Creating an Empire:
Local Political Change at Angamuco, Michoacán, Mexico

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Abstract

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Regime change is a critical social process that has occurred throughout human history and yet much is still unknown about how political developments shape local communities. This dissertation examines the impacts of the Late Postclassic (1350-1530 CE) Purépecha Empire on residents at Angamuco, an ancient city within the Lake Pátzcuaro Basin imperial heartland in Michoacán, Mexico. Imperial narratives in ethnohistoric texts emphasize that authorities controlled craft production, tribute, and social practices. Archaeologists have investigated these narratives within a social evolutionary framework that underscores an expanding and highly centralized Purépecha state and empire. Drawing upon material from five field seasons of excavation and survey of domestic and public ritual contexts, I evaluate whether the dominant top-down model of political economic consolidation has more explanatory power than alternative bottom-up models. Changes in the production and use of the ceramic artifacts, as well as differences in stone architecture, suggest that the Purépecha exploited existing resource systems, and that imperial changes are most visible in elite areas of Angamuco. In addition to investigating models of political development, this dissertation provides a foundation for understanding the chronologies of occupation at Angamuco derived from architectural patterning, artifact use and variation, and radiocarbon determinations. By critically analyzing the prevailing Purépecha social evolutionary model, this project adds to our knowledge of complexity and urban forms in western Mexico and contributes to studies that investigate how local communities are transformed or impacted by processes of political growth.

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DEDICATION

To my grandmothers,

Leanore Robin Cohen and Mary Michna

CHAPTER 1. ANCIENT POLITICAL DYNAMICS

At the time of European contact in 1519 CE, western Mexico was dominated by a population that the Spanish called the *Tarascos* and who spoke a language called Purépecha. At its height, between 1350 CE and 1530 CE, the Purépecha Empire controlled minimally 75,000 km^2 of the modern state of Michoacán as well as parts of Guerrero, Jalisco, Colima, and Guanajuato. The supreme ruler (*cazonci)* operated from the imperial capital of Tzintzuntzan in the Lake Pátzcuaro Basin, Michoacán. Never defeated by the bordering Aztec Empire, the Purépecha instituted a bureaucratic system that was designed to extract tribute from subjects and to control political, economic, and social life throughout their territory.

The story of Purépecha political development is often told through the lens of ethnohistory that was recorded by Spanish religious figures and *conquistadores* in the sixteenth century. Much less is known about the Purépecha compared with their Aztec (Mexica) neighbors due in part to the lack of a known writing system and the perception that the former easily succumbed to or even welcomed the Spanish into their kingdom after the fall of Tenochtitlan in 1521 CE. Even less clear is how the Purépecha developed within western Mexico – an area long overlooked by Mesoamerican scholars – to become one of the most powerful kingdoms in the Americas at the eve of Spanish encounter.

In this introductory chapter, I outline the specific goals of my dissertation project and the theoretical framework that orients my research. In particular, I examine archaeological accounts of states and empires including the ways in which scholars have studied the integration and expansion of empires. I emphasize local views of political incorporation as a critical way of identifying potential changes in the daily lives of pre- and post-imperial subjects. Material remains from both domestic and public ceremonial spaces within the ancient city of Angamuco provide a view into the micropolitics of sociopolitical behaviors throughout Purépecha regime growth and expansion. Finally, I present an overview of the organization of this dissertation.

Introduction to the Problem

This research focuses on how the daily activities of people living within an imperial heartland change as they are incorporated as subjects. In both pre-modern and contemporary societies, polity development involves co-opting existing local institutions and creating new administrative, economic, and ideological systems (Parker 2003; Smith and Montiel 2001). In most cases, the creation of an imperial core region with a capital city is fundamental to political and ideological processes in regime growth because this zone is designed to differentiate and legitimate new political regimes (Alcock et al. 2001; Sinopoli 1994). Legitimizing practices require negotiation between the various groups affected, including elites of various levels and commoners. While polity growth and regime-subject relations have long been addressed from a regional perspective (e.g. Berdan et al. 1996; Johnson and Earle 1987; Flannery and Marcus 1983; Marcus and Flannery 1996; Wright 1977), recent studies have shown that local communities respond differently to political incorporation and that additional work must be done to evaluate these diverse interactions (Dietler 2010; Huster 2016; Stark and Chance 2012). In this dissertation, I examine how residents living within an imperial core zone were impacted by an emerging regime by assessing differences in ceramic production and consumption from private and public contexts within the ancient city of Angamuco, Michoacán.

In western Mexico, scholars have emphasized that the Purépecha created the most centralized and consolidated empire in Postclassic Mesoamerica (1000-1521 CE) that formed through manipulation, intermarriage, and control of resources (Pollard 1993, 2008). Importantly, it is thought that the empire and its associated market-based economies facilitated urban growth in the Lake Pátzcuaro Basin imperial heartland (Pollard 1980, 2003a). While some resource control between the core region and surrounding areas is established archaeologically (Maldonado and Rehren 2009; Rebnegger 2010), local social practices in the imperial heartland are largely unknown. Intra-site study in the Pátzcuaro region is thus crucial for determining how changes in local socioeconomic and/or ceremonial practices coincided with early regime development. More specifically, who was living in the lake basin before empire formation? What did these communities look like and how did the emerging Purépecha Empire impact their daily lives?

In this dissertation, I address these questions by examining ceramic production and consumption in both household and public contexts at Angamuco, a recently documented urban site within the imperial heartland. For many ancient polities, imperial strategies intersected with both domestic and public activities by creating shared economic and cultural systems (D'Altroy and Hastorf 2001; Hendon 2004; Topic 2009). Like other technologies, pottery involves a series of choices that are learned and practiced in a culturally specific environment (Lechtman 1977; Lemonnier 1992). Studies show that during political development, craft producers such as potters may be subject to top-down state directives in terms of raw material selection, material recipes, and labor organization, but that they also retain local knowledge and practices (Hayashida 1999; Rice 2009). Ceramic production, which involves material selection, vessel forming, and decoration, is thus an important way to link multiple socio-political contexts, including domestic and public patterns of exchange and use, and potter choices (Rice 1987:168–174). Study of consumption focuses on the uses of produced ceramic items until they are discarded, which can help to assess the meaning and processes behind economic actions because consumption represents the socially constituted termination of the economic cycle (D'Altroy and Hastorf 2001; Giddens 1979). Consumption is also a symbolic activity embedded in social relations and cultural conceptions which bridge domestic and political economies: individual decision-making based on gender, status, and wealth is influenced by broader social activities of production and exchange (Dietler 2010; Orlove and Lutz 1989). By focusing on how daily activities in the domestic and public realm changed within the context of broader political changes, this research will add to our knowledge of Purépecha complexity and urban forms in western Mexico while contributing to research that investigates how local agencies and agendas are transformed or impacted by processes of political growth (e.g. Bélisle 2015; Brumfiel 1998, 2006; Kosiba 2010; Morrison 2001; Morrison and Lycett 1994; Roddick 2013; Stein 2005).

Dimensions of Political Change

Archaeological States and Empires

Since the mid twentieth century, ancient polities have commonly been set in universal histories which identify discrete political types (Adams 1966; Childe 1950; Johnson and Earle 1987; Service 1971; Yoffee 1993). Though the developmental sequence has been modified in recent years to include diachronic processes (Marcus 2008; discussion in Smith and Peregrine 2012), the state and empire are thought to represent the most sophisticated stages of social "evolution." Traditional attempts to define the state often focus on the presence of radical social stratification (Fried 1967) and centralized institutions (e.g. Carneiro 1970; Johnson and Earle

1987; Sanders and Price 1968; Steward 1955; White 1959; Wright and Johnson 1975) which renders a political economic entity in which strictly-administered bureaucracies mediate between the rulers and subjects.

These archaeological views of the state are rooted in other social scientific disciplines such as political science and sociology. In particular, an emphasis on a centralizing state is based upon interpretations of the post-Westphalia European Weberian (Weber 1968)[1921]) state in which an institution holds monopoly by physical force (see discussions in A. Smith 2003:Ch. 2; Yoffee 2004:Ch. 1). In comparative politics, the state has long been the focus of study as the dominant form of organizing political power – especially in the twentieth century as traditional colonialism and imperial expansions disappeared or were manifest in the concept of the modern nation-state (Gellner 1983; Lichbach and Zuckerman 2009). For example, Weber's vision of the state sought to create uniformity and structure within circumscribed boundaries, and leaders were thought to pursue this through standardizing customs, taxation, leadership, measurement, and writing systems. Similarly, Scott (1998:82) has argued that the modern state is most "legible" in its attempts to reduce a chaotic and changing social reality to something resembling an administrative grid of observations. This is reified in Oscar Niemeyer's LeCorbusier-influenced centralized plan of Brasilia – as a city constructed like the hierarchical organization of Roman military camps and a model designed to control residents within self-functioning neighborhood units.

Anthropologists in particular have critiqued this narrow centralizing view of the state for assuming rationality or coherence on the part of institutional structures (e.g. Asad 2004; Das and Poole 2004; Trouillot 2001). Social systems are not rigid and they are influenced by sometimes uncontrollable or unintentional internal, external, and historical processes. Notably, in *Negara*, Geertz (1980) argued that the acts associated with authoritative behaviors such as trials and performances in 16th century Bali comprised a theater state. These theaters were not just the nucleus or engine from which a regime operates; rather, they *were* the state and shaped the world around them and ultimately functioned as the cultural glue that linked complex institutions. In his discussion of the "colonial state," Comaroff (1998) shows how official inscriptions of local South African residents' identities and differences – which were typically documented using census records, map-making, and bureaucratic systems – were attempts to integrate diverse communities and produce compliant subjects, but that each state had its own political culture. Similarly, scholars have critically interrogated the assumption that "the state" is a fixed empirical object and that we should instead focus on how it comes into being, the differences between forms, and the impacts of an emerging regime on the political and socio-economic lives of subjects (papers in Sharma and Gupta 2009).

While archaeologists still examine and compare the traditionally-viewed centralized states, there have been many calls for modification and flexibility with the introduction of newly applied terms and concepts (e.g. Emberling 2015; Renfrew and Cherry 1986; A. Smith 2003, 2011, 2015; Southall 1999; Yoffee 2004). Without reviewing the enormous literature on states and state formation in archaeological context (see Spencer 2010; Wright 1977), a few studies highlight the diverse ways in which archaeologists engage with ideas of the state. For example, when comparing Mycenaean and Minoan states, Parkinson and Galaty (2007:124; see also Price 1978) re-introduced the concept of secondary states, which can be viewed as developmental trajectories that involved the incorporation of foreign symbols, ideas, and prestige goods into local social, political, and economic systems. In northwestern Uganda, Southall (2004[1956]) discussed the idea of a segmentary state, or a minimally centralized and ethnically diverse system that governed via ritual authority rather than direct political sovereignty. The segmentary state concept has been applied broadly in Mesoamerica in particular (Fox et al. 1996; Southall 1999; Young 2015), though critics point out that segmentary states may better be viewed as ranked societies and that lineages and trade networks are more useful for understanding how these societies functioned (Feinman and Marcus 1998:7). Emberling (2015) has recently considered the concept of the pastoral state in Kush where subjects were highly mobile and less urbanized than in other political systems. Here herd animals are the source of wealth and symbolic capital, while alliances between groups concentrated authority through agricultural production (for a similar argument in Mongolia, see Honeychurch 2014).

Although archaeologists have long been interested in the next social evolutionary stage, the empire, it has received renewed attention by anthropologists and political scientists in recent years probably due to American unilateralism and militarism after 2001 (see Pitts 2010 for a review). Often viewed in archaeology as a territorially expansive and incorporative kind of state, an empire is also typically understood through its concern with resource control and socio-political consolidation (Alcock et al. 2001; Parker 2003; Sinopoli 1994; Spencer 2010). Local and regional integration – achieved through consensus (Blanton and Fargher 2008; Service 1971) and/or conflict (Fried 1961; Haas 2001) – is thus central to this model. Recent studies have been concerned with how empires functioned, flourished, and even failed when tasked with consolidating diverse landscapes, communities, and institutions (Earle and Jennings 2012; McAnany and Yoffee 2009; Stark and Chance 2012; Stein 2005).

An important trend in the study of ancient states and empires is what can be broadly regarded as archaeologies of colonial encounters. Within this body of literature, rather than a focus on defining political entities, imperial or colonial encounter is treated as having intersecting nodes which include the metropole, colonies, and indigenous societies (Stein 2005:25). Within these nodes, the boundaries of archaeological cultures and identities typically based on material culture are multidirectional and fluid (Deagan 1996; Gasco 2005; Gosden 2004; Hu 2013; Meskell 1999; Voss 2015). Even in situations where imperial institutions strive to dominate through military, economic, and political directives, what often occurs instead is an "intercultural consumption of objects or practices" (Dietler 2010:55), sometimes viewed as an "entanglement" of cultures, economies, and politics (e.g. Hodder 2012; Martindale 2009; Silliman 2016; Thomas 1991). While the idea that political realignments facilitate social changes and material syncretisms is certainly not new, an explicit focus on the complexities of interactions between imperial colonizers and indigenous peoples problematizes classic binarism such as regime/subject or Native/European. Within the diverse landscapes that constitute emerging regimes, such binary distinctions may not be clear-cut. This recent body of literature has been critical for investigating intersecting spaces and activities, and for highlighting how individuals and communities were impacted by political dynamics.

Archaeological Studies of Incorporation

Views of ancient political dynamics discussed above have led archaeologists to evaluate incorporation in a few key ways.

Regulatory Institutions

Given the historical emphasis on centralized apparatuses, the study of regulatory institutions has been an important component of imperial consolidation studies (Brumfiel and Earle 1987; Claessen et al. 1984; Costin and Hagstrum 1995; Feinman and Marcus 1998; Spencer 2010). Such research contends that governmental authorities integrate and consolidate large territories by coordinating, overseeing, and regulating socioeconomic production (e.g. Berdan et al. 1996). For example, the intensification of production – observed through pottery manufacture, agriculture, and raw material procurement – is thought to characterize complex polities, fueling economic growth and social hierarchy (Brumfiel and Earle 1987). The standardization hypothesis, which tests the relationship between intensity of craft production and social complexity, has been applied to ceramic studies of Mesoamerican (Hirshman 2003; Rice 1991), Andean (Costin 2000; Costin and Hagstrum 1995), Middle Eastern (Blackman et al. 1993; Wattenmaker 1998), and South Asian (Sinopoli 1988, 2003) political organization. Advocates of these analyses argue that increasing clay-source and vessel form homogenization over time reflects increasing state control over ceramic production. Similarly, control over agricultural practices, such as raised fields along the margins of Lake Titicaca in the Andes, may have been exerted through large-scale construction efforts monitored by the Tiwanaku state (100-1000 CE) (Kolata 1991). Critics of institutional-regulation approaches point out that production intensity may instead be attributed to other socioeconomic processes, such as the transition between household and surplus production, improved manufacturing skills, and changing access to resources (Arnold 2000; Erickson 1999, 2006; Fisher 1999; see Field et al. 2011 discussed below).

Trade and Exchange

Archaeologists also examine broader processes of social integration through the exchange, circulation, and redistribution of economic goods. Traditionally, such political economic approaches were influenced by Polanyi, who argued that trade was a significant factor behind the emergence of ancient states (Polanyi 1957). Traders who engaged in diplomatic missions to other polities or settlements on behalf of political rulers facilitated gift exchanges, and secured military, marital, and other trade alliances (Berdan 1977; Carrasco 1978; Hirth 1978). In recent years, the political economic approach has been modified by M.E. Smith (2004), who emphasizes the study of both economic and political behaviors of regimes, in addition to the identification of social classes and the role of local historical processes within a broader imperial system. Dimensions include variability in state power (e.g. hegemonic versus tributary), urban-hinterland (or core-periphery) relations, and the household level of analysis (M.E. Smith 2004; Stein 2002). For example, political economic studies of the Aztecs indicate that they engaged in a "Postclassic world system," in which provinces from across the Aztec realm paid tribute and traded with the capitals of the Triple Alliance (Smith and Berdan 2003). Aztec consolidation in the Basin of Mexico was characterized by increased provincial-capital city ceramic vessel trade, decreased household and increased institutional obsidian tool production, and increased cotton spinning in the provinces (Brumfiel 1991; Garraty 2007; Garraty and Stark 2002; Minc 2009). These approaches emphasize that the core was not just extracting materials from the provinces; rather, there was a back and forth relationship between the two entities – they relied on one another for economic, political, and social integration (D'Altroy 2015; Oka and Kusimba 2008; Stein 2002, 2005; Ur 2009).

Ideological or Cultural Change

Ideological change, often visible through distinctive architectural styles, monumental forms, and altered ritual activities, is another common dimension used to assess political integration. In many archaeological models of the state, empirical variables such as monumental architecture and institutional structures are interpreted as expressions of political control and authority. Monumental architecture in particular is often assumed to materialize governmental authority and to buttress claims to territorial and political sovereignty (Adams 1966; Childe 1950; Moore 1996; Sjoberg 1960; Steward 1955; Trigger 1990, 2003). From this perspective, the construction of monuments such as earthen mounds and stone pyramids is linked to the large-scale organization of labor that represent regulatory institutions, but also to the expression of a unifying ideology. For example, when Mughal rulers conquered the powerful Vijayanagara kingdom in southern India, they constructed new Mughal-style buildings, but they also integrated existing Hindu populations by using temples in their ceremonies (Sinopoli 2003b). Another widespread strategy used to bring together diverse communities involved public feasting sponsored by an emerging state. Comparative ethnographic and archaeological studies show that feasts are ritual consumption events that are designed to exchange different ideas and materials, but also to reinforce the cultural traditions of dominant institutions (papers in Dietler and Hayden 2010). In Mesoamerica, elaborate meals with rivals and kin groups were a strategic part of alliance formation and a way in which polities could show their generosity and reiterate claims to status and importance (Hendon 2004; LeCount 2001; Rosenswig 2007; Pohl 2003; Turkon 2004). Other ideological shifts in the archaeological record include evidence for new forms of religious practices, such as those documented in inscriptions (Morrison and Lycett 1994), changing figurine styles (Halperin 2014; Joyce 2000), and iconography on ceramic artifacts (Crown and Bishop 1994; DeMarrais et al. 1996; Halperin and Foias 2010).

Localized Approaches

The above dimensions for explaining the development of ancient polities have led to the recognition of the empire as a machine of socioeconomic integration (Sinopoli and Morrison 1995; A. Smith 2003:96–104). This recognition has been accomplished through a critically important emphasis on the broad processes of integration and consolidation that probably characterized early empires, but the tendency to focus on larger regions means that the dynamic local processes of incorporation remain largely unexamined. Importantly, even in regional studies, there is evidence that imperial strategies, constitutive polities, and community response varied and that the impacts of political incorporation on local groups can be diverse from area to area and within a state and empire (e.g. Bélisle 2015; Berdan et al. 1996; Cohen 2016; Cutright 2015; D'Altroy and Hastorf 2001; Fargher et al. 2011; Huster 2016; Schreiber 2001). Within the Oaxaca Valley, Fargher et al. (2011) argue that local Aztec rulers were reliant on local taxpayers, resulting in greater taxpayer voice and a form of socioeconomic autonomy. Elsewhere, material studies demonstrate that local agencies retained distinct social practices apparent through studies of consumption or food preparation (Stein 2002, 2005), and inscriptions (Morrison and Lycett 1994; Sinopoli and Morrison 1995). Such research serves as important additions to the study of regime-subject relations, but it also shows how local views of incorporation are critical for understanding how states and empires developed and ultimately succeeded within an archaeological context.

Local Perspectives of Imperial Development

Intra-site, localized approaches to political incorporation seek to amalgamate several aspects of existing integration models. Since a new regime is a claim to authority that is dependent upon the production of compliant subjects, archaeologists can look at spaces and associated practices through which subjects and their rulers interact. Research on local daily processes investigates micropolitics – formal and informal political strategies by embedded social actors and communities – of regime-subject relations, which are otherwise overlooked by broader regional integration analyses.

The differences between political strategies in the imperial capital, heartland, and hinterland may be different even if the imperial narrative indicates direct rule and top-down incorporation processes. States did not necessarily impact communities within their territories in the same ways. In a study of Wari state expansion at the provincial site of Ak'awillay in Peru, Bélisle (2015) found that ceramic and stone tool artifacts did change to include more imports in certain houses and public buildings during Wari expansion, but that the majority of households did not exhibit material changes. This suggests that despite having a reputation for establishing direct imperial control over their provinces, Wari state expansion had limited impacts on rural or distant communities within their empire. In contrast, through his work in the Inka imperial heartland, Kosiba (2010) has shown that Inka elite converted locations that were meaningful to past rulers into Inka spaces of authority through acts of display such as feasting. Although the Inka did apply general labor taxes and pursue resettlement initiatives throughout its empire, incorporation or conversion in the imperial core looked very different from regime-subject relations in the far southern provinces where communities may have actively resisted their rulers (D'Altroy 2015).

Domestic Spaces

One critical way to look at spaces of regime-subject interaction is through the study of domestic contexts, commonly called household archaeology. Developed from settlement pattern and political economic studies, household archaeology is particularly fruitful for detailing political impacts in everyday life (for recent reviews, see Carballo 2011; Nash 2009; Pluckhahn 2010; Robin 2003; Steadman 2015). Early advocates argued that the household represents the most basic socioeconomic unit of society (Clarke 1972; Flannery 1973; Wilk and Rathje 1982) and that study of household contexts can provide a mid-level theory between domestic artifacts and behaviors of the broader community (Ashmore 2002; M.E. Smith 1987). Research in highland Mesoamerica has challenged prevailing assumptions about households as loci of high or low-intensity craft production (Brumfiel and Earle 1987:4–5; Costin 1991:3–18), and has shown that they often undertook multiple, interrelated production activities as a buffering strategy against risk and as a way to engage in a market-based economy (Carballo 2011; Feinman 1999; Hirth 2009).

Differences in socioeconomic status and ritual over time and throughout broader political changes can be determined from household contexts. In the Oaxaca Valley, Levine (2007) showed that commoner households enjoyed a relatively high standard of living as a result of Aztec imperial policies which suggests that Aztec incorporation policies in this region did not necessarily rely on exploitation and coercion. The archaeology of household contexts has also highlighted how social rank may have occurred on a continuum. At Moundville, traditional studies maintained that elaborate craft items were limited to elite households and thus elite control; however, recent work suggests that the most extravagant assemblages only appear in association with later elite occupations which could mean that Moundville communities became increasingly socially stratified over time (Pluckhahn 2010; Wilson 2008). Domestic ritual in Mesoamerica such as mortuary practices, offerings deposited during construction, and other activities such as bloodletting and ancestor worship may be formalized and conventional, but they can also show variation and resistance to existing hierarchies (Carballo 2009, 2011). For example, effigy incense burners were common in domestic contexts throughout the majority of the Teotihuacan state, but disappeared after its collapse. In contrast, an Old God vessel form both predated and survived the polity in Teotihuacan households, suggesting that the deity was central to the domestic central Mexican belief system (Cowgill 1997:142; Hirth and Smith 2000:40–41).

The architecture of households and constituent units (rooms, patios, storage features) can also channel and constrain social relations within the context of broader political initiatives. For example, house form and spatial arrangement can reflect changes in social order while sequential changes in form can show responses to economic, social, and political changes (Ashmore 2002; Kent 1990). Household units at Cantona in central Mexico consisted of spacious, enclosed patio groups with stone house platforms and encircling walls which suggest that defense and safety from the encroaching Teotihuacan state were central concerns (García Cook 2003; García Cook and Merino Carrión 1998). In Hawaii, researchers have shown that the construction of larger households over time reflects changes in household versus surplus production (Field et al. 2010, 2011). During pre-contact periods, the smaller size and scale of subsistence and craft production in Hawaiian households indicates that they engaged in a domestic mode of production while larger households and expanded production-related activities is interpreted as surplus production probably due to changing population levels and political organization.

As this brief review shows, study of domestic space is a critical way of understanding how broader social changes impact the daily life of residents. Importantly, however, social behaviors do not only operate within a domestic zone. It is possible, for example, that the impacts of new political systems on recently-incorporated subjects may not be immediately visible in domestic spaces due to longstanding traditions such as in craft-producers' learning networks or communities of practice in which ceramic, textile, lithic, etc. production and consumption outlast top-down initiatives to monitor local economies (Roddick 2013; papers in Wendrick 2012). As discussed above, households may have been affected differently during incorporation projects. Thus, an equally important context to consider is the public realm, where polities might have displayed authority to new subjects, or where the latter demonstrated some form of autonomy through the continued use of production and consumption activities.

Public Spaces

Scholars have shown that regime-subject interaction can occur through spectacle, or large public events that demonstrate political power and that can bind community through participation, regulation, and awe (papers in Inomata and Coben 2006; A. Smith 2011). As Inomato (2006) has pointed out, past societies may have achieved social cohesion in different ways than contemporary nation-states (though see discussion in Yoffee 2004:92-94). The "imagined community" (B. Anderson 1983), in which the vast majority of nation-state subjects never interact with their fellow subjects but instead are galvanized through media circulation, may work well for the modern nation concept. In the past, however, many communities emerged without the benefit of written media, so it is likely that human sociality was rooted in our sensory perceptions of the presence and actions of others (Inomato 2006; see Azoy 2012 for a modern example). Such communities were probably not necessarily imagined in Anderson's sense, but rather based on direct interactions with others – in kin, craft, and religious-based groups.

The idea of daily interaction with our peers and figures or symbols of authority as a form of social cohesion is certainly not new for social scientists and anthropologists in particular (see for example, Durkheim 2014[1893]; Gluckman 2012[1966]; Weber 1968[1921]). As Erving Goffman (1967:12, 45) emphasized, the study of daily face-to-face interactions is the key to understanding the social order of a particular society. This is because the rules of a social group include the concept of "face," which consists of verbal and nonverbal acts in face-to-face interaction and which must be maintained by a moral code. While archaeologists may not necessarily access face-to-face interaction in the past, we can consider the spaces and material remains of micropolitical encounters within household or public contexts.

In fact, the development of large polities may have been impossible without the presence and heavy reliance on public events (Inomata and Coben 2006). In an archaeological context, state power was developed and reinforced through what was seen in public spaces, such as during ceremonial events associated with open plazas, monumental structures, and ballcourts. In Mesoamerica, the centrality of plazas at most settlements suggests that residents consciously or unconsciously recognized their utility and importance within society. Plaza spaces can thus be viewed as part of a historically ingrained political and social discourse and interaction (papers in Inomata and Tsukamoto 2014). Activities associated with plazas and other structures (e.g. feasting, sport, bloodletting and sacrifice) and changes in association with social upheaval reflect how emerging regimes dictated public displays and displayed their political narrative to subjects and other elites. For example, feasting was an important social event that sought to consolidate political and economic power, but it also demonstrated the generosity of polities through redistribution (Bray 2003; Dietler and Hayden 2010; Hastorf 1991). Additionally, the Mesoamerican ballgame is often examined as a political or ritual institution of the ruling classes and in some cases as a spectacle in which players representing culture heroes played out predetermined scenarios (Diehl 2004:105). Recent work on early ballcourts has reconsidered their association with exclusively elite activities, suggesting that the public ballgame was both an institution of symbolic power with restricted access and a tradition available to everyone within a society (D. Anderson 2012).

Within an ancient city, the study of contrasting temporal and socio-functional contexts can highlight the local impacts, responses, and transformations resulting from broader political strategies. A focus on domestic and public ritual spaces and their associated activities is integral for showing the relationship between communities and for highlighting differing strategies between and within imperial sites. In this project, I compare such different contexts in order to evaluate Purépecha political development.

Evaluating Purépecha Political Change

Before the Purépecha Empire expanded over 75,000 km^2 in western Mexico, it had to consolidate existing settlements in the Pátzcuaro core region. The organizing hypothesis of this research takes the "bottom-up" perspective that early Purépecha state formation at Angamuco was based upon negotiations with existing local communities of craft producers and consumers while creating distinct spaces and activities at preexisting urban centers (after, for example, Balée 1994; Bélisle 2015; Crumley 1995; Erickson 2006; Fisher 1999; Morrison and Lycett 1994; Morrison 2001; Scott 2009). In order to evaluate local imperial incorporation, this project examines ceramic technology through production and consumption patterns in elite and commoner households and associated plaza contexts. As discussed above, these are domains where larger strategies of political development would have intersected with the daily activities of Purépecha subjects. Previous archaeological work in western Mexico and related imperial contexts suggests a range for these political economic activities at Angamuco during Purépecha development (Figure 1.1; discussion in Ch. 6).

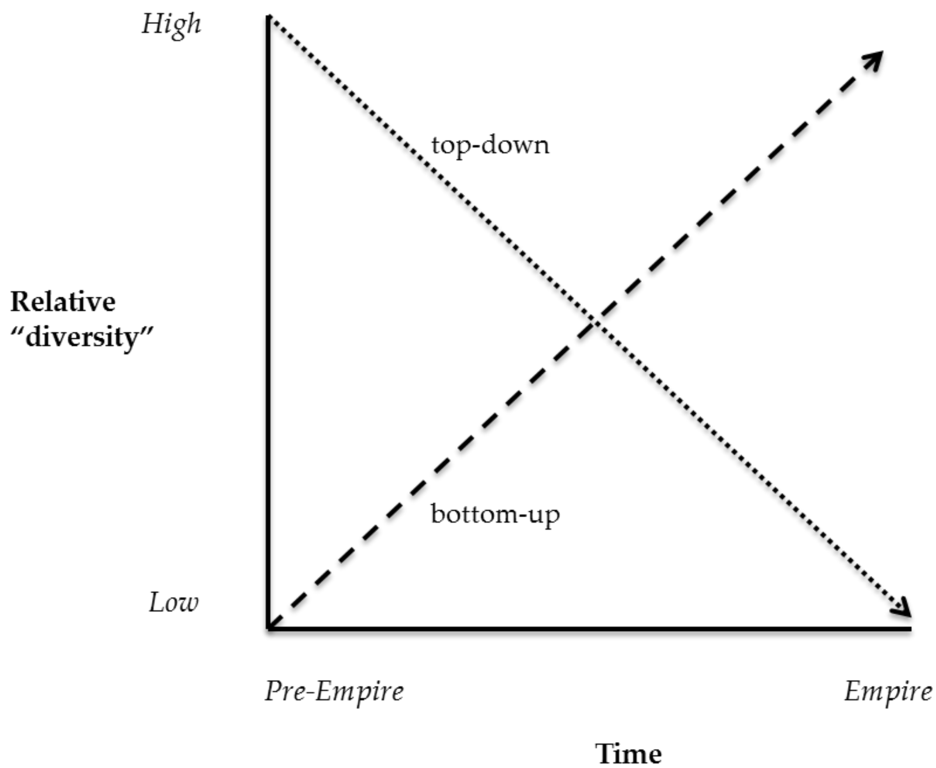

Figure 1.1. Idealized schema of diversity outcomes for bottom-up (Outcome A below) and top-down (Outcome B below). A bottom-up political development model would be supported by increasingly diverse ceramic production and consumption between pre-imperial to imperial contexts. A top-down model would be visible through a decrease in ceramic variation from the pre-imperial to imperial periods.

Potential Outcomes in Domestic Contexts

Imperial political economies depend on a stable domestic economy to provide labor or revenue, and ultimately on the constitution of compliant subjects. The demands of a newly imposed political economy can thus affect how households organize labor and consume products. Household artifacts such as ceramic vessels are best suited to study diachronic changes in manufacturing techniques because they have a short life span and are sensitive indicators of time (D'Altroy and Hastorf 2001; M. Smith 1987). Although the relationship between centralized political economic power and the ceramic material record may be difficult to detect (Hayashida

1999; Sinopoli 1988, 2003), this study will be the first of many projects necessary to robustly evaluate the impacts of the Purépecha regime on Angamuco residents.

Outcome A (bottom-up)

If the Purépecha established an imperial core region by negotiating with existing residents and potters, then I expect to see a continuation of local pre-Purépecha vessel production throughout the sequence. I also expect to see increased variation in raw material selection and the types of vessels produced, including new imperial styles. For example, some Purépecha forms would occur in smaller numbers relative to pre-Purépecha forms, but they would not comprise the majority of the assemblage. Similarly, pre-Purépecha styles would continue throughout incorporation, though some imperial decorations would appear on vessels. Vessel paste composition would become more heterogeneous during and after Purépecha control, indicating that households or ceramic manufacturers had increased access to various clay materials because of broader political changes.

In this scenario, Purépecha development would have facilitated a market-based system in which households had continued access to previous resources, and additional access to imperial and non-local styles and materials (Hirth 1998). If political incorporation enabled wider availability of multi-status and non-local artifacts, Purépecha fine wares would occur in small numbers in the household contexts. A similar pattern that shows elite vessels and artifacts in multi-status contexts has been identified elsewhere in Mesoamerica (Hendon 2009; Pool 2009) Pyburne 2008), including at Urichu in the Pátzcuaro Basin (Hirshman 2003:131, 234–235). These data would indicate that the imperial capital did not centrally control the political economy of Angamuco, a conclusion which supports Hirshman's (2003, 2008) data from Urichu that there was no basin-wide economic unification during empire formation. This outcome also supports household production research in highland Mesoamerica, which details the important role of domestic, part-time craft manufacturing throughout political development processes (Carballo 2011; Feinman 1999; Feinman and Nicholas 2007; Hirth 1996, 1998, 2009).

Outcome B (top-down)

In contrast, if becoming part of the Purépecha regime resulted from top-down control of the political and economic systems, I expect to see a reduction in the diversity of local ceramic forms and the increasing presence and standardization of Purépecha type vessels during and after formation. Similarly, I expect a reduction in pre-Purépecha pottery styles, and a quantitative increase in Purépecha styles as the regime incorporated Angamuco residents. Vessel paste composition would also show changes in this scenario, such as a transition from variable clay and added materials (i.e. indicating clays and tempers from several different sources) to a more homogenous paste after consolidation (i.e. indicating materials from fewer sources).

Ceramic evidence supporting this outcome would occur during and after political development due to strategies of domestic incorporation and/or emulation of imperial materials. Vessel form, decoration, and composition would become increasingly standardized or homogenized due to regime control of production (including formation techniques and clay procurement locations). These changes should begin to occur during initial Purépecha consolidation, between the 12th through 14th centuries CE; the most pronounced vessel standardization should occur after Purépecha consolidation in the 15th and early 16th centuries CE. This outcome would be manifest as a change in economic production from multiproducer systems in which individual households procured clay and manufactured their own vessels, to a primarily state-sponsored institutional mode of production (*sensu* Costin 1991, 2001). Data supporting this outcome are available at Inka imperial sites in the Andes, where Costin (2001) has shown that Inka leaders controlled ceramic and stone tool manufacturing as they sought to stabilize their regime. Angamuco may exhibit this pattern due to its geographic proximity to the Purépecha imperial capital of Tzintzuntzan, and due to the basin-wide incorporation processes highlighted in ethnohistoric texts (Pollard 1993; Warren 1985).

Potential Outcomes in Public Contexts

While it is crucial to inquire how a regime impacts a private domestic economy, it is equally important to examine how political economic practices in the public, such as during ceremonies and feasting events, may have changed throughout imperial growth. Study of products associated with monumental architecture and plazas can thus highlight broader political strategies that may include redistribution of wealth, displays of force, and other communal events. Ceramic vessels are suitable to study diachronic changes in a plaza context because Purépecha type serving vessels and other highly decorated artifacts used in public ritual events are well-documented in the region and may be indicative of increasing regime influence (Pollard 1993; Ramírez Urrea 2005).

Outcome A (bottom-up)

If Angamuco subjects were incorporated through bottom-up negotiations, ceremonial ceramic vessels would exhibit some adoption of Purépecha forms, but also continuation of pre-imperial forms and decorations. In this scenario, I expect an increasing number of vessel forms, styles, and raw materials used to create ceramics produced and consumed in publicized zones. Some Purépecha forms would occur, but would rather be a minor portion of the assemblage. Pre-Purépecha styles would continue throughout incorporation, though imperial decorations would appear on a small number of vessels over time. Paste composition would become more heterogeneous as regime presence increased, suggesting an increasing number of clay sources and thus greater access to materials. Data reflecting this outcome would support my hypothesis by suggesting that public activities established before regime changes continued in conjunction with newer Purépecha practices.

Similar to Outcome A in the domestic setting, pre-Purépecha and Purépecha ceramic forms, styles, and compositions would have been available to a wide audience (*sensu* Hirth 1998). This outcome could be interpreted as indirect control of the ceramic political economy of Angamuco: imperial style vessels were occasionally consumed and used in public ceremony, but previously established forms, styles, and manufacturing processes continued to be employed. The new Purépecha regime would have combined old symbols and artifacts of power (such as vessel style and architecture) with new forms in order to legitimate themselves to a broad population. Public events such as feasts or ceremonies would have functioned to combine the old and the new, serving to constitute political authority at an existing urban site (Blitz 2009; Dietler and Hayden 2010; Sinopoli 2003).

Outcome B (top-down)

In contrast, if imperial incorporation resulted in top-down control of political economic public events, I expect to see a reduction in pre-Purépecha ceremonial and serving vessels and an increase in standard Purépecha vessel forms over time. Pre-Purépecha pottery styles would also decrease, while Purépecha styles and decorative attributes would increase in the plaza assemblage. Paste composition would become increasingly homogenous, reflecting a transition from multiple clay sources and producers, to fewer sources and standardized clay procurement strategies. This outcome would indicate that the new Purépecha regime used public ritual display in the plaza context to reiterate its presence and ultimately its authority upon residents of Angamuco. Data supporting this outcome are available elsewhere in Mesoamerica, where rulers and nascent political entities used ceremonial occasions to assert their power and wealth to regional inhabitants (e.g. Hendon 2009; LeCount 2001). Similar to Outcome B for the domestic context, Angamuco may exhibit this pattern due to its geographic proximity to the Purépecha imperial capital of Tzintzuntzan, and due to the basinwide incorporation processes known from ethnohistory (Pollard 1993; Warren 1985). In addition, the large size of Angamuco and potentially large population at the site may have required the new polity to try to institute direct and centralized control.

