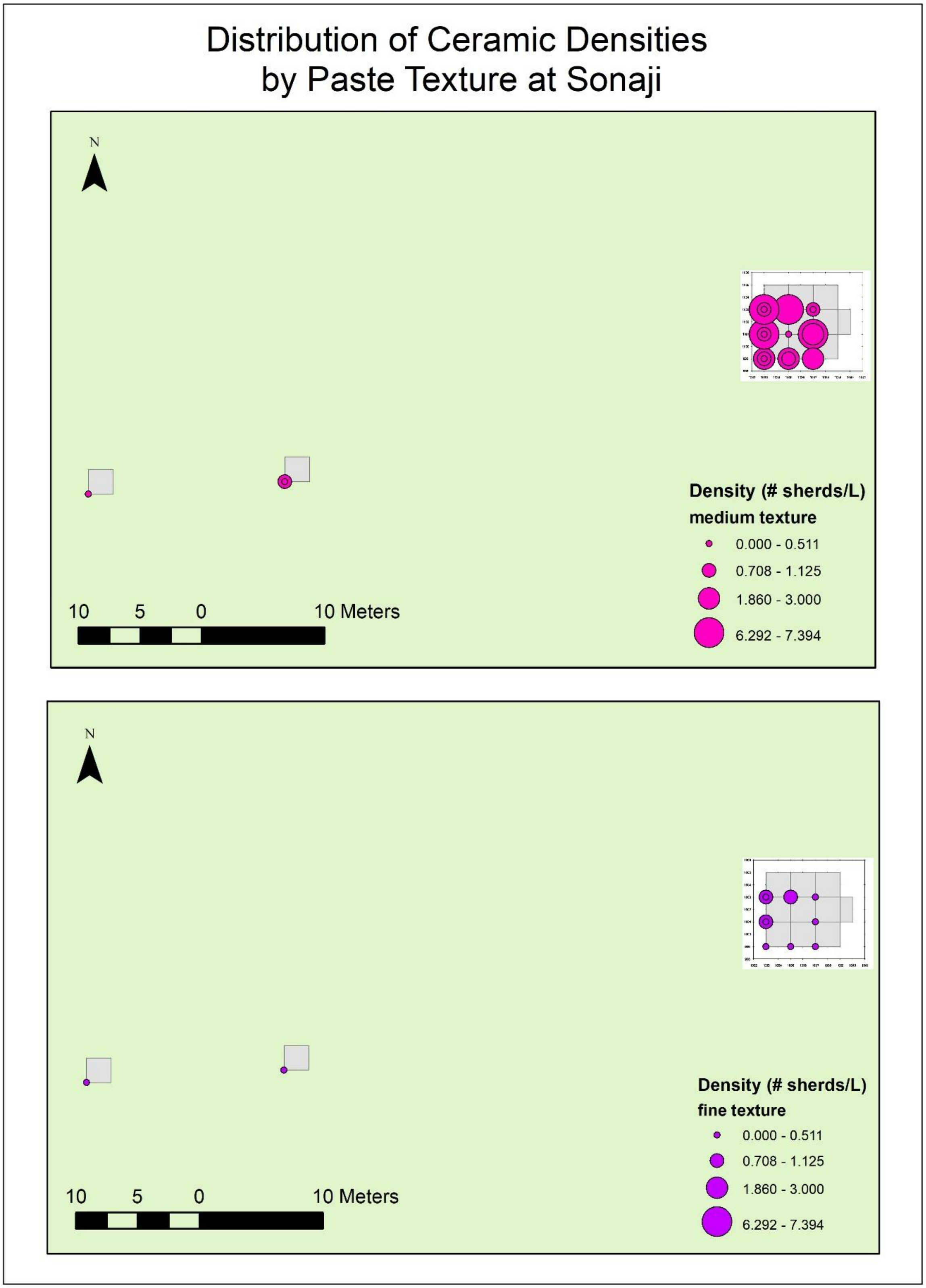
Map of Late Formative Sonaji and the three terraces showing the distribution of the mineral and fiber tempers present by event.



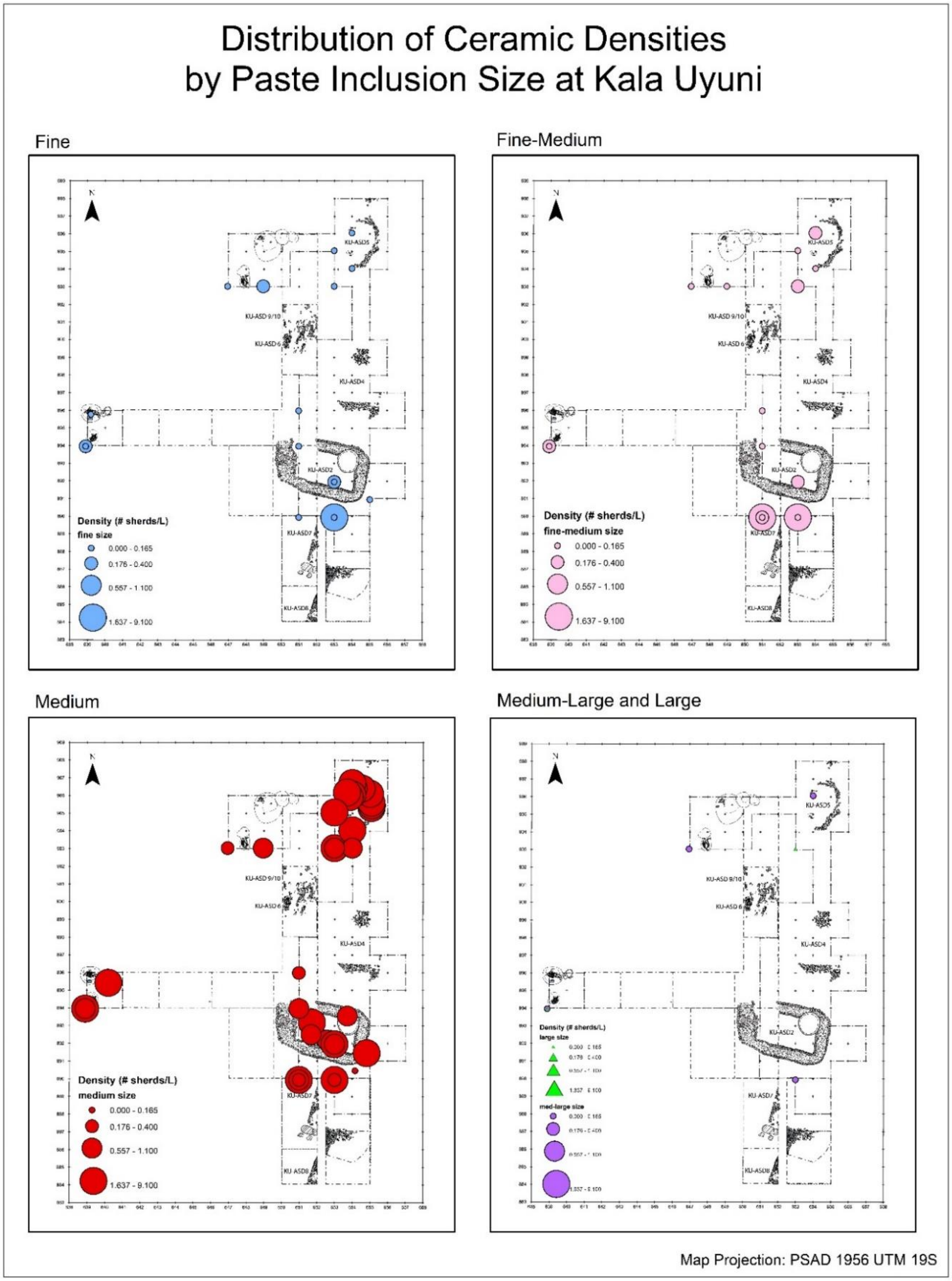
Map of the KU sector of Kala Uyuni depicting the spread and densities of ceramics by paste texture types and grouped by event. Medium textures dominate in all events.



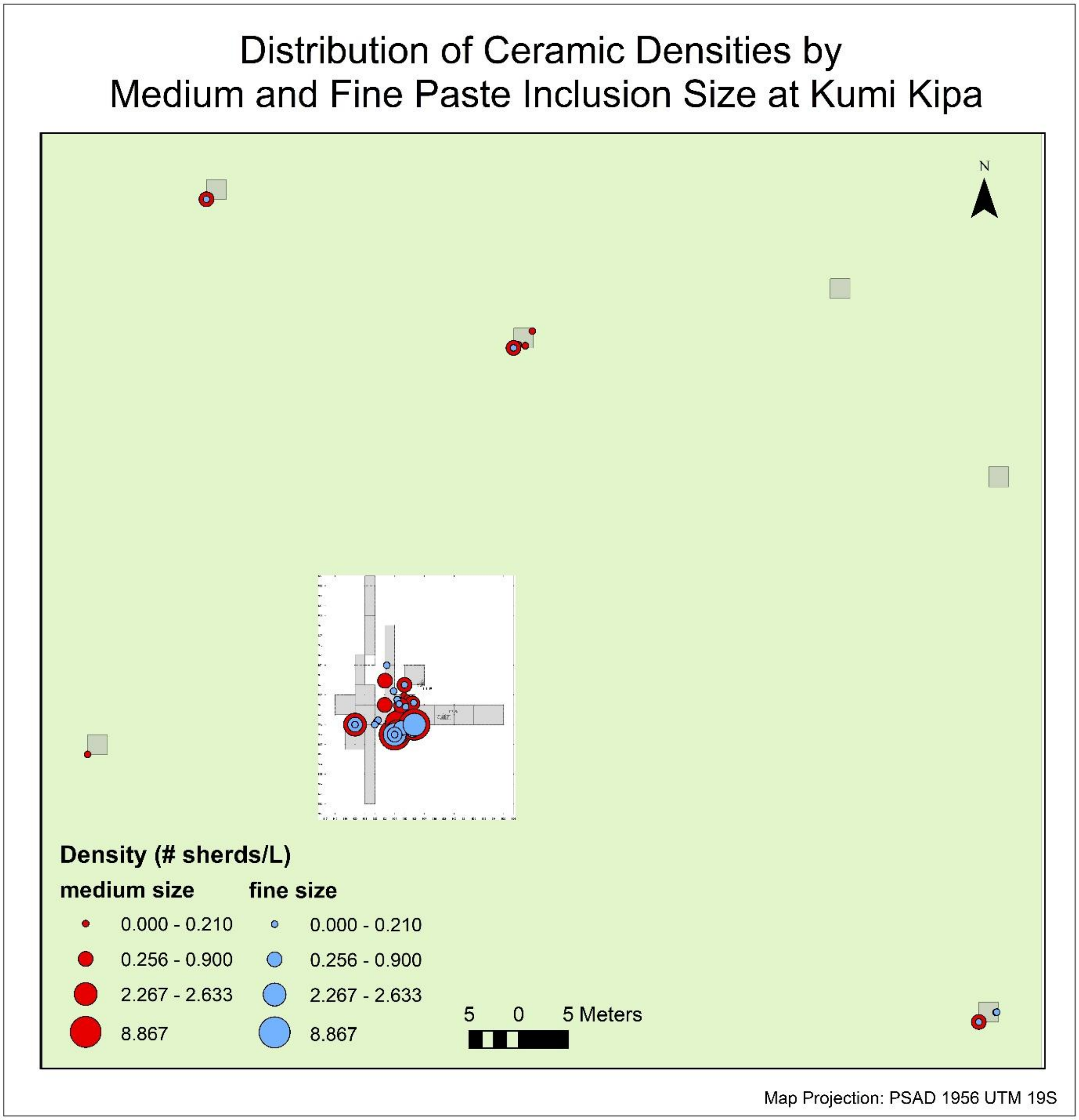
Map of KK ASD 1 showing the spatial distribution of sherds by paste texture. Unlike the distributions at Kala Uyuni or Sonaji, fine textured ceramics seem to be concentrated around the outside of the KK ASD 1 wall to the south.



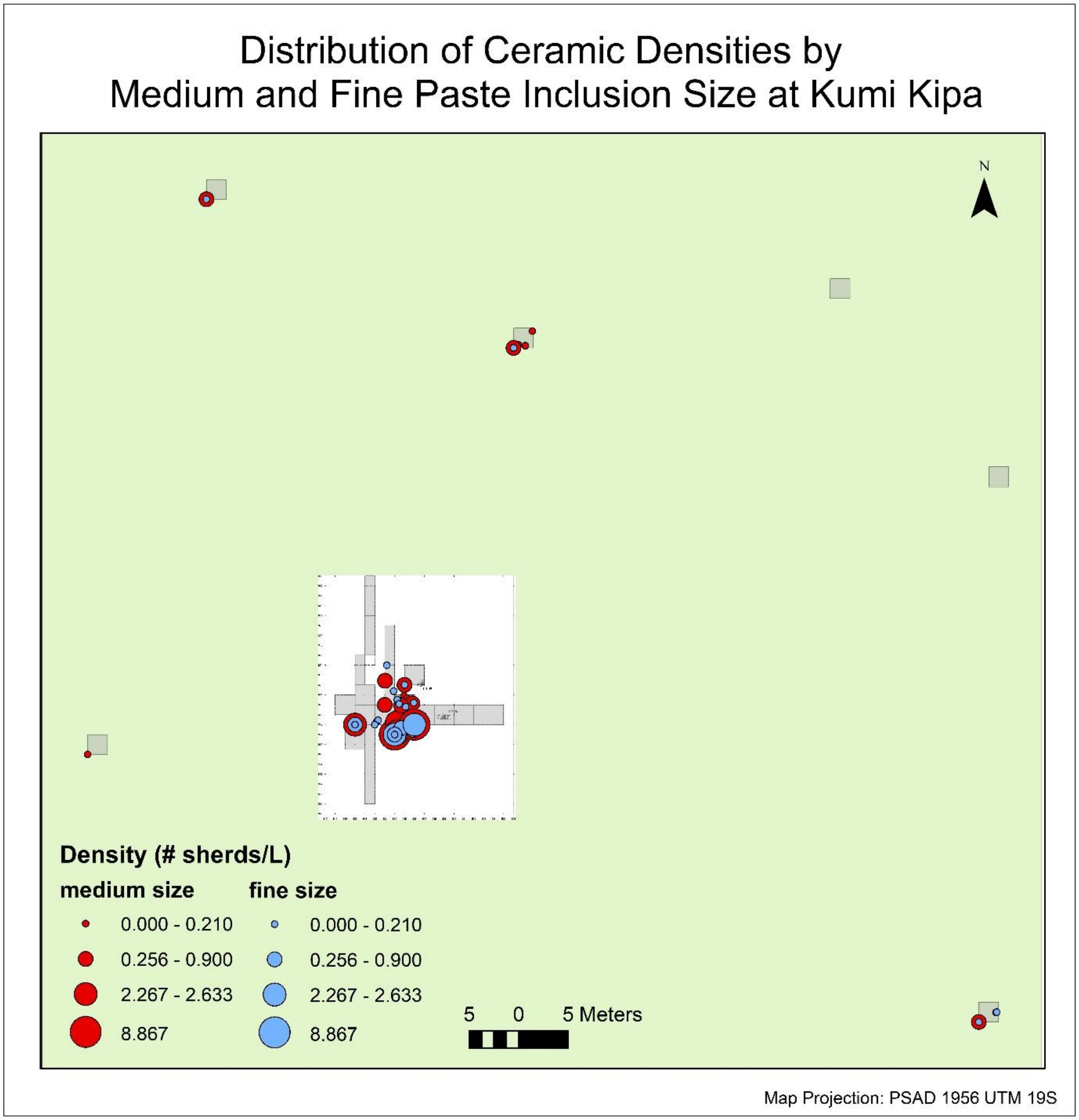
Map of Sonaji depicting the spread of paste texture types by event.