Organization of the Dissertation

This dissertation examines the processes through which the Purépecha Empire developed and established its political power at the ancient city of Angamuco, which was located within the Purépecha imperial heartland in Michoacán, Mexico. Political power can be understood as the capacity of an institution to regulate and control the production, practices, and consumption of newly incorporated subjects. The process of constituting authority, which involves establishing political legitimacy within diverse communities of new subjects, is part of this recognition of political power. Such political projects begin in imperial heartlands and an understanding of how the Purépecha regime established power therefore requires an examination of the political, social, and economic activities of societies before, during, and after regime change.

In this dissertation, I ask how emerging political regimes secure their authority and integrate local communities through political, economic, and ideological practices within preexisting spaces. To better understand how social groups of the Pátzcuaro area were incorporated into the empire, I present survey and excavation data from the city of Angamuco – a settlement that was occupied before, during, and after Purépecha imperial development. My focus is on intra-site variation in the production and consumption of ceramic artifacts – a ubiquitous and integral part of daily life in Mesoamerica – and the impacts of the growing political regime on these activities. The imperial narrative depicted in ethnohistoric texts emphasizes that Purépecha political authorities controlled craft production and tribute, including the production of polychrome pottery (Alcalá et al. 2000:558-572; Hirshman 2008). In contrast to the latter view, which has been framed in social evolutionary terms as an expanding and increasingly centralized Purépecha state and empire, I anticipate that imperial incorporation at Angamuco occurred through bottom-up processes of negotiation with existing ceramic producers and consumers. Changes in pottery technology will help to address questions such as: Did ceramic production and consumption become increasingly standardized or more diverse throughout regime development? Are there changes in the public and private consumption of ceramic artifacts? If so, when did these changes occur?

My field and laboratory work in Mexico focused on intra-site analysis at one ancient city because I wanted to know how people experienced and were impacted by broader processes of political change at the local scale. This study may be compared with research elsewhere in the imperial territories so that we can better understand local, intermediate, and micro-scalar processes of political change.

In this first chapter, I discuss archaeological theories of the state, and the ways in which this research has examined state and empire formation and integration. Though many previous studies look at broad regional patterns of political economic and ideological incorporation, I highlight a few ways that we might focus on localized processes such as craft production and intra-site spatial dynamics. I conclude by introducing a model for Purépecha political change, including whether the regime instituted top-down control as suggested in previous models and ethnohistoric data, or whether the regime was more visible through the integration of preexisting and new symbols and activities.

Chapter 2 presents archaeological and ethnohistoric evidence for Purépecha governance within the imperial heartland and throughout the imperial territories. Purépecha elites maintained that a distinctive group of people (the Uacúsecha lineage), migrated into the Pátzcuaro Basin sometime in the thirteenth century and integrated existing chiefdoms via inter-marriage, tribute, and centralized modes of production and political authority. This chapter illustrates how the Late Postclassic Empire was based on some preexisting political economies and symbols, but that the imperial period might be viewed as a distinctive articulation between the old and the new.

Chapter 3 discusses the survey, excavation, and laboratory methodologies employed for this research between 2009 and 2015. Working with *Legacies of Resilience: The Lake Pátzcuaro Basin Archaeological Project* (LORE-LPB) over three field seasons of full-coverage survey and two seasons of excavation, I helped to document thousands of architectural configurations and artifacts that may be used to date, classify, and understand different spaces and associated objects before, during, and after regime growth. I also describe the laboratory methodologies in Mexico City and in the U.S. that I used to evaluate intra-site practices, including attribute and geochemical analyses of ceramic artifacts.

Chapters 4 and 5 present archaeological data on Angamuco derived from the field and laboratory work. In Chapter 4, I outline the physical and architectural dimensions of Angamuco, including an architectural typology developed by the LORE-LPB team to document spatial arrangements. Data from this survey phase helped us to outline a basic settlement plan for

Angamuco that can be evaluated with additional research. Chapter 5 builds upon these survey data by discussing the seven excavated areas, their preliminary chronologies, and past functions. Here I lay the groundwork for future archaeological work by presenting the first radiocarbon determinations, and ceramic formal, decorative, and geochemical compositional data at Angamuco.

In Chapters 6 and 7, I evaluate the results of this study within the context of localized political changes. Chapter 6 in particular discusses ceramic measures of diversity between the different excavated areas at the site which contrast commoner and elite, and public and private spaces of consumption. Here I also evaluate the urban settlement plan for Angamuco using the architectural, ceramic, and chronometric data presented in this dissertation. In Chapter 7, I provide examples of ongoing and future research that can help further evaluate the transformation and preservation of new and existing spaces and practices within Angamuco, a pre-imperial and Purépecha urban site in the imperial heartland. Overall, this dissertation contributes to our understanding of Purépecha political development and provides insight into our understanding of how political regimes develop and maintain power, which is important throughout the social sciences and of particular importance in many parts of the world where processes of regime change, resistance, and immigration are ongoing today.

CHAPTER 2. PURÉPECHA GOVERNANCE

Current archaeological research centers on determining the processes that the Purépecha elite used to consolidate political and economic power to become the dominant force in western Mexico during the Late Postclassic period (1350-1530 CE). Ethnohistoric investigation suggests that existing socio-political heterogeneity in western Mexico was co-opted by Purépecha tribute-based and ideological systems (Gorenstein and Pollard 1983; Pollard 2008; Warren 1985), but this remains to be tested archaeologically. According to the official Purépecha history documented in the *Relación de Michoacán* (RM) (2000[c. 1541]), by 1350 CE leader Taríacuri and his descendants had successfully subjugated and consolidated small polities in the Lake Pátzcuaro Basin. This was followed by territorial conquest in western Mexico through ideological manipulation, intermarriage, and warfare which allowed for control of resources.

In this chapter I review the traditional social evolutionary model of Purépecha development by incorporating archaeological research from both the Pátzcuaro Basin imperial core region and elsewhere in the empire. I first discuss the geography of the empire, including multiple centuries of environmental and lake-level changes that have been recorded in the Pátzcuaro Basin. Next I consider how the Purépecha have been discussed in ethnohistoric documentation and historical analyses from western Mexico, and from Aztec and Spanish sources in the century after Spanish incursions into Mesoamerica. Ethnohistoric documents have been an important component of archaeological research in western Mexico and as I show, the RM in particular has driven research questions and interpretations in the region for many years. This section is followed by a discussion of the material evidence for the Pátzcuaro Basin chronological sequence and other parts of western Mexico which are thought to have influenced the Purépecha during the Late Postclassic period.

While my focus is the imperial heartland, I incorporate recent data from other societies in central-western Mexico because the existing Pátzcuaro Basin social evolutionary model borrows material and ideas about social behaviors from these areas.

In the next section, I focus on the archaeological work for the Purépecha Empire and previous research in the twentieth century in the Pátzcuaro Basin. Other data from imperial territories in the Cuitzeo and Sayula Basins are also discussed within the context of political economic models of resource exploitation and extraction and imperial borderland activities. Finally, I conclude this chapter by considering ideas of long-term cultural continuity in western Mexico from the Preclassic until the Late Postclassic Empire. As I highlight through the existing archaeological data, there was a spectrum of state-local relations that were likely more complicated than the ethnohistoric record suggests. Although it is likely the Purépecha regime developed over a long trajectory in western Mexico, engaging in a series of negotiations that can be documented over multiple centuries of social, political, and economic change, it is important to recognize the role of regional model-building in Mesoamerican archaeology and how this history has shaped current interpretations.

Geography of the Empire

According to ethnohistoric, linguistic, and a growing body of archaeological evidence, the Purépecha Empire controlled a territory in western and central-western Mexico that extended beyond the Lerma River in the north and the Balsas River in the south (Espejel Carbajal 2008; Gorenstein 1985; Gorenstein and Pollard 1983; Valdez et al. 1994; Macías Goytia 1990; Pollard 1993; Silverstein 2001; Warren 1985). The western boundary consisted of the Lake Chapala and the Coalcoman region of Jalisco while the eastern side began at the frontier settlement of Acambaro and continued south of the Balsas River (Figure 2.1). Today these boundaries comprise much of the modern state of Michoacán as well as parts of Guerrero, Jalisco, Colima, and Guanajuato.

In Mesoamerican archaeology, western Mexico has been subject to various regional categorizations which have depended largely on research objectives rather than on any set of fixed geographic or cultural attributes (Beekman 2010:42–43; Pollard 1997:348; Williams 1994:11–12). For example, Paul Kirchhoff's (1960) trait-based model for Mesoamerican cultural traditions and areas focused on existing linguistic, ethnographic, ethnohistoric, and ecological evidence. Due to the presence of contemporary Purépecha language-speakers, the Purépecha imperial zone was included in the broad category of "West Mexico," which covered western Mexico from Sinaloa to the southern part of Michoacán. As Beekman (2010) highlights, recent scholars have conceived of central-western or western Mexico in two ways: (1) as the *Occidente*, a distinct region that is comprised of the shaft tombs of Jalisco, Nayarit, and Colima, the Classic period Teuchitlán tradition in Jalisco, Purépecha roots in Michoacán, northern Guerrero, and southern Guanajuato, and parts of Sinaloa and Zacatecas (Kan et al. 1970; Palafox 1989; Weigand 2000); or (2) as everything west of the Toluca Valley which was not necessarily culturally or politically unified (Pollard 1997). Yet another approach is to focus on the diversity within western Mexico and to consider instead distinct subregions such as the coast, the far western highlands, the eastern slopes of the Sierra Madre Occidental, and the Bajío/eastern highlands which all began to exhibit different characteristics and historic trajectories beginning in the Formative period (1500 BCE – 300 CE) (Beekman 2010:43).

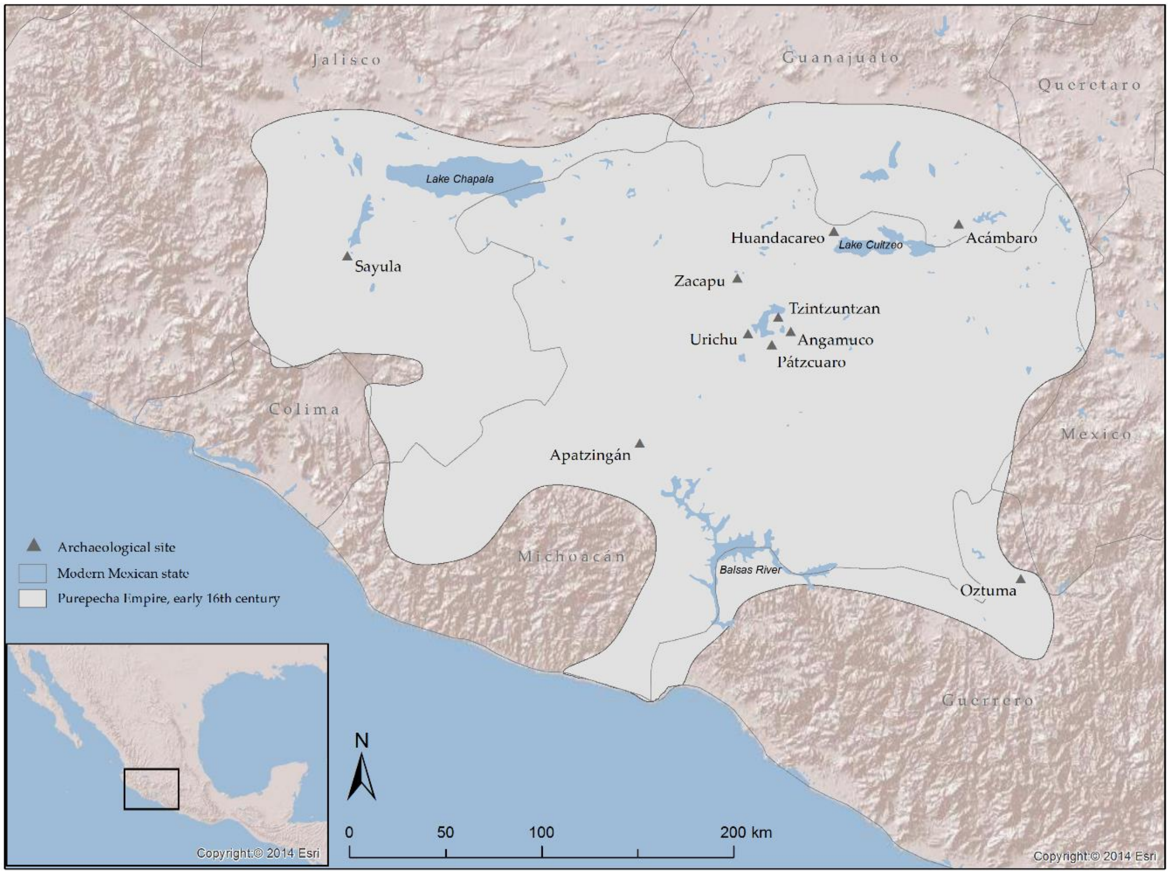

Figure 2.1. The Purépecha Empire in the early 16th century. The capital city of Tzintzuntzan and other major sites with the imperial heartland are located within the Lake Pátzcuaro Basin (data from Michelet 2008; Pollard 2008).

In this chapter, I concentrate on the Lake Pátzcuaro Basin, the heartland of the Purépecha Empire which contains the site of Angamuco that is the focus of this dissertation. In addition, I include several areas of central-western Mexico which were conquered by the Purépecha and/or which were thought to have influenced the development of the Late Postclassic Empire. This broader imperial geography is particularly relevant for understanding Purépecha development models because much of the data for social evolutionary development in the Pátzcuaro area are drawn from nearby regions such as the Zacapu Basin and the Bajío area of Guanajuato.

The Lake Pátzcuaro Basin is a small basin (929 km^2) in the central Mexican altiplano with considerable variation in altitude, topography, rainfall, frost, soils, and vegetation (Figure 2.2). The lake basin is characterized by the distinctive C-shaped Lake Pátzcuaro and steeply sloped volcanic terrain with elevations ranging from 2,043 to 3,200 meters above sea level (Bradbury 2000; Metcalfe et al. 2007). Paleoenvironmental studies of the region indicate that the basin has experienced significant environmental changes throughout the mid-Holocene (Fisher et al. 2003; Garduño-Monroy et al. 2011; Israde-Alcántara et al. 2011; Metcalfe et al. 2007; Ruter et al. 2004; Street-Perrott et al. 1989; Watts and Bradbury 1982). Lake cores document cool and arid temperatures until about 11,000-10,500 years BP when summer precipitation began to increase. This was followed by cycles of wetter and drier conditions. A dry period during the Epiclassic and Early Postclassic periods (900-1200 CE) was followed by increased precipitation during the Middle and Late Postclassic periods (1200-1530 CE) which flooded areas around the existing lake and which led to increasing vegetation. Similar to lake level and other environmental changes throughout Mexico (see Metcalfe et al. 2000), Street-Perrott et al. (1989) and Fisher (2000; Fisher et al. 2003) found that the lake basin underwent three episodes of erosion: during the Preclassic and Classic periods (150-590 CE and 665-775 CE) which has been interpreted as a result of maize cultivation and population growth, and during the Early Historic period (1520-1650 CE) probably due to the expansion of agriculture and postcolonial grazing activities (O'Hara 1993; *cf* Kennett and Marwan 2015; Metcalfe et al. 2007).

Currently, Lake Pátzcuaro covers an area of approximately 100 km^2 and is 8-12 m deep, though the variable climatic cycles of wet and dry periods have led to transgression and regression episodes over the past few millennia (Bradbury 2000; Chacón Torres 1993; Fisher et al. 2003). For example, lake levels were highest (>2,040 m asl) during the Late Postclassic and Early

Hispanic periods, flooding Classic period settlements in low-lying areas when the lake was undergoing a regression episode (>2,033 m asl). Today the mean annual precipitation in the region is about 1040 mm, but this varies from year to year. Annual temperatures average about 16.3° C with higher temperatures during parts of the dry season (March – May), and cooler temperatures during the wet season (June – October). Modern vegetation includes natural pine (*Pinus*) and oak (*Quercus*) grow on hills throughout the basin between 2300 and 2800 m while fir (*Abies*) and pine dominate above 2800 m (Chacón Torres 1993). Agricultural fields and secondary herbaceous plants and scrub grow at lower altitudes; aquatic vegetation such as reed (*Scirpus Americana*) and bulrush (*Typha latifolia*) flourish south of the lake (Metcalfe et al. 2007). Six environmental zones are identifiable in the lake basin: open water (15%); tule-reed marsh (1%); lakeshore (12%); lower sierra slopes (32%); upper sierra slopes (36%); and alpine (4%) (Gorenstein and Pollard 1983:Appx. 1; Pollard 1993:63–67). Soil types include volcanic hill varieties (*t'upuri* or yellow earth), basin floor types (*charanda* or red earth), lacustrine (*tamacua*, or humid and fertile earth), and infertile volcanic ash (*uirás* or white earth) (see also Barrera-Bassols 1988; Barrera-Bassols and Zinck 2003; soil discussion in Ch. 4). It is estimated that approximately 40% of the terrestrial landscape has been cultivated for agricultural purposes in the modern period (Toledo 1991:151).

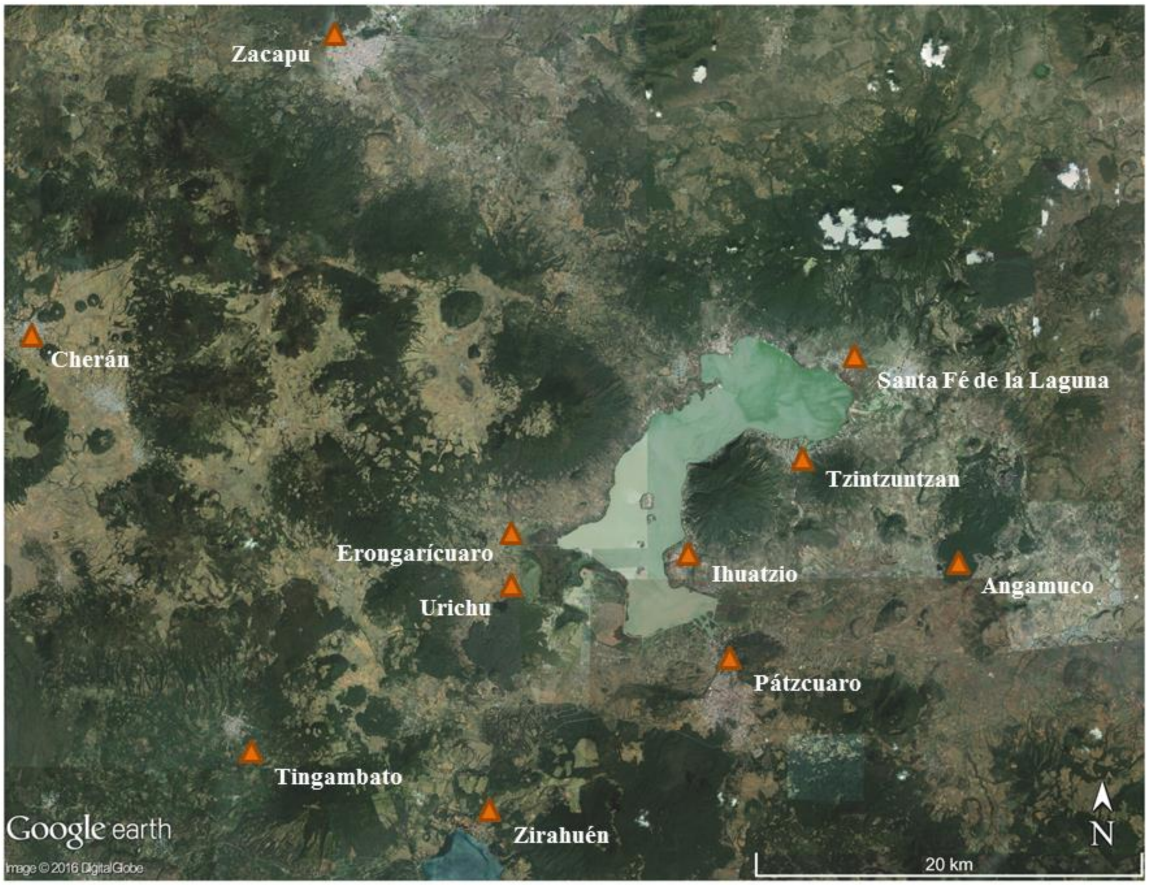

Figure 2.2: The Lake Pátzcuaro Basin (a 929 km^2 catchment around the lake) and surrounding areas with archaeological sites mentioned in this chapter.

During the Late Postclassic period (1350-1530 CE), Purépecha imperial territory encompassed a range of environmental zones outside of the Pátzcuaro Basin. This included parts of the Neo-Volcanic axis which extends between the Pacific coast to the Gulf of Mexico and which has high-quality obsidian sources throughout Jalisco, Michoacán, Guanajuato, and Querétaro (Darras 1999, 2008; Pollard and Vogel 1994; Weigand et al. 2004). Importantly, Ucareo obsidian from northeastern Michoacán has been found throughout Mesoamerica from the Early Formative period (Golitko and Feinman 2015; Hernández and Healan 2008). In the highlands, additional lake basins such as Cuitzeo, Chapala, Sayula, Zacapu, Zacoalco, and Magdalena were rich in aquatic resources, wildlife, arable land, and other items such as cotton, wood, salt, and lime. Along the eastern boundary of the empire, the Bajío region includes parts of southern Guanajuato and Querétaro, which are defined by wide temperate valleys and low rainfall. In the northern part of imperial territory, the Lerma River formed one of the largest hydrographic features in Mesoamerica and linked central and western Mexico. In the south, the Río Balsas depression served south-central Mexico and the Oaxaca Valley, parts of which contained copper, silver, and gold deposits.

Purépecha Governance in Ethnohistory

Between the 14th and early 16th centuries, Purépecha rulers are thought to have established the most consolidated and centralized empire in Postclassic Mesoamerica (1000-1521 CE) (Beekman 2010; Pollard 2013; Smith and Berdan 2003a). This was due in part to the highly centralized bureaucratic system instituted by the Purépecha elite that is described in the partially preserved RM. It is important to emphasize that although ethnohistoric documents are commonly used in Postclassic Mesoamerican studies, the RM has served as a guiding force for archaeological research on the Purépecha Empire. Compared to the more widespread accounts of pre- and post-conquest societies in central Mexico, Oaxaca, and the Yucatán peninsula, few germane documents exist for western Mexico except for the RM and it has thus become a key source for research in the region. Other documents that refer to the empire include the *Relaciones geográficas* of 1579-1580 (Corona Núñez 1958), the *Carvajal visitas* of 1523-1524 which lists major settlements and their subject settlements throughout the Purépecha Empire prior to the establishment of the Spanish *encomienda* system (Gorenstein and Pollard 1983; Pollard 1993; Warren 1985), the *Suma de visitas de pueblos* of 1547-1550 (Paso y Troncoso 1905), and the writings and maps of Pablo Beaumont (1932) and Eduard Seler (1914) which include reproductions of the cartographic *pinturas* drawn in the decade following 1538 (Gorenstein and Pollard 1983:ii, 13). Sources from central Mexico, such as the *Florentine Codex* of 1569 by Fray Bernardino de Sahagún (1970), various Aztec codices, Hernán Cortés' (2001) *Letters from Mexico*, and summaries of secondary sources are also useful for understanding how the Purépecha interacted with their Aztec neighbors (see Hernández 2000:47–59). Fortunately, over the past 45 years these ethnohistoric documents have been reproduced and analyzed for their depictions of Purépecha society by scholars of anthropology, archaeology, and history (Aguilar González 2005; Afanador-Pujol 2015; Albiez-Wieck 2011; Beltrán 1994; Berdan et al. 1996; Berdan 2014; Espejel Carbajal 2008; Gerhard 1972; Gorenstein and Pollard 1983; Haskell 2008, 2013; Hassig 1988; Krippner-Martínez 2001; K. Lefebvre 2012; Martínez Baracs 2005; Michelet 2010; Pollard 1993; Puaux 1990; Roskamp 1997, 2010; Stone 2004; Warren 1971, 1985).

The most widely used document, the RM, is an official history of the Purépecha that is attributed to Fray Jeronimo de Acalá, a Franciscan friar who lived in Michoacán for several years. In 1539, after a request by the viceroy of New Spain, Don Antonio de Mendoza, Acalá asked Purépecha priests to recount the elite origin story. This was done through a long speech that had been traditionally narrated every year by the chief priest (*petámuti*), capturing the attention of the audience over the course of an entire day. The document is divided into three parts: the first part which is lost was devoted to religious concepts and activities; the second part recorded the official history of the Purépecha kingdom; the third part discussed Purépecha customs such as marriage and death practices, and concluded with the story of Spanish encounter at Tzintzuntzan. Most interesting for archaeological study, the RM was illustrated with 44 paintings that depict material objects, landscapes, and other daily activities which bring to life pre-Hispanic Purépecha society (Figure 2.3). Yet, while the RM has been central to our understanding of the Purépecha Empire, scholars have questioned the authenticity of the stories and descriptions in the document: the text may have been a part of the origin myth of the Purépecha elite, but other portions are similar to medieval, feudal European monarchic systems (Espejel Carbajal 2008; Haskell 2008; Stone 2004). Study of the context of textual production and its early colonial purpose will help us better understand the role of the RM in Purépecha history and archaeology (e.g. Afanador-Pujol 2015).

Figure 2.3. *De la justicia general que se hacia* (Concerning the general administration of justice) (Escobar Olmedo 2001). Courtesy of Dumbarton Oaks Research Library Rare Books Collection f. 61, facsimile no. 284.

The story of Purépecha origins and imperial expansion is an exciting and at times violent work of oral history. According to the RM, the semi-nomadic eagle (*uacúsecha*) lineage migrated from the Zacapu Basin to the Pátzcuaro Basin in the 1200s (see also Beaumont 1932:Ch. 7). After defeating several chiefdoms in the region, leader Taríacuri ruled from the city of Pátzcuaro and installed his nephews Híripan and Tángaxoan as lords of the cities of Ihuatzio and Tzintzuntzan. Between 1350 and 1440, their descendants expanded Purépecha territory throughout western Mexico. The success of this expansion may have depended on aggressive acculturation practices including the export of imperial elites to new territories to oversee political marriages, newly-instituted religious practices, and tribute collection. According to Pollard's reading of the RM (1993:88–90), in 1440 Purépecha leaders instituted a tributary system and an administrative bureaucracy centered in the Pátzcuaro Basin and other administrative centers that served as bases for future conquests. The political economic system functioned by appointing a tribute collector (*ocámbecha*) for every 25 households who would submit payments to the central authority in Tzintzuntzan (Beltrán 1994). Tribute largely varied by settlement. For example, at the high-ranking site of Acámbaro located on the northeastern border of the empire, inhabitants paid maize, food stuffs, and bolts of cotton cloth to Tzinztuntzan while Pátzcuaro Basin residents may have paid tribute in labor (Aguilar González 2005; Beaumont 1932:64–69). The RM also lists numerous officials who were in charge of each aspect of craft production and resource procurement, ranging from hunting, wood-work, and pottery production, to *pulque* and honey processing (Alcalá et al. 2000:558–572). In other words, the RM depicts a highly-centralized system which coordinated tax collection, leadership, and political economic activity throughout the empire.

Aspects of Purépecha social and religious life are illustrated in the RM, including architecture, social organization, customs, and material culture. Distinctive 'Purépecha-style' ceramic artifacts such as polychrome spouted vessels, miniatures, elaborate pipes, and animal effigy vessels called *patojas* appear in the RM and have been documented archaeologically in the Pátzcuaro Basin and elsewhere in Late Postclassic contexts in western Mexico (e.g. Arnauld et al. 1993; Castro-Leal Espino 1986; Hernández 2000; Macías Goytia 1990; Pollard 1993, 2016a; Porter 1948; Ramírez Urrea 1996). Metallurgy activities and metal objects, which also appear in the RM, were strongly associated with elite culture and played a significant role in the structure of political economic power. Copper ingots and items such as tweezers and bells were given as gifts to foreign visitors and by regional elites to the king, and as tribute to state storehouses in the Pátzcuaro Basin (Pollard 1993:119).

The Purépecha were associated with distinctive architecture, such as the *yácata*, which was a semi-circular rubble-filled pyramid faced with dressed stone slabs that sometimes had petroglyphs and a perishable structure on top. These pyramids were devoted to the main deity Curicuaeri and were related to religious practices such as human sacrifice in major settlements. The recovery of skeletal remains of several elite individuals exhibiting dental modification and grave goods associated with the Tzintzuntzan *yácatas* indicate that they were also used in funerary contexts (Moedano 1941; Rubín de la Borbolla 1939, 1941). According to the RM, there was a ball court in the Lake Pátzcuaro Basin at the site of Ihuatzio devoted to the goddess Xarátanga, but architectural evidence is not clear (though see Cárdenas García 2004). Ball courts associated with Purépecha culture have been identified in the Zacapu Basin (Michelet et al. 1995; Taladoire 1989) and ethnographic accounts document ball games elsewhere in Michoacán such as in the Sierra Tarasca (Beals and Carrasco 1944) and in the Lake Cuitzeo Basin (Corona Núñez 1958).

Purépecha religion is not particularly well understood because the RM portion that probably described specific details has been lost. Mention of religious activities in existing parts of the RM and in other ethnohistoric and ethnographic accounts suggests that a Purépecha regime-sponsored ideology emerged some time during the Postclassic period (Pollard 1993; Silverstein 2001). In fact, Purépecha religion may have developed as a part of political authority construction – in an effort to galvanize existing diverse populations and belief systems into a politically-mandated enterprise (Pollard 1993; Haskell 2008). Major deities were Cuerauáperi, the creator goddess who was venerated throughout Purépecha territory; Curicaueri, the god of fire; and Xarátanga, the moon goddess. In addition, several cults associated with specific deities are listed in the RM along with related aspects (e.g. wood; bloodletting; human sacrifice) and the roles of priests during ritual practices (Corona Núñez 1957; Leon 1903; Pollard 1993:Ch. 7). Religious events included a calendar system which revolved around two monthly rituals related to fertility and the glorification of the Purépecha regime (Caso 1943). During this latter event, the RM was retold and subjects were invited to renew or reaffirm their loyalty to Purépecha leaders.

In the 15th and early 16th centuries, the Purépecha fought a number of wars against the Aztecs and their allies, but there is no record of them losing against the larger empire (Durán 1984:282; García Payón 1942:80). Though the first instance of conflict between the two empires occurred in northeastern Michoacán in 1462 and is recorded as a Purépecha attack, the Aztecs consistently attacked the Purépecha eastern border between 1475 and 1478. Following a devastating Aztec loss near present-day Charo, Michoacán, Aztec King Ahuitzotl (1486-1502) changed strategies and instead heavily fortified his western boundary with the support of ethnic border populations (Hassig 1988:186–187; Warren 1985:11). These populations – the Matlatzinca, Mazahua, Chichimec, and Otomi – were instrumental in the formation and maintenance of political frontiers, and served as critical buffers between the two empires (Carrasco Pizana 1979:40–42; Hernández and Healan 2008; Corona Núñez 1958:248; Warren 1977:4). Archaeological research along the border of the two empires has documented a series of forts within the rugged topography, which suggest a state of chronic warfare that probably defined transfrontier political and ethnic relations (Gorenstein 1985; Silverstein 2001).

When Hernán Cortés and his European cohort arrived in Veracruz in 1517, Purépecha rulers in the imperial core were aware of Spanish presence due to an intricate network of spies in Aztec territories and later due to several Aztec emissaries sent to Tzintzuntzan requesting aid. The Purépecha refused to help their enemies against the Europeans. As early as February 23, 1521, soldiers under the command of Cortés had met with representatives of the Purépecha *cazonci* at Taximaroa (now Ciudad Hidalgo), a village on the border between the Aztec and Purépecha empires (Hassig 1994:33–34; Krippner-Martínez 2001:17; Martínez 1989:39–73; Warren 1985:29). Pablo Beaumont (1932:Ch. 5) recounts in the *Crónica* that Spanish general Cristóbal de Olid arrived at Tzintzuntzan in 1522 and that *cazonci* Tangáxuan II submitted without resistance. In his *Letters from Mexico*, Cortés (2001:271, 284) notes that the *cazonci* visited him in Mexico City in 1524 or 1525 and agreed that some male children of the indigenous elite would be educated by the Franciscans (Warren 1985:83–84). Importantly, despite these Spanish claims of submission, the *cazonci* continued to rule in Tzintzuntzan and refused to recognize Spanish direct tribute claims until his death in 1530. Nuño de Guzmán tortured and executed the *cazonci* after presiding over a trial which convicted the leader for killing Spaniards, and for stealing gold and silver that belonged to the Spaniards, among other accusations (for discussion of the trial, see Krippner-Martínez 2001:Ch. 1).

Material Evidence: Archaeological Data in the Imperial Core and Beyond

Archaeological research has examined this ethnohistoric model by looking at how the Purépecha regime controlled elite identity, economy, and border zones to the north. Scholars have argued that political changes were triggered by environmental fluctuations and associated population growth (Gorenstein and Pollard 1983; Pollard 2008). During the Early Middle Preclassic period (Figure 2.4), sedentary or semi-sedentary farmers probably inhabited the region. There is no archaeological evidence for this occupation in the Pátzcuaro area, however, and it is based solely on the presence of maize pollen from sediment cores dating to 1500 BCE (Bradbury 2000). Pollard (2008) believes that this population was culturally part of Chupícuaro societies, a dominant Preclassic tradition from the eastern Bajío region that has been found in the Cuitzeo Basin, the Valley of Mexico, the Tlaxcala-Puebla Valley, and in the neighborhoods at Guadalupita Las Dalias, Puebla (see also Darras and Faugère 2007). Although Chupícuaro style artifacts have not been recovered in the lake basin, based on material syncretisms throughout the pre-Hispanic period in western Mexico, the tradition has been associated with the Purépecha since excavations in 1926 uncovered round-based pyramids at the sites of Cuicuilco and Chupícuaro, Guanajuato (Carot 2013:135). In 1945 and 1946, a salvage project led by Rubín de la Borbolla in an area on the outskirts of Chupícuaro that was set for destruction by the Solis Dam Project recovered clay-lined basins, complete vessels, a tomb with 400 burials and offerings, 46 dog burials, and disarticulated human crania which may represent an early trophy head cult (Carot 2013:136–142; Estrada Balmori and Piña Chan 1948; Porter 1956). While unfortunately the dam construction destroyed archaeological evidence of six centuries of Chupícuaro occupation, a recent Centro de Estudios Mexicanos y Centroamericanos (CEMCA)-directed study of the salvaged artifacts has sought to document the widespread influence of Chupícuaro art and customs throughout central and western Mexico (Faugère 2013; Maurer et al. 2011). It is possible that evidence for such influence does exist in the Pátzcuaro Basin and that structures and artifacts are covered by later occupation episodes or that they were destroyed by the fluctuating lake levels; however, this remains for future research.

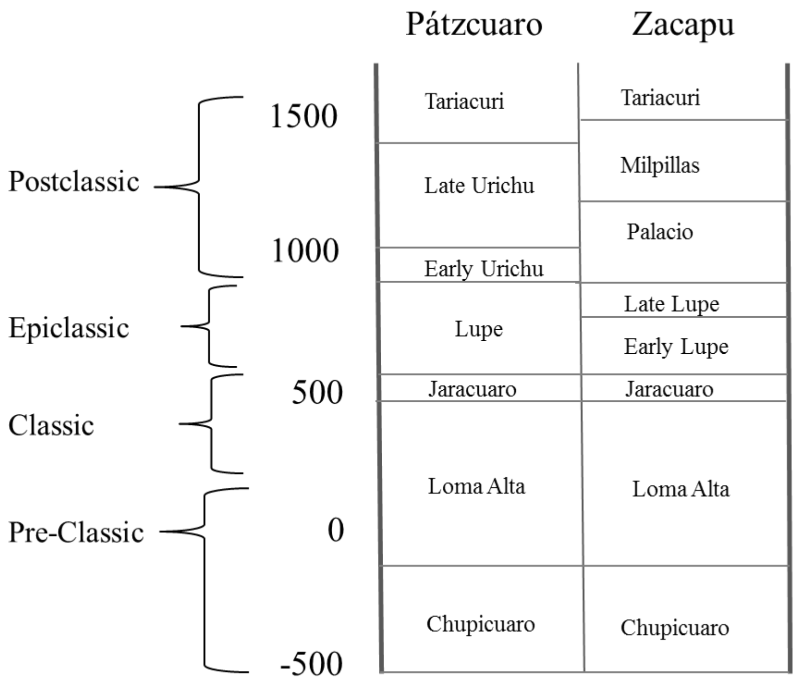

Figure 2.4. Local chronologies in the Pátzcuaro and Zacapu Basins. Pátzcuaro chronology is based on data from Fisher et al. 2003; Pollard 2008; Pollard and Cahue 1999; Zacapu data are after Carot 2001, 2013; Michelet 2013; Pereira 1999, 2013.

The next cultural period during the Late Preclassic to Classic periods (150 BCE to 550 CE) is called Loma Alta, after a type site in the Zacapu Basin. In the Pátzcuaro Basin, Loma Alta materials have been identified in lacustrine and non-lacustrine areas at the sites of Erongarícuaro and Urichu, and possibly from surface survey and Late Classic period layers at Tzintzuntzan (Cabrera Castro 1996; Carot 2001; Haskell 2008; Pollard and Vogel 1994; Pollard 2008). Five radiocarbon dates from burial contexts, trace evidence of architecture at Erongarícuaro, and long-distance obsidian trade are thought to represent the emergence of social inequality in the region (Pollard 2008). This interpretation is based largely on the Loma Alta site data and while it is possible that the Pátzcuaro Basin followed the same pattern as the Zacapu Basin – earlier Chupícuaro populations transitioned into socially-ranked Loma Alta societies – much more archaeological material needs to be recovered and examined to assess this model.

At the type site of Loma Alta, archaeologists point to the presence of monumental architecture, distinctive funerary practices, and long-distance trade as indicative of increasing social ranking. Located in the Zacapu Basin approximately 20 km from the western edge of the Pátzcuaro Basin, Loma Alta was first identified in 1983 and subsequently studied by CEMCA researchers (Arnauld et al. 1993; Carot 2001). Excavations have documented an ancient island cemetery and ceremonial center, which includes quadratic and circular platforms, a sunken plaza with a main platform and altar, and 40 funerary urns that may be linked with the Bajío traditions nearby (Arnauld et al. 1993; Carot 2013). Some Loma Alta funerary practices were distinctive from previous Chupícuaro traditions: the body was first cremated and deposited in a painted vessel; later, the vessel was opened and the bones were pulverized and mixed with lime (*cal*) to produce a fine powder which was put back into the urn and reburied (Carot 2013:168; see also Pereira 1999). This particular procedure marks a shift from interment techniques and other social practices known from Preclassic western Mexico such as the shaft tomb tradition in Jalisco, Michoacán, and Colima (Beekman 2006; Morales 2013). Over 40 motifs that depict deer, coyotes, birds, serpents, etc. have been documented on polychrome pottery, which Carot (2001, 2013) believes are similar to motifs in the American Southwest and therefore demonstrate a migration of Loma Alta societies to the northwest (cf. Haury 1976). During this time, there is evidence that Loma Alta societies and other contemporaneous settlements in the Cuitzeo Basin area emulated Teotihuacan art and figurines (Filini 2004; Kelly 1947:202–208; Pereira 1999), for Loma Alta figurines at Teotihuacan (Begun 2013; Carot 2013:172; Gómez Chávez and Gazzola 2013), and for long-distance obsidian exchange between western Mexico and elsewhere in Mesoamerica (Golitko and Feinman 2015; Rebnegger 2013). Based on the documentation of the Loma Alta phase in many parts of Michoacán, current interpretations suggest a period of transition from the earlier Chupícuaro societies to small socially-ranked agrarian societies that provided a foundation for later Epiclassic and Postclassic Purépecha cities (Carot 2001, 2013; Macias Goytia 1990; Michelet 2013; Pollard 1993, 2008).

The Later Classic and Epiclassic periods in the Pátzcuaro Basin are defined by increasing populations and small-scale ranked polities. Study of burials from the Lupe phase (600-900 CE) at Urichu suggests that elite individuals were associated with imported and luxury grave goods and that the number of associated goods increased dramatically (Pollard 2008; Pollard and Cahue 1999). These included prismatic blades made from green Pachuca obsidian in central Mexico, shells from the Pacific coast, and other ceramic objects such as Tula-style flutes and polychrome vessels (Pollard and Cahue 1999; Rebnegger 2013). Trace-element studies of ceramics from Urichu suggest that ceramic production probably remained localized at this time (Hirshman 2008). Interestingly, the burials at Urichu indicate that males were interred in large multiple-use tombs while children and women were buried underneath floors and cists (Pollard 2008). Evidence for soil erosion in the southwestern portion of the lake basin during these time periods suggests landscape degradation and subsequent recuperative strategies such as terracing (Fisher et al. 2003).

Elsewhere in the region, the Epiclassic period experienced increasing numbers of settlements and a continued central Mexican influence on architecture and material objects. In the

Zacapu Basin, over ten sites date to the late Lupe phase with plazas and ballcourts; recent work on the ceramic chronology has sought to parse out details about technological changes in the region (Jadot 2016; Michelet 2013; Pereira 2013). Burials of male warriors and associated offerings such as projectiles, atlatls, and maces suggest pronounced social differences (Pereira 1999). Depictions of warfare, figurine styles, and pyrite discs (a Classic period warrior's belt called a *tezcacuitlapilli*) all point to some form of influence from Epiclassic central Mexico that has also been documented in the Zacapu Basin, at the site of Apatzingán, and Tomb 1 at Tingambato (Kelly 1947:125–127; Pereira 1999; Piña Chan and Oi 1982:Fig. 25). In the Bajío and around the Zináparo and Ucareo mining complexes in northern Michoacán, scholars have documented increasing numbers of sites which may indicate expanding populations (Darras 1999; Hernández and Healan 2008). Though the dearth of chronometric dates in much of the archaeology in Michoacán makes direct comparisons with the Zacapu and Pátzcuaro Basin materials difficult, the emerging data seem to reflect increasing populations and pronounced social stratification throughout the region.

In the Pátzcuaro area, the subsequent Early to Middle Postclassic periods (900-1350 CE) have been identified in the local ceramic chronology, but it is not well understood how social practices manifested or changed from previous periods. Significantly, this is the time period that the RM indicates led to the development of the Purépecha regime in the mid-fourteenth century. Until the excavations at Angamuco that are discussed in this dissertation, archaeological data has been primarily from Urichu and some published material from Erongarícuaro. Geoarchaeological data from around these sites in the southwestern part of the basin suggests that site size and number again increased including settlements on newly exposed islands and fertile lacustrine soil that were exposed by an episode of lake regression (Fisher et al. 2003; Haskell and Stawski 2016; Stawski 2012). At this time, the lake level was at its lowest since first human occupation of the basin. Based on the existing model for Zacapu Basin social and settlement developments, Pollard (2008) believes that during this time settlements may have expanded not only onto islands, but also onto defensible upland zones such as a lava flow or *malpaís*. This was due to population pressure and competition for resources.

Recent work in the Zacapu Basin has been working to chronometrically isolate local Postclassic period occupations. Thirteen urban sites such as El Palacio and the Malpaís of Prieto have been documented on a *malpaís* landform of roughly 4 km^2 (M. Forest, personal communication 2016; Michelet 1998). Ongoing research which includes recent LiDAR data indicates that a primary occupation dates to the Epiclassic-Early Postclassic at El Palacio (Palacio phase, 900-1200 CE) and to the Middle Postclassic (Milpillas phase, 1200-1450 CE) at the recently excavated site of Prieto (Forest 2014; Jadot 2016; Pereira et al. 2012). During the Palacio phase, pottery production was characterized by flat-coiling and incised vessels while clay was obtained from local volcanic soils (Cohen and Jadot 2015). Based on personal observation of these sherds at the CEMCA, the forms and styles are reminiscent of spherical and incised vessels from the Prado phase (700-800 CE), Coyotlatelco incised designs from the Corral phase (800-900 CE), and other vessels such as *comales* and spoons that are characteristic of Epiclassic Tula (see for example Cobean 1990:Fig. 33, 87, 122, 189). Fragments of black polished plumbate, which is typical of the Maya region during this time period, were also recovered at El Palacio and recent chemical characterization indicates one import from the Yucatán and several local copies of Tohil Plumbate (Jadot et al. 2016). In contrast, during the Milpillas period at Prieto, vessels were made by scarf-jointed coiling and potters began to exploit clays from the marsh zones of the Zacapu Basin. Instead of incised designs, Milpillas decorated vessels include resist and some polychrome. Based on my personal observation and recent site reports, artifacts from these urban sites show pre-imperial vessel forms and styles that share some affinities with Angamuco ceramics (Cohen and Jadot 2015; Pereira et al. 2012). Future comparative work will help to empirically assess these initial observations.

The current understanding is that the Zacapu *malpaís* sites primarily date to the Postclassic periods. Similar to Pollard's interpretation discussed above, Michelet (Michelet 2008; Michelet et al. 1995) believes that movement to these inhospitable lava flow settlements may have been due to a need for defensive locations and reorganization under a central authority. There is however currently no evidence for warfare in the lake basin. Another theory is that the Milpillas phase settlements such as Prieto represent a migration of individuals who engaged in different technological and social practices (Jadot 2016). Following this idea, the presence of these migrants also corresponds to the RM story of a Chichimeca population moving into the Zacapu area during the Middle Postclassic period and eventually leaving to help form the Purépecha Empire in the Pátzcuaro Basin. In some ways this interpretation may be supported by the archaeological data: the differences in pottery technology between the Palacio and Milpillas phases could represent a new population of migrants into the region; additionally, by the mid-15th century, the *malpaís* sites were abandoned. Though this remains to be tested archaeologically, it is thought that the abandonment represents a migration to the Pátzcuaro Basin as a part of Purépecha centralizing tendencies during imperial expansion (Michelet 2010; Migeon 2003).

Did a similar reorganization occur in the Pátzcuaro Basin during the Early or Middle Postclassic? In addition to the urban site of Angamuco that is the focus of this dissertation, *malpaís* sites probably exist but have not been extensively archaeologically documented elsewhere in the lake basin including at Urichu, Cuanajo, and Santa Fe de Laguna/Quiroga. If these sites do fit into the existing Purépecha development model and the RM narrative, then the Purépecha imperial core region would have been composed of several small and potentially competitive multi-status societies during the thirteenth century. This could have thus been a transitional period when settlement patterns, funerary rituals, and leadership were in flux. In fact, later Postclassic burial data from Urichu shows that while earlier elites exploited non-local items from Central Mexico and the Pacific coast, later Purépecha elites used local products. This shift has been interpreted as a Purépecha elite emphasis on home-grown symbols of power as they established a centralized imperial base in the Pátzcuaro Basin (Pollard 2008; Pollard and Cahue 1999; *cf* Pollard 2016b, 2016c). In Ch. 6, I return to the question of possible socio-political reorganization at Angamuco after I present survey and excavation data in Ch. 4 and 5.

Materials of the Empire: The Purépecha in the Late Postclassic

Sometime during the fourteenth century, the development and consolidation of the Purépecha Empire was visible in the construction of *yácatas*, elite artifacts, and increasing populations around Lake Pátzcuaro. The lake level was at its highest during the Late Postclassic period and low-lying sites were flooded and settlement shifted to the new lakeshore and to areas of high agricultural fertility (Haskell and Stawski 2016; Metcalfe et al. 2007; O'Hara 1993). Long-term landscape modification in the Pátzcuaro area included agricultural intensification during the Late Postclassic which is interpreted as state-sponsored production in part due to population growth (Fisher 2005). Based on the large number of settlements that have been documented in association with the development of the Purépecha Empire, scholars believe that population density reached its highest in the Pátzcuaro Basin during the Late Postclassic period (Gorenstein and Pollard 1983; Fisher et al. 2003; Pollard 1993, 2008; Stawski 2012).

At the imperial capital city of Tzintzuntzan, five *yácata* features were constructed on a raised mound overlooking Lake Pátzcuaro. At another Postclassic Purépecha city, Ihuatzio, the ceremonial core consisted of at least two square-based pyramids and a large plaza with raised walkways or walls. Stone *chacmool* sculptures were placed in front of pyramids at both sites, suggesting major ceremonies celebrating the empire such as ritual sacrifice and stylistic influences from central Mexico and the Maya (Cárdenas García 2004; Miller 1985) Chronometric dates for the sites are lacking, but excavations at the base of the Tzintzuntzan *yácatas* during the 1930s-40s, 1960s, and 1977-78 recovered artifacts that are typically associated with the Late Postclassic Empire (Cabrera Castro 1996; Castro-Leal Espino 1986). As part of a broader national effort to establish a pan-Mexican identity in the present and past, this early work at Tzintzuntzan and Ihuatzio sought to initially identify Purépecha material objects in the archaeological record (Bernal 1980; Oliveros 2011). In 1937, Alfonso Caso was formally invited by Michoacán local and Mexican President Lázaro Cárdenas to do the first systematic excavations at Tzintzuntzan. At the same time, Jorge Acosta (1939) excavated and surveyed at Ihuatzio. Later, research at the imperial capital was undertaken by former students of Franz Boas such as Daniel Rubín de la Borbolla (1939, 1941, 1944) and others (Gali 1946; Moedano 1941) – all individuals who incorporated multiple lines of anthropological evidence into their work, such as skeletal remains, ethnographic accounts, and an emerging scientific archaeology that used stratigraphy.

Major finds of these projects included a preliminary classification of Purépecha style ceramics and architectural features (Acosta 1939); the identification of elite burials and elite burial goods (Acosta 1939; Rubín de la Borbolla 1939, 1941); and a suite of artifacts that comprised a distinct Purépecha identity (metal, ceramics, stone tools, architecture, mortuary traits) (Moedano 1941; Rubín de la Borbolla 1944). Spouted polychrome vessels, *patojas*, use of negative decoration, and other painted motifs were officially associated with Purépecha imperial identity as they were documented in stratigraphic context for the first time.

Later work by Pollard (1972) and Stawski (2008) sought to map the broader settlement of Tzintzuntzan using ethnohistoric data from the RM and pedestrian and remote survey. Pollard's (Pollard 1972) survey collections helped to establish an initial type-variety system that has been used to identify Purépecha imperial style ceramics throughout the imperial territories. A GIS-based model suggests that the ancient city exhibited high levels of residential zoning in which areas were divided by social classes of individuals, including various levels of elites and commoners (Stawski 2012). Furthermore, it is possible that political, administrative, and economic areas were not spatially separated since all activity was designed to serve the *cazonci*, who was associated with the palace on the main *yácata* platform (Pollard 1993; Stawski 2012). While such mapping projects are important, much more materially-grounded archaeological work remains to be to done to identify which areas of the imperial capital were inhabited by particular groups of individuals.

Elsewhere in the Pátzcuaro area, excavations at Urichu in the 1990s were designed to establish chronometrically-dated and stratigraphic sequence for the lake basin (Pollard and Cahue 199). Pollard (2008) recovered Late Postclassic imperial style artifacts, including spouted polychrome vessels, zoomorphic vessels, and miniature items which suggest that regional imperial elites consumed items identical to those from the capital. This has been interpreted as a shared Purépecha elite and commoner identity in which the Late Postclassic lake basin participated in a single social system dictated by imperial cultural traditions. Archaeological survey and excavation at the site of Erongarícuaro in the early 2000s documented ceramic pipes and finely crafted ceramic vessels that may have been used for feasting activities (Haskell 2008, 2013; Pollard 2005). The recovery of a copper bell, spindle whorls, and other possible tripod bowls could indicate the remains of a Purépecha temple platform (Haskell 2013). Forthcoming publication of the Urichu and Erongarícuaro data sets will provide an excellent framework in which to compare local developments in the lake basin throughout broader Purépecha imperial changes.

Resource Extraction and Production

Research into resource exploitation and production shows that while the Purépecha Empire may have exacted tribute from its subjects, all craft production was not under direct state control. For example, the primary supplier of copper was the central Balsas Basin in the southern portion of Purépecha territory, but there is evidence that smelting – one of several key production steps – occurred in other areas such as Zirahuén Basin, south of Pátzcuaro (Hosler and Macfarlane 1996; Maldonado and Rehren 2009). After copper ingots were produced, they were sent to yet another location for final processing. This means that intermittent specialists, who carried out copper production steps such as smelting in addition to other activities such as farming, were probably key players in the broader political economic system (Maldonado 2009). Moreover, imperial involvement in production varied and economic integration was probably very local.

Lithic and ceramic production studies reflect a similar pattern. Obsidian, which is not local to the imperial core, was primarily exploited during the Late Postclassic from the Ucareo-Zinapecuaro source in Michoacán (Rebnegger 2013). This source was used throughout central and western Mexico during the preceding time periods, but was largely limited to the Purépecha territories during imperial consolidation (Pollard and Vogel 1994). This may have been because the Purépecha wanted direct control over the Ucareo-Zinapecuaro source area which is in a strategic region that bordered the Aztec Empire (Hernández and Healan 2008; Healan 2009). Importantly, however, the empire did not control all aspects of production since obsidian items continued to be processed by part-time specialists and in households near the Zináparo mining complex (Darras 2008, 2009). Pottery manufacture at sites in the Pátzcuaro Basin may also have been local though with clear stylistic changes during the Late Postclassic. Comparison of ceramics between the Classic and Postclassic periods at the site of Urichu and Postclassic ceramics from Tzintzuntzan suggest that Purépecha pottery emerged from a long tradition of local forms and motifs rather than from top-down, state-controlled production (Hirshman 2008; Hirshman et al. 2010). Interestingly, based on a study of ceramic paste and distributional patterns, Pollard (2016a) argues that some vessel forms may have been produced centrally and distributed for gift-exchange. This would be interesting to test in future work both within the heartland and throughout the imperial territories.

The Imperial Borderlands

Settlements along the imperial border regions reveal a mixed picture of imperial consolidation and porosity (see Pollard 1994) Along the regime’s northeastern border, between the states of Michoacán, Hidalgo, Querétaro, and México, there is evidence for different ethnic communities (e.g. Otomí, Matlatzinca, Nahuatl, and Purépecha speakers) throughout the Postclassic who may have served as a “buffer” between the warring Aztecs and Purépecha (Hernández 2000; Hernández and Healan 2008). Borderland fortress communities retained distinct practices despite allegiance to their respective kings in Tzintzuntzan or Tenochtitlan (Gorenstein 1985; K. Lefebvre 2012; Silverstein 2001). In northern Michoacán in the Cuitzeo Basin, Purépecha objects and local ceramics have been recovered in association with temples and tombs, indicating contemporaneous Purépecha and non-Purépecha populations (Macías Goytia 1990). In the Sayula Basin, Jalisco, Purépecha elite ceramics and other artifacts were found exclusively in local elite burials, suggesting that Purépecha symbols were exported and used to constitute authority in heterogeneous border regions (Acosta Nieva 1996; Ramírez Urrea and Cárdenas 2006).

In the twentieth century, other piecemeal studies were conducted along the southern and western borders of the empire. Though lacking chronometric dates, these studies documented *yácatas* and Purépecha-style pottery. For example, as part of Donald Brand's University of New Mexico project that focused on pre-Hispanic Michoacán and Guerrero in 1939, John Goggin (1943) surveyed the modern towns of Apatzingán, Nueva Italia, and Tepalcatepec. He recorded rubble-filled and earth-filled *yácatas* throughout the area and a spouted "teapot" that is similar to items recovered in the Postclassic excavations from Tzintzuntzan (Goggin 1943:51). At Apatzingán, Isabel Kelly (1947:35–41, 202) excavated several mounds and documented tripod bowls with polychrome and negative designs that she assigns to the Postclassic Chila phase and that are similar to Postclassic types recovered in the Zacapu and Pátzcuaro Basins (see discussion in Chapter 5; also Cohen and Jadot 2015). Also associated with these likely Postclassic layers are copper objects and decorated ceramic pipes. Though Kelly (1947:200–201) argued that Tepalcaltepec did not encounter Purépecha imperial expansion because the area is not mentioned in ethnohistoric texts, these Purépecha type artifacts suggest that the area may have experienced some stylistic exchanges or influences. Interestingly, a small sample (n = 17) of Chila phase obsidian from Kelly's excavations at Apatzingán were sourced using rapid-scan x-ray fluorescence and the results show that all samples were from Cerro de las Navajas (400 km to the northeast) or Guadalupe Victoria (400 km to the east-northeast) (Hester et al. 1972). These long-distance procurements suggest that perhaps the region was not in good contact with the Purépecha Empire, which at that time controlled the closer Zinapécuaro/Ucareo obsidian zone. Although the Apatzingán area has been politically unstable in recent years, making field research difficult, it will be interesting to further examine the potential communication or animosity between the Pátzcuaro core and this region.

Ideas about Long-Term Cultural Continuity

Archaeological work over the past few decades has sought to problematize the limited ethnohistorical accounts of Purépecha development and governance (Arnauld et al. 1993; Carot 2013; Darras 1999; Gorenstein 1985; Hernández and Healan 2008; Fisher 2005; Fisher et al. 2003; Michelet 2008, 2010; Pereira 1999; Pollard 1993, 2008). One perspective that has become increasingly accepted is that the Purépecha Empire did not emerge in a vacuum during the Late Postclassic, but was rather the product of long-term changes throughout Western Mexico. Postclassic artifact styles and motifs may have their roots in earlier Pre-Classic to Classic period Chupícuaro and Loma Alta traditions, and artifact changes do not reflect significant ruptures over time (Carot 2013; Michelet 2013; Pollard 2003b, 2008, 2013).

It is interesting, however, that this long-term model of Purépecha identity can be linked to the pan-Mexican and Partido Revolucionario Institucional (PRI) political archaeology that occurred in the 1930s-40s. As mentioned above, early work at Tzintzuntzan explicitly sought to identify relationships between the Purépecha and other communities across Mexico – a goal which fit in nicely with pan-Mexicanism and PRI political rhetoric that sought a materially connected sense of history (Bernal 1980; Litvak King 2007). Research often focused on the links between Michoacán and the rest of Mexico. For example, Noguera (1932) discussed findings from Pre-Classic period shaft tombs in northwestern Michoacán that showed later Purépecha influences from Teotihuacán. Ceramic studies were explicit in their attempt to illuminate interaction between western Mexican societies and the Mixtec, Puebla, and Teotihuacán cultures elsewhere in the country (Ekholm 1942; Lister 1949). On the one hand, this research may be viewed as a product of diffusionist explanations for cultural change that were present elsewhere in archaeology (Trigger 2006:246–247); on the other hand, purported links between different geographical and temporal zones throughout Mexican prehistory were in line with claims for a pan-Mexican history.

In order to popularize the Purépecha Empire and to celebrate the Purépecha descendant community, Tzintzuntzan and Ihuatzio were made into *Zonas de Arqueología* in 1992 (though INAH established site boundaries since at least the 1940s). Today, visitors can walk around the reconstructed *yácatas* and visit a newly-constructed museum that exhibits some of the material highlights of the 1930-40s excavations (e.g. stone tools; figurines; metal bells and tweezers). The area around the pyramids and associated stone ruins is littered with pottery sherds, and in some areas, with human bone possibly from sacrificial activities. The site makes accessible the monumental and material remains of the Purépecha Empire and their indigenous descendants, some of whom live near the site and elsewhere in the Pátzcuaro area today. In effect, Tzintzuntzan and other government-led archaeological zones try to document continuity in Mexican history from the earliest pre-Hispanic times to the present, while at the same time showing how a Mexican past is a collective one.

This long-term model of Purépecha complexity and change does provide an important foundation for understanding localized practices in both the Pátzcuaro area and elsewhere in the Late Postclassic imperial territories. Less clear however is the mechanisms for empire formation and the changes in internal social, political, and economic structure that must have occurred in pre-imperial contexts. How did Purépecha leadership subjugate existing local communities? How were particular domestic and social practices affected during subject incorporation and when did this occur?

This dissertation aims to address these types of questions in the imperial core region at the ancient city of Angamuco. Located on a *malpaís* approximately 9 km southeast of Tzintzuntzan, Angamuco was occupied from at least the Classic to Late Postclassic periods (300-1530 CE), with a primary occupation before and during imperial changes in the Postclassic. Covering an area of over 26 km^2 and comprised of minimally 40,000 stone architectural features such as *yácatas*, roads, terraces, and domestic structures, this city was first documented archaeologically in 2009 and demonstrates that complex urban centers existed in the core region before the Purépecha established their empire (Chase et al. 2012; Fisher and Leisz 2013; Fisher 2010; Fisher et al. 2011, 2012, 2016, 2016 in press). This is particularly significant because if a large population of people was living in the Pátzcuaro area before imperial consolidation, this means that the path to imperial development must have occurred earlier than previously thought. If the Purépecha did emerge from a long trajectory of social, economic, and material practices in the Pátzcuaro Basin, then they had to negotiate with existing cities or even states with complex bureaucratic systems and large populations. This dissertation will contribute to the regional model of Purépecha development by incorporating a local perspective on domestic and public strategies of political incorporation and social change.

Chapter Summary

In this chapter I reviewed the traditional model of Purépecha development by incorporating archaeological research from the Pátzcuaro Basin imperial core region and elsewhere in the imperial territories. First I discussed the geography of the empire, including multiple centuries of environmental and lake-level changes that have been recorded in the Pátzcuaro Basin. Next I considered the ethnohistoric and subsequent historical analyses of the Purépecha in Aztec and Spanish sources in the century after the Spanish arrived in Mesoamerica. In particular, I highlighted how the RM has been a critical force behind research in Purépecha studies and how textual information has contributed to existing interpretations of archaeological data. Following this I examined the material evidence that comprises the Pátzcuaro Basin chronological sequence primarily at the excavated sites of Urichu and Erongarícuaro. I also incorporated data from other societies in western Mexico, which are thought to have influenced the Purépecha during the Late Postclassic period, including from Chupícuaro, and Loma Alta and Lupe in the Zacapu Basin. Discussion of these sites and their associated artifact traditions is important because the Pre-Classic through Classic periods of the existing Pátzcuaro Basin social evolutionary model is not well-documented and thus borrows material and ideas about social behaviors from these areas.

In this chapter I evaluated much of the archaeological research that has been conducted in the Purépecha imperial core region throughout the twentieth century. Initial excavations in the 1930s were linked with the creation of a pan-Mexican identity after the Revolution (1910-1922), but ultimately helped to establish a framework for identifying Purépecha type artifacts and architecture. Archaeological work from other imperial territories such as the Cuitzeo and Sayula Basins were also included in discussion of resource exploitation and extraction and imperial borderland activities. I concluded this chapter by considering ideas of long-term cultural continuity in western Mexico from the Preclassic through the Late Postclassic Empire. Regime-local relations were likely more complicated than the ethnohistoric record suggests. Scholars argue that the Purépecha Empire developed over a long trajectory in western Mexico, over multiple centuries of social and material change. I emphasize, however, that it is important for future research to incorporate both regional and local perspectives into what were undoubtedly a series of political, economic, and social negotiations that occurred between individuals and institutions within diverse contexts.

CHAPTER 3. METHODOLOGY

This project involved multiple research phases including survey and excavation in the Lake Pátzcuaro Basin, laboratory analysis in Mexico City, and geochemical characterization and radiocarbon dating at institutions in the U.S. The fieldwork component of this research was done as a part of the LORE-LPB project, which I participated in as a Crew Chief (2009-2011) and as a Field Director and Ceramic Analyst (2012-2014). In this chapter, I describe each research phase and include justification for why certain procedures were employed, the benefits of these techniques, and the specifics of sampling strategies during excavation and ceramic and chronometric analyses.

I begin by discussing our full-coverage survey strategy, which was adapted to the dense vegetation and urban architectural conditions at the site. Use of Light Detection and Ranging (LiDAR) data in association with traditional survey techniques greatly aided our ability to document features and to analyze the spatial layout of the city including individual buildings, plaza groups, and larger neighborhoods across the site. I also summarize how architectural and artifact data were processed, catalogued, and stored in the field and laboratory settings. Next I discuss the excavation strategy in 2013 and 2014 during which we tested several different types of social and spatial contexts using both horizontal and vertical excavation techniques. The combination of strategies ensured that we could evaluate different areas and establish more stratigraphic and chronological control.

In the next section I focus on the laboratory analyses of ceramic artifacts. For this research phase, I spent roughly six months at the Centro de Estudios Mexicano y Centroamericano (CEMCA) laboratory in Mexico City refitting sherds, categorizing forms, identifying decorative styles, and photographing representative samples of the ceramic materials. During this time, I conducted attribute analysis on a sample of excavated ceramics that coded for quantitative and qualitative variables throughout the site and within excavation contexts. I included a small sample of survey sherds in this analysis as a representation of the broader site.

The next section presents the archaeometric methods employed for understanding differences in the ceramic production and consumption. I first discuss my sampling strategies and use of Instrumental Neutron Activation Analysis (INAA) for assessing geochemical characterization of sherds and raw clay briquettes. This technique was used in order to examine clay procurement strategies, paste recipes, and the relationship between ceramic manufacturing and consumption of different forms and styles of vessels over time. Finally, I discuss the organic samples that were submitted for radiocarbon dating of different areas. Though cost and risk of contamination limited the number of samples that could be analyzed, the initial absolute dates presented in this dissertation provide a foundation for evaluating the urban settlement pattern at Angamuco.

Survey and Mapping 2009-2011

The LORE-LPB was originally developed in 2007 in order to explore the relationship between socio-political and environmental changes in the eastern part of the lake basin before and during the formation of the Purépecha Empire in the Postclassic period (900-1530 CE). Current understanding of imperial development derived from archaeology and ethnohistory indicates that this part of the basin was located between the two powerful polities of Pátzcuaro and Tzintzuntzan, and that at the time of Spanish conquest was directly controlled by the Purépecha dynasty (Enkerlin 1993; Gorenstein and Pollard 1983; Pollard 1993). Previous research in the region has examined pre-Hispanic sites such as Urichu and Erongarícuaro in the southwestern part of the lake basin (Pollard and Cahue 1999; Pollard 2003b), but there has been limited archaeological work on the eastern side of the lake – with the important exceptions of early work at Tzintzuntzan and Ihuatzio (Acosta 1939; Moedano 1941; Pollard 1972:197, 1972, Rubín de la Borbolla 1939, 1941) (Figure 2.2). In addition, previous geoarchaeological work by Fisher (2000, 2005; Fisher et al. 2003, 2009) in the southwestern part of the lake basin suggested large-scale agricultural reorganization such as terrace construction around the emergence of the Purépecha Empire (c. 1350 CE). Less clear were the socio-cultural and material responses to these political events, especially in the eastern part of this Purépecha core area. Study of the eastern area is thus critical for understanding how pre-imperial polities were integrated into Purépecha culture and the impacts of the emerging empire on existing settlements.

LORE-LPB team members conducted pedestrian full coverage survey of Angamuco over six months during the rainy season in May through July 2009, 2010, and 2011. For the final season, we were able to use LiDAR-derived hillshades to advance the feature recording process. As part of the LORE-LPB project, the survey involved the participation of over 20 scholars and students from institutions in the U.S., Mexico, and France. Additional information about the survey methodology is available in LORE-LPB reports to INAH and a recent Master's thesis (Bush 2012; Fisher et al. 2011, 2012).

Full-Coverage Pedestrian Survey

A major goal of the LORE-LPB was to document settlements in the eastern lake basin and to identify a regional settlement pattern using full-coverage pedestrian survey. Common throughout the Americas since Gordon Willey's (1953) pioneering Virú Valley study, settlement pattern analyses derived from survey of large regions are standard in highland Mesoamerica (e.g. Balkansky 2006; Balkansky et al. 2000; Billman and Feinman 1999; Blanton 1999; Kowalewski 2008; Nichols 1996; Parsons and Whalen 1982; Rodríguez et al. 2011; Sabloff and Ashmore 2001; Sanders et al. 1979; Stark and Garraty 2008). The goals of this approach include documenting changes in settlement distribution, reconstructing ancient populations (e.g. demographic reconstructions), positioning settlements and other features relative to land degradation, and evaluating the effects of changing environmental conditions on human populations (Billman and Feinman 1999; Kowalewski 1990). Importantly, a full coverage survey entails mapping an entire study area with a consistent degree of resolution. This involves spacing field crews along equal transacts and mapping material distributions consistently. Key benefits of full-coverage survey include the acquisition of larger databases with greater variability, an understanding of spatial relationships between sites and artifacts, and the identification of regional boundaries and multi-scalar settlement patterns (Balkansky 2006; Kowalewski 1990:39–75, 2008).

While useful for examining the macroregional scale of a large area, there are a few critical limitations of full-coverage survey. First, the size of the research area can be tens of thousands of square kilometers. This means that such survey projects become expensive and multi-generational due to the decades required to study large areas and rugged terrains. Second, this type of survey does not necessarily work in areas with dense vegetation: field crews have limited visibility and it can be difficult to navigate through heavy tree cover and shrubs, and to keep a consistent pace with someone on rocky terrain 15-30 m away. Finally, for landscapes that may include urban sites, full-coverage survey must be adapted for documenting densely-situated architecture. If surveyors are the first to archaeologically record an urban site, would they realistically move on before examining the spatial layout of the ancient city? This is particularly relevant because urban surveys are often only partially documented and published due to the immense amount of time necessary to document complex sites. For example, even the innovative Teotihuacan Mapping Project (Millon 1973) which produced a map of 20 km^2 of the ancient city and associated sites, collected 1.25 million artifacts, and facilitated studies about neighborhood organization and construction, craft production, cosmology, and regional dynamics (e.g. Cowgill 1997, 2003; Manzanilla 2015; Murakami 2015), took years to publish an urban map (see Cowgill 2015; Millon and Altschul 2015). Mesoamerican archaeologists have some fully published urban surveys (Blanton 1978; Healan 1989; Hirth 2000; Finsten 1995; Feinman and Nicholas 2004), but most are partial or preliminary studies (e.g. (Balkansky 1998; Charlton et al. 2000; Fargher et al. 2011; García Cook and Merino Carrión 1998; Joyce et al. 2004; Ohnersorgen 2006; Rodríguez et al. 2011; Pollard 1972; Stark 1991).

With these limitations in mind, the LORE-LPB incorporated a modified full-coverage survey methodology. As discussed below, we combined pedestrian survey of a rugged urban site with airborne laser mapping to increase the speed at which we mapped the city of Angamuco. Initially, we chose an area of 62 km^2 that comprised much of the eastern side of the lake basin south of Tzintzuntzan. In preparation for fieldwork, we designed a nested map grid of the study area in ArcMap which was then loaded onto Trimble Nomad Personal Data Assistant (PDA) Global Positioning System (GPS) units, and deposited into an ArcGIS database. The largest scale of the grid begins with 1 km^2 blocks quartered into 500 m^2 square blocks and then divided into 250 m^2 square blocks. A unique designation was assigned to each 1 km^2 and quartered 500 m^2 block (i.e. block J18NE equals a 1 km^2 block (J18) and 500 m^2 (NE) quarter) (Figure 3.1 and Figure 3.2).

Figure 3.1. The 62 km^2 of the original LORE-LPB survey area.

LORE-LPB survey teams walked west to east in systematic transects of 15-30 m within this gridded area. Field data were recorded on a Trimble Nomad PDA linked via Bluetooth to an external Trimble Pro XT GPS receiver using Trimble Terrasync as mobile GIS software with sub-meter accuracy. Data such as surface artifact densities, architectural dimensions, and natural and/or anthropogenic features, were categorized in a data dictionary. Sites were defined by the presence of surface pottery and lithic artifacts and/or some kind of mound or pre-Hispanic architectural feature. All visible sherds and lithics larger than 1.5 cm were collected and recorded in lots as polygons (zones) or points which were assigned UTM coordinates with the GPS units. Once documented and photographed, features were stored in the Archaeological Database for Artifact

Management (ADAM), a Microsoft Access database designed by the Center for Environmental Management of Military Lands at Colorado State University.

Architectural features were assigned a unique number and ordered sequentially. Archaeological visibility throughout the survey area varied due to natural and human impacts such as increased vegetation during the rainy season (June-October) and cattle grazing. Data such as feature integrity and visibility were incorporated into the project database. Additional information regarding site-formation processes includes a preservation index describing the condition of each feature and aids in interpreting the reliability of surface collections and recording of architecture using a classification system comprised of three levels: 1) poor, 2) moderate, and 3) excellent. Materials such as ceramics and lithics were recovered in open fields, plazas, or adjacent to features with ground exposure. Once identified, artifacts larger than 1.5 cm were assigned an annual and sequential lot number in the field. The location of the lot was recorded as either a polygon or a point, depending on the size of the artifact collection area.

The data dictionary utilized in the GPS proved to be especially useful for organizing large quantities of information collected in the field and served as a 'living document' that could be easily modified as new information became available. Each GPS-PDA used a data dictionary that included a classification system for architectural features recorded as points, lines, or polygons using real time logging or a digital 'sketch' (digitizing) on the unit. The GPS-PDA utilized a Wide Area Augmentation System (WAAS) signal, which allowed real-time horizontal accuracy to within 0.50-2 m and vertical accuracy to within 1-4 m depending on the availability of the WAAS signal.

We post-processed and corrected GPS data daily in Pathfinder Office software to increase horizontal accuracy to within 0.30-1 m. Post-processing concluded with exporting the corrected

GPS files into an ESRI shapefile format using Trimble Pathfinder Office for interoperability with a GIS. Exported data was projected into UTM with a 1984 World Geodetic System datum. ArcGIS software served to create maps, manage geospatial data, conduct spatial analyses, and allowed data set manipulation by attribute and spatial relationships at various scales and object dimensions. Initial base maps loaded onto the Trimble units and printed out for surveyors consisted of an aerial photograph with the project grid.

A few weeks into the 2009 field season, we came across densely-situated stone and earthen structures on top of a rugged landform (referred to as a *malpaís* or "bad land"; see Ch. 4). Though LORE-LPB director Chris Fisher and a colleague had previously identified some architecture in 2007, they were not aware of the extent of the stone structures until systematic survey documented that they were part of a large settlement that is now known as the ancient city of Angamuco. For the rest of 2009 and in 2010, we adapted our full coverage survey methods to local topographic and environmental conditions which included both plowed fields and large open plazas in the lower areas of the site and dense vegetation and multiple forms of stone architecture on the upper areas. Similar to the approach employed by French researchers at the Zacapu *malpaís* sites (Forest 2014; Michelet et al. 1995; Pereira et al. 2012), project members continued to survey within the established grid system, but we walked closely together in order to record the densely situated architecture. All geospatial data including the location of ancient architecture, and landscape and topographic features, were assigned sequential numbers, recorded using the GPS units, and subsequently digitized in ArcGIS. Stone architecture types (e.g. platform; plaza; pyramid) were documented using the same data dictionary, but we modified the categories as patterns and variations within and between the types were identified (see Ch. 4 for discussion of architectural classification). This allowed field investigators to quickly categorize architecture and other landscape features that could be entered into both ArcGIS and the Microsoft Access database. For each building, survey teams filled out a form that included information about the architectural type, location, measurements taken using a TruPulse 360 laser rangefinder or fiberglass measuring tape, vegetation, and material density. In the GPS units, architectural features were mainly recorded as polygons, but artifact lots were recorded as polygons or as points. Due to the rugged topography of the *malpaís* and deep forest cover, material recovery was minimal and most collections were confined to areas of faunal or floral-turbation in plazas or other open features. In some portions of Angamuco, areas of poorly preserved structures were classified as ‘zones’ consisting of degraded terraces located on slopes or as ephemeral building clusters.

Airborne LiDAR Survey

Through reconnaissance and pedestrian survey in 2009 and 2010, we documented approximately 3,000 architectural features, though the spatial arrangement and forms of these features was unclear. Given the rugged topography, documentation of additional areas of the site through full-coverage pedestrian survey would have taken what we estimated to be at least a decade of fieldwork and analysis (Fisher and Leisz 2013). Fortunately, in January 2011 the LORE-LPB obtained high resolution airborne LiDAR data for 9 km^2 of Angamuco from Merrick and Company. Airborne LiDAR involves sending laser pulses from an aircraft towards the ground which are reflected back towards the aircraft from the surfaces that they hit and recorded by the laser scanner (Devereux et al. 2005; Fernandez Diaz 2011; Fernandez-Diaz et al. 2014). As outlined in Fisher and Leisz (2013), prior to Angamuco LiDAR data collection, the operator recorded weather conditions, LiDAR operation parameters, and flight line statistics. Two GPS base stations and four GPS control points surrounding the area where LiDAR collection took place were established. Using WGS84 as the horizontal datum and Gravimetric Geoid (GGMO5) as the vertical datum, and the UTM Zone 14 coordinate system, sixteen ground returns per meter (1 return every 25 cm) were specified in the protocol. The time taken for the laser energy to return was converted to a distance by halving the time and multiplying the speed of light. Bare-earth digital elevation models (DEMs) were created from the filtered ground returns (cloud of x, y, z points) using Merrick Advanced Remote Sensing 7 (MARS) software.