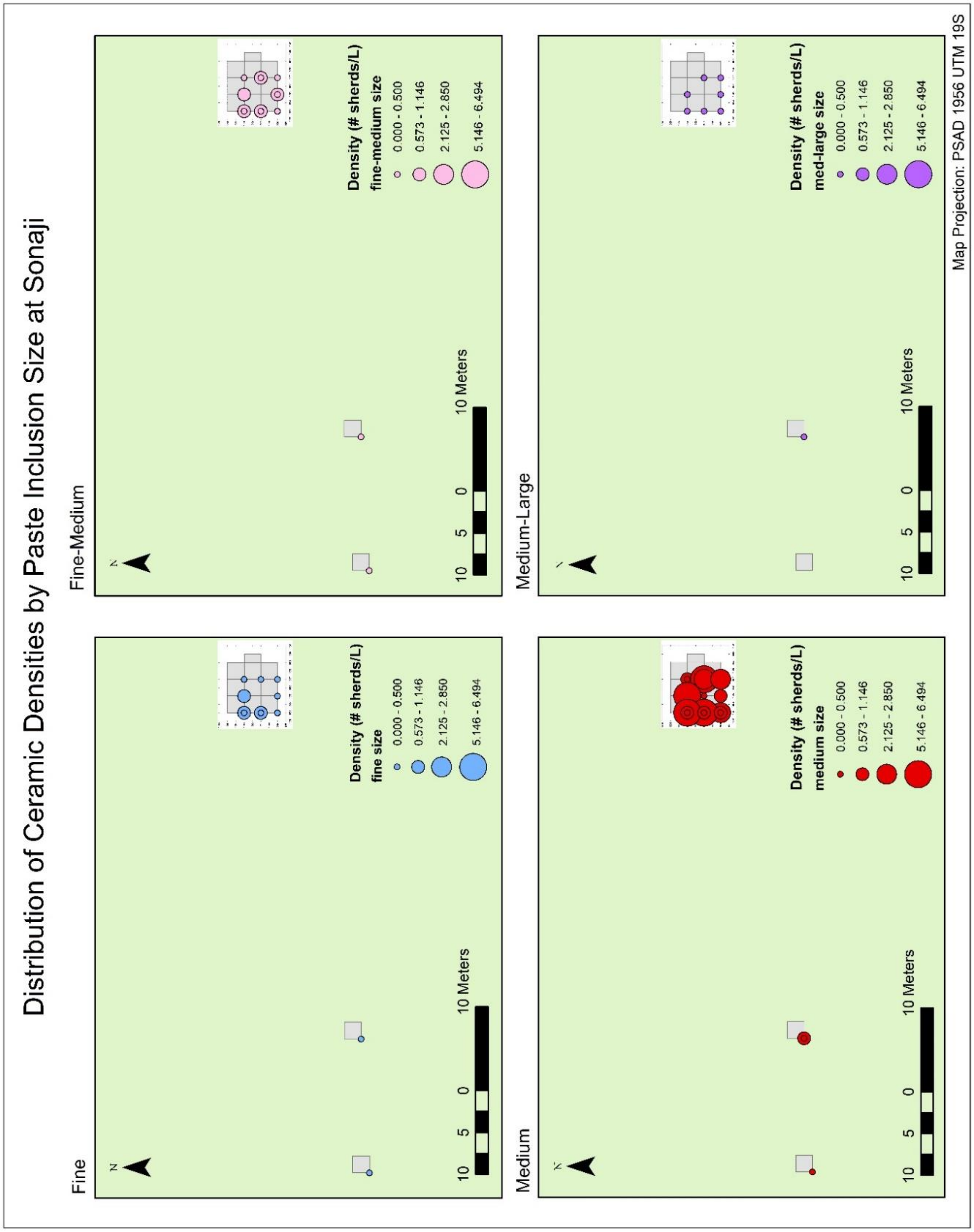
Map of Kala Uyuni showing the distribution of ceramics with different paste inclusion sizes. Sherds with fine or fine-medium inclusions are concentrated in events linked to ASD 2, which may suggest more finely made ceramics (perhaps ritual-related?) were used in this space.



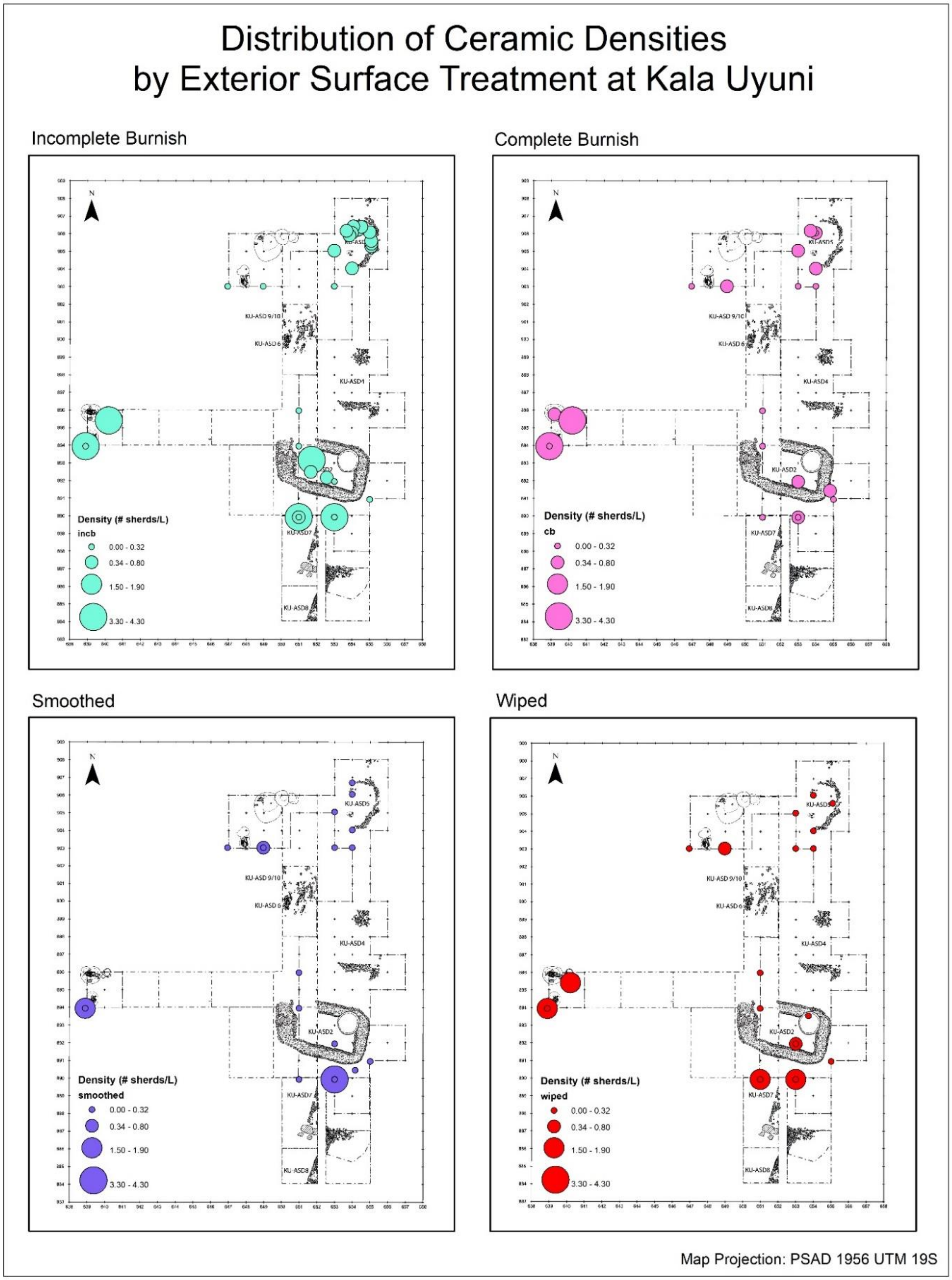
Map of Kumi Kipa showing the distribution of ceramics with different paste inclusion sizes.