The filtered point cloud data were assessed in MARS from Merrick and ArcMap and ArcScene from ESRI in 2D+ and 3D (Fisher and Leisz 2013). Through image analysis and the generation of multiple single and composite-direction hillshades, we were able to identify thousands of architectural features covering the *malpaís*. After the first LiDAR collection, we estimated that the site of Angamuco was at least 12 km^2 and that it was comprised of over 20,000 architectural features that vary in terms of shape, function, and temporality. More recent scanning indicates that the site may be as large 26 km^2 (Fisher et al. 2016, in press).

For the 2011 survey season, we divided each sub-quadrant from the initial survey grid into a 250 m x 250 m grid in order to systematize our recording areas (Figure 3.2). LiDAR-derived hillshades were loaded as new base layers onto the GPS units and the images of above-ground architecture were field-checked for accuracy (Chase et al. 2012; Fisher et al. 2011; Rosenswig et al. 2013). Features were similarly categorized according to the architectural types identified in previous seasons, but the clarity of the high-resolution hillshades and the ability to digitize features in the field enabled us to record features much more quickly. For example, before the LiDAR data our teams of 2-3 people could record 30-40 features a day; in 2011, our teams could average up to 80 features a day (Figure 3.3). After three years of survey, we documented over 7,900 architectural features throughout a 3.5 km^2 area primarily in the western and southern portions of Angamuco.

We focused on these areas of the site due to accessibility and safety issues associated with the isolated and rugged topography.

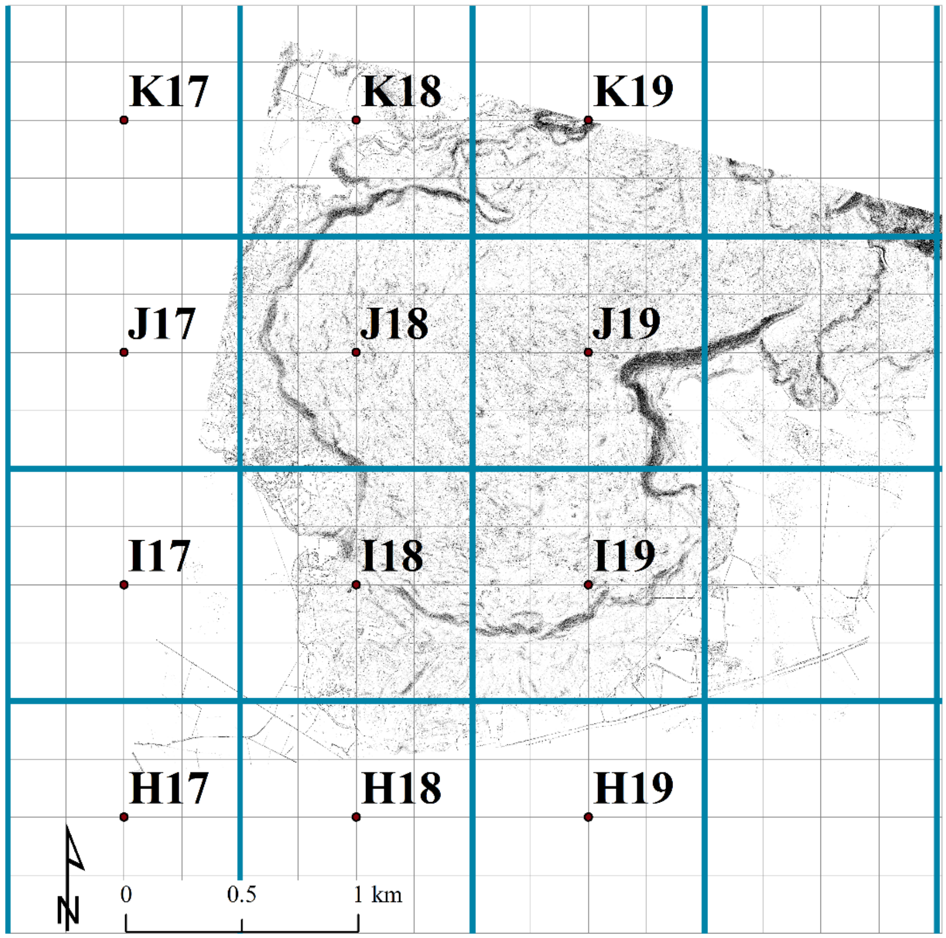

Figure 3.2: Survey quadrants at Angamuco and surrounding area. Each quadrant (blue lines) was divided into tiles (gray lines) that are 250 m x 250 m. Hillshade is derived from a 25 cm DEM.

Although LiDAR has been used by federal and academic institutions for environmental, engineering, and other purposes (Barber and Shortridge 2005; Devereux et al. 2008; Mackey et al. 2011; Perron et al. 2009), its use in archaeology has only recently begun to be fulfilled by researchers (Chase et al. 2011, 2012, 2014; Devereux et al. 2005; Evans et al. 2013; Hare et al. 2014; Fernandez-Diaz et al. 2014; Freeland et al. 2016; Johnson and Ouimet 2014; Pingel et al.

2015; Pluckhahn and Thompson 2012; Rosenswig et al. 2014). High-resolution remote sensing techniques are particularly useful for documenting settlements along coastlines impacted by rising water levels and for recording the extent of archaeological sites in areas that experience environmental disasters and political instability (Bachofer et al. 2014; Chase et al. 2012). In the Middle East, for example, remote sensing techniques have aided documentation of looting and destruction by regional insecurity (e.g. Casana 2014; Casana and Panahipour 2014; Chen et al. 2015; Hritz 2014; Parcak 2007; Stone 2008). At Angamuco, LiDAR was instrumental for identifying the extent of the site for both research purposes and for documenting the landscape that is currently being impacted by development activities. In 2014, construction began for a new toll road between Pátzcuaro and Morelia which passes along the southern edge of Angamuco. Although the construction is not occurring in the heart of Angamuco, the development of a major new road in the area will increase the amount of vehicle and pedestrian traffic near the site and has the potential to negatively impact parts of the cultural landscape. Such construction activities highlight the importance of non-destructive recording techniques like LiDAR so that researchers, residents, and development companies are aware of the potential impacts on historic resources long before construction activities commence.

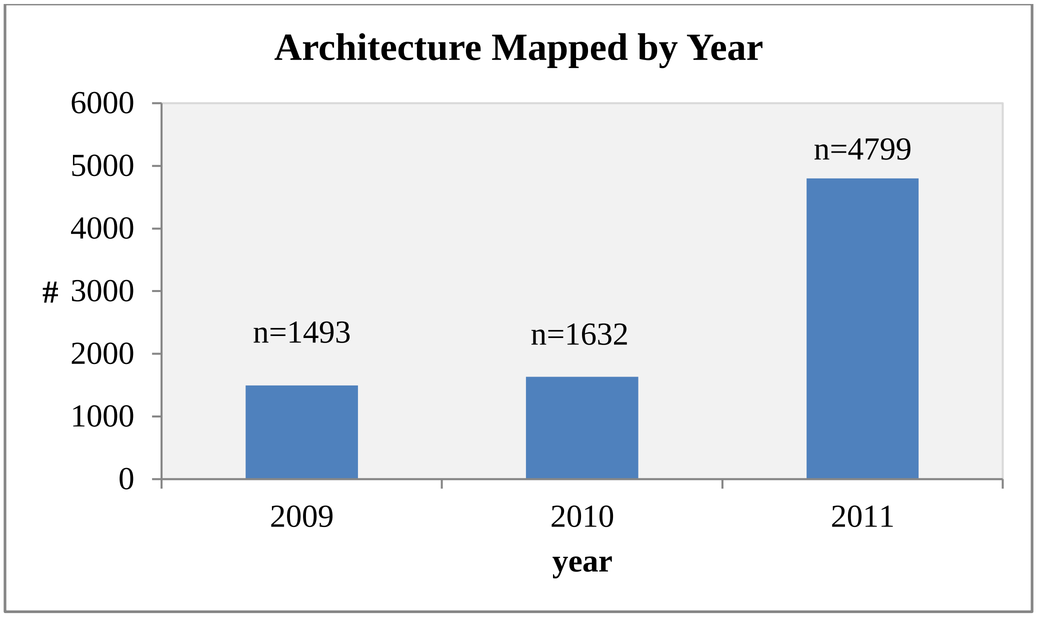

Figure 3.3: Number of architectural features (ballcourt, circular feature, room, mound, wall/road, platform, plaza, pyramid, and terraces) mapped by year (n = 7924). Use of LiDAR hillshades in 2011 greatly improved our recording speed. Note that this chart does not include points and polygons recorded for artifact scatters or environmental zones.

Survey Laboratory Procedures

Our usual procedure after each day of survey was to deposit the geographical data collected on the GPS units into an ArcGIS geodatabase and to write a daily log and/or a description of each sub-quadrant or tile that we completed. This information and all data from the feature field forms were entered into the ADAM database. Survey members were able to wash artifact lot bags in the evenings often on the same day that materials were collected. We inventoried and analyzed all artifacts by material and form throughout the survey field season.

Our first step was to sort artifacts into broad material categories of ceramic, lithic, groundstone, and other, and then further divide them into particular elemental or formal categories. We classified ceramics into groups according to form (rim, body, neck, handle, figurine, spindle whorl, pipe) and then according to slip color (red, cream, café, eroded) and decoration (paint, appliqué, negative, eroded) when visible. Rim sherd thickness and approximate diameters were also measured and diagnostic ceramic materials were sketched in order to establish a preliminary motif catalog for surface artifacts. We did not record paste type due to the preliminary nature of this analysis. Stone artifacts were initially sorted into material groups of obsidian, chert, basalt, quartzite, and chalcedony. If possible, we distinguished between different tool categories: blade (a narrow flake with parallel margins); biface (a stone artifact that has been modified on both sides); scraper (oval or blade-like shape exhibiting convex use-wear on the distal or lateral edges); core (raw material from which flakes and/or tools were isolated for future use); and chipped stone tools (debris, flake fragment, broken or complete flake) (following Andrefsky 2005; Sullivan and Rozen 1985). The small number of groundstone recovered was categorized as *mano* or *metate*. A few other materials were collected, including portable petroglyphs and daub. All artifacts were manually counted, weighed, photographed, and entered into ADAM (the survey artifact data are available in a Materials Analysis report submitted to INAH and available upon request).

The survey field seasons and the addition of LiDAR data in 2011 helped us to obtain a basic understanding of the extent of Angamuco, to identify architectural forms and patterns of spatial organization, and to determine areas for future excavation. Additional information about the LiDAR component of the LORE-LPB project is available in publications (Chase et al. 2012; Fisher and Leisz 2013; Fisher et al. 2016, in press). As discussed at the end of this chapter and in Ch. 4 which focuses on Angamuco, the survey data formed a foundation for our current understanding of the ancient settlement.

Excavation 2013-2014

Excavation occurred over approximately six months in the winters of 2013 and 2014 and again involved the participation of students and scholars from several institutions in the U.S., Mexico, and France. Initially, LORE-LPB objectives for excavation were to determine the depth and profile of deposits, the general state of architectural preservation, and to obtain radiometric dates for the occupation of Angamuco. For the second field season, we expanded our objectives to include testing different geographical areas in order to better understand the occupational history of the site and the potential uses of different zones and buildings. Broadly, the locations for excavation were based on two criteria: (1) preservation of architecture and associated potential midden deposits; (2) location within potentially different temporal and socio-functional areas of the site; e.g. pre-empire versus empire contexts or elite versus non-elite locales.

We employed two complementary excavation strategies: horizontal recovery and the use of individual 2 x 2 m units to test multiple architecture types within one area. Use of the horizontal technique was critical for uncovering a large building or area at one time – a procedure that has proven effective for documenting successive building episodes over ancient urban sites such as El Palmillo in the Oaxaca Valley (Feinman and Nicholas 2002) and at Calixtlahuaca in the Toluca Valley (Smith et al. 2013). Smaller units were useful for testing the function of structures identified in the survey, for comparing artifacts and deposits in different parts of the site, and for excavating undisturbed floor segments that can yield information about daily consumption activities and temporal affiliation (Carballo et al. 2014; Parker and Foster 2012).

Based on survey data, we selected seven areas of Angamuco (Figure 3.4, Table 3.1). We chose Area A as an elite domestic area because it was comprised of large buildings and enclosed plazas, patios, and rooms that are only accessible on top of a terraced hill. Area B consisted of a well-preserved building with an internal space of 4 x 6 m that was located approximately 250 m to the south of the largest pyramid and plaza (Area C) currently documented at Angamuco. Area B was initially categorized as a multi-functional space that was used for activities by the broader community. Areas C and D were associated with the major pyramid and were thus classified as public spaces. If these areas were the settings of ceremonial activities, it is possible that they were used by people from multiple social classes. One exception is an enclosed room in Area D (DN16E10) that we considered as a private elite zone. Area E was located on the upper zone of the *malpaís* and was chosen as a commoner domestic area that showed distinctly sunken plazas and exposed middens with diagnostic supports (see Ch. 5). Within this area, we excavated in one of the middens and in a sunken plaza in order to test commoner public contexts while a habitation terrace and room were also tested to evaluate commoner domestic contexts. Areas F and G were located on the eastern side of the upper zone and were chosen based on surface preservation and their potential as commoner areas. Test units in F were associated with a plaza and an altar (F1S1E0, F3N0E0) and a habitation terrace (F4N0E0, F5N0E0), while excavation in G took place in a room (G1N0E0) and on a small patio (G2N0E0). In addition, an environmental trench (G3N0E0) of 1 x 4 m was exposed in order to document terrace construction on the upper part of Angamuco.

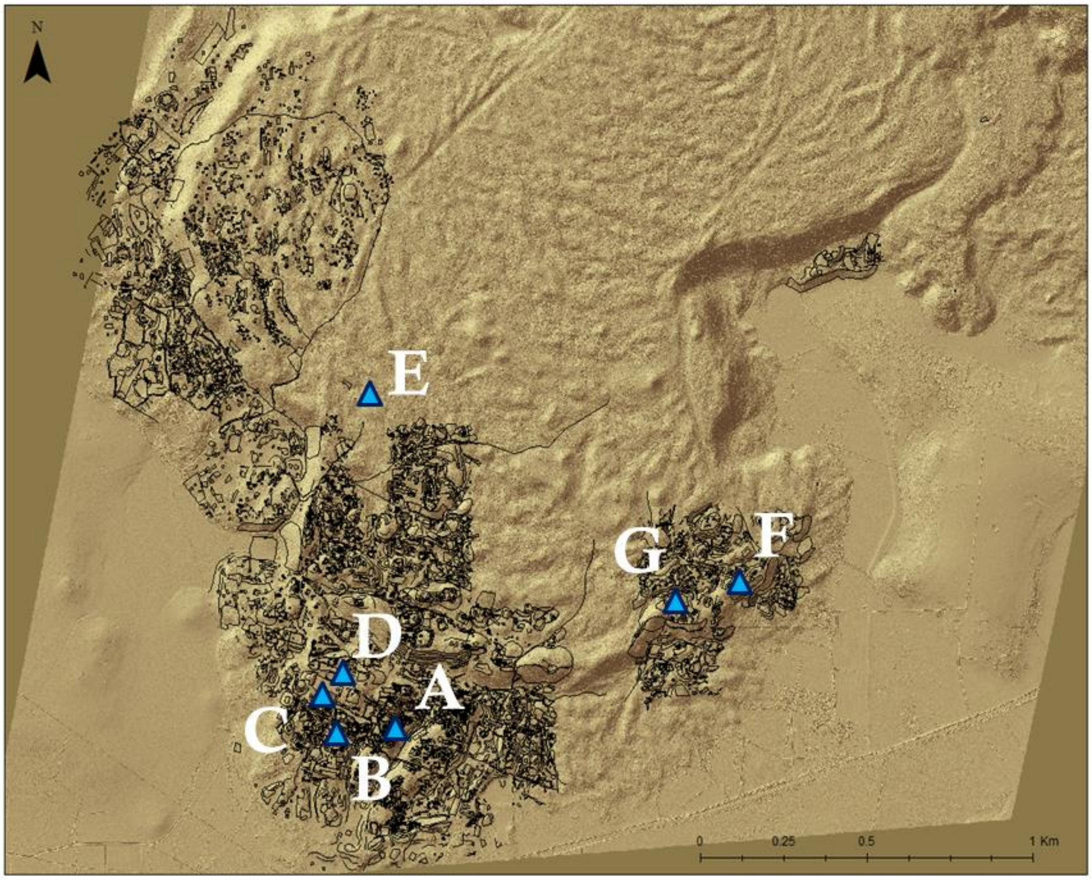

Figure 3.4: LiDAR-derived hillshade (25 cm DEM) showing the features mapped between 2009 and 2011 (n = 7,924) and the excavation areas during the 2013 and 2014 field seasons. The lower areas (A, B, C, and D) may be contrasted with the upper areas (E, F, and G).

Based on the original grid used for the survey phase, we used quadrant or sub-quadrant corners as reference points or datums. We used 2 x 2 m units though 1 x 1 m, 1 x 3 m, and 4 x 4 m units were also used depending on topography, architecture, and whether we exposed features that continued to an adjacent unit. A total of 88 units was documented over the two field seasons, including 80 units of 2 x 2 m and 8 others of varying sizes. Excavations occurred in 77 of the units while the other 11 were cleared and left intact to retain architectural construction and/or due to time constraints. Deposits were usually 75 cm to 1.5 m, though units in Area F (F1 and F3) were deeper than 2 m. Once an excavation area was identified, project members and Fontezuelas *ejido* members cleared vegetation from the structures. Using a total station, we established grids in areas where horizontal excavation was used (Areas A, B, C, and D), but not in testing areas due to logistics (e.g. the rugged terrain associated with Areas E, F, and G made carrying a total station difficult). In these testing areas, we recorded the UTM coordinates for the southwest corners of units with Trimble GPS units. We chose to excavate in artificial 10 cm levels unless we encountered changes in the natural stratigraphy and/or materials that could be used to define strata. We consolidated architecture associated with excavation units and avoided excavating if stone walls did not seem secure. All soil was dry-screened using ¼" (6.35 mm) mesh and artifacts from each level were assigned a lot number which was recorded on level and feature forms. In addition to these latter forms, after we completed excavation, we wrote a unit summary for each unit that described what was recovered and basic interpretations. Ch. 5 shows maps of the units within each excavation area.

Although all areas were excavated using the same basic recording methods, we did adapt certain strategies based on features and topography as they were uncovered. In Area B, the interior of the large building was simultaneously exposed while several units on the eastern and southern exterior areas were also excavated. This was so that we could observe the entire first level of the building, better understand how the architecture was associated, and the preservation level of the stone walls (Figure 3.5). In Area C, we opened a row of three units running east to west in the plaza in front [or east] of the major *yácata*, and then another perpendicular row of 7-8 units between the y*ácata* and an altar in the middle of the plaza (Figure 5.4). We continued to expose units that were adjacent to the T-shaped transect as we recovered features which included burials, dispersed bone, and grave inclusions. This ensured that we fully excavated the features while at the same time we sampled an extensive portion of the *yácata*-altar area. Two additional 2 x 2 m units were exposed to the south of the altar in order to better understand potential building episodes and to obtain material for dating (Figure 5.25). This excavation strategy is similar to the ones undertaken at the Malpaís Prieto in the Zacapu Basin (Pereira et al. 2012; Forest 2014) and at Huandacareo in the Cuitzeo Basin (Macías Goytia 1990).

Figure 3.5: Area B (ED 5128) excavation grid after surface-clearing. Used with permission of LORE-LPB.

In contrast, our strategies for sampled features in Areas A, D, E, F, and G varied. In all domestic rooms (AN2E28, AN8E38; DN16E10; E3N0E0; G1N0E0), we excavated the interior (usually 4 x 4 m or slightly less) to sterile. An exterior unit was not excavated in each of these rooms due to time constraints and our concern about keeping architecture intact. In two 2 x 2 m test units we recovered features that led us to open two adjacent units for a better understanding of the context of the architecture and function: in Area A, we exposed a possible *ofrenda* that included fragments of a human cranium and long bones (AN18E53, AN19E51, AN18E52); in Area F (F1S1E0, F3N0E0), we uncovered a circular stone construction that is similar to a feature identified as a granary at the Malpaís of Prieto in Zacapu (Migeon 1990; Pereira et al. 2012:fig. A10). In order to understand the depth and construction of stone wall features, we exposed several adjacent units in Area A on the well-preserved east side of a potential elite plaza (AN10E26, AN8E26, and AN10E25) and an associated open room (AS6E6, AS2E4, AS2E6, and AS4E6). Finally, other isolated 2 x 2 m excavation squares were excavated to sterile in order to test sunken and other plaza or patio features in Areas A, D, E, F, and G. The combined strategies of horizontal and isolated/adjacent test unit excavation helped us to understand construction techniques for large public and smaller domestic features, to compare depths and artifact density in several similar features such as plazas and rooms, and to test the potential of deposits and features in different areas of the site for future study.

Within the 88 units, we hypothesized that approximately 12 represent commoner contexts and 18 represent elite contexts (Table 3.1). The remaining 38 units were selected as multi-component contexts (Area B – large house or public building; Area C – cemetery and plaza associated with a pyramid and altars). In terms of architecture, we were able to test 3 elite rooms/domestic structures and 4 commoner rooms/habitation terraces/domestic structures; 4 elite plazas/patios/public spaces and 6 commoner plazas/patios/public spaces. Based on our understanding of the site from the survey data, excavations of Areas B and C served to represent multi-purpose contexts that could be contrasted with the distinctly elite or commoner areas.

AREA-YEAR	FEATURE TYPE	STATUS	# UNITS	UNIT NUMBERS	REASON CHOSEN FOR EXCAVATION
A-2013	Room	Elite, Private	1	AN2E28	Well-preserved room
A-2013	Room	Elite, Private	1	AN8E38	Well-preserved room
A-2013	Patio	Elite, Private	2	AN5E34, AN4E36	Patio associated with rooms AN2E28 and AN8E38
A-2013	Plaza	Elite, Public	4	AN1E41, AN18E53, AN19E51, AN18E52	Open plaza associated with AN2E28 and AN8E38
A-2013	Plaza	Elite, Public	3	AN10E26, AN8E26, AN10E25	Enclosed plaza with well-preserved stone wall
A-2013	Plaza	Elite, Public	4	AS6E6, AS2E4, AS2E6, AS4E6	Enclosed plaza with well-preserved stone wall
B-2013	Large Type A Room	Multipurpose	42 (31 exc)	*Walls/Interior*: BN10E6, BN10E8, BN10E10, BN10E12, BN12E8, BN12E10, BN12E12, BN12E14, BN12E16, BN14E8, BN14E10, BN14E12, BN14E14, BN14E16, BN16E8, BN16E10, BN16E12, BN16E14, BN18E8, BN18E10, BN18E12 *Exterior:* BN2E4, BN4E8, BN7E7, BN6E8, BN6E10, BN6E12, BN8E10, BN8E12, BN8E14, BN18E4	Well-preserved large building
C-2014	Plaza	Elite, Multipurpose	16	CN10E04, CN10E06, CN10E20, CN10E22, CN11E03, CN12E0, CN12E02, CN12E04, CN12E06, CN12E14, CN12W2, CN12W4, CN12W5, CN12E16, CN14E14, CN14E16	Plaza in between well preserved *yácata* pyramid and altar
D-2014	Room	Elite, Private	1	DN16E10	Well-preserved room
D-2014	Plaza	Elite, Public	2	DN0E2, DN0E8	Open plaza to north of Area C
E-2014	Plaza	Commoner, Public	1	E1N0E0	Open plaza, Epiclassic style supports recovered on surface
E-2014	Hab. Terrace	Commoner, Private	1	E2N0E0	Habitation area in commoner area
E-2014	Room	Commoner, Private	1	E3N0E0	Well-preserved room in commoner area
E-2014	Plaza	Commoner, Public	1	E4N0E0	Sunken plaza associated with room E3N0E0
F-2014	Plaza	Commoner, Public	2	F1S1E0, F6S3E0	Plaza associated with large mound on east side
F-2014	Plaza	Commoner, Public	1	F3N0E0	Plaza associated with large mound on east side
F-2014	Patio	Commoner, Public	1	F4N0E0	Enclosed space adjacent to F3N0E0
F-2014	Hab. Terrace	Commoner, Private	1	F5N0E0	Habitation area associated with other area F units
G-2014	Room	Commoner, Private	1	G1N0E0	Well-preserved room in commoner area
G-2014	Patio	Commoner, Public	1	G2N0E0	Patio overlooking east side lower area
G-2014	Agr. Terrace	Commoner, Multi	1	G3N0E0	Test of agricultural terraces

Table 3.1. Excavation areas and units at Angamuco. The "Status" categories were hypotheses based on the survey data.

Excavation Laboratory Procedures

During excavation, we assigned each level or feature a lot number and all artifacts, carbon, bone, and daub samples were associated with that number. Artifact types (ceramic, lithic, human bone, animal bone, metal, groundstone, shell, or other miscellaneous such as bead) were separated in the field and then washed and sorted at the field laboratory in Pátzcuaro. We further classified ceramic artifacts into basic morphological groups: rim, body, base, support, handle, spout, figurine, and pipe. Within these morphological categories, we divided ceramics into "decorated" and "undecorated" groups when possible. Decorated sherds were identified by any kind of slip, paint, negative, incision, or appliqué; undecorated sherds had no identifiable slip and were often eroded. Other ceramic artifacts such as pipe fragments were described in the comments section (e.g. black polished pipe stem). I refit sherds and complete vessels later in the CEMCA lab to reduce damage from transportation from the field lab to Mexico City. We catalogued lithic artifacts in the same way as during the survey season. Due to the large number of artifacts recovered from excavation, additional sorting or analysis was not done in the field laboratory. Decorated sherds and vessels were photographed and then all excavated artifacts were added to the ADAM database by material type and count. Abbreviated descriptive statistics from the field sort are in the INAH Materials Analysis report from the 2013-2014 seasons (in Fisher et al. 2016: Appx. A, available upon request).

Laboratory Analyses

I conducted lab work in Mexico City and the U.S. During the 2014 field season, I collected clay samples from around the site of Angamuco in order to compare sherd paste composition with raw materials that were locally available to ancient potters. In fall 2014, I made the clay samples into briquettes at the University of Washington Geoarchaeology Laboratory. Between 2012 and 2015, I conducted ceramic analysis at the CEMCA in Mexico City and later at laboratories in the U.S. at the University of Washington and the University of Missouri Research Reactor (MURR). The purpose of the ceramic analysis was to investigate whether there was morphological, stylistic, and compositional change over time, between areas of the site, and between different socio-functional contexts. In order to identify potential changes, I chose to employ attribute analysis on a sample of excavated and survey ceramics and geochemical characterization using NAA on a sub-sample of the excavated sherds used in the attribute analysis. The clay was also submitted for NAA in order to see whether any of the excavated pottery matched local sources. A sub-sample of sherds and clays identified from the NAA analyses was made into thin-sections for future assessment using point-counting quantitative petrography (see section on future research in Ch. 7). The methodologies for each analytical technique and sampling strategies are discussed here.

Clay Sampling

I intensively sampled approximately 30 clays in areas around Angamuco (Table 3.2; Figure 3.6). Local clays were collected because of their potential availability to pre-Hispanic potters and because regional and global ethnographic studies indicate that 50% of artisans typically exploit clay sources within 2 km of their workshops (Arnold 2005; Foster 1948, 1955). Clays were primarily sampled from exposed profiles. Most of these samples came from possible reservoir areas around the site though two examples are from excavation units in Areas C and D. I chose the locations based on where cuts were visible around the site and some anecdotal information from *ejido* community members. Once a sample was identified, I recorded a GPS point and took photographs of the soil profile and of the north, south, east, and west views from the location (Figure 3.7). Clay was collected from a non-eroded portion of the profile (B or C horizons) whenever possible. The depth below the surface and any contextual information was also recorded.

Table 3.2: Clay samples submitted collected around Angamuco and sampled using NAA. The Clay_ID corresponds to the locations on the map in Figure 3.6. MURR_ID is the lab identifier while Field_ID refers to my field identifier.

Clay_ID	MURR_ID	Field_ID	Northing	Easting	Context
1	LPB314	JAG1	2167291.65	235151.555	El Jaguey
2	LPB315	ANG1	2168147.729	237144.807	Angamuco, Northwest
3	LPB316	ANG2	2168517.463	237657.739	Angamuco, Northwest
4	LPB317	ANG3	2168411.494	238069.346	Angamuco, Northwest
5	LPB318	ANG4	2167727.195	239860.482	Angamuco, East/Northeast
6	LPB319	ANG5	2167507.424	240135.074	Angamuco, Northeast
7	LPB320	ANG6A	2167433.134	240490.167	Angamuco, Northeast, off *malpaís*
8	LPB321	ANG6B	2166122.628	239889.374	Angamuco, Northeast, off *malpaís*
9	LPB322	ANG7	2165995.562	239586.726	Angamuco, South, off *malpaís*
10	LPB323	ANG8	2166039.964	239058.133	Angamuco, South, off *malpaís*
11	LPB324	ANG9	2166287.128	239358.98	Angamuco, South, off *malpaís*
12	LPB325	ANG10	2165548.612	237975.715	Angamuco, South, off *malpaís*
13	LPB326	ANG12	2165360.589	237904.542	Angamuco, South, off *malpaís*
14	LPB327	ANG13	2165231.228	237792.733	Angamuco 13, South, off *malpaís*
15	LPB328	CHA1	2164937.263	237039.521	Eastern base of Cerro Chapultepec
16	LPB301	COR1	2167671.167	236423.649	Corrales, North/Northwest
17	LPB302	ANG14	2166517.191	237453.765	Angamuco, West, Corrales spring
18	LPB303	ANG15	2166446.867	237355.822	Angamuco, West, Corrales spring
19	LPB304	ANG16	2166174.354	237325.249	Angamuco, West, reservoir
20	LPB305	ANG17	2165981.028	237390.398	Angamuco, West, pond
21	LPB306	ANG18	2166466.668	239412.726	Angamuco, East, reservoir
22	LPB307	ANG19	2166768.814	239188.088	Angamuco, East, reservoir
23	LPB308	CC1	2165497.776	238983.569	Cerro Colorado profile
24	LPB309	CC2	2165777.5	238978.841	Cerro Colorado base, reservoir
25	LPB310	FONT1	2166808.251	241716.113	Fontezuelas, drainage
26	LPB311	FONT2	2167337.842	242810.54	Fontezuelas, construction cut
27	LPB312	LP1	2167882.989	244816.994	Las Pilas, Quiroga road exit
28	LPB313	LP2	2168528.28	244469.855	Las Pilas, construction cut
29	LPB329	D	2166145.45	237662.60	Unit DN0E2
30	LPB330	C	2166109.15	237637.00	Unit CN12W2

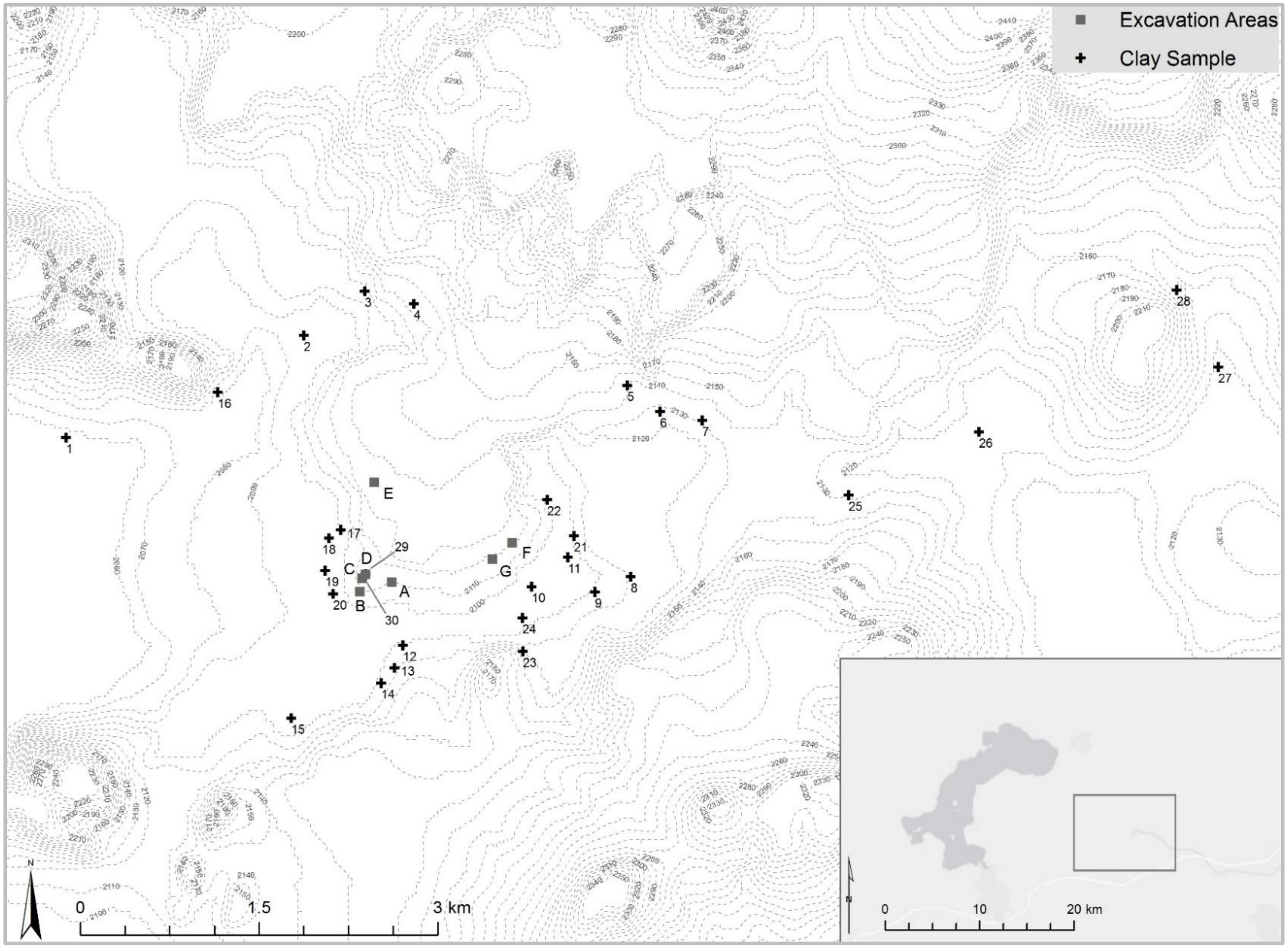

Figure 3.6. Clay sample and excavation locations at and around Angamuco. Clay numbers refer to the Clay_ID in Table 3.2.

Figure 3.7: Clay sample 16 (LPB301), Corrales: A-north view; B-east view; C-west view; D-south view.

Briquettes

After collection, I divided the samples into three portions and I exported one portion (between 200-500 g) to the Geoarchaeology Laboratory at the University of Washington. The remaining two portions are in the CEMCA laboratory in Mexico City for future analysis. At the UW, I used a pestle to crush the mostly hard clay and added approximately 50 mL of water to soften the samples (Figure 3.8). I then kneaded the mixture by hand to homogenize the clay and a coil test helped to determine clay workability. Each sample was then put into silicone cupcake molds to form two to three briquettes which were laid out for 24 hours at room temperature for drying. The briquettes were then put into a drying oven for 24 hours at 100° C in order to gradually remove any residual moisture from the homogenizing process and to keep the briquette shape intact for a higher temperature firing. Such gradual drying also reduced the potential for damage during subsequent firing (Carney 2010; J. Feathers, personal communication). Finally, the samples were removed from the silicone molds and put into a Thermolyne 48000 furnace and a Barnstead/Thermolyne 6000 furnace in the Geoarchaeology Laboratory at a set ramp increase rate of 2° C per minute for 5 hours. This incremental rate was chosen in order to protect the clays and potential organic materials from cracking and decomposition. I chose not to go above 600° C in order to preserve any potential calcium carbonate materials (which begin to decompose at 750° C). After 5 hours, I turned off the oven and returned it to room temperature. Once the briquettes cooled, I documented the Munsell color and photographed each sample. I used a coarse saw in the Luminescence Laboratory to cut each briquette in half – one half was sent for NAA and the other half was curated for petrography selection and future study at the UW.