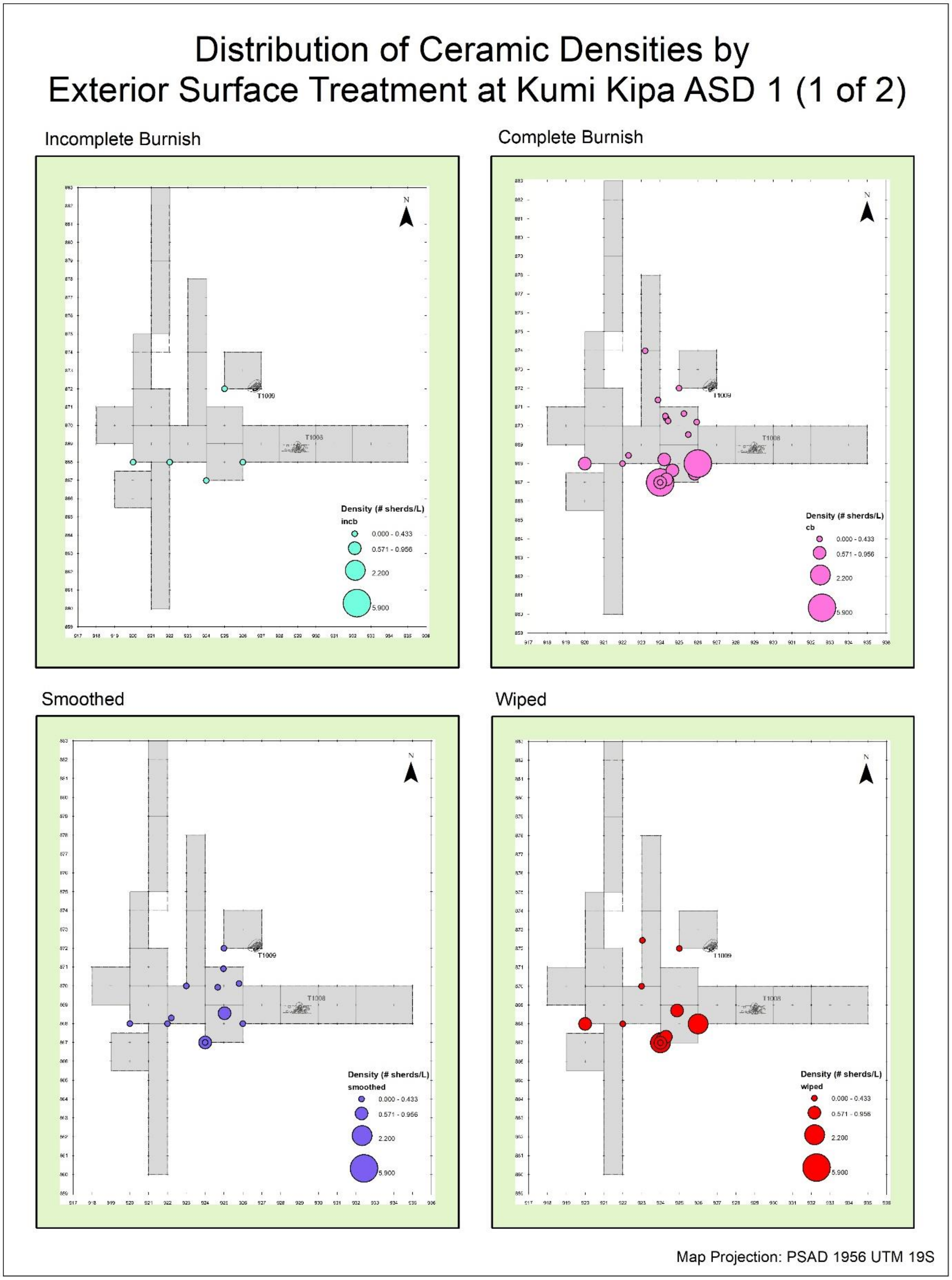
Map of Kumi Kipa showing the distribution of ceramics with different paste inclusion sizes. Medium and fine-sized inclusions vary in density between events over time at KK ASD 1. The lack of dramatic shifts between inclusion size does suggest that potters used the same or similar kinds of clay to craft their pots.



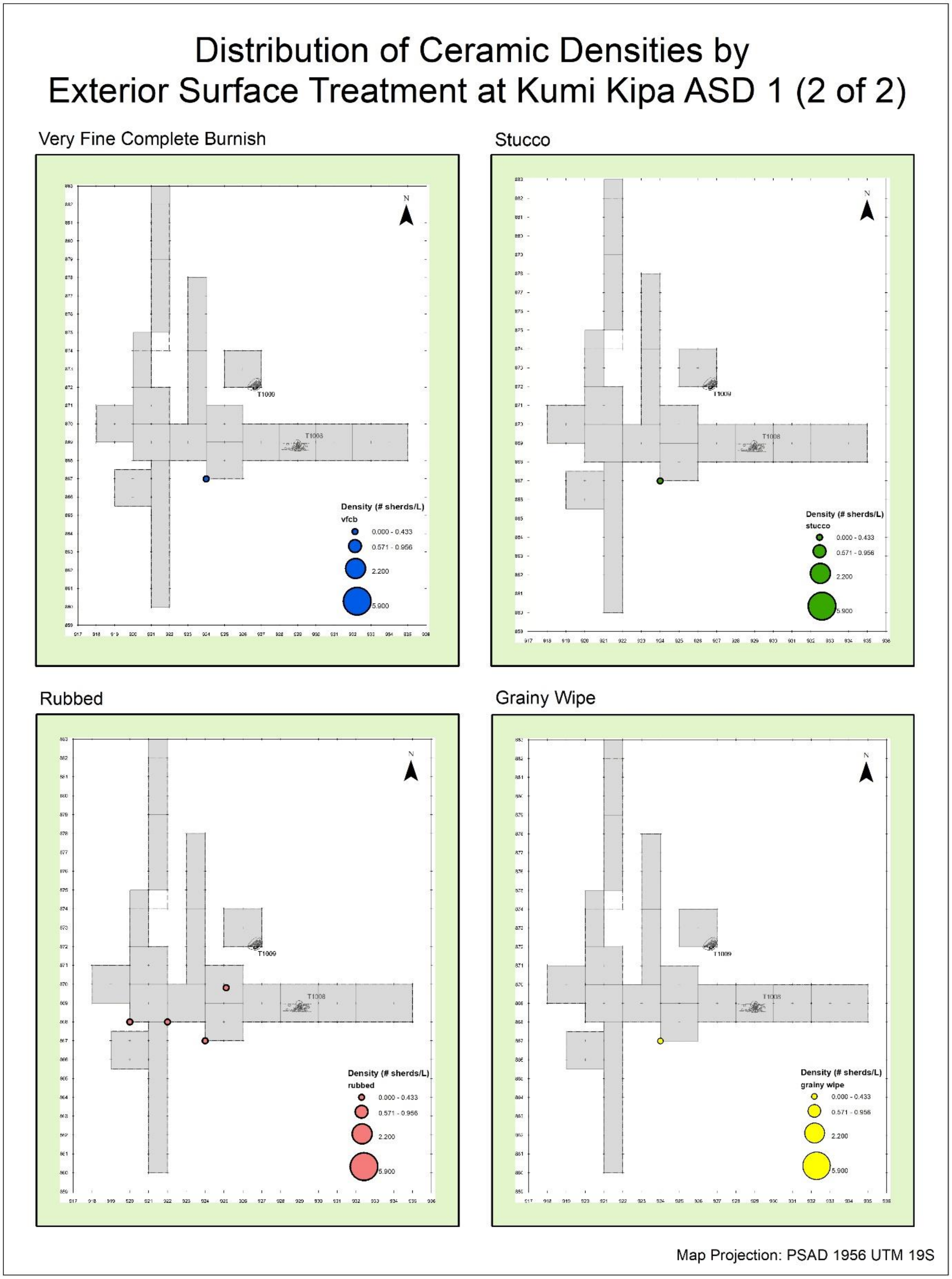
Maps of Sonaji showing the distribution of ceramics with different paste inclusion sizes. This site is like Kala Uyuni in that it has sherds with a variety of inclusion sizes.