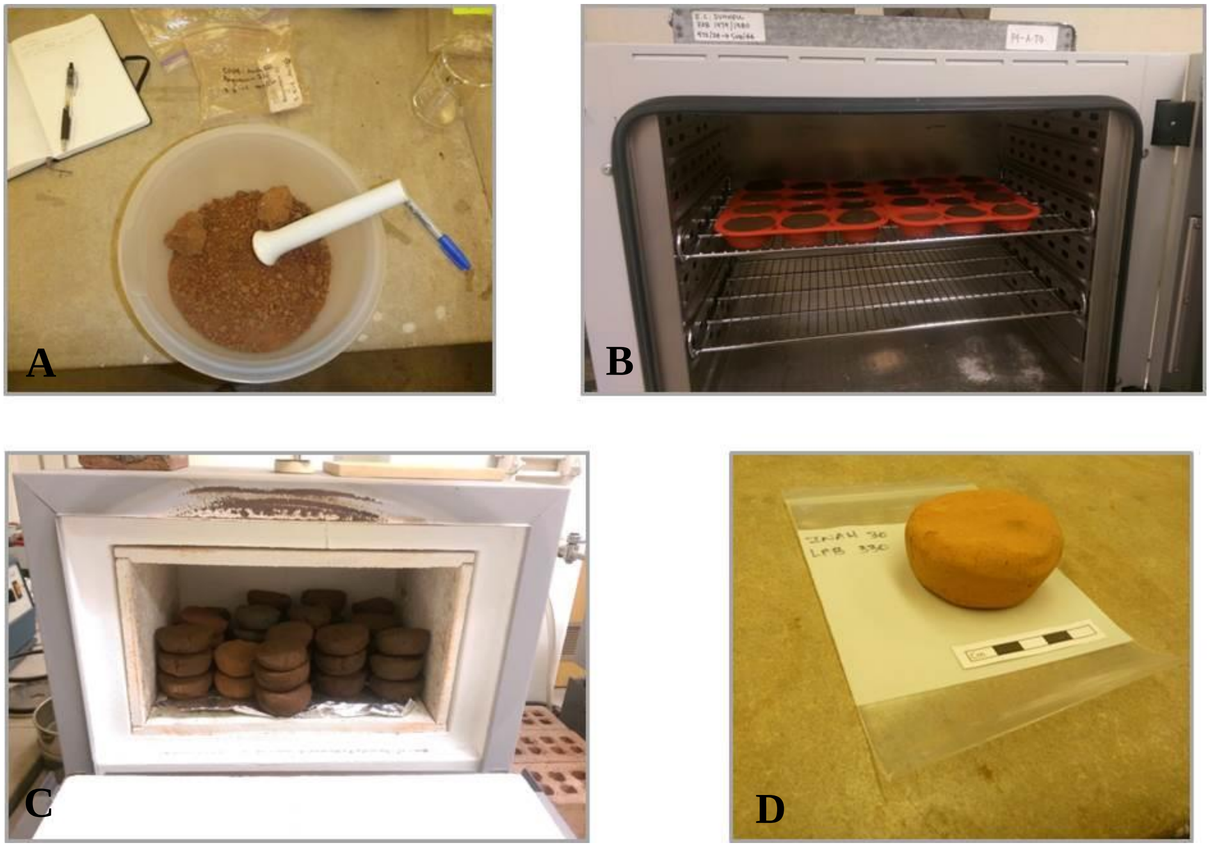

Figure 3.8: Briquette production: A. Breaking clay with a pestle; B. Briquettes in silicon molds in the drying oven; C. Briquettes in the furnace; D. Fired briquette.

Attribute Analysis

This dissertation assesses differences in ceramic production and consumption between different areas of Angamuco, including architectural features associated with elite or commoner public and domestic activities, and over time. I was thus interested to see if there are differences in ceramic forms (e.g. jars versus bowls), decorative styles (e.g. monochromes versus polychromes), and paste recipes within and between the site contexts. More specifically, I want to know whether ceramic vessel forms, styles, and pastes became increasingly standardized, which could suggest top-down control of production and consumption, or more diverse, which could suggest a bottom-up system in which Purépecha regime growth facilitated increasing access to an array of materials and the integration of multiple ceramic production systems. Alternatively, perhaps there are limited or variable changes over time within the different categories suggesting that broader political activities did not impact the production and consumption of ceramic artifacts and potentially the food and ritual items that were consumed with the artifacts. These issues guided my attribute analysis.

Examination of ceramic production and consumption required that I code for attributes that could provide information about vessel form, technology, and decoration (Rice 1987; Stark et al. 2000). For example, measurements such as rim and body thickness and rim diameter can be used to evaluate vessel standardization while documentation of slip color and motif can reflect differences in terms of information exchange between potters and consumers (e.g. Hegmon 1995; Roux 2003). Based on informal analysis of Angamuco ceramics since 2009 and initial assessments of the excavated ceramics in 2013 and 2014, I selected attributes that could be coded and that could be used to address my research questions (Table 3.3; see Appendix A for the complete coding manual). Attributes of vessel form included lip attributes, rim attributes, neck, body, base, appendages, and artifact type such as figurine, pipe, or vessel. Attributes of technology included paste characterization (e.g. fineness, color, firing core), finishing steps, and slip color(s). Decorative attributes were documented for subtractive decoration, displacement/joining, paint and/or negative, and motifs. I also created a preliminary motif catalog that is in progress.

In summer 2012, I began by noting general differences in the form and decorative styles of the ceramics recovered during survey. After laying out sherds from all sub-quadrants, I began by noting the attributes that could be recorded and that might be able to address quantitative differences between contexts. These included rim diameter, rim thickness, vessel type (bowl, tripod bowl, and jar), polishing and burnishing, and evidence of paint, negative, and motifs.

Though the surface ceramic artifacts were much more eroded than the artifacts that we would later excavate, they served as a basis for defining attributes to formally code in subsequent lab sessions. During the laboratory season in 2013 and 2014, I added to the coding manual if I could identify an additional attribute such as a specific bowl form or decoration.

Table 3.3: Attributes recorded on Angamuco ceramic artifacts.

ATTRIBUTES CODED	
Basic Identification	**Vessel Form**
Date	Lip Attributes
Catalogue Number	Tapering/Thickening
Provenience	Symmetry
Level	Flaring
Analytical Entity	Rim Attributes
	Maximum orifice diameter
	Rim thickness at body
Attributes of Technology	Rim form
	Neck
Inclusion types	Body
Overall characterization of paste	Body form
Paste Color	Wall thickness
Source Group	Vessel height
Firing Core	Base
Finish	Base form
Slip	Base thickness
Secondary Slip	Appendages
	Figurines
	Pipes
Decorative Attributes	Portion
	Pipe type
Subtractive Decoration	Pipe decoration
Displacement/Joining	Vessel type
Painted Decorations	Vessel type 2
Motifs	
Comments	

For my sampling strategy, I selected sherds based on a hierarchy of variables:

1) To sample from all excavation areas and from each survey sub-quadrant.
2) To sample from all contexts within the areas (e.g. room, plaza, habitation terrace, etc.).
3) To sample from as many levels as possible.
4) To sample from as many different identifiable forms as possible.
5) To sample from as many basic decorative categories as possible.

Using this hierarchy, I selected ceramic artifacts from all seven functional and social areas and from all excavation levels that included identifiable forms and/or decorated sherds. I focused on decorated sherds from each unit so that I could code as many attributes as possible and because they can be indicators of differences in production and consumption (Huster 2016; Stark et al. 2000). I also decided to include the complete or almost complete vessels from Area C in 2014 (n = 14) as they serve as important ideal examples of the different forms and decorations, and other ceramic artifacts such as spindle whorls, figurines, pipes, handles, and spouts because they helped to document the variety of ceramic artifacts throughout the site. Decorated sherds were previously classified in the field laboratory as anything with evidence of slip, incision, or appliqué (see Excavation Laboratory Procedures). Eroded sherds were eliminated from analysis.

For the attribute analysis discussed here, I used 5,861 sherds recovered from 7 excavation areas and 40 units, and 64 survey lots at Angamuco (Table 3.4). The number of samples within each area varied because of the different artifact densities recovered. Ceramics were chosen from rooms and plaza contexts in Area A in order to compare potential differences in the contexts while in Area B, I purposely selected samples from units located both within and outside of the large building to evaluate potential depositional variation. In Areas C, D, E, and F, I sampled from each excavation unit and level when possible. In G, I omitted the terrace trench because the architecture did not correspond to the socio-functional spaces that I intended to examine. I did analyze a small sample of the survey sherds from the largest collection lot within each survey sub-quad to compare any potential diversity found on the surface throughout the site. Survey artifacts included decorated sherds, supports, spindle whorls, and figurine fragments. Over 65,000 ceramic artifacts were excavated and catalogued during excavation and when combined with the survey collection, the Angamuco ceramic database is comprised of over 70,000 specimens (see INAH Materials Analyses, available upon request).

Table 3.4: Samples chosen for ceramic analysis at Angamuco.

Area	**No. Units**	**Context**	**Attribute Analysis**	**INAA**
A	6	elite plazas (n=2), elite rooms (n=2)	1894	68
B	5	public building - inside and outside	936	31
C	16	public plaza-*yácata*, burials, altar	1552	95
D	3	public plaza, elite room	791	18
E	4	commoner room, habitation terrace, plazas (n=2)	179	32
F	4	common habitation terrace, plaza (n=3)	269	52
G	2	commoner room and patio	13	4
Total Excavated	40		5634	300
Survey	64	upper and lower *malpaís*	219	
		OVERALL TOTAL	**5861**	**300**

Towards the end of the laboratory work, I also sorted the sherds into basic decorative categories such as monochrome, bichrome, polychrome, incised, appliqué, etc. (see Ch. 5 and

Appendix C for elaboration). For those sherds not initially assigned to these categories, I went through the ceramic data a second time to assign as many samples as possible. These categories are intended as a starting point for future classificatory work on the ceramics, but should not be viewed as formal, static categories.

Mesoamerican ceramics are often organized according to a Type-Variety-Mode classificatory system in which ceramic attributes facilitate a hierarchy of classification involving levels of abstraction beginning with the 'type' and 'variety' (Cobean 1990; Forsyth 1983; Gifford 1976). In the Pátzcuaro area, Pollard (Pollard 1972, 1993) followed this approach for Tzintzuntzan surface ceramics and for the excavated ceramics at Urichu (Pollard 1999). Within this system, the 'type' is a polythetic category that is created so that pottery can be sorted to communicate shared aspects of decoration and/or chronology (Ball 1977; Bishop 2014; Culbert and Rands 2007; Neff 1993; M.E. Smith 1979). In other words, the ceramic type is an abstraction that is created by the analyst for an inexact model (*cf*. Ford 1954). One major problem with this system is that analysts cannot or do not always identify how particular types are put into groups and future comparative work becomes a challenge. Other classificatory systems include the use of paste as a dominant attribute (Cárdenas Garcia 1990; Obando et al. 2011; Rice 1976; Shepard 1956) and vessel forms (Huster 2016; M.E. Smith 1979). At Angamuco, I anticipate that later work will group and regroup sherds according to new research questions and that the data can be evaluated from multiple perspectives.

Geochemical Analysis

Following attribute analysis, I selected sherds for geochemical characterization via INAA at MURR. The purpose of this analysis was to assess variation in paste composition of the excavated ceramics and to determine if there are any differences in paste recipes over time and throughout the site areas. When combined with attribute and other analyses at Angamuco, potential changes in paste recipes could reflect reorganization of production, differential access to resources, and preferential use of resources for particular forms or styles. Study of geochemical signatures of clay sources has been used in Mesoamerican archaeology for some time and it is among the best techniques to establish a centralized comparative dataset because of its accuracy, precision, and replicability (Bishop et al. 1982; Glascock and Neff 2003; Glascock et al. 2007; Neff 2000; Rice 1987:374–375; Stoner and Glascock 2012). Although the bulk analysis that INAA generates on a heterogeneous ceramic paste may not be appropriate for research that attempts to isolate individual components of a ceramic paste (techniques such as Inductively Coupled Plasma Mass Spectrometry may be better suited for this task (Speakman and Neff 2005)), the limited amount of geochemical work in the Pátzcuaro region first required that I establish general differences in paste composition at one site over time.

Elsewhere in the Americas, studies of ceramic technology and chemical composition have been used to infer decreased interregional trade (e.g. Minc 2009; Nichols et al. 2002), decreasing wealth (M.E. Smith 2010), and state-sponsored and/or local production (Hayashida 1999) throughout broader political changes. In the Pátzcuaro area, one project has geochemically characterized 36 clay samples from several different areas of the lake basin and 171 sherds (56 from surface survey of Tzintzuntzan; 115 from stratified excavations at Urichu and Erongaricuaro) (Hirshman 2003; Hirshman et al. 2010; Hirshman and Ferguson 2012). Based on the INAA results, the researchers argue that compositional variability differs over time at the three sites and that clay and ash recipes may have structured ceramic production between the Preclassic and Postclassic periods (50-1521 CE). Although clays and ash were not sampled from the Angamuco site area in that study, this previous research serves as an important base to build and expand upon this dissertation project. Importantly, the INAA data from the previous study are in the MURR database for comparison with the Angamuco specimens.

From the attribute sample, I selected 300 sherds for submission to MURR (Table 3.4). Samples were again chosen with the same hierarchy as in the attribute analysis discussed above (i.e. variability throughout the areas, contexts, and formal and decorative traits) and in consultation with geochemical specialist and petrographer Dr. Michael Galaty (Mississippi State). My sample selection was restricted by two factors. First, revised INAH export laws prohibit the transport of rims or other diagnostic forms (supports, handles) for destructive analysis and I was thus relegated to body sherds which reduced the number of forms that I was able to confidently identify. In addition, it was necessary that I choose sherds that were larger than 2 cm in order to break as a potential petrographic specimen. The 30 clay briquette samples were included for comparison with the potential paste recipes and because geochemical characterization of ceramics is ideally facilitated by ceramic ecology, or prior knowledge of geological clay sources and the local environment (Arnold 2005; Galaty 1999:35; Matson 1965). In sum, a total of 330 samples were submitted to MURR for INAA analysis.

INAA at MURR

A detailed report of the sample preparation and analysis written by MURR is in Appendix B and the procedure has been published elsewhere (Glascock 1992; Neff 2000), so here I summarize the methodology. Fragments of about 1 cm^2 were removed from each sample and abraded using a silicon carbide burr in order to remove glaze, slip, paint, and adhering soil, to avoid contamination. Two analytical samples were prepared from each source specimen. Portions of approximately 150 mg of powder were weighed for short irradiations while 200 mg of each sample was used for long irradiations. The Angamuco samples were prepared along with Standards made from the National Institute of Standards and Technology, including SRM-1633a (coal fly ash) and SRM-688 (basalt rock), in addition to quality control samples of SRM-278 (obsidian rock) and Ohio Red Clay.

The MURR neutron activation analysis of ceramics consisted of two irradiations and a total of three gamma counts (Glascock 1992; Neff 2000). A short irradiation was carried out through a pneumatic tube irradiation system which yielded gamma spectra containing peaks for nine short-lived elements: aluminum (Al), barium (Ba), calcium (Ca), dysprosium (Dy), postassium (K), manganese (Mn), sodium (Na), titanium (Ti), and vanadium (V). Samples were then subjected to a 24-hour long irradiation after which samples were left to decay for seven days, and then counted for 1,800 seconds (the "middle count") on a high-resolution germanium detector coupled to an automatic sample changer. This middle count served to determine seven medium half-life elements: Arsenic (As), lanthanum (La), lutetium (Lu), neodymium (Nd), samarium (Sm), uranium (U), and ytterbium (Yb). After an additional three to four week decay, a final count of 8,500 seconds was carried out on each sample which yielded measurements for 17 long half-life elements: cerium (Ce), cobalt (Co), chromium (Cr), cesium (Cs), europium (Eu), iron (Fe), hafnium (Hf), nickel (Ni), rubidium (Rb), antimony (Sb), scandium (Sc), strontium (Sr), tantalum (Ta), terbium (Tb), thorium (Th), zinc (Zn), and zirconium (Zr). Element concentration data from the three measurements were tabulated in parts per million (ppm).

Interpreting Chemical Data

The MURR analyses produced elemental concentration values for 33 elements in most of the samples. Nickel was removed from all statistical techniques due to the high number of missing values within the dataset. Statistical analysis was carried out on base-10 logarithms of concentrations on the remaining elements in order to compensate for differences in magnitude between the major elements such as calcium and trace elements such as the rare earth or lanthanide elements (e.g. lanthium (La); cerium (Ce); praseodymium (Pr)). Base-10 logarithms also yield a more normal distribution for many of the trace elements (Appendix B).

The purpose of conducting compositional analysis on ceramic artifacts is to identify distinct and relatively homogeneous groups within the analytical database (e.g. Baxter et al. 2008; Bieber et al. 1976; Glascock 1992; Harbottle 1976; Neff et al. 1989). These compositional groups can be graphically viewed as "centers of mass" which can each be assumed to represent geographically restricted sources and/or paste recipes (Bishop et al. 1982; Glowacki and Neff 2002; Weigand et al. 1977). At MURR, cluster analysis (CA), principal components analysis (PCA), and discriminant analysis (DA) using the MURR Statistical Routines and SPSS for multivariate statistics helped to identify patterns in the elemental concentrations. First, hierarchical CA was used to identify clusters of 32 of the recorded elements for each sample. Four rough groups were identified. This was followed by PCA in order to define and maximize the sources of variation between specimens. Groups were further refined through visual inspection of PC loading plots. Finally, the intersections of individual elements were projected on bivariate plots to better visually assess group membership. Mahalanobis distance calculations were used to test each group member against its group for robustness.

Through visual inspection of bivariate and PC loading plots and Mahalanobis distance calculations, the Angamuco chemical groups were compared with other ceramic samples in the MURR database. Using MURR Statistical Routines for GAUSS software implementing Mahalanobis distances and the Mean Euclidian Distance Search, the Angamuco samples were compared to previous groups identified in an earlier study in the region (Hirshman and Ferguson 2012). The raw clay samples were also projected onto the identified compositional groups to identify source production potential. The Angamuco samples were also compared to the existing MURR ceramic database. Comparison with the local and regional database is an important rational for submitting samples to MURR: the Angamuco data can be compared with existing chemical groups, but they will also be added to a larger database for future comparisons. Large datasets are critical for evaluating the accuracy of geochemical techniques and will ideally contribute to future use of ceramic sourcing studies in archaeology.

Radiocarbon Samples

One key objective of this dissertation is to date changes in social, economic, and political activities within and between site areas and architectural features and to link these to broader imperial changes occurring in central-western Mexico, such as the development and consolidation of the Purépecha Empire in the Late Postclassic. My goal was to date each feature type that was excavated and each excavated area of the site. During excavation, LORE-LPB project members ranked the carbon and bone samples that they recovered for dating potential, including a note about associated cultural materials, sedimentary changes, and contamination. All samples were given unique ID numbers, described in the unit reports, and entered into the ADAM database. While I was reasonably successful at dating all site areas, I was restricted by negotiations with the broader LORE-LPB sampling strategy which was focused on the Area C cemetery excavations. In addition, given the relatively shallow deposits of the excavation units (0.75 cm – 1.5 cm), the recovery of human bone in burials and *ofrendas* meant that bone samples would have a greater chance of returning uncontaminated dates than carbon. The full list of radiocarbon samples submitted for Accelerator Mass Spectrometry (AMS) at the University of Arizona AMS Laboratory is in Table 3.5.

Table 3.5: List of samples submitted for AMS.

Area	Unit	Level	Context	Material
A	AN2E28	4	elite room	charcoal
A	AN18E52-53	n/a	elite plaza; bone *ofrenda*	bone-long bone
B	BN12E8	4	multi-purpose house; interior, capa 4	charcoal
C	CN14E14	8-9	multi-purpose plaza/cemetery, burial 25	bone-metatarsal
C	CN12E16	6	multi-purpose plaza/cemetery, burial 2	bone-left fibula
C	CN10E20	5	multi-purpose plaza/cemetery, burial 17	bone-long bone
C	CN10E4	7-9	multi-purpose plaza/cemetery, burial 6.1	bone-left radius
C	CN12E14	5	multi-purpose plaza/cemetery, burial 1.1	bone-left arm
C	CN12W4	8-9	multi-purpose plaza/cemetery, burial 4	bone
C	CN12E4-6	7-9	multi-purpose plaza/cemetery, burial 7	bone-right arm
C	CN12E16	8	multi-purpose plaza/cemetery, burial 9	bone
C	CN12W4	7	multi-purpose plaza/cemetery, burial 14	bone-long bone
C	CN10E20-22	7-8	multi-purpose plaza/cemetery, burial 16	bone-femur
E	E3N0E0	5	commoner room	charcoal
F	F6S3E0	17	commoner plaza	charcoal

Chapter Summary

In this chapter I presented an overview of the field and laboratory methodologies employed in this dissertation project. With each method, I justified why certain techniques and sampling strategies were used. I began by outlining the full-coverage and airborne LiDAR survey strategies undertaken between 2009 and 2011 which included discussion of how a combination of remote sensing and traditional pedestrian techniques improved the accuracy and speed of our data collection. I also reviewed laboratory procedures for geospatial and artifact data processing, cataloguing, and curation in the Pátzcuaro field laboratory. This was followed by an outline of the excavation strategies in 2013 and 2014. Working with the LORE-LPB, I tested elite and commoner domestic and ritual spaces across seven areas of Angamuco. We used a combination of horizontal and vertical testing excavation techniques to ensure stratigraphic and chronological variability.

After fieldwork, I described the various laboratory analyses of ceramic artifacts that I used at both the CEMCA in Mexico City and at various institutions in the U.S. In Mexico, I initially categorized forms and styles, and carefully examined complete or nearly complete ceramic artifacts as references. Here I also discussed the attribute analysis on a selection of the excavated ceramics and a small sample of survey sherds. This was followed by the archaeometric methods used for evaluating potential differences throughout the site in ceramic production and resource-use. Use of INAA on sherds and clay briquettes from raw clay sources enabled study of the relationship between paste recipes and changes over time and within Angamuco areas. I conclude this chapter by noting the organic samples that were submitted for radiocarbon dating. Though cost and risk of contamination limited the number of samples that could be analyzed, the initial absolute dates presented in this dissertation provide a foundation for future research.

CHAPTER 4. ANGAMUCO

The site of Angamuco was first formally registered with INAH in 2009 by the LORE-LPB project (E14A2216178). Preliminary interpretations of the site settlement patterning, spatial layout, and organization appear in recent reports to the Mexican government (Fisher 2010; Fisher et al. 2011, 2012, 2014, 2016). The fieldwork and analysis discussed here suggest that Angamuco was a large urban site that was occupied from at least the Classic to Postclassic periods (300-1530 CE), including before, during, and after Purépecha imperial consolidation in the fourteenth century. Study of the occupational history, spatial layout, and organization is thus critical for providing a foundation to understand how local social practices were potentially impacted by broader political changes.

In this chapter I present an overview of Angamuco and discuss the architecture and layout of the site based on data collected from three years of pedestrian and airborne LiDAR survey and two years of excavation (see Ch. 3). I begin by briefly noting the environmental setting of the site including geological and geographical data from field observations, clay sampling, and conversations with geomorphologists and local residents. This is followed by a presentation of the architectural typology which was established by LORE-LPB project members for Angamuco. Over the years, this typology has been adapted due to ongoing fieldwork, but it has enabled us to quickly document features in the field and to evaluate potential urban settlement patterning throughout the site. Based primarily on data from this typology, I next summarize a recent urban settlement model suggesting that Angamuco had at least three major occupational periods from the Epiclassic through Postclassic periods. Certain feature types, such as sunken plaza groups, were documented primarily on the upper area of the site while larger monumental architecture such as *yácata* pyramids and open plazas with altars were found in the lower areas. These sunken plazas are diagnostic of the Classic and Epiclassic periods (300-900 CE) elsewhere in western Mexico, indicating that the upper area probably represents an earlier occupation of the ancient city. In contrast, the lower area may signify a reorganization of social and domestic practices due to the emerging Purépecha Empire during the Middle and Late Postclassic periods (1200-1530 CE). In Ch. 6 and 7, I evaluate this settlement model using excavation data. Finally, I conclude this chapter by examining possible ethnohistoric references to the Angamuco landscape. Although place-names change over time, Angamuco was such a large urban site during the Postclassic that it is conceivable that some aspects of the ancient city were mentioned in the ethnohistoric literature.

Environmental Context

Lake Basin Geology and Soils

Regional geography for western Mexico is mentioned in Ch. 2, so here I include additional information about the bedrock geology and volcanic parent materials that is relevant to the study of clay and temper production near Angamuco. The Lake Pátzcuaro Basin is located within the active Michoacán-Guanajuato Volcanic Field which is dominated by cinder cones and some stratovolcanoes (Figure 4.1). Three different sets of faults and fractures occur in the field, including those with NE-SW, E-W, and NW-SE orientations (Garduño-Monroy et al. 2009). Radiometric studies suggest that volcanism within the region migrated southward around one million years ago and that activity is now restricted to the southern part, including the youngest volcanoes Jorullo (1759-1774 CE) and Parícutin (1943-1952 CE) (Guilbaud et al. 2011). The base of the lake basin was formed by Miocene andesites derived from semi-shield volcanoes, ashes, gravel, and breccia from the El Metate volcano and faulting roughly 700,000 years ago (Chevrel et al. 2015). During the Early Pleistocene, the lake basin was altered by basaltic-andesite lavas that dammed the proto-Balsas River and resulted in substantial faulting (Fisher 2000; Garduño-Monroy et al. 2011). Several large volcanoes are visible in the lake basin (El Bosque, Tariaqueri, Yahuarato); the northern boundary is formed by flows from the Timben, La Acumara, La Pemba, and Huayambo volcanoes while the southern border consists of flows from La Taza and El Estribo eruptions (Pola et al. 2014). Lacustrine deposits from these eruptions date to the Pleistocene and Holocene, but more recently the La Taza cinder cone has been dated to 8430 ± 330 years BP (Israde-Alcántara et al. 2005).

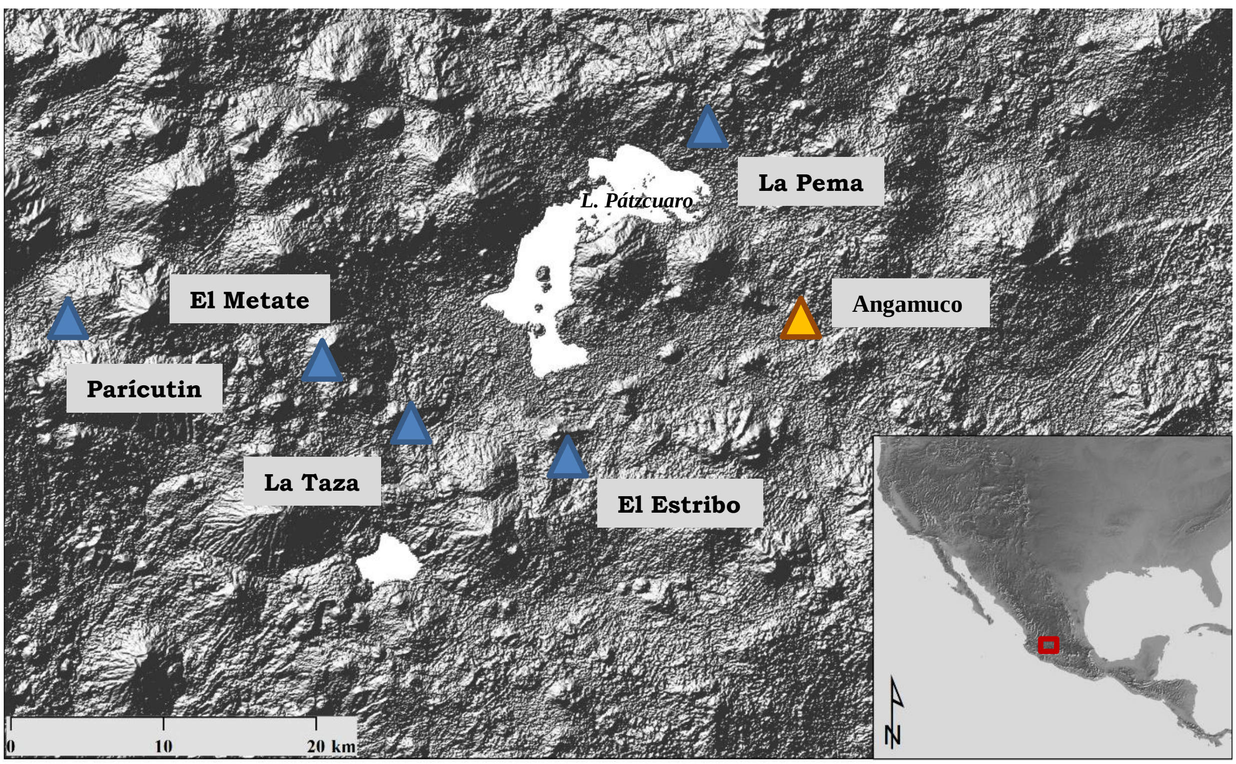

Figure 4.1. Location of key volcanoes within the Pátzcuaro Basin and surrounding areas in relation to the archaeological site of Angamuco. This region is located within the active Michoacán-Guanajuato Volcanic Field (NASA LP DAAC, 2009, ASTER GDEM v2).

Sediments and soils within the Pátzcuaro Basin are derived from two different parent materials. One material, *uirás*, consists of thick deposits of diatomite combined with tuff from Tertiary stratovolcanoes and underlies much of the lake basin in contact with basalt bedrock. *Uirás* is distinctively white with a blocky structure and a silty (silt loam to silt) texture with some clay (silty clay) lenses. *Uirás* may date to the original formation of the lake basin (Fisher 2000; Israde-Alcántara et al. 2005). The second parent material is composed of several types of volcanic sediments and rock. As described by Fisher (2000:53), much of this material is regolith and weathered from tertiary basalts, and consists of andesites containing olivine, albite, biotite, augite, and hypersthene. A large portion of this material also includes unconsolidated sediment from composite and cinder cones. This second parent material may be generally characterized as ash, breccia, and other pyroclastic material over volcanic bedrock.

Purépecha residents within the lake basin today use a tri-partite soil classification system that correlates directly to those identified for the region in the FAO-UNESCO system (Barrera-Bassols 1988; Barrera-Bassols and Zinck 2003; Toledo 1991). The local taxonomy is based on a multidimensional assessment of the landscape, including productive potential for food, materials for construction and ceramics, and other social purposes (e.g. medicine; ritual; magic). Lake basin residents recognize five major soil or 'soil cover' (*echeri* in Purépecha) types: dusty soils (*echeri tupuri*), clayey soils (*echeri charanda*), sandy soils (*echeri kutzari*), gravelly soils (*echeri tzacapendini*), and hard soapy soils (*echeri querekua*). These soils can be further subdivided into 15 subtypes and eight varieties based on textural and color differences in the upper 45 cm (Barrera-Bassols and Zinck 2003:Fig. 9). Soils may also be distinguished by their position on the landscape and proximity to neighboring landscapes, among other considerations. For further discussion on these soil types and land management strategies, see Barrera-Bassols 1988; Barrera-Bassols and Zinck 2003; Chacón Torres 1993; Fisher 2000:54–56; Pollard 1993; Toledo 1991; West 1948.

Geographical Context of Angamuco

Angamuco is located in the southeastern portion of the Lake Pátzcuaro Basin, approximately 9 km from Tzintzuntzan and 13 km from Pátzcuaro (Figure 2.2). Much of the site is situated on two major lava flow episodes that formed lower (2100 – 2180 m asl) and upper (2180 – 2400 m asl) occupation areas. Lava flow landforms such as Angamuco are called *malpaís* ("bad land") settlements in the American Southwest and Mesoamerica due to the rough and barren landscapes that can develop in xeric environments (Neuendorf et al. 2011). The natural surface of the Angamuco *malpaís* is irregular and punctuated by ridges, swales, and faults that formed at the same time as the magma of the parental flow. An initial assessment of the lava flow by geomorphologists indicates that it was probably formed during the early to middle Holocene, approximately 9,000 years ago (V-H. Garduño-Monroy 2010, personal communication; see also Guilbaud et al. 2012; West 1948:Map 2).

The Angamuco *malpaís* is located on the lower slopes of the sierra, which are currently characterized by four months of potential frost, at least two major soil types, and woodland and lakeshore biota. Importantly, the soils on the *malpaís* are anthrosols, which means that the entire landscape has been modified by people. The dominant soil on the upper part of the site is yellow earth (*t'upúri*), which is a productive mountain soil with fine texture that retains moisture well. Important for agriculture, this soil soaks up moisture during the rainy season preventing erosion (Gorenstein and Pollard 1983:Appx. 1). Some version of this sandy silty clay soil may have been modified by past inhabitants and used at Angamuco, which we documented at the bottom of units (see Ch. 5). Another common soil that was identified primarily in the lower areas of the site is a red earth clay (*charánda*), which developed from the weathering of volcanic rock in a climate characterized by warm summers, mild winters, and broad-leaf vegetation (Gorenstein and Pollard 1983:Appx. 1). This soil can be used for agriculture, but only after the rainy season has begun in late May and early June since it does not retain moisture. Based on clay sampling around Angamuco and discussion with local residents, this clay is the primary raw material for Angamuco pottery (see Ch. 6).

Currently the upper part of Angamuco can be defined as a densely-forested woodland environmental zone with oak, pine, and fir in the highest areas. Several species of oak (*Quercus* spp.), coral (*Erythrina Americana*), madroño (*Arbutus xalapensis*), pine (*Pinus* spp.), alder (*Alnus oblongifolia*, tepamu, *Alnus jorullensis*, aile. *Alnus cardifolia*, aile.), maguey (*Agave* spp.), and nopal (*Nopalea cochinellifera*) occur in the forest (Flores Mata 1972:41; Gorenstein and Pollard 1983:Appx. 1; West 1948:7–8, Map 5). Small brush and shrubs also cover much of the site, becoming larger and greener throughout the rainy season. The lower part of the site includes some trees, and may be considered a lakeshore vegetation zone, though much of it has been cleared of native forest and woodland growth for non-mechanized *milpa*-style agriculture by the Fontezuelas and Corrales communities. Local flora are grass, shrub, shrub oak, and cacti. Corn, beans, squash, pepper, and maguey are cultivated on the lower areas, but very little has been cultivated on the upper area in recent years. *Ejido* members indicate that this is because the upper area is difficult to access compared to the flatter lower areas, the soils are thin and mixed with rocks making them difficult to plow, and because the landscape consists mainly of collective land used for grazing animals. It is possible that kitchen gardens and small-scale agricultural activities occurred on the upper areas in the past, similar to the Purépecha house-lot gardens (*ekaŕлu*) and *malpaís* soil planting documented in ethnohistoric and ethnographic sources (Beltrán 1982:51; West 1948:38). As West (1948:45–46) noted almost 70 years ago, Purépecha house-lot gardens were used to grow *elote* maize, older varieties of maize (teosinte), beans, amaranth, various squashes, chayote, chiles, medicinal and ornamental plants, and fruits, as well as more recent imports such as cabbage, tomato, and lettuce (see also Gorenstein and Pollard 1983:Appx. 3 for discussion of protohistoric diet and references).

In addition to domesticates such as cows, horses, and dogs that belong to nearby residents, animals in the area include fox, squirrels, skunks, chipmunks, gophers, rats, rabbits and hares, mice, lizards, salamanders, leopard frogs, various species of birds (ally hawks, owls, ravens, hummingbirds, etc.), garter snakes, and at least two types of poisonous snakes (rattlesnakes and coral) (many of these were observed by LORE-LPB crew members and/or confirmed by the *ejido* field crews; see also Foster 1948:27; Gorenstein and Pollard 1983:Appx. 1). Older *ejido* residents indicated that in the past coyote and deer lived in the area, while it is possible that wolves once inhabited this environmental zone as late as the nineteenth century (Lumholtz 1987[1902]:362). Residents recalled that the *malpaís* had not always been forested and that sections were deforested in the 1920s for charcoal production. Historic documents from the Tzintzuntzan municipality confirm that this part of the lake basin was targeted for coal production after a railroad was installed post-Revolution, c. 1920s (Solinis-Casparius et al. 2015).

When the Lake Pátzcuaro was at its highest during the Late Postclassic period (1350-1530 CE), it may have been as close as 2.5 km west of Angamuco. Today the site is at least 8 km from the lake or further depending on whether one measures from the southern or northern sides of the *malpaís*. A spring on the western side of the *malpaís* is still in use and floods during the rainy season (June-October). Both the eastern and western sides of the site exhibit large depressions

(0.5-1 km^2) that likely served as reservoirs in the past. The soils associated with the potential reservoirs are cumulic and lacustrine indicating that they would have held water in the past (I. Israde-Alcántara 2014 and C.T. Fisher 2014, personal communication). In addition, during survey Prehispanic artifacts were not recovered from these areas, suggesting that they were not occupation zones. I sampled several of these possible reservoirs for clay as shown in Figure 3.6. Other sources of water on the *malpaís* likely came from hand-dug circular wells which we noted during the survey phase of the LORE-LPB project. Another possibility is that water was held in sinkholes and depressions on the upper part of the site, such as the *rejolladas* and rock cavities documented in the Maya region (Fedick 2014; Weiss-Krejci and Sabbas 2002).

Architecture at Angamuco

The surface of Angamuco is covered with well-preserved architectural remains, so we quickly realized that we needed to develop a strategy for documenting the ancient buildings and landscape features. Archaeologists have examined ancient architecture as an important way to understand how past societies organized their communities for some time (e.g. Blanton 1994; Childe 1950; Earle 1997; Zanker 1998). Spatial relationships such as the form and layout of buildings convey information about the basic internal structure of a settlement, which can in turn be used as evidence for interpreting different aspects of organization such as socioeconomic and political activities (Hirth 2000). Study of monumental structures, for example, can be used to infer control of labor, materials, and technology, accessibility to certain spaces, and the wealth and social status of those allowed into restricted areas (e.g. Barrett 1994; Fisher 2009; Moore 2005; Trigger 1990). The spatial expression of households, including domestic rooms and related open spaces such as patios, can detail the quotidian activities required for survival and how human behavior was structured in a particular community (Brumfiel 2006; Hastorf 1991; Kent 1990; Robin 2003; Smith 1987; Steadman 1996; Wilk and Ashmore 1988; Wilk and Rathje 1982; Wilson 2008).

Archaeological approaches to studying urban architecture often involve several areas of analysis (for reviews, see Marcus and Sabloff 2008:Ch. 1; M.E. Smith 2008:Ch. 1; M.L. Smith 2003). First, scholars may examine the form of structures at a settlement, layout and planning, population densities, or simply architectural elements such as terraces or pyramids (Millon 1973; Pollard 1972:197; Rodriguez 2013). On another level, researchers use inferences based on form and layout to examine urban life such as issues of social class, gender, ethnicity, and the social organization of neighborhoods (Arnauld et al. 2012; Meskell 1999; M.E. Smith 2010). Household archaeology and craft production studies often fall into this type of urban architectural analysis (e.g. Brumfiel 1987; Costin 2000; Hirth 2000; Smith 1987). Another research area also applies inferences based on mapping and context to infer the meaning of architectural features, such as the symbolism of ancient buildings in terms of power, authority, and accessibility (Hillier and Hanson 1984; Rapoport 1982, 2008). Urban meanings can be important indicators of identity in culturally specific environments. In this chapter, I primarily discuss the urban form and settlement pattern and an archaeological typology as a foundation for future work on aspects of household archaeology and architectural symbolism.