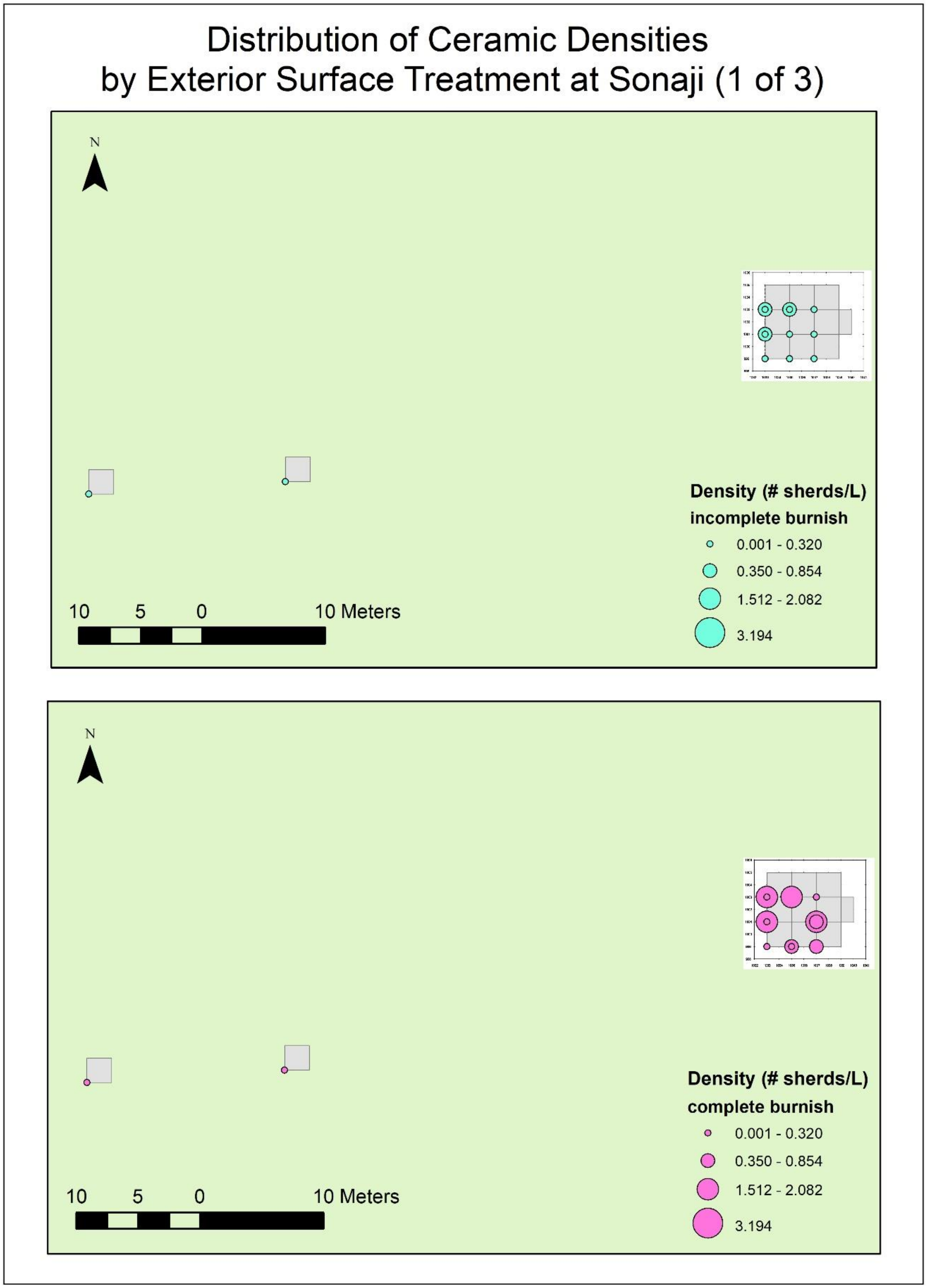
Maps of Kala Uyuni showing the distribution of surface finishes. Ceramics with incomplete burnish are the most ubiquitous. Interestingly, sherds with a smoothed and wiped exterior are more concentrated in the centre and south end of the site.