Typology

Typological systems have long constituted a fundamental element of classification and analysis toward understanding social variation through time (Adams and Adams 1991; Cowgill

1990; Dunnell 1986; Ford 1954; Hill and Evans 1971; Krieger 1944; Ramenofsky and Steffen 1998; Spaulding 1953; Whallon and Brown 1982; Willey and Phillips 1958). Such typologies have spatial, temporal, or functional associations, and are commonly created from collections of ceramics, stone tools, or other classes of artifacts. A classification scheme is an important first step for ordering and understanding field data, including architecture in the form of buildings, agricultural features, roads, etc. Importantly, such schemes must be reproducible so that future researchers can examine data from multiple perspectives (Boozer 2015).

In this study, an architectural type includes buildings and landscape features that demonstrate similar rules of morphology, potential function, placement within a settlement, and relationships to other features (Scheer 2010; Wandsnider 1998). The study of architectural types is important because their construction was part of a particular set of socio-political forces acting upon builders in specific cultural moments. This means that types are a reflection of cultural and technological activities, behaviors, and norms that can enhance our understanding of social settings and that can be used to infer the meanings of urban and other social processes (Barrett 1994; Lominy 2006; *cf*. Dobres 1995, 2001; Dobres and Robb 2000). At Angamuco, it is clear that there is a corpus of distinct and differentiated building types that served to create and distinguish space. These standardized forms create an architectural 'grammar' based on the orientation of walls, platforms, doorways, roads, passages, terraces, and their shape, arrangement in space, and association and placement in relation to other such features (Glassie 1975; Sutro and Downing 1988). Elsewhere in Mesoamerica, scholars have classified standardized forms in discussions of the ideal types of the Gulf Lowlands (papers in Stark and Arnold 1997; Stark 1999), patio groups of the Maya lowlands (Ashmore 1981; Hutson et al. 2004, 2007), and major urban sites such as Xochicalco (Hirth 2000) and Teotihuacan (Cowgill 2015; Millon 1973; Millon and Altschul 2015).

At Angamuco, we focused on creating a typology that served to identify urban forms and spatial layout. After establishing a basic methodology for identifying urban forms and spatial layout, study of style will be an important step that can both provide critical cultural information and help to document the diversity of Purépecha architecture.

Identifying Architectural Features

The thousands of ancient buildings and associated landscape features visible on the surface of the Angamuco *malpaís* were constructed from basalt boulders and slabs (*lajas* in Spanish; *xanamu* in Purépecha (see León 1886b)) removed from the surface or mined from a shallow depth. Basalt gravel, pumice, and sediment were used for fill. Builders took advantage of the *malpaís* topography and used natural features to enhance architectural construction. Sunken plazas and surrounding terraces were located on basin or swale areas while the longest roads follow faults that extend for almost the entire length of the *malpaís*. This involved various degrees of landscape modification including flattening areas with fill, terracing slopes, and creating divisions and connections with the built environment. Very little of the *malpaís* was not modified by people.

Currently, the architecture at Angamuco is composed of stone which lacks preserved mortar. Mounds, pyramids, and platforms are rubble-filled and faced with stacked stone. Many of these stone structures probably supported a super-structure of walls made from wood, wattle-and-daub, or other perishable materials. It is possible that walls, interior features, and monumental architecture were covered with plaster or paint – similar to the architecture documented for the imperial capital, Tzintzuntzan (Acosta 1939; Rubín de la Borbolla 1939, 1941), and in the nearby Zacapu region (Migeon 1990; Pereira et al. 2012; Puaux 1990). In addition, some walls may have been used as screens, fences, and planks that were sewn together. Roofed areas were likely covered by thatch, similar to those depicted in historic illustrations and descriptions by anthropologists in the nineteenth and early twentieth centuries (Beals and Carrasco 1944:33–36; Lumholtz 1987[1902]:365; West 1948:30). Structures that did not have stone foundations were probably common at Angamuco, but we are not able to observe these on the surface. For example, broad terraces in residential zones have artifact scatters that indicate a domestic occupation but no observable foundations. Features in these areas were probably constructed using wattle-and-daub or other perishable materials.

The Angamuco Architectural Typology

The typology, which is described in earlier versions in INAH reports and Master's theses (Ahrens 2013; Bush 2012; Fisher et al. 2011, 2012), is best illustrated as a flowchart shown in Figure 4.2. We designed the typology by classifying components from the smallest unit, such as a wall or individual room, and then at the next level by how buildings are arranged so that surveyors can move through the flowchart even with partial or fragmentary structures. The format of the typology also works well as a data dictionary loaded onto a GPS unit so that surveyors can quickly and efficiently classify buildings and landscape features in the field.

The Angamuco typology begins by categorizing whether a feature may be placed in one of four groups: above ground; ground level; prepared open zone; or a landscape feature. An above-ground feature would typically be situated on a platform or mound. In contrast, a ground level feature such as a wall possesses a foundation whose primary functional area was located at the elevation of the ground surface. I discuss these four groups in more detail below.

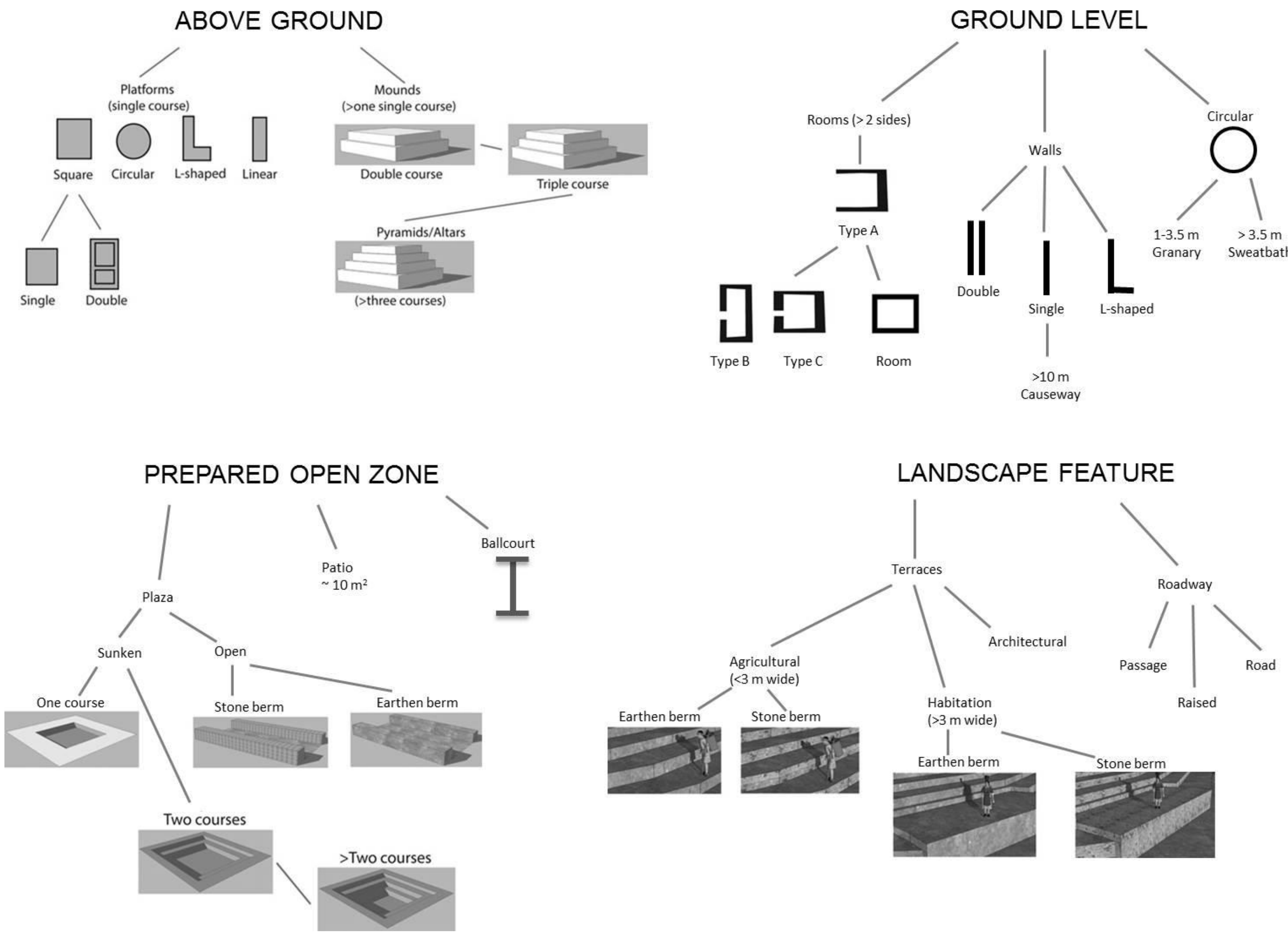

Figure 4.2. Architectural typology used at Angamuco (modified from Fisher et al. 2011, 2012).

Above Ground Types: Platforms

Above ground features were classified into platforms or mounds. Platforms (identified as PLT in the LORE-LPB data dictionary) have one course (*cuerpo*) and a complex structure with a rubble core that is faced with larger, sometimes almost fitted, stones (Figure 4.3). Platform courses average around 50 cm in height though some are taller. The overall plan for platforms varies, ranging from abstract through compound shapes for buildings, and they can be free standing or connected. Artifact collections from survey suggest that platforms were primarily associated with domestic occupations in both elite and commoner contexts (Fisher et al. 2011:Appx A).

We identified four platform subtypes based on shape, size, association, and context (Figure 4.3). The square or rectilinear single square platforms can be categorized into single square or double square subtypes. For double examples, one of the platforms is smaller while the division is often composed of a passage-like feature. Square platforms may have served as superstructures for above ground buildings such as domestic structures like wooden *trojes* documented in Michoacán and elsewhere in central Mexico in more recent periods (Barthelemy and Meyer 1987; Beals and Carrasco 1944:33–36; Lumholtz 1987[1902]:365; West 1948:27–32). In addition to the square forms, we identified circular, L-shaped, and linear platforms. The circular examples, which we defined based on a lack of corners and sides that are equidistant from a central point, may have served as a foundation for maize storage features called *cuexcomates* and larger circular domestic buildings illustrated in the RM (e.g. Craine and Reindorp 1970[1541]:Plates 24, 34). We distinguished the L-shaped subtype as two linear platforms forming a 90 degree angle. Based on depictions in the RM and excavations at the site of Lagunillas, these features may represent a small enclosed building attached to a large porch on which a lord received subjects (e.g. Craine and

Reindorp 1970[1541]:Plates 3, 9, 11, 15, 17, 31, 33, 38; Cruz Robles et al. 2014). Finally, linear platforms were defined by one long dimension. These platforms may have served as walls marking roads, groups of buildings, and other social configurations.

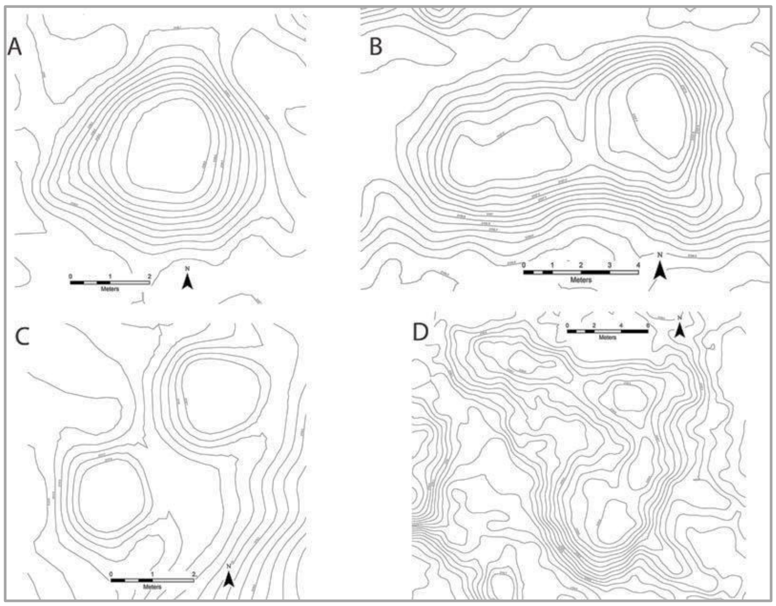

Figure 4.3. Examples of formal platform types from Angamuco: A. Single, B. Double, C. Two circular platforms, D. L-Shaped. All examples shown with 10 cm contours derived from LiDAR data using a DEM with 25 cm resolution (modified from Fisher et al. 2016, n.p.).

Above Ground Types: Mounds (Pyramids and Altars)

The other above-ground architectural type is the mound (identified as MO in the LORE-LPB data dictionary), which we distinguished from platforms by the presence of more than one course. Mounds with three or more courses probably represented either pyramids or altars, which will likely be further categorized in future research. Pyramids have two key forms, the rectilinear and the semi-circular or *yácata*, which both occur mainly in the lower areas of the *malpaís*. The more common rectilinear forms consist of a primary axis that is much shorter than the secondary axis, which results in two long open faces. Perishable building forms were likely constructed on the top of this pyramid and were accessed by a stairway running along the primary axis. The rectilinear pyramids vary in terms of size, configuration, and cardinal orientations. Some examples anchor the end of a sunken plaza similar to Epiclassic (600-900 CE) configurations in the Bajío region (Cárdenas García 1999; Piña Chan and Oi 1982; Pomédio et al. 2013). Pyramid 2768 is the largest rectilinear pyramid documented at Angamuco (Figure 4.4) and forms the northeast end of a plaza complex (PLZ 2738) flanked by buildings to the west, south, and east sides, including proto-*yácata* 2740 to the west (see discussion below). This example has at least four courses and is approximately 15 m high. The remains of a perishable structure, probably room Type B (see below), occupy a small platform on the uppermost level. Access to the top of the pyramid would have come from a stairway that ran along the primary axis on the west face, suggesting that the entrance faced the sunken plaza. Similar to the Middle Postclassic rectilinear pyramid contexts excavated at Prieto in the Zacapu Basin, this Angamuco example likely served a ritual function associated with religious and funerary activities (Forest 2014; Pereira et al. 2012).

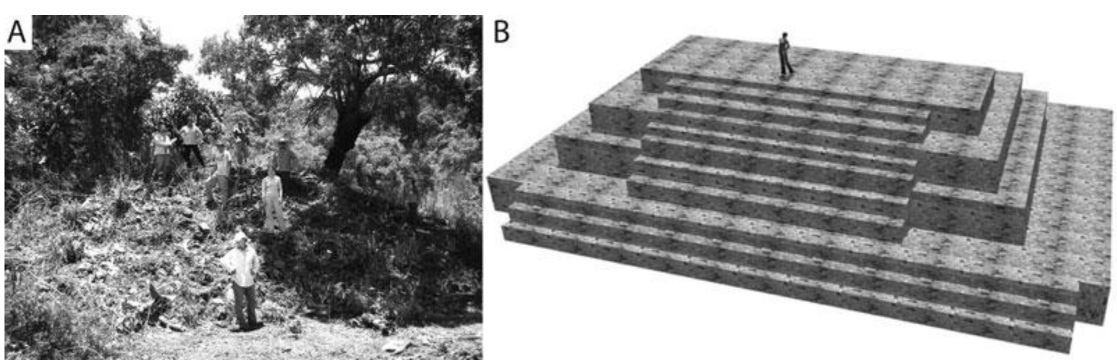

Figure 4.4. Two views of the pyramid 2768. A. Photo of this feature after vegetation was cleared; B. Reconstruction of the pyramid based on intensive mapping (modified from Fisher et al. 2011).

The other type of pyramid at Angamuco, the semi-circular and rectangular-based *yácata*, is traditionally associated with Purépecha settlements in Michoacán (e. g. Acosta 1939; Beaumont 1932; Gali 1946; Goggin 1943; León 1886b; Lumholtz 1987[1902]:374; Pepper 1916; Rubín de la Borbolla 1941, 1944; West 1948). The largest *yácata* yet documented at Angamuco (MO 5037) (Figure 4.5), was associated with the Area C excavations (discussed in Ch. 3 and 5). The circular section has dimensions of 17.5 m by 19 m while the rectilinear section is 34 m by 13 m. Each course on both sections includes several steps that are 1 m wide and 80 cm tall and that likely served as stairway access to the top of the pyramid. The overall height of the structure is approximately 5 m tall, though some modern looting probably impacted this dimension. On the top of the circular portion, we documented the remains of a large room (4 x 6 m) with stone floor remnants. Based on images in the RM, it is possible that a perishable structure with a thatched roof was also located on top of the rectangular portion. Access to the plaza features to the east and northeast of this *yácata* appear highly restricted with specific points of entry. Consistent with the material from the Area C excavation, this pyramid was likely used during the Middle to Late Postclassic periods (1200-1530 CE) and it has a morphology similar to Purépecha examples at the sites of Tzintzuntzan, Ihuatzio, Pátzcuaro, Lagunillas, and San Juan Paragaricutiro (Acosta 1939; Castro-Leal Espino 1986; Lumholtz 1987; Cruz Robles et al. 2014; Rubín de la Borbolla 1941).

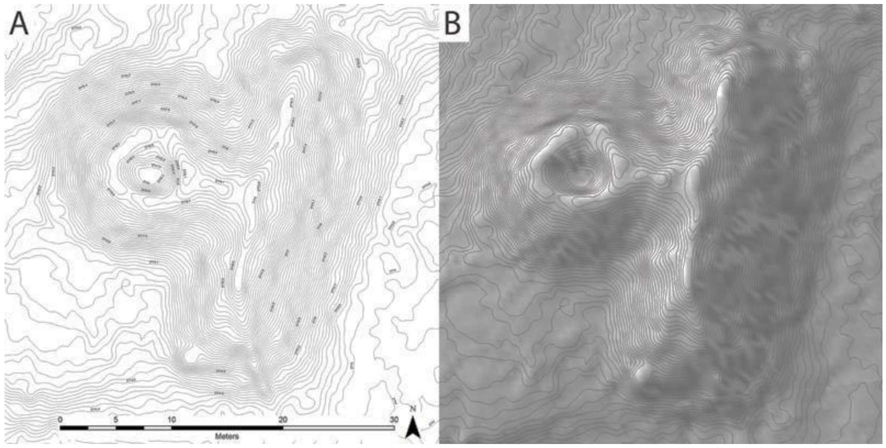

Figure 4.5. *Yácata* 5037. A. A plan view of this feature as a 5 cm contour map; B. A perspective view using the same contour map overlain on a hillshade. All features derived from a 0.25 cm DEM created from high resolution LiDAR (modified from Cohen and Fisher 2016).

A variation of the traditional *yácata* form is MO 2784 shown in Figure 4.6. In this example, the circular and the smaller rectilinear portions are directly joined together. Although this *yácata* was damaged by post-depositional processes including looting, it is possible to distinguish four small steps with similar dimensions to *yácata* 5037 described above. Access to the top of this feature likely came from the open side of the rectilinear portion within a plaza though the poor condition makes this unclear. Also like *yácata* 5037, a single room with a paved floor and a possible perishable structure was visible on top of the circular portion. The overall plan of this *yácata* is similar to Aztec pyramids dedicated to Ehecatl, an avatar of the feathered serpent Quetzalcoatl (Castro-Leal Espino 1986:60; Pollock 1936:3–18; M.E. Smith 2008:103–105). A prominent circular temple also appears at the site of Tula which suggests to M.E. Smith (2008:104) that the Aztecs borrowed the form from the Epiclassic to Middle Postclassic period Toltecs in central Mexico. It is worth noting that circular-based temples or pyramids have been documented at Classic period Teuchitlán sites (the *guachimontes* structures) in Jalisco and at Preclassic period

Cuicuilco in southern Mexico City, so the circular form is not an anomaly in Mesoamerican societies (see discussion in Castro-Leal Espino 1986:48–63).

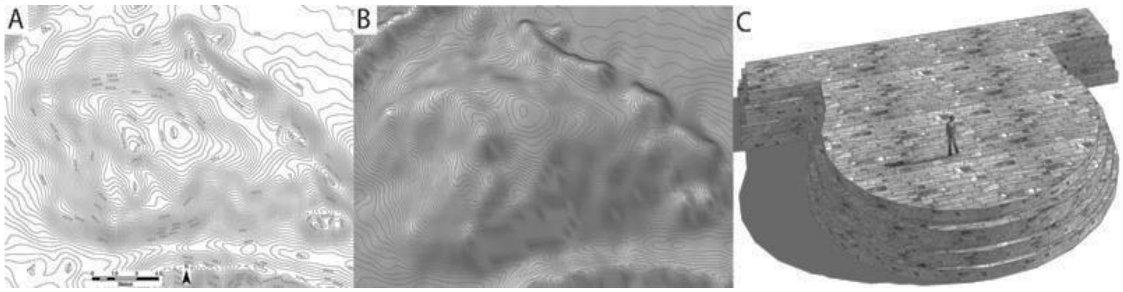

Figure 4.6. Variation of a Purépecha *yácata* (MO 2784). Feature is damaged from modern land use. A. Plan view using a 5 cm contour map; B. Perspective view using the same contour map overlain on a hillshade; C. Reconstruction of MO 2784 based on intensive mapping with a 1.5 m tall human figure on top. The pyramid is oriented differently in this image to emphasize the circular portion. All features derived from a 0.25 cm DEM created from high resolution LiDAR data (modified from Fisher et al. 2016, n.p.).

One more variation of both the rectilinear pyramid and the semi-circular shaped *yácata* may be called a proto-*yácata*. This composite shape is formed by a conjoined circular and rectilinear element connected at the center by a short linear platform. The resulting form is a stepped pyramid with a 'keyhole' shaped plan created by combining a circular, linear, and rectilinear mound (Figure 4.7). This proto-*yácata* forms the edge of a sunken patio with the rectilinear pyramid 2768 (Figure 4.4), anchoring one end. The primary axis runs along the central connecting portion and a secondary axis follows the long direction of the rectilinear section. This results in three façades for the rectilinear portion and a circular façade at the other end of the primary axis, which would have comprised the main visible portions of the structure aside from perishable features on the top. Similar to other *yácatas*, the primary functional area of this structure was probably the top of the circular portion. Access to this area was by a narrow stairway on the rectilinear portion that faced the adjacent sunken plaza. Since this type of pyramid occurs in association with the rectilinear-based type that is similar to the pre-imperial pyramid forms in the Zacapu Basin, it is possible that these two pyramid forms represent pre-imperial and imperial occupations. LORE-LPB survey and intensive mapping of structure 2740 suggest that the circular portion was added after the linear element had been constructed. This would have resulted in a sequence in which the sunken plaza and pyramid complex were constructed first, followed by linear walls forming the plaza, and then surrounding structures including the circular element. The rectilinear pyramid could thus represent the earlier occupation and forms of ceremonial or ritual practice while the semi-circular form represents the imperial occupation which involved new practices. When Jorge Acosta and Daniel Rubín de la Borbolla excavated the site of Ihuatzio in the 1930s, they documented both rectilinear-based and semi-circular *yácata* pyramids at the site and concluded that the former form relates to an earlier occupation (900-1200 CE) while the latter relates to a later Purépecha occupation (1350-1530 CE) also at Tzintzintzan (Acosta 1939:93; Rubín de la Borbolla 1941). Although this work was done before the use of radiometric dating, their interpretation does support the idea that the rectilinear-based pyramids at Angamuco are similar to the earlier sunken plaza complexes as seen in the Bajío and Tingambato and that the two forms represent different temporal periods.

A final type of mound that we categorized at Angamuco was the altar, a small stepped rectilinear mound found in the centers of plazas and patios and at the entrance/exits of road systems. Altars are composed of more than three courses and are distinguishable from pyramids by their smaller size and the presence of stairways on 2-4 sides (Figure 4.8). There is significant variation in the morphology and placement of these features and future research will likely identify several subtypes. The altar shown in Figure 4.8 and Figure 4.9 is a rectilinear stepped mound with four courses and stairways on the west, south, and east sides. In the Area C excavations, we excavated several units around this altar (MO 5001) which is one of two located in an open plaza flanked by the large *yácata* discussed above. This architectural configuration is similar to that found at the site of Ihuatzio (Acosta 1939:19) and our excavations indicate use of this feature in funerary activities during the Middle to Late Postclassic periods (1200-1530 CE) (see Ch. 5). In addition, ethnographic discussion of Purépecha pyramids in the nineteenth and twentieth centuries indicate that some may have been used as tombs, places of worship, and stages for display and spectacle (León 1886b:65, 68–70; Foster 1948; Lumholtz 1987[1902]:375; Pepper 1916).

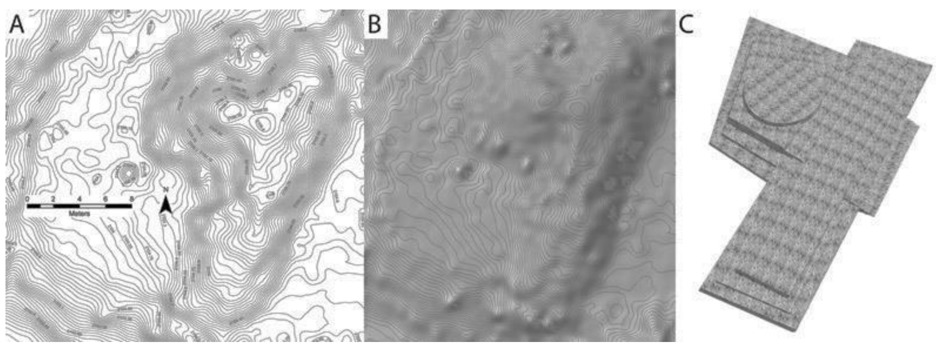

Figure 4.7. Second variation of a traditional-style Purépecha pyramid from Angamuco. A. Plan view of this feature using a 5 cm contour map; B. Perspective view using the contour map overlain on a hillshade; C. Reconstruction of the pyramid based on mapping. All features derived from a 0.25 cm DEM created from LiDAR data (modified from Fisher et al. 2012).

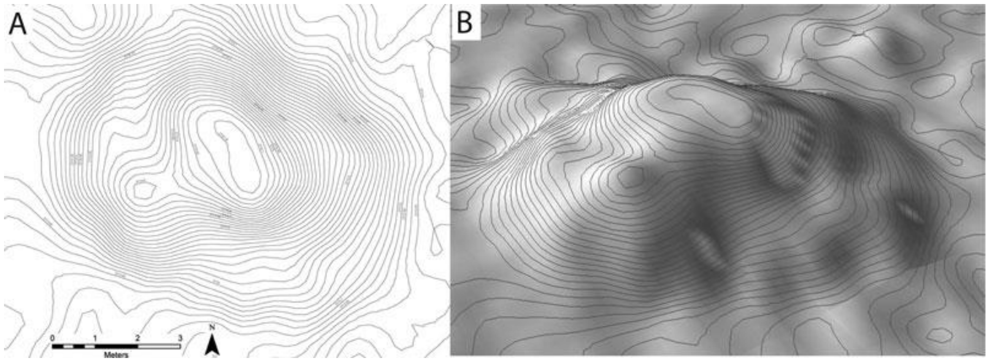

Figure 4.8. The large altar (MO 5001) in excavation Area C. A. Plan view of this feature as a 5 cm contour map; B. Perspective view of this feature using the same contour map overlain on a hillshade. All features derived from a 0.25 cm DEM created from LiDAR data (modified from Fisher et al. 2016, n.p.).

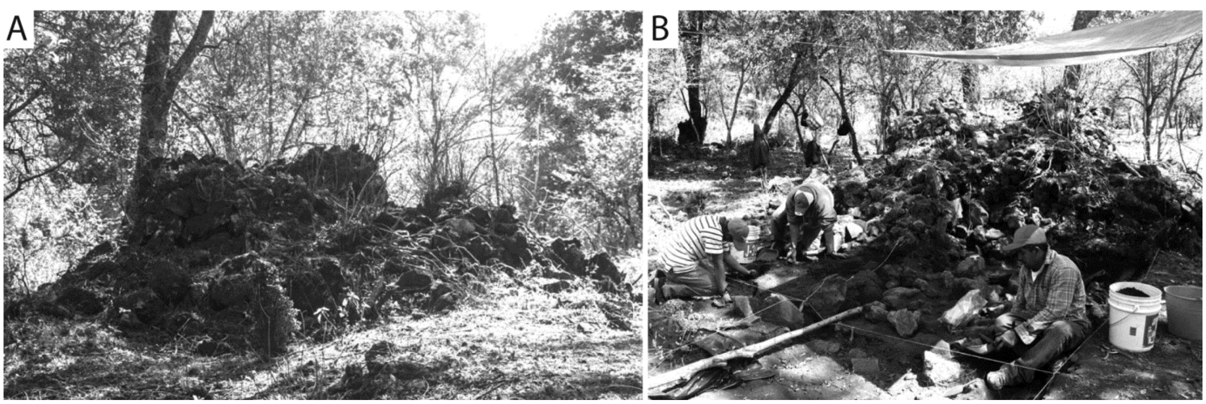

Figure 4.9. Two views of altar 5001 looking east: A. Prior to clearing and excavation; B. During excavation (modified from Fisher et al. 2016).

Ground Level Type: Rooms, Walls, and Circular Features

Another major architectural category in the typology is ground level features which we characterized by square, linear, and circular forms that likely served as a foundation for buildings made from perishable materials such as adobe, wattle and daub (*bajareque*), or wooden/cane screens. We distinguished ground level features by the number of sides, shape, and overall configuration. We classified structures with more than two walls as either square-based or circular rooms (*edificios* or ED in the LORE-LPB data dictionary). Based on the number of walls, the overall shape, and the presence or absence of a discrete entrance, we classified square-based rooms into four subtypes. The small (~1.5-2 m x 2 m) Type A form is composed of three walls and an open side; the fourth side may have been a perishable wall and entranceway. We distinguished Types B (rectilinear) and C (square) as having four walls with an open entrance area in one wall. Smaller versions of these types are 1.5-2 m by 2 m while larger examples range from 4 m to 10 m on one side. The fourth subtype, the enclosed room (*cuarto*), is defined by four walls surrounding an enclosed space (~1.5 m x 1.5 m) that lack a clear entrance. These rooms appear in both the upper and lower areas of the site, though larger examples of Type C in excavation Area B (Figure 4.10) are only in the lower areas and may have been embedded within large plaza or ritual complexes as a type of public building. Some of the B and C subtypes occupy centralized positions within residential complexes and can be associated with private patios such as in excavation Area A (Ch. 5). Many of the Angamuco rooms appear in residential contexts based on surface and excavation material, while others are similar to storage rooms documented at Tzintzuntzan and Tingambato (Rubín de la Borbolla 1941; Piña Chan and Oi 1982). We excavated several different types of these rooms in Areas A, D, E, and G and the results are discussed in Ch. 5.

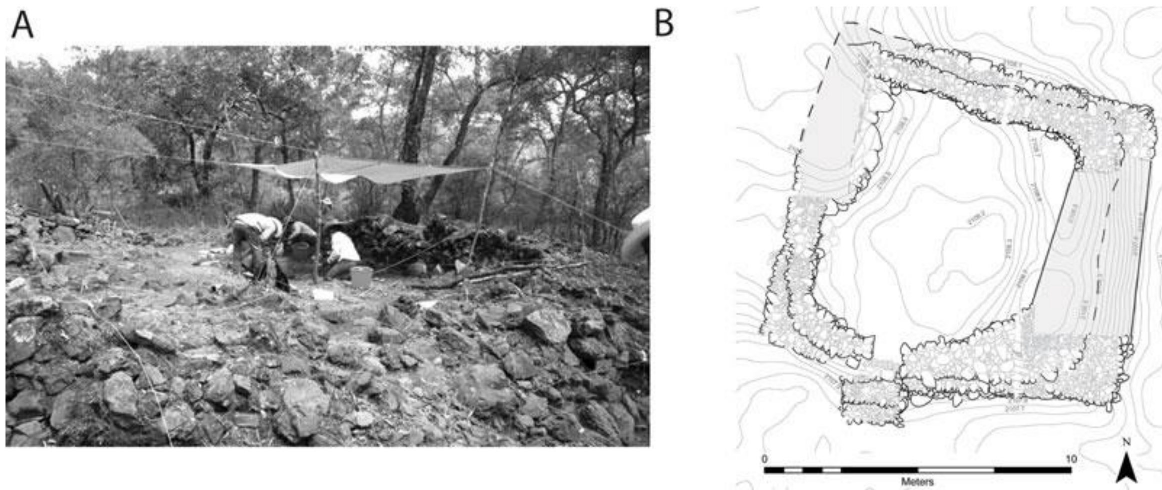

Figure 4.10. An example of a large type C building (ED 5128) that was excavated as Area B in 2013. A. ED 5128 looking north; B. Plan map of this structure (modified from Fisher et al. 2014).

Another ground level type is the wall, which is composed of a single-course of stacked stone that is typically 50 cm wide (although thicker examples do exist) and that range in height from 50 cm to 1 m (referred to as M for *muro* in the data dictionary). Four subtypes of walls can be defined by their overall shape and total dimensions: single wall (< 10 m long); causeway (*calzada*) (> 10 m long); parallel (single-course stacked stones used to form a room); L-shaped (two linear sections at 90 degrees). Depending on associated architecture and size, these walls would have been used to designate plaza groups, neighborhood or community access, or larger social divisions throughout the site.

Finally, we defined the two kinds of circular ground-level features based on the presence of a circular foundation. In her Master's thesis, Ahrens (2013) examined 296 of these circular features and argues that there are two major prototypes based on diameter, morphology, and context. The first is a granary (*cuexcomate*), which consists of a circular stone foundation that would have contained a circular wattle and daub superstructure topped with a grass lid (Figure 4.11). The stone foundation varies in diameter from < 1 m to 3.5 m (mean = 2 m) with a small (25 cm) entranceway in one section of the foundation. Granaries sometimes include basal features such as semi-subterranean interiors with a shallow dished-out bottom while other bases were made from small cobble pavements with an exterior apron. Similar to data from the Zacapu Basin and elsewhere in Mesoamerica (Ahrens 2013:15; Hernández Xolocotzi 1949; Pereira et al. 2012; Pollock 1936; Puaux 1990), it is likely that the superstructure was composed of wattle and daube with an upper entrance and a thatch roof. In terms of spatial configuration, Ahrens (2013) found that granaries with variable diameters occur in public ritual, elite, and commoner contexts and that many are located in highly visible locations such as the edge of a plaza or adjacent to a road. One cluster of roughly 12 granaries occurs on the western hillslope between the upper and lower areas of the *malpaís* next to a major road. They range in size from 1.3 m to 2.9 m and are all located within 5 m of each other, implying similar function and ownership (Ahrens 2013:72). Mesoamerican scholars have shown that the number and location of granaries likely served as markers of status, wealth, and/or group identity and that the location of several granaries in one place may be a more sensitive indictor of socio-economic status rather than the overall size of the feature (Hirth 1992; Lumholtz 1987[1902]; Smyth 1989). The other circular ground-level feature, the sweatbath (*temezcal*), has a stone foundation that is greater than 3.5 m in diameter (Ahrens 2013). Sweatbaths are located on a small stepped platform that follows the outline of the overall feature and that includes a narrow step (>30 cm). In the RM, sweatbaths are depicted when the text discusses how the king takes baths with his women and during punishment (Figure 4.12).

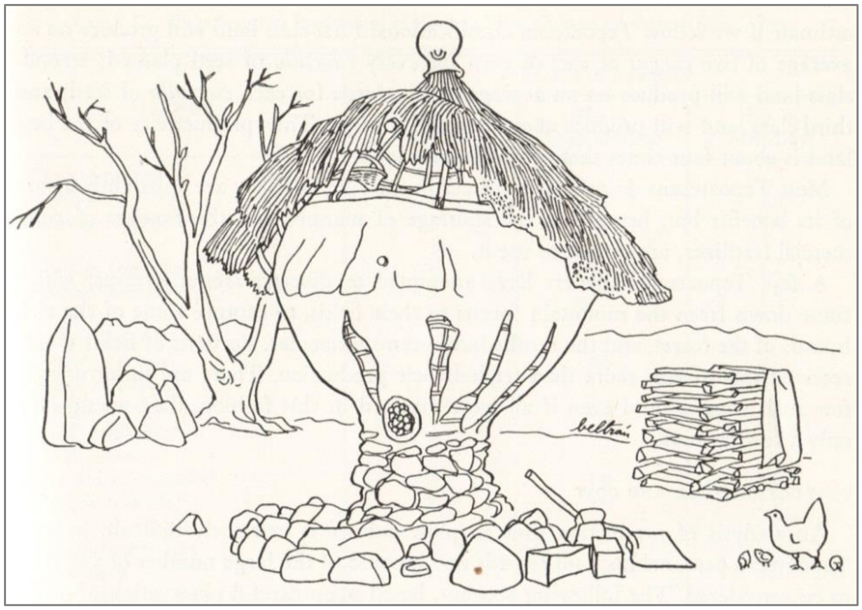

Figure 4.11. Drawing of a granary from Tepotzlán, Mexico (Lewis 1951:52).

Figure 4.12. Circular sweatbaths depicted on the far left (Escobar Olmedo 2001[1541], Courtesy of Dumbarton Oaks Research Library Rare Books Collection, facsimile no. 284).

Prepared Open Zone: Plazas, Patios, and Ballcourt

In addition to ground level and above ground structures, other features at Angamuco represent intentional open space (referred to as PLZ and PA in the data dictionary). These features are discussed in another Master's thesis (Bush 2012) and I summarize a few results here. A plaza refers to an intentionally-cleared, level, and open space (Inomata and Tsukamoto 2014). At Angamuco, we distinguished sunken plazas as rectangular or kidney bean-shaped open spaces with one to three earthen or stone steps on all four sides. Located only on the upper area of the site, sunken plazas vary in size from 250 m^2 to 1000 m^2 and may represent an extended household residential group rather than public space (Bush 2012:58, 68–69). Wider sections may have been built into the raised roadways (*calzadas*), serving as bastions, ramps or staircase while others may have been used to contain water such as sinkholes (*rejollada*). We excavated two sunken plazas in Areas E and F and I discuss the results in Ch. 5. The other open subtype of plaza is characterized by cleared spaces that are more than 10 m^2 and that often have surrounding walls of stone and/or earth, and that may have adjacent buildings. These mainly co-occur in the lower area with larger monumental architectural (such as excavation Areas A, B, and D), suggesting that they were used in more public contexts than the sunken plazas. In general, Bush (2012) suggests that plazas in the upper area may have been associated with smaller buildings while plazas in the lower area were more likely to be associated with a few larger buildings or monuments. Finally, we classified the patio subtype as a small (<10 m^2) ground-level plaza with paved or packed earth that was located within a set of buildings on all four sides. Access to these features was restricted and probably served a particular social group or family. We excavated a patio space in Area A that rendered evidence for ritual domestic activities such as building consecration (Fisher et al. 2016: Appx. A).