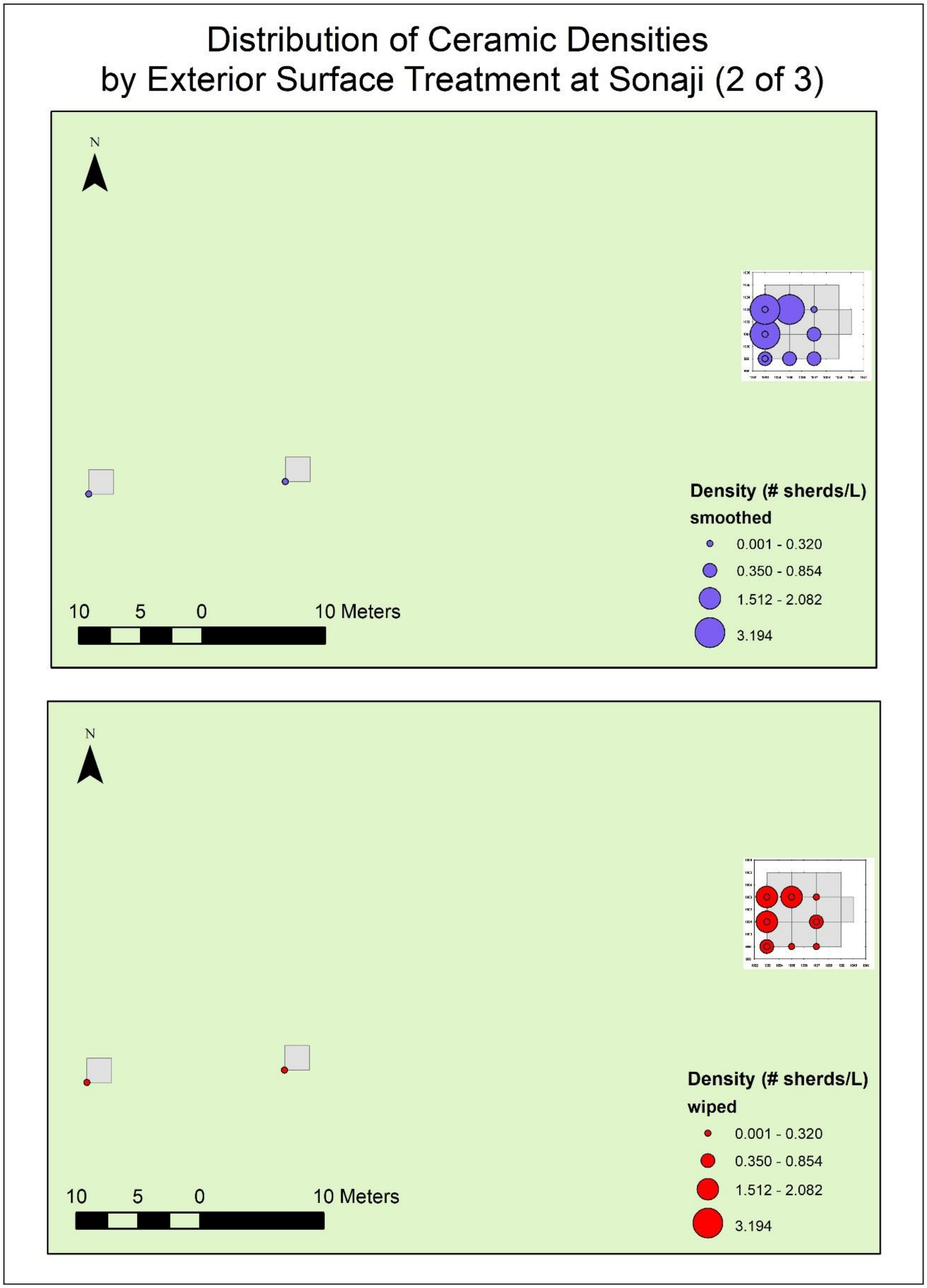
Map showing the distribution of exterior surface finishes at Kumi Kipa. The assemblage here has proportionally more sherds with complete burnishing than at Kala Uyuni, which has more incomplete burnishing.



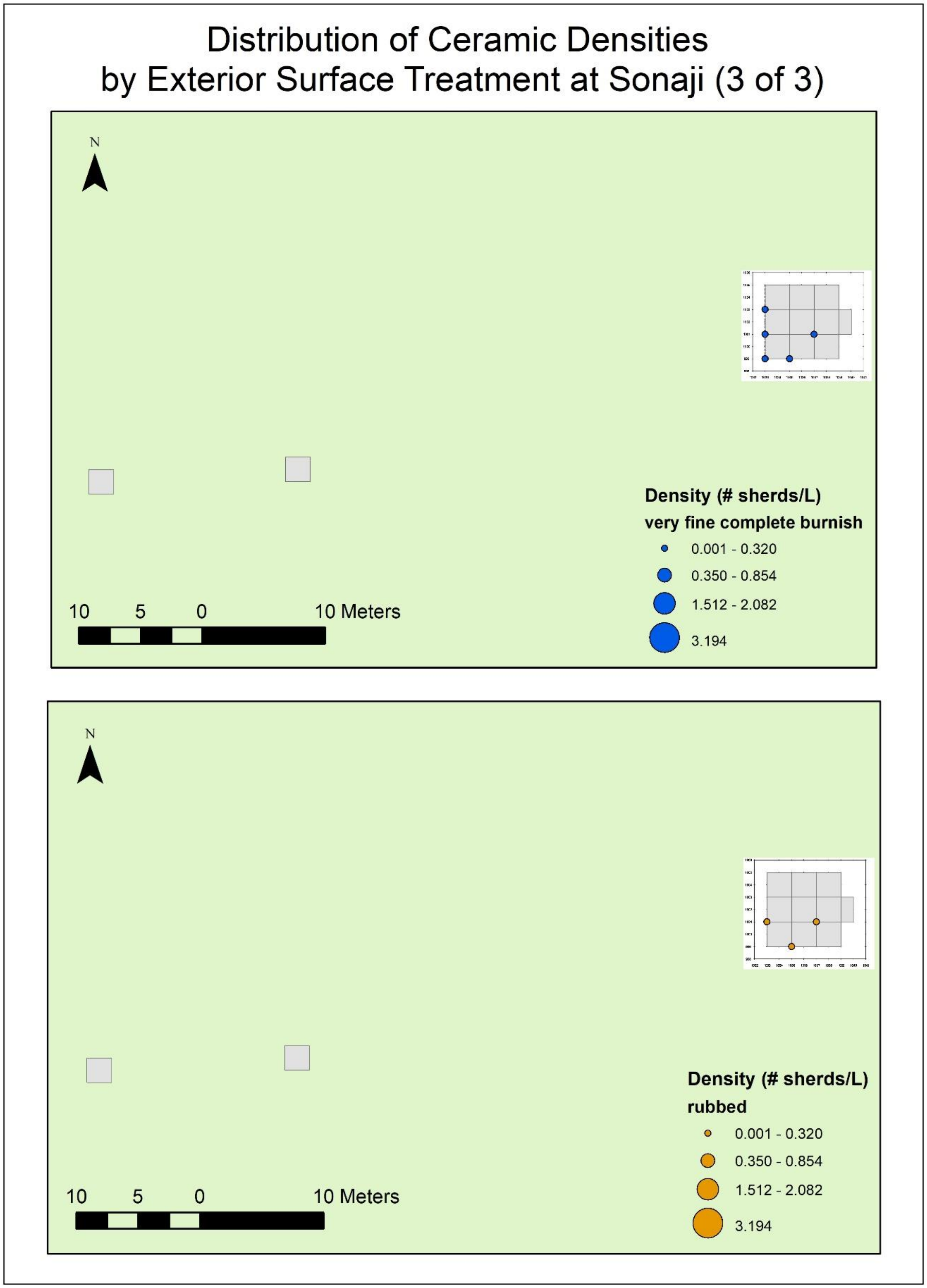
Map showing the distribution of other, less common exterior surface finishes at Kumi Kipa.