A final type of prepared open zone is the I-shaped ballcourt, which had previously not been identified in the Lake Pátzcuaro Basin archaeological record. We have only documented one at Angamuco and it is difficult to see on the surface despite the clear I-shape visible with the LiDAR hillshade (Figure 4.13). The I-shape is typical for Classic and Postclassic period ball courts in Mesoamerica (Taladoire 2001) and in western Mexico the form has been documented at the Zacapu Basin *malpaís* sites (Michelet et al. 1995; Taladoire 1989) and at Tingambato (Piña Chan and Oi 1982). Although ball courts at Ihuatzio and Tzintzuntzan are mentioned in the RM, this represents the first archaeological example of the I-shaped ball court in the Pátzcuaro Basin (see Cárdenas García 2004 for discussion of the possible Ihuatzio ballcourt). A ballgame using sticks, called the *Pelota Tarasca,* is still played in parts of Michaocán (Beals and Carrasco 1944; Corona Núñez 1957) and today Purépecha communities in Uruapan, Erongaricuaro, and elsewhere in the Pátzcuaro Basin participate in a game using a ball on fire. Based on the one example at Angamuco, it is unsurprising that others have not been identified since it is almost impossible to see on the ground.

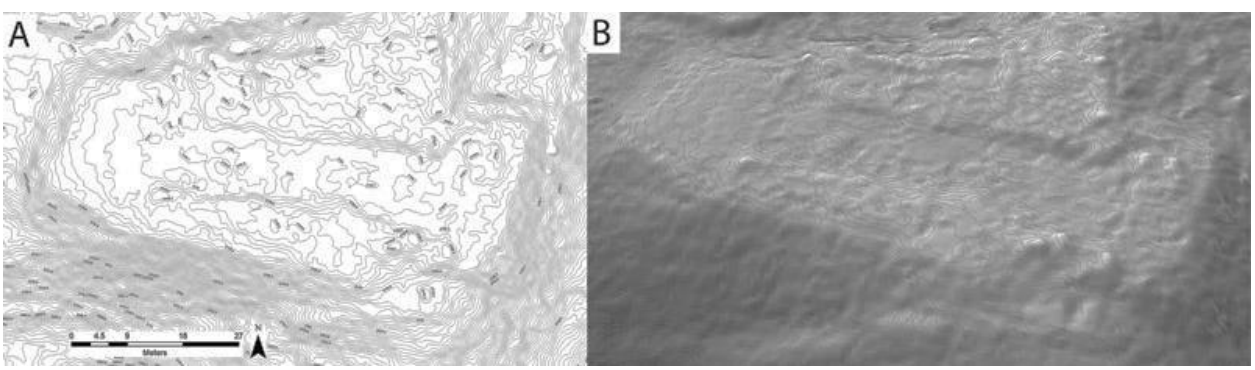

Figure 4.13. I-shaped ballcourt from Angamuco. A. Plan view of this feature as a 5 cm contour map; B. Perspective view of this feature using the same contour map overlain on a hillshade. All features derived from a 0.25 cm DEM created from LiDAR data (modified from Fisher et al. 2012).

Landscape Feature: Terraces and Roadways

The final major architectural type that we defined at Angamuco is the landscape feature, which is closely associated with the natural topography of the site (identified as TZ in the data dictionary). For example, the terrace, which is a flat strip of land cut into a hillside and formed by earth and/or stone is common at Angmauco and likely had multiple functions ranging from agricultural, habitational, and architectural (Donkin 1979). We defined agricultural terraces as < 3 m in width and located on both steep and gentle slopes. Elsewhere in the Pátzcuaro Basin, such as at the Purépecha island treasury site of Apupato, narrow terraces that are 1.5 m wide were used for maguey cultivation (Pezzutti 2010). West (1948:38) reported the use of soil retaining walls or terraces at the lower edges of hillside fields in recent Purépecha communities which is similar to agricultural terraces used elsewhere in highland Mesoamerica (Parsons and Parsons 1990; Rodríguez 2006). A habitational terrace subtype is distinguished as >3 m in width and associated with domestic contexts such as sunken plazas. These terraces do not commonly have architectural remains on the surface, though excavations indicate that they would have served as a platform for one or more residences (e.g. Areas E and F discussed in Ch. 5 and Fisher et al. 2016: Appx A). A third subtype, the architectural terrace, is composed of stone benches or berms typically found in and around large buildings, pyramids, and other structures. These terraces probably served to support architectural components and/or served as stairs leading to the top of the features. We found little soil in association with these terraces, possibly due to erosion.

Another important landscape type that we can identify are roads and passages that are visible on the surface and in LiDAR data. There are several different subtypes of such 'movement landscape features' that are currently being evaluated, so I anticipate that these categories will be refined in the future. Units of movement such as passages (*pasajes*) and raised roadways (*calzadas*) functioned as access points within and between clusters of buildings, neighborhoods, and other sections of the city. A passage is the fundamental unit of movement in areas of complex architecture and is composed of an interior space formed by walls, platforms, or other adjacent architecture, that connects one activity area within a plaza complex to another. A raised roadway is a special type of linear platform consisting of a well-constructed and elevated road >10 m in length (Figure 4.14). At Ihuatzio, Cárdenas García (2004:206-207) calls such features *uatziris* and argues that they were used as formal pathways for the elite. At Angamuco, these features are raised or prepared (with flattened dirt or paving stones), vary in width, and may continue for substantial distances. Wider sections may have been built into these raised roads, serving as bastions, ramps, or staircases.

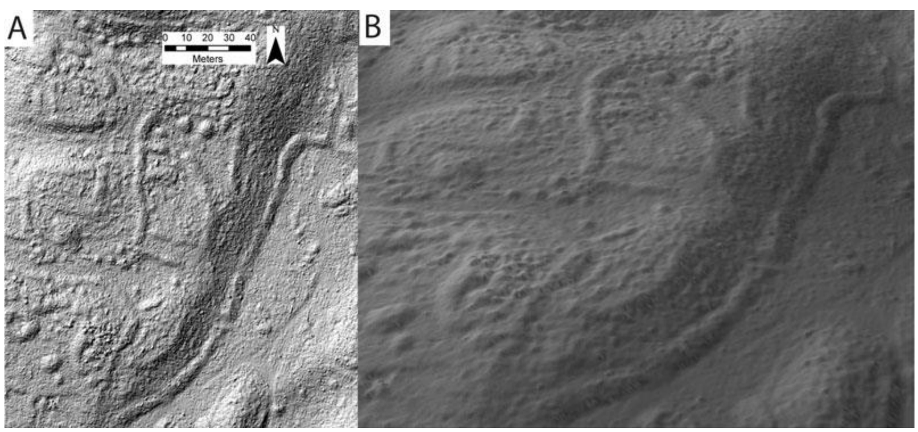

Figure 4.14. Example of *calzadas*. A. Plan view of these features over a 0.25 cm hillshade; B. Perspective view of this same feature using the same contour map overlain on a hillshade (modified from Fisher et al. 2012).

Finally, we defined a formalized road as made of packed dirt, slightly elevated, and banked with stone and/or dirt (Figure 4.15). They are typically <1 m wide and exhibit many of the features that are common among ancient transport networks in the Americas such as abrupt turns and common spaces designed for foot traffic (papers in Snead et al. 2009). At Angamuco, roads served to link buildings, clusters of buildings, neighborhoods, and different areas of the site and future study will provide important insight into understanding of urban infrastructure beyond domestic and public ritual architecture.

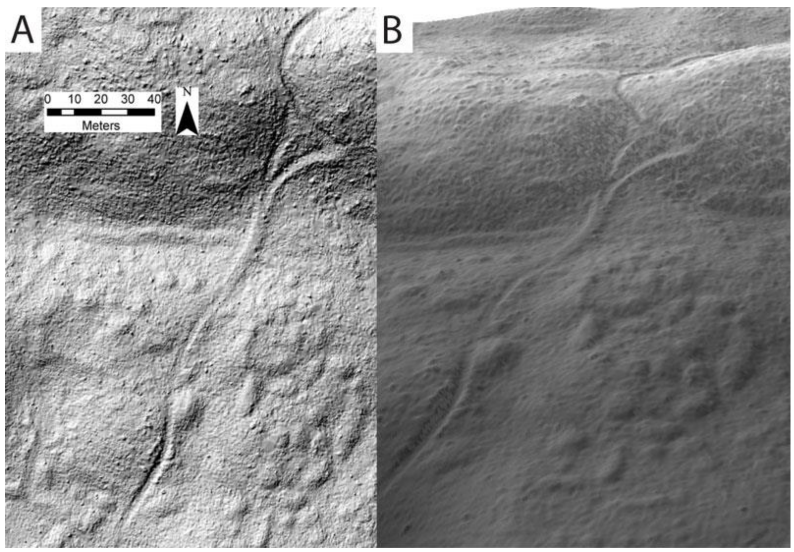

Figure 4.15. Example of a formalized road with an abrupt right angle indicative of a feature designed for foot traffic. A. Plan view of this feature over a 0.25 cm hillshade; B. Perspective view using the same contour map overlain on a hillshade (modified from Fisher et al. 2012).

Urban Settlement Pattern

Based on initial study of the architectural types and spatial configuration of the features discussed above, Fisher and Leisz (2013) proposed a preliminary model of the Angamuco settlement pattern. After discussing the excavation data in Ch. 5 and 6, I further evaluate this model using information from AMS dates and artifact associations.

Fisher and Leisz (2013; see also Cohen and Fisher 2016; Fisher et al., 2011, 2012, 2014) proposed that during the Early Postclassic period (900-1200 CE), inhabitants lived in sunken plaza complexes on the upper areas of the *malpaís*. These self-similar plaza complexes were dug into the natural topography of the landform. Plazas are surrounded by one or more earthen or stone terraces on which other houses and buildings may have been constructed. Some of these terraces may also have served as roadways connecting different plaza groups. During this time period, occupants expanded the settlement throughout the upper part of the *malpaís* and populations increased. Monumental architecture was not common, but it is possible that such features exist under later construction episodes. The absence of such architecture and the uniformity of the sunken plaza groups do not reflect clear differences in social stratification, though perhaps social differences were not expressed through architecture.

During the subsequent Middle Postclassic period (1200-1350 CE), the population at Angamuco increased significantly and communities expanded throughout the lower and upper areas of the site. Building platforms and walls were clustered in distinct areas with rectilinear pyramid complexes. Architectural types were more varied, including open, raised, and sunken plazas, large and small rooms, and raised or paved circular features which may have been sweat baths or granaries. During this period, the urban expansion filled previously empty spaces and formed centralized zones around monumental architecture.

In the final phase of occupation during the Late Postclassic (1350-1530 CE), the site size contradicted and settlement focused around a few nodes of imperial style architecture such as *yácatas* and associated multi-tiered altars and plazas. Inhabitants largely abandoned the upper areas of the site. The I-shaped ball court discussed above may relate to this occupation due to references in the RM, but the ball courts in nearby Zacapu and Tingambato date to the Epiclassic through Middle Postclassic, so it is possible that it was used for a longer period of time. Late period features reflect a high degree of social differentiation and an emphasis on public ritual activities which suggests that Angamuco at this time was organized like other Late Postclassic sites in the Pátzcuaro Basin, such as Ihuatzio (Acosta 1939; Cárdenas García 2004). Such evidence for rigid social stratification and centralized ritual practices supports the idea that the Purépecha may have used cultural activities associated with religion and funerals to consolidate and expand existing diverse populations during the Late Postclassic period (see Ch. 6 and 7).

Ethnohistoric References

Based on ethnohistoric references to a *malpaís* site in the eastern lake basin, we selected the name Sacapu Angamuco (later shortened to Angamuco to limit any confusion with the Zacapu Basin sites) for the site. In Purépecha, '*anga*' means to put a large thing upright while '*angamutani*' refers to having something upright at the door (Gilberti 1991 v. II:33). Though speculative, the name could refer to the location of the *malpaís* settlement at the eastern entrance to the Pátzcuaro Basin. This assumes, however, that residents of the lake basin defined the basin catchment area in a similar way as we do today. Archaeological evidence discussed in this chapter and in Ch. 5 indicate that parts of the site were occupied during the Late Postclassic Purépecha Empire and at the time of Spanish contact in the sixteenth century. Given that Angamuco was at one time a large city that sprawled over 26 km^2 and that was located in a region that was purportedly under the control of the central Purépecha authority in nearby Tzintzuntzan, the site may have been mentioned in the colonial literature.

A settlement named "Sacapo Angamuco," does appear on the Pablo Beaumont (1932[c. 1740s]) maps in roughly the same area where the site is currently located (Figure 4.16). The same map does also show several other settlements on the eastern uplands of the lake basin, including Ychuen, Hiripo, and Itziparamucu. In the more recent map created by Eduard Seler (1908:35), Sacapo Angamuco is located in the same place, but it is called Tzacapanzarادembo. If these are the same settlements, the name change could have been due to broader land reform reconfigurations that were occurring in Mexico during the first century after Spanish conquest. Using aerial photographs and field verification, Gorenstein and Pollard (1983) examined Early Hispanic (1520-1550 CE) settlements in the lake basin that were mentioned in ethnohistoric sources. They suggest that the historic Sacapo Angamuco is located at the modern-day town of Corrales (on the western side of the *malpaís*) and that Ychuen was located at the modern town of Chapultepec. They placed Hiripo at the modern town of El Jaguey based on its location depicted in the Beaumont map, and identified Itziparamucu as a modern settlement with the same name though it is unclear when that settlement existed (Gorenstein and Pollard 1983:20–22). A review of historic texts from western Mexico shows that Itziparamucu is referenced in two different Beaumont maps (published in 1874 and 1932) and in the RM; Hiripo is referenced in the Beaumont maps and the Seler map; Sacapo Angamuco is mentioned in the Beaumont and Seler sources only; Ychuen was identified in the Beaumont maps, Seler map, and in the RM (Gorenstein and Pollard 1983:Table 1).

Figure 4.16. Map of the Lake Pátzcuaro Basin from the *Crónica de Michoacán*, an account of Purépecha residents and early Spanish colonizers written by Pablo Beaumont (Beaumont 1932: Map 5). Courtesy of Dumbarton Oaks Research Library Rare Books Collection.

According to the RM, Itziparamucu (also written Itzíparámuco) is the only settlement located on a *malpaís*. Since the historic settlement appears further north than the part of Angamuco that we have documented, it is possible that southern Angamuco was part of Itziparamucu or that the *malpaís* was described as multiple settlements during the Early Historic period. Itziparamucu does feature prominently in the RM: the settlement was a large city before the Uacúsecha lineage came into the region and there was an alliance between the city and another polity located to the northeast called Curinguaro (Craine and Reindorp 1970:138; Urquhart 2015). When the Uacúsecha lineage, or the future Purépecha, arrived in the lake basin from Zacapu, the lords of

Itziparamucu eventually abandoned their village (Stone 2004:5, 102). One story relates how the wife of the Itziparamucu lord is tricked into thinking that her infant son is a rodent and then cooks him (Craine and Reindorp 1970[1541]:Plate 37). The lord eventually killed his wife, but the story may reflect an omen of bad things to come – possibly abandonment – for the people of Itziparamucu (Stone 2004:105). Though it may be difficult to link the archaeological site of Angamuco to one of the settlements mentioned in ethnohistoric documents, additional research into place names in the region can help to evaluate the possibilities discussed here.

Chapter Summary

In this chapter, I provided an introduction to the ancient urban site of Angamuco by describing some of the data collected during pedestrian and airborne LiDAR survey by the LORE-LPB. I first discussed the environmental context of the site, including informed derived from clay sampling and other regional geographic and ethnohistoric references. Observations from local community members who have been using the Angamuco landscape throughout the twentieth century also informed this section. Next I briefly discussed the importance of well-preserved ancient architecture for assessing broader social practices and the use of typologies in archaeology. This was followed by a summary of the working Angamuco architectural typology, which has facilitated our understanding of site occupational history and functional areas. The typology can be used as a flow chart, first identifying the smallest architectural unit and classifying it according to whether it is a ground-level, above ground, prepared open space, or landscape feature. Additional types (e.g. platform, wall, triple-coursed mound or pyramid, open plaza) and a brief discussion of the context of the architectural configurations helped to formulate an initial urban settlement pattern which I evaluate in subsequent chapters.

I conclude the chapter by considering how the site may appear in ethnohistoric documents. Although many settlements of varying size existed in the Lake Pátzcuaro Basin during the Postclassic period, there is limited archaeological evidence of the form and function of these cities. Increasingly, it seems as though archaeological settlements were common on *malpaís* landforms in the region, such as near Urichu and Santa Fé de la Laguna in the lake basin (C.T. Fisher 2015, personal communication), the Zacapu lake basin sites (Michelet 1992; Forest 2014), and elsewhere near the modern town of Santa Clara del Cobre (Maldonado 2008) and to the south at Lagunillas (Cruz Robles et al. 2014). Future work will help understand why these rugged landscapes were occupied and how they functioned within broader regional patterns.

CHAPTER 5. DATA OVERVIEW AND CONTEXT

In this thesis, I highlight how the Purépecha Empire developed from a long tradition of social complexity which included urban societies such as Angamuco with differing architectural configurations and artistic traditions. Importantly, however, I anticipate that the archaeological record does reflect increased diversity of ceramic artifacts throughout imperial changes. This diversity should be visible in different chronometrically-dated areas of the site associated with specific types of architecture, and most notably through comparison of ceramic forms, decorative styles, and paste recipes. In this chapter, I discuss the ceramic data collected at Angamuco and describe the different areas of the site that I excavated and chose to sample from for laboratory analyses. I also incorporate observations from the survey phase of this project which informed my choices for excavation.

I begin by presenting an overview of the site data for Angamuco. This includes a discussion of the seven contexts and associated architecture chosen for excavation and 15 radiocarbon determinations. I then consider the entire corpus of sampled ceramics (n = 5,878), including vessel forms and decoration. Next I present the results of the subsample of ceramics and briquettes (n = 330) that were analyzed via NAA. Finally, I conclude with a brief discussion of the overall dating and functions of the different areas of Angamuco.

After presenting the site overview data, I consider each of the seven areas of Angamuco separately. Within each area section, I illustrate the excavation contexts and associated architecture including discussion of the stratigraphy and the artifacts recovered from the sampled units. Since I also used survey specimens in my ceramic analysis, I have a short section on the survey materials and my attribute analysis on a small sample of ceramics. In Ch. 6, I assess the standardization and diversity of the Angamuco ceramics and consider these results in more detail within the context of urbanism, political economy, and the development of the Purépecha Empire.

Overview of Angamuco

Architectural Context and Dating

As discussed in Ch. 3, information from the survey phase of research at Angamuco led the LORE-LPB to hypothesize that the site was probably occupied in at least three major occupation phases. Architecture in the lower portion of the site (excavation areas A, B, C, and D) is larger than the buildings in the upper area (areas E, F, and G) (Figure 5.1). Lower area architecture is dominated by large open plazas, *yácata* pyramids, altars, and other large buildings. In contrast, the upper area is characterized by sunken plazas surrounded by terraces and rooms that were probably domestic spaces. Based on comparison to architectural configurations in the Bajío region and elsewhere in central-western Mexico (Cardenas Garcia 1990; Pomédio et al. 2013), I anticipated that the upper area of the site dates to the pre-imperial Epiclassic to Early Postclassic periods, while the lower area was primarily occupied during the Middle to Late Postclassic periods or during empire formation and consolidation.

In fact, radiocarbon dates from areas A, B, C, E, and F confirm that the site may have been occupied at different times, but over a longer span of time than discussed by Fisher and Leisz (2013) between the Preclassic and Postclassic periods (Table 5.1). There are also differences in the dates and materials recovered from the upper and lower zones of the *malpaís* landform: the lower excavation areas (A, B, C, and D) had primary occupations during the Middle to Late

Postclassic periods while the upper areas (E, F, and G) were occupied before empire formation, during the Epiclassic to Early Postclassic periods (Figure 5.1, Table 5.1). I provide additional information in each area section below, but based on radiocarbon determinations from charcoal (AA102894 in Table 5.1) and human bone (AA102893), Area A was occupied for the longest amount of time, for over 1,500 years. This can be confirmed with the variation in ceramic materials and from similar objects recovered in the Zacapu Basin from the Preclassic to Classic Loma Alta societies (Carot 2001), from the Classic period Delicias phase at Apatzingán (Kelly 1947), and from the Classic period Lerma complex at Acámbaro (Gorenstein 1985). In addition, the presence of Purépecha polychrome and metal objects in two rooms and an associated plaza suggests a Postclassic occupation. For Area B, one Preclassic-Classic period date (AA102895 in Table 5.1) was obtained from the interior of the large building. This early age range does correspond to some ceramic materials recovered in Area B that match Loma Alta objects in the Zacapu Basin (Arnauld et al. 1993). The majority of the materials from Area B, however, such as Purépecha polychrome sherd fragments, suggest a primarily Middle to Late Postclassic use of the building.

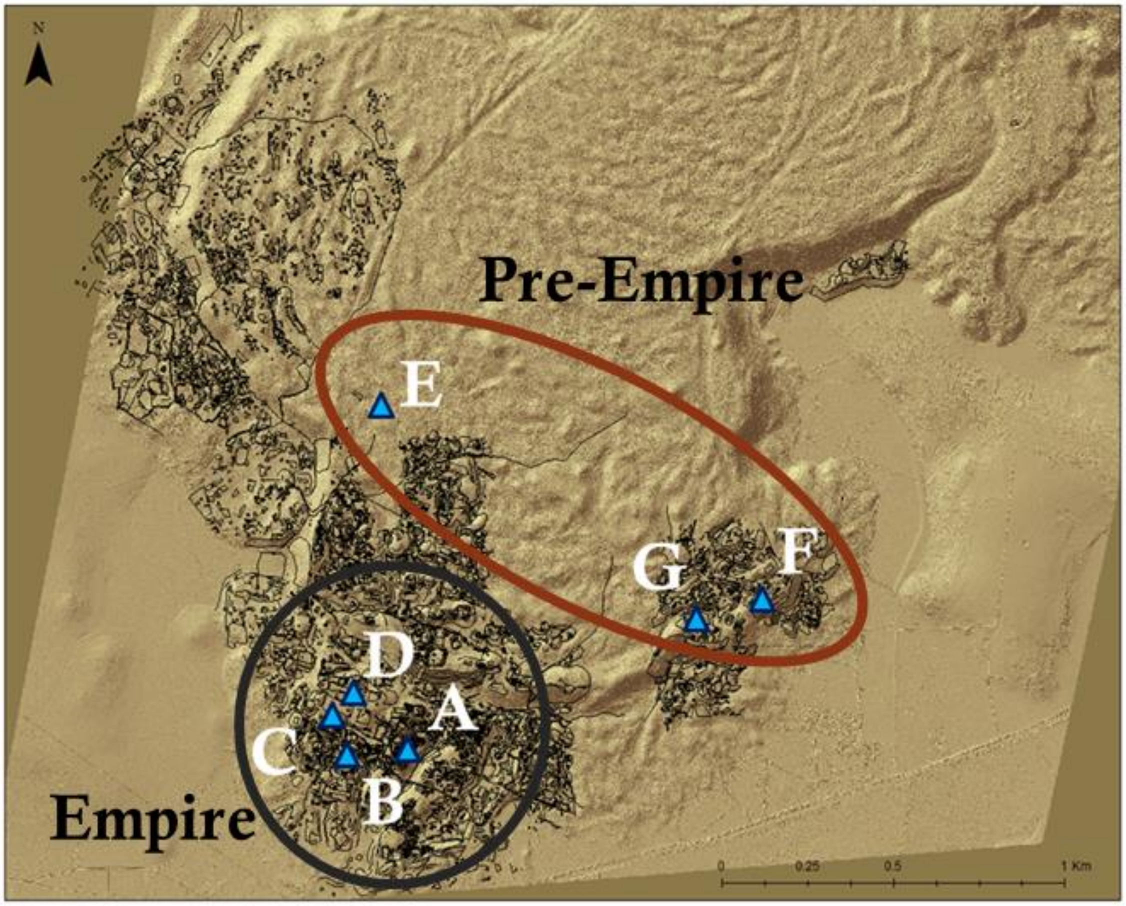

Figure 5.1. Excavation areas at Angamuco. Contexts located on the lower part of the malpaís are Areas A, B, C, and D with primary occupations during the imperial Middle and Late Postclassic periods. The upper excavation areas, E, F, and G, date to the Epiclassic and Early Postclassic periods before imperial consolidation.

Table 5.1. Radiocarbon (AMS) determinations listed in descending chronological order from Angamuco. Analysis occurred at the University of Arizona AMS Laboratory; calibration used OxCal version 4.2, Intl 13 Calibration Curve (Reimer et al. 2013).

Lab #	**Area Unit**	**Stratum**	**Context**	**Material**	**^{14}C yr BP**	**δ13C%**	**95.4% Confidence Interval (CE)**	**Cultural Period**
AA102894	AN2E28	II	elite room	charcoal	399 ± 45	-21.9	1430-1635	Late Postclassic-Early Colonial
AA105513	CN12E16	III	*yácata* plaza, Burial 9	bone	435 ± 34	-7.8	1416-1617	Late Postclassic-Early Colonial
AA105514	CN12W4	III	*yácata* plaza, Burial 14	bone-long bone	459 ± 28	-9.2	1414-1464	Late Postclassic
AA105511	CN12W4	III	*yácata* plaza, Burial 4	bone	478 ± 32	-8.2	1405-1457	Late Postclassic
AA105506	CN14E14	III	*yácata* plaza, Burial 25	bone-metatarsal	555 ± 32	-8.5	1309-1432	Middle-Late Postclassic
AA105508	CN10E20	III	*yácata* plaza, Burial 17	bone-long bone	557 ± 32	-8.1	1307-1431	Middle-Late Postclassic
AA105507	CN12E16	III	*yácata* plaza, Burial 2	bone-left fibula	574 ± 32	-8.8	1301-1423	Middle-Late Postclassic
AA105515	CN10E20-22	III	*yácata* plaza, Burial 16	bone-femur	580 ± 29	-8.5	1301-1417	Middle-Late Postclassic
AA105509	CN10E4	III	*yácata* plaza, Burial 6.1	bone-left radius	644 ± 32	-8.3	1281-1397	Middle Postclassic
AA105510	CN12E14	I	*yácata* plaza, Burial 1.1	bone-left upper extremity	680 ± 32	-8.0	1268-1390	Middle Postclassic
AA105512	CN12E4-6	III	*yácata* plaza, Burial 7	bone-right upper extremity	789 ± 32	-8.8	1188-1280	Middle Postclassic
AA105505	E3N0E0	II	commoner room	charcoal	934 ± 24	-27.1	1032-1157	Early Postclassic
AA102893	AN18E52-53	III	elite plaza *ofrenda*	bone-long bone	1653 ± 48	-8.6	257-537	Early-Middle Classic
AA102895	BN12E8	IV	building interior	charcoal	1739 ± 42	-24.4	145-402	Preclassic-Early Classic
AA105504	F6S3E0	III	commoner plaza	charcoal	2529 ± 26	-22.8	795-547 BCE	Preclassic

In contrast, Area C – which has 10 AMS determinations from human bone – can be bracketed to the Postclassic period. Several dates (AA105512, AA105510, and AA105509 in Table 5.1) fall within the Middle Postclassic period while the remaining seven determinations fall within the range of the Middle to Late Postclassic periods. This suggests use of the plaza area for funerary and other activities during and after imperial development. Ceramics and other artifacts are similar to those documented throughout the Postclassic sequence in Michoacán, including from the Middle Postclassic at Apatzingán (Kelly 1947) and in the Zacapu Basin at Milpillas and Prieto (Cohen and Jadot 2015; Pereira et al. 2012; Puaux 1990), and from the Late Postclassic at Tzintzuntzan (Castro-Leal Espino 1986; Pollard 1993), south of the Pátzcuaro area at Lagunillas (Cruz Robles et al. 2014), Huandacareo (Macias Goytia 1990, 2005), and Sayula (Ramírez Urrea and Cárdenas 2006). There are some similarities in motifs between Area C and Loma Alta ceramics, but this is expected as Postclassic societies were thought to emulate earlier designs (Carot 2001, 2013). In addition, the presence of a large *yácata* pyramid which is traditionally associated with the Purépecha Empire at Tzintzuntzan, Ihuatzio, and other imperial occupations in central-western Mexico supports the radiometric and ceramic data for primarily Middle to Late Postclassic use. The recovery of Late Postclassic polychrome pottery and other artifacts similar to Area C indicate that adjacent Area D also had a Postclassic occupation.

Areas E and F, two contexts that I tested in the upper portion of the site, likely date to earlier primary occupations at Angamuco. Charcoal from a room in Area E dates to the Early Postclassic period (AA105505 in Table 5.1), which roughly corresponds to the Tingambato and Tula-style domestic ceramics recovered in the Area E excavation contexts (Cobean 1990; Piña Chan and Oi 1982), but also to contemporaneous materials from the Zacapu Basin site of Palacio (Cohen and Jadot 2015; Jadot 2016). Polychrome sherds were not found in this area, which could reflect its function as a domestic commoner zone. The excavated materials and the AMS date does however suggest that Area E was occupied prior to Purépecha influence at Angamuco, so it is possible that the absence of Purépecha polychrome also reflects an earlier occupation in which polychrome was not widespread rather than solely the domestic function. One early Preclassic determination from Area F (AA105504) indicates that the site may have an even longer occupational history than the Early Classic period. Additional dates are needed to better understand the area, however, since ceramic artifacts and a deep deposit excavated below a circular feature are comparable to architecture and ceramics from Epiclassic Lupe and Middle Postclassic Milpillas phases (Pereira 1999; Pereira et al. 2012; Puaux 1990) and from Early-Middle Postclassic Urichu levels (Pollard and Cahue 1999). We did not recover appropriate materials for AMS dating in Area G, but I include discussion of the ceramic materials below. For a summary of these area interpretations, see Table 5.2.

Table 5.2. Proposed cultural periods and functions of the Angamuco excavation areas.

Area	Primary Occupation	Proposed Status & Function	Supporting Data
A	Empire Late Postclassic	Elite-Domestic	Architecture, ceramic, metal, AMS
B	Empire Late Postclassic	Elite-Multipurpose	Architecture, ceramic
C	Empire Middle-Late Postclassic	Elite-Public Ritual	Architecture, ceramic, metal, obsidian, AMS
D	Empire Middle-Late Postclassic	Elite-Public Ritual	Architecture, ceramic, obsidian
E	Pre-Empire Epiclassic-Early Postclassic	Commoner-Domestic	Architecture, ceramic, AMS
F	Pre-Empire Early Postclassic	Commoner-Public Ritual	Architecture, ceramic
G	Pre-Empire Early Postclassic	Commoner-Domestic	Architecture, ceramic

Ceramics from the Field Sort

Based on raw ceramic artifact counts from the field sort, the greatest numbers of sherds were recovered in areas with the largest number of excavated units: Area C (16 units), Area A (15 units), and Area B (31 units excavated, 44 total cleared) (Table 5.3). These are also all areas located in the lower elite zones of the site. The number of ceramic artifacts from Areas D (3 units), E (4 units), and F (6 units) are similar. Interestingly, there were slightly more sherds recovered from Area E, which only had four units, than these other areas despite its potential function as a commoner domestic space. The large number could also reflect a high degree of fragmentation due to poor preservation. Area G had the fewest number of artifacts which may indicate a short occupation of this area (for descriptive statistics of the excavated ceramics, see Fisher et al. 2016: Appx A).

Area A	Area B	Area C	Area D	Area E	Area F	Area G	Survey	TOTAL
16,050	12,125	21,159	4,934	5,838	5,285	768	6,111	72,270

Table 5.3. Number of sherds recovered in each Angamuco excavation area based on initial field sort.

Ceramics Forms from the Angamuco Sample

My approach to identifying ceramic forms was to first use a basic classificatory scheme documented in the existing literature on central-western Mexico ceramics (e.g. Hernández 2000; Michelet 2013; Pollard 1993). As I became more familiar with the ceramics, I developed a second level of classification that helped to identify additional specific forms (see Appendix A for descriptions). When possible, I assigned sherds to the bowl category if they had an unrestricted orifice and/or decoration on both sides. More specific categories (composite silhouette, convex wall, everted rim, incurved rim, large shouldered, out sloping wall, and two sizes of tripod) were assigned based on rim measurements and shape and compared with existing ceramic forms documented at Tzintzuntzan and Urichu (Pollard 1993, 1999). I categorized another common form, the jar, as a restricted vessel with no decoration on the interior of the sherd. Additional categories included everted and incurved rim examples. A circular or worked sherd was a flat semi-circular or rounded sherd that was decorated (usually a monochrome slip) on both sides. Some of these were smoothed along the edges while others looked roughly broken. I identified an incense burner (*brasero*) as a grayish coarse sherd that sometimes had traces of very pale brown slip and/or appliqué circles or pellets. A grater (*molcajete*) had linear or dot-like incisions on a basal sherd while I classified spouted vessels as fineware comparable to complete or almost complete vessels found with spouts and often handles. When possible, I further classified these as shoe-shaped (*patoja*), gourd-like, and square. I identified bottles as vessels with a neck very narrow in comparison with their height and weight, and with exclusively exterior decoration. A plate was a shallow form with unrestricted orifices. I defined other objects such as spindle whorls (*malacates*), figurines, lip plugs, etc. based on comparison with regional literature (Carot 2001; Cobean 1990; Pollard 1993; Pereira 1999).

From the ceramic sample, I was able to assign 1,281 sherds to basic formal categories (Table 5.4). The majority (n = 733 or 57%) were bowls which I identified in all excavation and survey contexts. A small number (n = 231) of these that included complete rims and/or other identifiable attributes such as a support were further classified into composite silhouette (n = 78), convex wall (n = 38), everted rim (n = 14), incurved rim (n = 11), outsloping wall (n = 1), and tripod (n = 89) forms. I found the largest number of bowl fragments in Area C (n = 364) and D (n

= 122), and relatively equal numbers in the survey sample (n = 61), and Areas F (n = 54), E (n = 52), and B (n = 51). Jars were the next most dominant form (n = 304) in Areas D (n = 167) and C (n = 104), and in small numbers in all other contexts except for Area G. I was able to assign approximately 1/3 (n = 108) of the jars to the everted rim form. Other forms such as worked sherds, incense burner fragments, pipes, graters, and spouted vessels were all recovered primarily in the lower elite areas of the site (A, B, C, D), though with the exceptions of a few grater sherds in Areas E (n = 2) and F (n = 3). I also only documented miniature vessel fragments, spindle whorls, bottles, and plates in the lower elite areas while I identified spoon fragments in both the upper and lower excavation contexts (Areas B, C, and E), one figurine in an Area F context and seven others in areas A, B, and D. A lone earspool was recovered from Area E.

Table 5.4. Number of identifiable sherd forms within the ceramic sample by Angamuco area.

	A	B	C	D	E	F	G	survey	TOTAL
Bowl	24	51	364	122	52	54	5	61	**733**
Jar	19	17	104	167	3	14	0	20	**344**
Circular/Worked Sherd	62	0	4	1	1	0	0	0	**68**
Incense Burner	3	0	31	0	0	0	0	0	**34**
Pipe	10	8	13	1	0	0	0	0	**32**
Grater	16	1	0	1	2	3	0	0	**23**
Spouted Vessel	1	0	6	0	0	0	0	4	**11**
Miniature	0	0	6	2	0	0	0	1	**9**
Figurine	3	2	0	2	0	1	0	0	**8**
Spindle Whorl	0	3	5	0	0	0	0	0	**8**
Spoon	0	1	4	0	1	0	0	0	**6**
Bottle	0	0	2	0	0	0	0	0	**2**
Plate	0	2	0	0	0	0	0	0	**2**
Ear spool	0	0	0	0	1	0	0	0	**1**
TOTAL	**138**	**85**	**539**	**296**	**60**	**72**	**5**	**86**	**1281**

Ceramic Decorative Categories

As discussed in Ch. 3, my attribute analysis noted decorative elements such as slip, paint, incision, appliqué, use of resist (negative), etc. Coding of these attributes helped me to group the sherds into general decorative categories defined by whether I could see one slip (monochrome), two slips or paint (bichrome), some combination of three or more slips/paint/negative (polychrome), and incised and appliqué detail. I further divided each of these categories into subcategories based on surface color and finish. Detailed information about these categories is in Appendix E.

Based on my sample from excavated and survey sherds, I could confidently assign 2,733 to basic decorative categories (Table 5.5). I found monochrome sherds in all areas of the site and they formed 33% (n = 902) of the identifiable decorated samples. They are dominant in the ceramic sample from Area F in particular (n = 116 or 67%) and include subcategories (dull red and reddish gray) that are not as common as or absent elsewhere in the site. This is interesting since the area was chosen for excavation as a public ritual space on the upper *malpaís*, which may be contrasted with the more public ritual space in the lower Area C. In the latter, polychrome sherds dominate the decorated assemblage (see below). Monochrome sherds also form just over half of the Area D decorated sample (n = 220 or 53%) which is notable because of its location near the *yácata* and burials in Area C. The large number of monochrome ceramics supports the interpretation that the Angamuco occupants constructed the Area D plaza (PLZ 5013) with fill that included less desirable (or less decorated) sherds and clay (see Area D description below). Alternatively, perhaps the monochrome sherds represent an earlier occupation in the area. I was unable to assign more than one sherd to the monochrome category in Area E due to poor preservation.