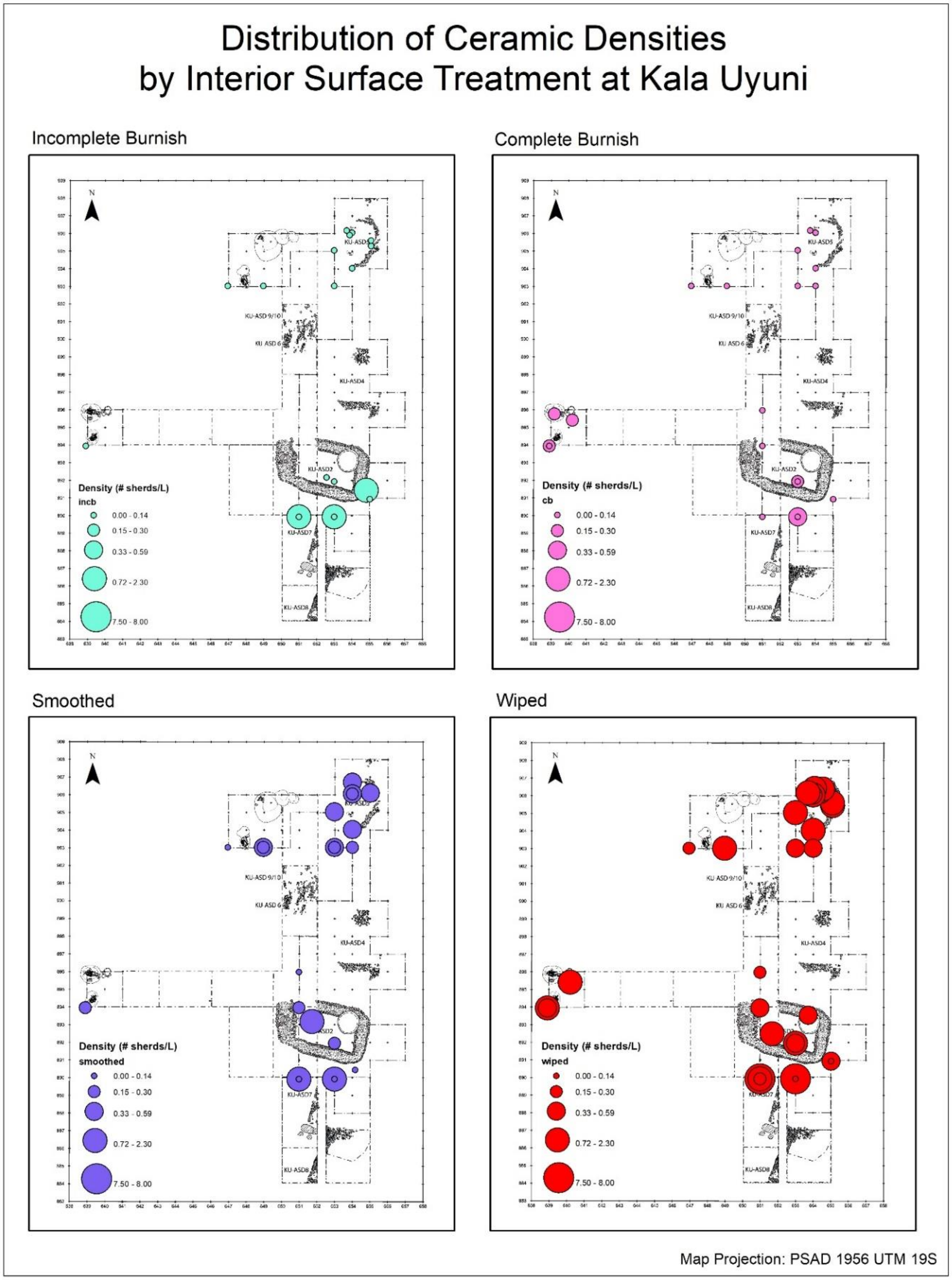
Map 1 of 3 of Sonaji showing distribution of ceramics with exterior complete and incomplete burnishing.



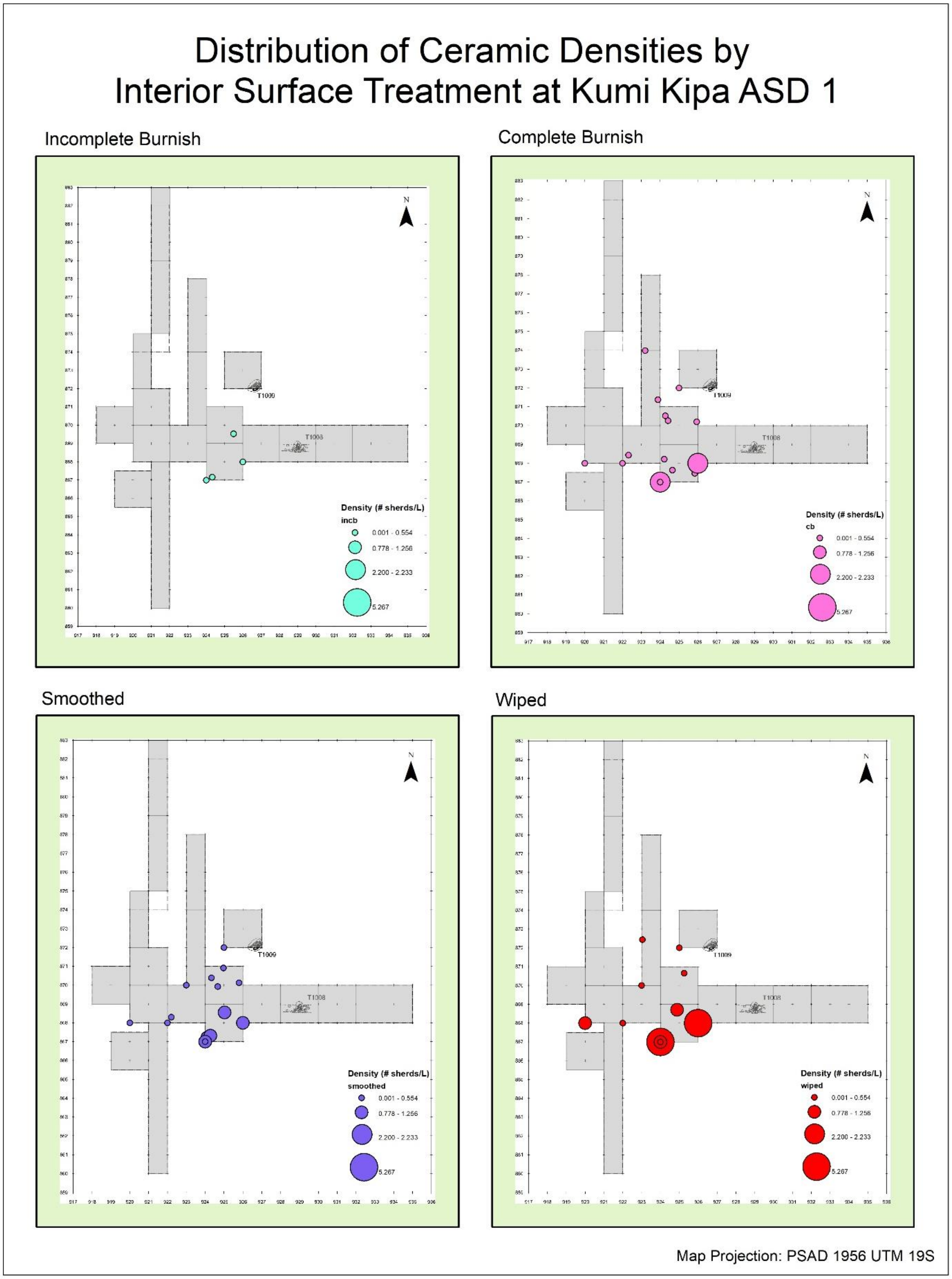
Map 2 of 3 showing the distribution of surface finishes (smoothed and wiped) at Sonaji



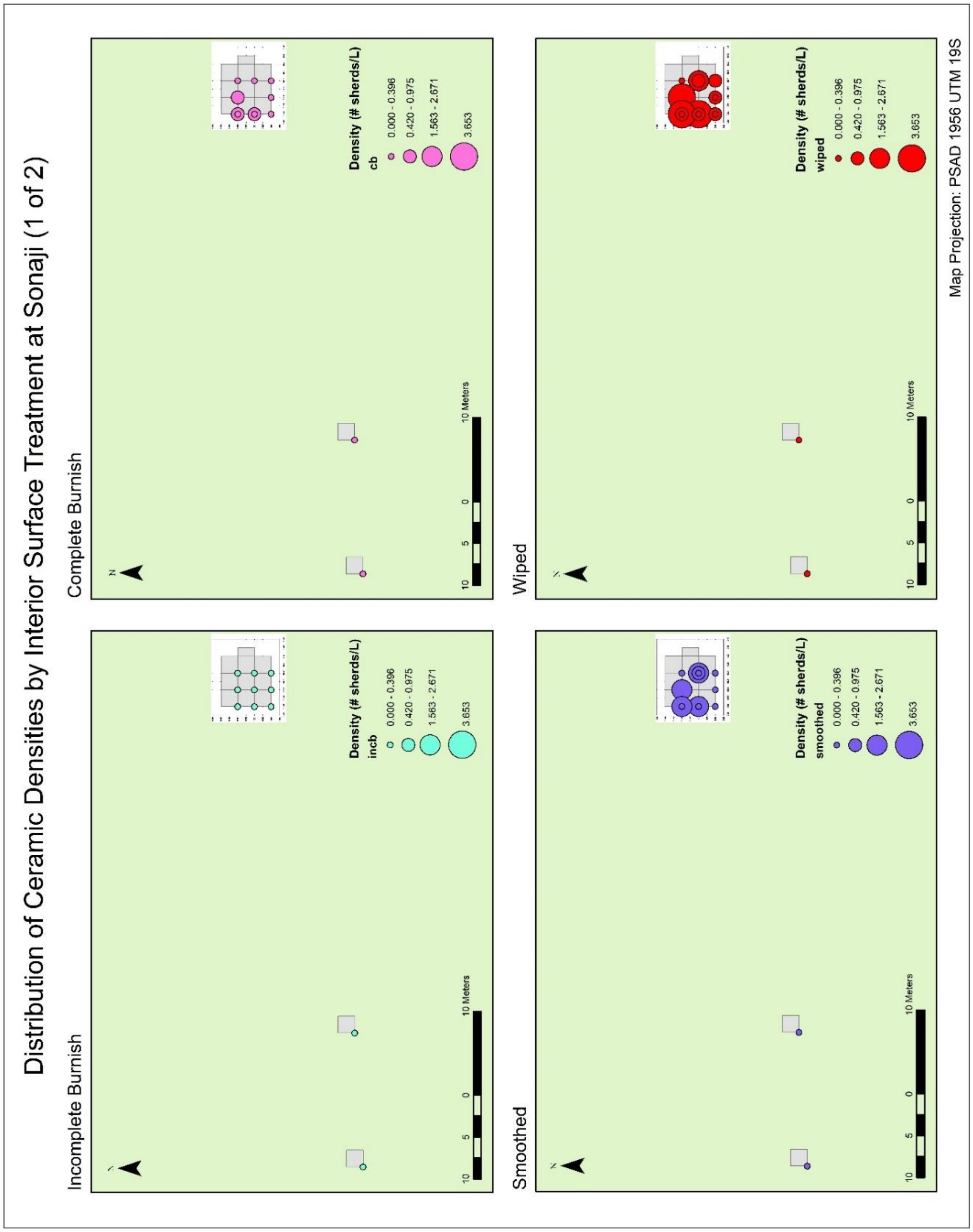
Map 3 of 3 showing the distribution of surface finishes at Sonaji. Rubbed and very fine complete burnish are very common here.



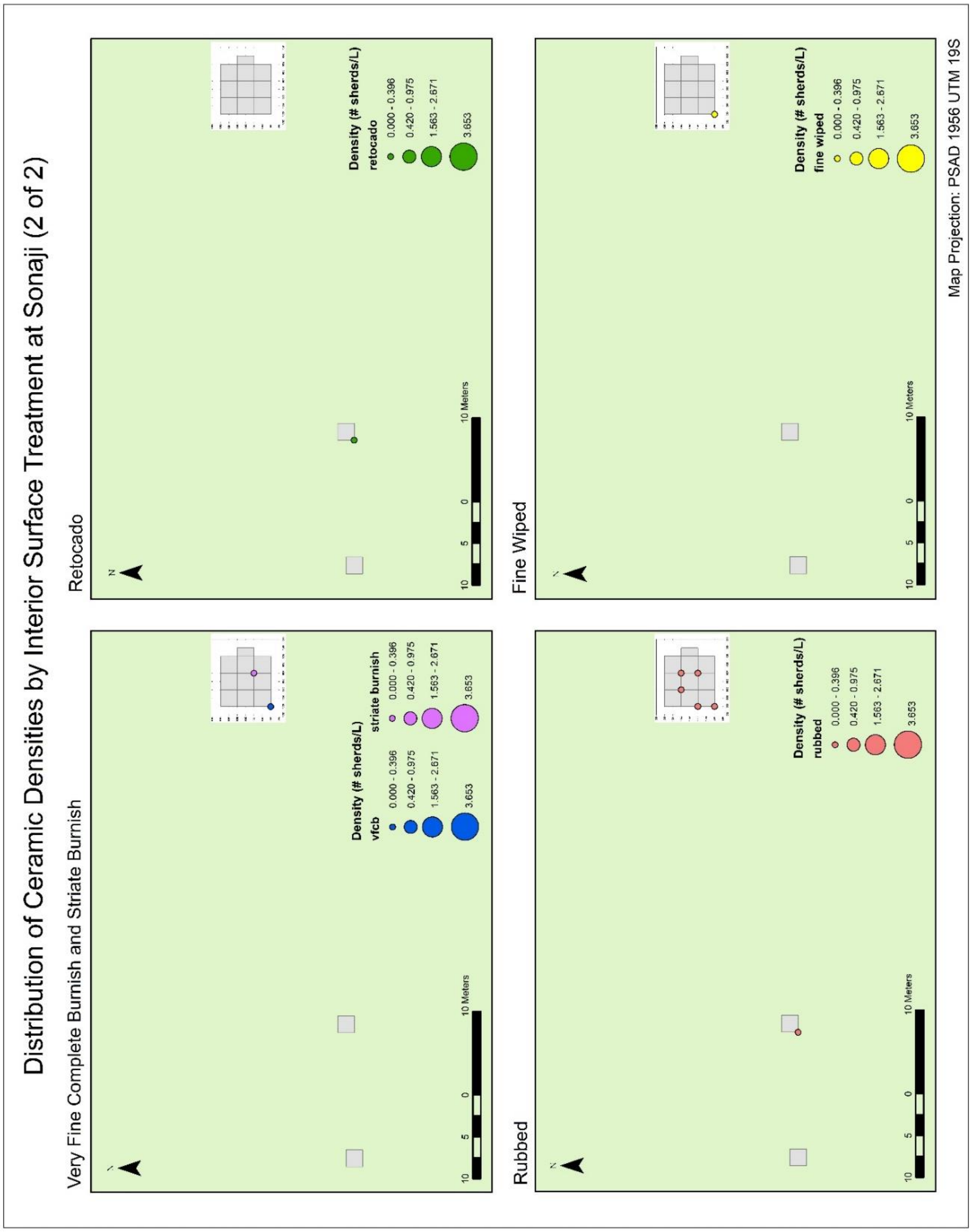
Distribution of the main interior surface finishes found on ceramics at Kala Uyuni. It is interesting that the burnished material is concentrated in the centre when juxtaposed against the exterior surface treatment since the patterns corresponds with ceramics that have a smoothed or wiped outside finish. Burnishing on the interior could suggest that they held liquids since this kind of surface treatment decreases porosity.



Distribution of the main interior surface finishes found on ceramics at Kumi Kipa. Like Kala Uyuni, most sherds have a wiped or smoothed finish.



Map of Sonaji showing the main interior surface finishes.



Map of Sonaji showing the uncommon interior surface finishes at the site. Striate burnish, retocado, and fine wiped interior finishes are not found at Kumi Kipa or Kala Uyuni.