Monochromes

I divided monochrome sherds into five subcategories (Appendix C). Fine red monochrome, which I defined by a polished red slip that ranged from 2.5 YR 5/6, 4/6 red to 2.5 YR 5/4 reddish brown, were found in Areas A, B, C, D, F, and in five survey sub-quadrant samples (I18NE, I18SW, J17SE, J18NW, J20SW). The greatest numbers were in elite Areas D (n = 158) and C (n = 82) suggesting that they date to the Middle to Late Postclassic periods and also based on similarities to sherds recovered from similar contexts at Tzintzuntzan (Cabrera Castro 1996; Castro-Leal Espino 1986; Pollard 1972, 1993) and Urichu (Pollard 1999), and in the Cuitzeo Basin (Macias Goytia 1990, 2005). I identified pale brown monochromes (light brown slip ranging from 7.5 YR 6/4 light brown to 10 YR 7/4 very pale brown) as polished sherds recovered in areas A, B, C, D, and F and in one survey sub-quadrant (J20SW). Similar to the fine red, these contexts date to the Postclassic periods. I found that dull red polished monochromes (2.5 YR 3/2 dusky red to 2.5 YR 4/2) were evenly distributed through Areas A, B, and F while fine reddish gray polished sherds (2.5 YR 4/6 red and 5 YR 5/2 reddish gray) were mainly associated with circular feature F1 in Area F (n = 40). The absence of this latter type of sherd in Areas C and D suggests that the decorative style was not common in public ritual consumption in the Late Postclassic and that it may be characteristic of the Early Postclassic period. Finally, I found polished black specimens (slip 7.5 YR 3/1 very dark gray to 7.5 YR 2.5/1 black) throughout the site in Areas A, B, D, E, and F, and in survey sub-quadrants H18NE, I18NW, I18SW, I18SW, J20SW which demonstrates that this style was present throughout the Angamuco occupational sequence.

Bichromes

Bichrome sherds constituted 47% (n = 1,287) of the sample and appeared in all areas of the site and in all contexts (domestic/ritual, commoner/elite) tested. I found that this category was largely comprised of red on pale brown sherds (n = 1,114), which I also noted in all zones, including in half of the survey sample (n = 68). The other bichrome ceramics also appear in smaller numbers throughout the site, but I identified nearly all of the bichrome subcategories in Area A (n = 416): negative or positive (2%, n = 9), red on pale brown (83%, n = 344), red on orange (11%, n = 45), dark red on gray (3%, n = 12), and white on red (1.5%, n = 6). Interestingly, this variation in the ceramic decorative categories is also reflected in the overall diversity in terms of form and decoration in the Area A sample (see Ch. 6).

I was able to divide the bichrome samples into five subcategories. The dominant red on pale brown (base slip 10 YR 7/4 very pale brown, secondary slip 2.5 YR 4/3-4/4 reddish brown or 2.5 YR 4/6 red) subcategory were recovered in all temporal and socio-functional contexts suggesting that this type of decoration was used by Angamuco occupants throughout the occupational sequence. I found red on orange bichromes (base slip 5 YR 5/6 yellowish red, secondary slip 2.5 YR 4/6 red) in smaller numbers (n = 45), but also in all of the excavation contexts and in lower and upper survey sub-quadrants (I18SW, J17SE, J18NE, J18SW) again indicating use throughout the site occupation. Polished dark red on gray (base slip 10 YR 5/1 gray and secondary slip 2.5 YR 3/2 dusty red) were found primarily in Area A (n = 12), but also in small numbers in Areas B, D, E, and F and in sub-quadrant J18SW while red on white (2.5 YR 4/6 red) was only recovered in elite Areas A, B, and C and in survey locations from lower subquadrants I18NE, J17SE, J18SW, J19SE. I identified this latter bichrome subcategory exclusively in a bottle and bowls in Middle to Late Postclassic contexts. Finally, I defined the last bichrome group through evidence for negative painting or resist-dyeing. For this technique, potters would have covered the design area with a paint-resistant substance such as wax and then fired the vessel. When the wax was removed, the pattern was highlighted in its original color against the black background (Shepard 1965). I found a small number (n = 37) of these examples in all areas except for G. They are similar to Pollard's (1993) *Arocutín Rojo Negativo* type found in Early to Middle Postclassic contexts at Urichu and to the *Rojo sobre Negro Negativo* category from the Early Postclassic at Prieto (personal observation at the CEMCA) and can tentatively be attributed to a similar time period at Angamuco.

Polychromes

I found polychrome sherds almost exclusively in the lower imperial elite areas of the site and in lower area survey sub-quadrants. These sherds have a very pale brown primary slip (10 YR 7/4) and secondary slips, paint, and/or negative in red, black, and white. The large number of finely painted polychromes that I catalogued in Area C (n = 230) reflects its use as a ritual and elite location where occupants consumed carefully decorated fineware that was designed to be used in specialized contexts. My identification of similar polychrome sherds in more fragmented form in Areas A (n = 51), B (n = 30), and adjacent Area D (n = 96) suggests that these areas were similarly used by elites during the Late Postclassic period. The polychrome that I identified at Angamuco has been documented at Tzintzuntzan (Cabrera Castro 1996, 1996; García García 2009) and divided into paste-based categories by Pollard (1993), including *Copujo Rojo y Blanco sobre Crema* and *Copujo Rojo y Blanco sobre Crema con Negativo* which were assigned to the Middle Postclassic/Late Urichu phase. Pollard's Late Postclassic/Tariacuri phase ceramics include *Tariacuri Café engobes guinda, crema, rojo; Tariacuri Café Rojo, Blanco y Negativo sobre*

Crema; *Yaguarato Crema Rojo y Blanco sobre Crema*, *Yaguarato Crema Rojo y Negativo sobre Crema*; *Sipiho Gris Rojo y Blanco y Negativo sobre Crema*; *Tarerio Crema*; and *Tecolote Narajada*. In addition, I observed some overlap between the Angamuco polychromes and the Middle Postclassic Milpillas polychrome tripod forms and everted rim jars while at the CEMCA. This suggests that polychromes were in use during the Middle Postclassic period at Angamuco, but that the spouted vessel and zoomorphic fineware may have first been introduced for Late Postclassic elite and/or ritual activities.

Over the five field seasons at Angamuco, we did not recover polychrome sherds in the upper part of the site, with the exception of one polychrome bowl fragment found in the Area G room (G1N0E0). Since this is only one fragment and there are no radiocarbon dates for this area, it is difficult to interpret. Perhaps the Area G context dates to the earlier Postclassic when polychromes were present at the site elsewhere and some polychrome vessels made it to the domestic zones. The use of objects typically associated with both elite and commoner activities in domestic contexts is a pattern elsewhere in Mesoamerica (Carot 2001; Pyburne 2003). Though unlikely based on the cultural and radiometric dating elsewhere, it is also possible that Area G was occupied in the later Postclassic period during imperial changes.

Incised and/or Appliqué

The final decorative subcategory, incised and appliqué, occurred in small numbers throughout the site. This subcategory included lines, dots, and waves subtracted from the clay before the vessel was fired. These types often appear without additional decoration. Appliqué examples included circular pieces of clay added to rims and vessel bodies before firing. Without additional examples, it is difficult to assign this subcategory to a chronological period since there are examples within all Angamuco contexts except for G. The dominance of this category in Area C may be due to incense burner appliqué fragments recovered in front of Altar 5001. Although there are few Angamuco incised or appliqué examples (Table 5.5), some seem to be comparable to decorations from the Loma Alta Classic period (Carot 2001), the Middle Postclassic at Milpillas (Jadot 2016), and from the Late Postclassic at Huandacareo in the Cuitzeo area (Macias Goytia 1990).

Geochemical Groups

The purpose of using INAA in this project was to address compositional variability within the Angamuco ceramics and to better understand the production and consumption patterns based on differential source usage. My goal was to evaluate the variability in clay source and paste recipes within different contexts (e.g. elite versus commoner) at the site and over time. My expectation was that the samples from the later Postclassic occupations (Areas A, B, C, D) would show more diversity in the number of compositional groups and that there would be a difference in the number of clays exploited in these areas and the earlier contexts on the upper *malpaís* (Areas E, F, G).

The INAA analysis identified four compositional groups within the Angamuco sherd and clay sample (Figure 5.2, Figure 5.3). Here I discuss the general trends of each compositional group and then the INAA sample by area, form, and decoration. Table 5.6 shows the breakdown of each defined group by Angamuco context. Since I was not able to assign some specimens (n = 42 sherds, n = 20 clay), I focus on the total assigned samples (n = 268) in further discussion. Note that the sample sizes noted for each NAA group below are for sherds only – clay is considered separately. See Appendix B for the full MURR report.

Table 5.5. Sherd counts and percentages by decorative categories in the Angamuco ceramic sample. Detailed information about each subcategory noted here is in Appendix C.

	Area A	**Area B**	**Area C**	**Area D**	**Area E**	**Area F**	**Area G**	**Survey**	**TOTAL**
Monochrome-fine red	2	2	82	158	0	18	0	15	277
Monochrome-pale brown	235	57	9	57	0	6	0	1	365
Monochrome-dull red	51	50	0	1	0	46	0	1	149
Monochrome-fine weak/dusty red	7	1	0	0	0	40	0	1	49
Monochrome-polished black	37	10	0	4	1	6	0	4	62
Total Monochrome	332	120	91	220	1	116	0	22	902
	41%	**32%**	**12%**	**53%**	**2%**	**69%**	**0%**	**16%**	**33%**
Bichrome-negative or positive	9	5	11	2	1	9	0	0	37
Bichrome-red on pale brown	344	189	344	88	49	35	6	59	1114
Bichrome-red on orange	45	18	14	7	1	3	0	3	91
Bichrome-dark red on gray	12	1	0	1	3	4	0	2	23
Bichrome-white on red	6	2	10	0	0	0	0	4	22
Total Bichrome	416	215	379	98	54	51	6	68	1287
	51%	**57%**	**51%**	**23%**	**87%**	**30%**	**86%**	**50%**	**47%**
Total Polychrome	51	30	230	96	0	0	1	41	449
	6%	**8%**	**31%**	**23%**	**0%**	**0%**	**14%**	**30%**	**16%**
Total incised and/or appliqué	19	9	47	5	7	2	0	6	95
	2%	**2%**	**6%**	**1%**	**11%**	**1%**	**0%**	**4%**	**3%**
TOTAL	818	374	747	419	62	169	7	137	2733

Group A (n = 122) is the largest of the four identified compositional groups. Based on the PC loadings, it is a tightly clustered group that is easily distinguishable from the other groups (Appendix B). The largest number of samples from this group were found in Area C (n = 35), though this group was also dominant in Area F (n = 33) and in Area A (n = 27). This group corresponds with a previously established "Main Pottery Group (MPG)" identified by Hirshman and Ferguson (2012) for the lake basin. Based on comparison with clay and ash samples, they identified this paste group within a broad procurement zone in the southern part of the lake basin.

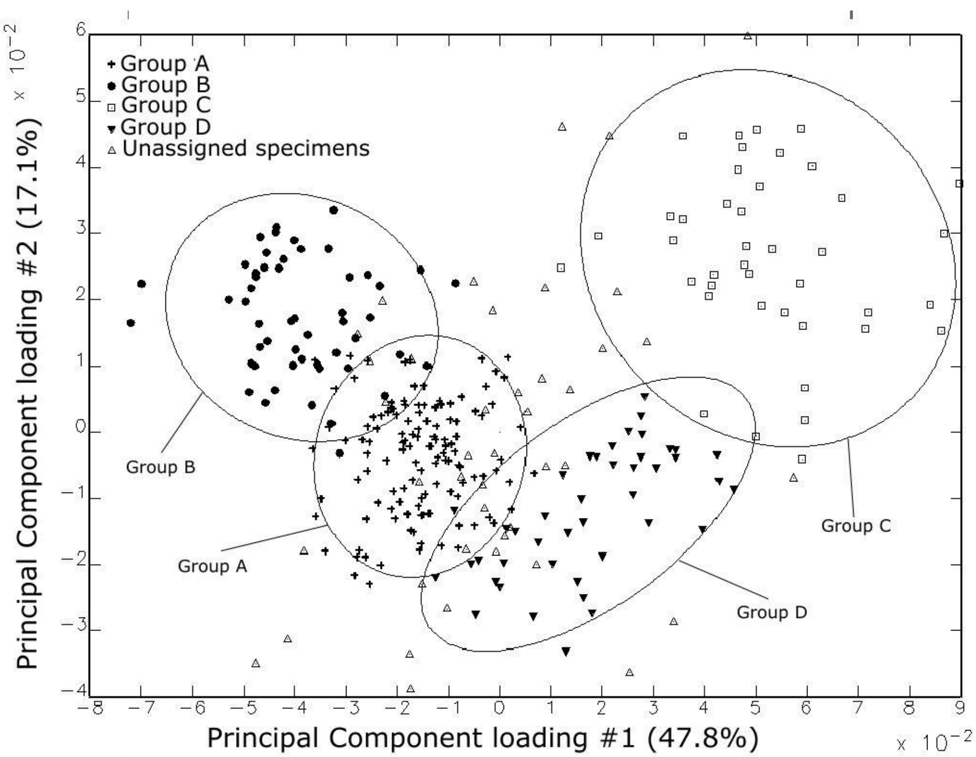

Figure 5.2. Principal Component Analysis (PCA) showing NAA groups, including assigned and unassigned sherd specimens. Note that this figure does not include the clay samples.

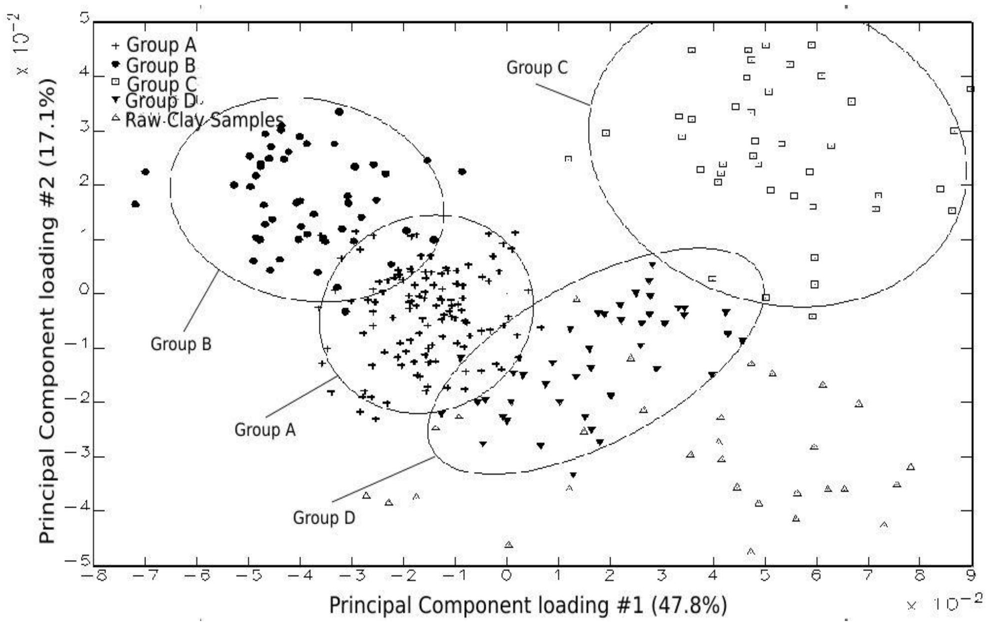

Figure 5.3. PCA showing the NAA groups and the raw clay samples. Only 10 clay samples fall within a compositional group ellipse (D), while the other 20 samples could not be assigned to these groups or others in the MURR database. Note that this figure does not include unassigned samples.

Of the 32 sherds in which forms could be identified, this group is relatively evenly split between bowls (n = 17) and jars (n = 13), and is present in all basic decorative categories: monochrome (n = 39), bichrome (n = 30), and polychrome (n = 12) (Table 5.6, Table 5.7, Table 5.8). Based on the large sample that can be attributed to this compositional group throughout the site, clays and tempers used to make this paste were likely used by potters throughout the Angamuco occupational sequence. The previous NAA group identification and the lack of match with this group and the local clay samples suggest that Group A pastes were comprised of clays similar to those in the southern part of the lake basin.

Table 5.6. NAA groups by Angamuco area, including unassigned specimens. Percentages refer to the proportion of NAA group within each area. Note that the totals in Group D and Unassigned include the clay samples.

	A	B	C	D	E	F	G	Clay	TOTAL
Group A	27 40%	11 35%	35 37%	9 50%	6 18%	33 63%	1 25%	0 0%	**122** **37%**
Group B	6 9%	6 19%	28 29%	3 17%	5 16%	3 6%	1 25%	0 0%	**52** **16%**
Group C	11 16%	6 19%	3 3%	1 6%	17 53%	2 4%	1 25%	0 0%	**41** **12%**
Group D	12 18%	3 10%	12 13%	2 11%	2 6%	12 23%	0 0%	10 33%	**53** **16%**
Unassigned	12 18%	5 16%	17 18%	3 17%	2 6%	2 4%	1 25%	20 67%	**62** **19%**
TOTAL	**68**	**31**	**95**	**18**	**32**	**52**	**4**	**30**	**330**

Table 5.7. Composition groups by ceramic form within the Angamuco sample.

	bowl	jar	grater	brasero	TOTAL
Group A	16	13	1	1	**31**
Group B	25	2	0	0	**27**
Group C	14	0	0	0	**14**
Group D	6	7	1	1	**15**
TOTAL	**61**	**22**	**2**	**2**	**87**

Group B (n = 52) is easily distinguishable in the PC plot and comparatively low in elements such as Samarium (Sm), Hafnium (Hf), Cerium (Ce), Manganese (Mn), and Tantalum (Ta), while comparatively high in Calcium (Ca) and Strontium (Sr) (Appendix B). This group is different from the Hirshman and Ferguson (2012) compositional groups, the Angamuco clay samples, and from all other samples included in the MURR database. Of the 52 samples assigned to this group, the majority (n = 28) were identified in Area C, while smaller numbers appeared in Areas A (n = 6), B (n = 6), D (n =3), E (n = 5), F (n = 3), and G (n = 1). In terms of form, 25 were bowl fragments (92.5%), while the remaining two have been identified as jar fragments. This group dominated the bichrome decorative category forming 91% (n = 42) of the sample. Given that the majority of the bichromes were assigned to the ubiquitous red on pale brown subcategory that was likely an Angamuco variety throughout the occupational sequence, it is interesting that a local clay source was not identified. It is possible that Group B is a temporal marker, but future work is necessary to confirm such an interpretation. Upcoming petrographic analysis will provide insight into what tempers were added to make the paste distinct.

Group C (n = 41) is the smallest of the groups but is distinguishable by numerous elements such as Rubidium (Rb), Thorium (Th), Ytterbium (Yb), Hafnium (Hf), Uranium (U), Terbium (Tb), Tantalum (Ta), Dysprosium (Dy), and Lutetium (Lu). Conversely, it is low in Calcium (Ca), and Scandium (Sc). This group shows a comparable composition to “Pottery Group 1 (PG1)” identified in the Hirshman and Ferguson (2012) study (Appendix B: Figure 8). Based on comparison with raw clays, they suggested that this group was derived from a broad procurement zone in the western and northern parts of the lake basin, so it is possible that the Angamuco Group C was exploited from that region as well. Though found in samples from all areas, Group C was most common in Area F (n = 17 or 41%) and Area A (n = 11 or 27%). Of the identifiable forms, 100% have been identified as bowls (n = 14) while 50% (n = 13) were polychrome, 46% (n = 12) were bichrome, and one was monochrome.

Table 5.8. Angamuco decorative categories by NAA compositional groups (n = 187). Percentages refer to the proportion of NAA group within each basic decorative category.

	Group A	Group B	Group C	Group D	TOTAL
Monochrome-fine red	10	2	0	0	12
Monochrome-pale brown	3	0	0	0	3
Monochrome-dull red	1	0	0	6	7
Monochrome-reddish gray	14	0	0	2	16
Monochrome-polished black	2	0	1	1	4
Total Monochrome	**30** **71%**	**2** **5%**	**1** **2%**	**9** **21%**	**42**
Bichrome-Negative/Positive	5	2	0	2	9
Bichrome-red on pale brown	22	34	10	7	73
Bichrome-red on orange	8	0	2	1	11
Bichrome-dark red on gray	2	6	0	0	8
Bichrome-white on red	2	0	0	0	2
Total Bichrome	**39** **38%**	**42** **41%**	**12** **12%**	**10** **10%**	**103**
Polychrome-red, white, yellow-red/red-brown, negative	12	2	13	15	42
Total Polychrome	**12** **29%**	**2** **5%**	**13** **31%**	**15** **36%**	**42**
TOTAL	**81** **43%**	**46** **25%**	**26** **14%**	**34** **18%**	**187**

Finally, Group D (n = 43 sherds only) is the most heterogeneous of all groups when considering individual elements. In aggregate through PCA and discriminant functions, however, the group is rather tightly constructed and distinct. In general, it is higher in Cobalt (Co) and Vanadium (V). This is the only group that overlaps with the clay samples suggesting that this group represents a local source. The 10 matching clay samples were collected from the shallow depressions from around the site that were probably used to hold water (e.g. retention ponds or *rejolladas* as discussed in Ch. 3). The same number of samples (n = 12) from Areas A, C, and F were identified, and a small number were found in the Area B (n = 3), D and E (n = 2 each) specimens. Similar to Group A, this group is generally evenly split between bowls and jars (n = 6 and 7 respectively).

Specimens (n = 42 sherds only) were left unassigned either because they were significantly different from all four chemical groups or they were chemically consistent with more than one group. In some occasions, specimens were unassigned due to conflicting likelihoods based on the different analyses performed. There is little similarity between the unassigned specimens and they likely originate from various source locations. The unassigned ceramic specimens were primarily from Areas A, B, C, and D which were all elite areas occupied in part or in full during the Middle to Late Postclassic periods (Table 5.6). In Ch. 6, I discuss differences between these areas and those on the upper part of the site in terms of ceramic form, decoration, and NAA analyses. Future study using mineralogical lines of evidence will further evaluate whether these certain areas differed more than others in terms of paste recipes and ceramic production.

Area A

The LORE-LPB project chose Area A for excavation as an elite zone with multiple well-preserved domestic architectural features on a hill on the south side of the *malpaís*. Survey data from this area in 2011 suggested that the sides of the hill were covered with agricultural or habitation terraces while the entire top of the hill was covered with stone architecture and designated open spaces such as plazas or patios. The different features excavated included two rooms (AN2E28, AN8E38), two patio units (AN5E34, AN4E36), several plaza contexts (AN18E53, AN19E51, AN18E52, AN10E26, AN10E25, AN8E26, AS6E6, AS2E4, AS2E6, AS4E6), and one semi-circular feature associated with a plaza (AN1E41) (Table 3.1; Figure 5.4). Here I discuss excavation data from the six units that I sampled from for the ceramic analysis.

We choose to excavate Room 1 (AN2E28) because it contained four intact stone, semi-circular walls that were located 4-8 m southeast from concurrently excavated units along the northeastern wall of a large plaza (AN10E26, AN10E25, and AN8E26). The room was also well protected from any disturbance from surrounding areas and thought to contain intact stratigraphy. We first excavated in the interior area of the room, leaving the four stone walls and associated moss intact for preservation (Figure 5.5). During excavation, we defined three strata (also interpreted as 'zones'), including two main occupation episodes followed by C Horizon material. Stratum I consisted of loosely packed dark brown (7.5 YR 3/4 dark brown) sediment with a high density of sherds (30% of sherds recovered, see Appendix B) and gray and green obsidian (Figure 5.6). While excavating in this stratum, we exposed *laja* stones in the southeast and southwest corners of the room, and increasingly large rocks along the north-northeastern portions of the wall. The wall on the northwestern and southeastern sides showed smaller rocks and fill – both of which may have been pavement, stairs, and/or entryways. In Stratum II the sediment changed to a dark yellowish brown color (10 YR 3/4 yellowish brown) with a silty loam and softer consistency than the previous layer. Here we encountered the greatest density of sherds in this context (60% of the total excavated sample, see Appendix B), including incised and polychrome decorations, and green and gray obsidian, and basalt flakes. The third stratum was a C Horizon that consisted of loosely-packed medium to large rocks and yellow brown (10 YR 5/6) sandy silty loam. A few artifacts were recovered when this stratum was first visible, but we eventually excavated to sterile. Based on excavation contexts elsewhere at Angamuco, this stratum represents the beginning of platform fill.

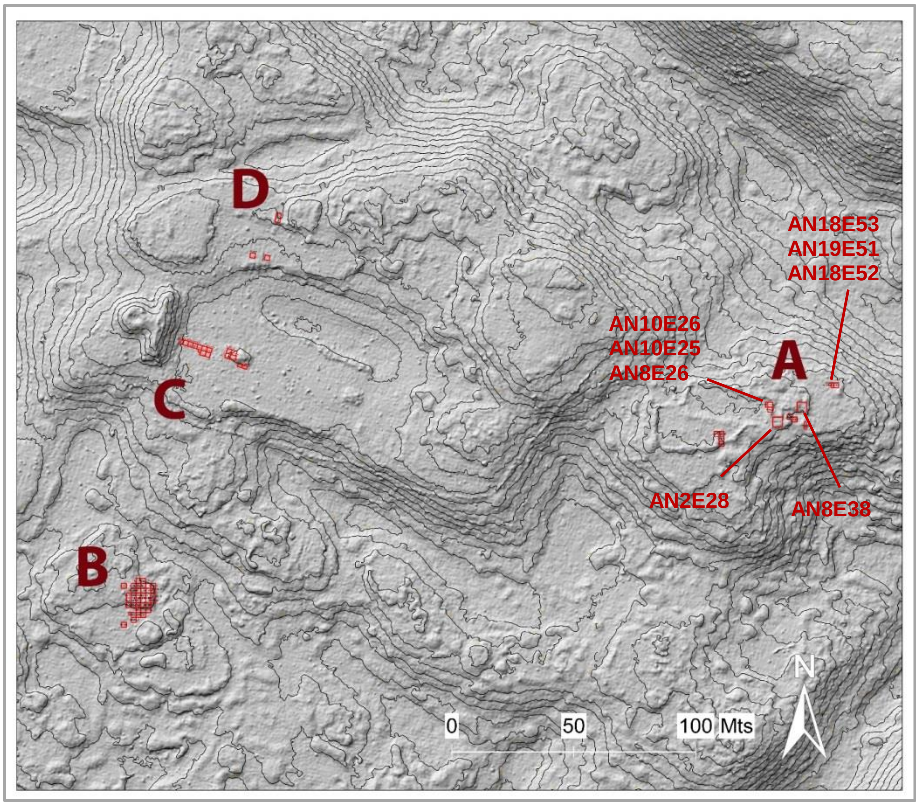

Figure 5.4. LORE-LPB excavation units in Areas A, B, C, and D. Units sampled for this dissertation are noted in red text. Contour lines are 5 cm overlain on a LiDAR-derived hillshade. Modified from map created by Rodrigo Solinis-Casparius for the LORE-LPB.

Figure 5.5. Left – north view of Room 1 (AN2E28), end of Stratum I; right – east view of Room 1 excavating Stratum II. Reproduced with permission of LORE-LPB.

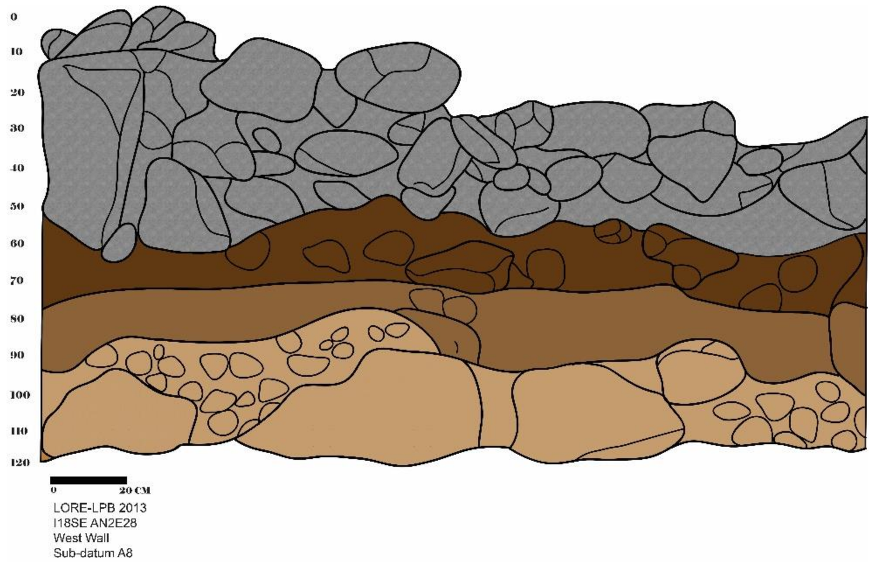

Figure 5.6. Profile of Unit AN2E28 showing stone architecture and three strata described in the text. Modified from Fisher et al 2016.

Interestingly, there were no clear packed earthen or paved floors identified throughout the excavation of this room. The high artifact densities in Strata I and II suggest that they may have once been used as loosely-packed floors or compact fill. Entryways into the room may have once existed in the northwest and southwest walls due to possible steps while a staircase off of the southeastern corner of the room and leading into a patio area (excavated units AN5E34, AN4E36) was fairly clear and mapped using the total station. Ceramic artifacts recovered include polychrome sherds that match those found in Area C, but also many semi-rounded sherds (62 of the worked or rounded sherds are included in my attribute sample). It is possible that these sherds were used for construction fill after Stratum II or as a form of specialized production. One radiocarbon determination from the Late Postclassic to Early Colonial period (AA102894 in Table 5.1) was obtained from charcoal at the top of Stratum II. This late dates suggests that the room was filled or used in Stratum I during the imperial occupation and/or around the time of Spanish incursions into the region, c. 1521-1530 CE.

In addition to the first room, we chose to excavate another semi-rounded room (AN8E38) with similar dimensions (4 x 4 m) (Figure 5.7). It also shared a patio with Room 1 which we later tested (AN5E34, AN4E36). We excavated this room in east and west sides (except for the first and final sterile levels), in order to expose the profiles of the floors and to carefully observe fine-grained material or geomorphological changes. Figure 5.8 shows the architectural and cultural layers identified in this room. The first A Horizon layer was crumbly and dark brown (7.5 YR 3/4) sediment with a high density of artifacts, including anthropomorphic figurine fragments and incised sherds that were similar to those from Room 1. Stratum II consisted of two compact dirt floors full of sherds, other lithic artifacts, and lighter sediment (10 YR 3/4 dark yellowish brown). As we exposed the first floor (2-5 cm depth), we noticed slightly darker sediment on the south end of the room and a possible flat stone which may have served as a step. The subsequent second floor (~5-10 cm) was similarly compact, but eventually turned into more loam-like dark brown sediment (10 YR 3/3) with a large number of artifacts, including a zoomorphic figurine head, a tiny metal hook, green obsidian, and other bichrome and polychrome ceramic pieces. Stratum III was a C Horizon which became increasingly loamy and yellow (10 YR 5/6 yellowish brown-10 YR 6/8 brownish yellow) and was characterized by a decrease in number of artifacts until sterile and at bedrock.

Figure 5.7. Exposed part of the first floor in Room 2 (AN8E38), view to the southeast. Photo by author for the LORE-LPB.

This room exhibited the clearest evidence for a floor in Area A. Similar to the floors identified in Area B (see below), the floors here included compact earth and some flattened ceramic and other artifacts. A large variety of artifacts such as figurine fragments, incised sherds, green obsidian, metal, and polychrome ceramics indicate that the room was in use as a storage space or occupation structure for elite individuals. Although I did not obtain radiocarbon dates from this feature, the ceramic figurine fragments I recovered are identical to those from the Classic period Delicias phase at Apatzingán (Kelly 1947:103–104, Fig. 59a; mentioned also in Noguera 1932:Pl. 32) and from Classic period at Loma Alta (Arnauld et al. 1993:Fig. 56e–f; Carot 2001:Fig. 59) (Figure 5.9). Other ceramic artifacts included polychrome sherds and pipe fragments similar to those dated in Area C to the Postclassic period. These data support the idea that Area A was used primarily during the Middle to Late Postclassic periods, including throughout imperial changes.

Overall, this room showed stronger evidence for occupational and elite use and better preservation than the first room excavated.

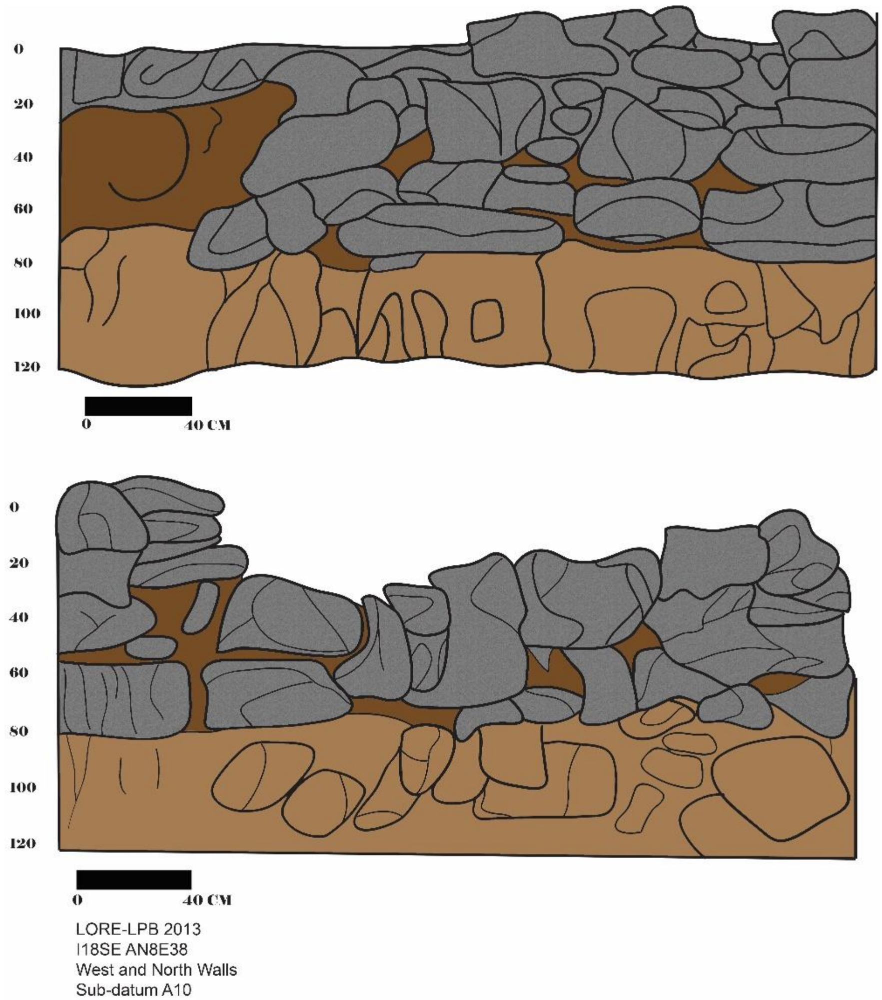

Figure 5.8. Profiles of west (top) and north (below) walls of AN8E38 showing stone architecture and two strata described in text. Modified from Fisher et al. 2016.

Figure 5.9. Anthropomorphic figurine fragment from Room 2 (AN8E38), Stratum I. The detail on the face and headdress is similar to figurines assigned to the Classic period at Apatzingán and Zacapu, Michoacán. Photo by author for LORE-LPB.

As a contrast to the rooms, we excavated plaza units in order to test more public spaces and construction episodes within Area A (units AN10E25, AN10E26, and AN8E26) (Figure 5.4). In these units, we identified three episodes (Figure 5.10) that probably relate to the original construction and expansion of Area A. Stratum I was a dark humus layer (7.5 YR 3/2 dark brown) that was immediately below the basalt stone architecture. Stratum II was a dark yellow brown (10 YR 4/3) that consisted of moderate densities of ceramic and lithic artifacts and few rocks. Stratum III was a silty loam yellowish brown (10 YR 5/5) associated with bedrock and few to no artifacts. Overall, excavation revealed 30-40 cm of cultural materials in the first two strata and which included Late Postclassic style motifs and spouted vessel fragments.

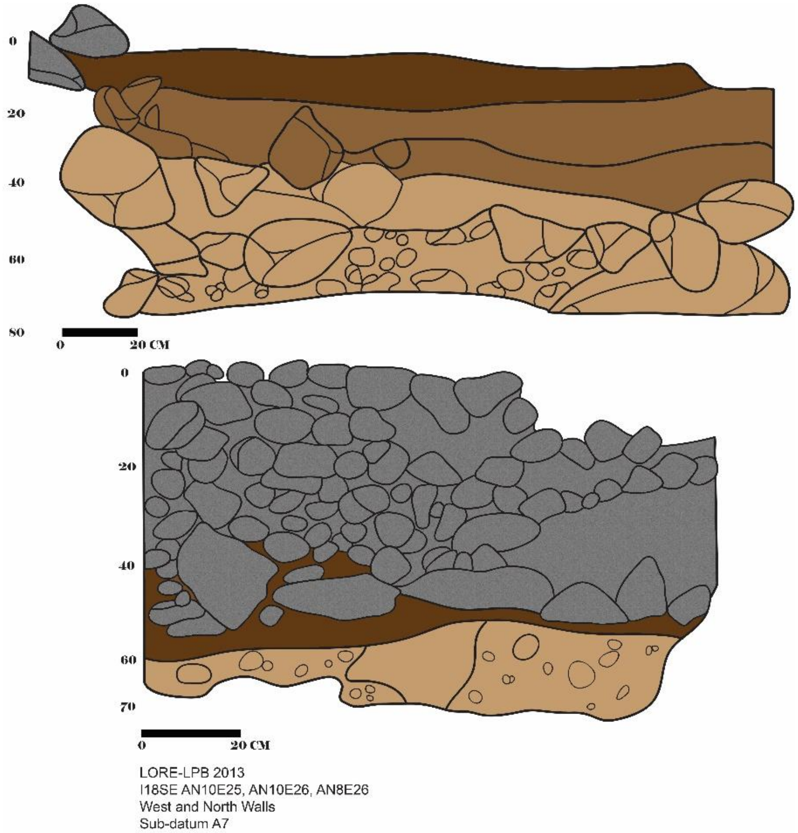

Figure 5.10. North (top) and east (bottom) wall profiles of AN10E26, AN10E26, AN8E26 showing stone architecture and strata described in text. Modified from Fisher et al. 2016.

A final context that we sampled in Area A was an open plaza to the east of the architecture discussed above (AN18E52, AN18E53, and AN19E53) (Figure 5.4). The purpose of excavation was again to identify construction episodes and temporal changes in different contexts located within this elite area. Our excavation of these units exposed types of architecture not visible on the surface and consistent with two alignments of parallel rocks bordering plaza 5233. It is likely that these alignments represented two architectural expansions related to the earliest occupations in Area A. Cultural deposits consisted of 30 cm of lithic and sherd artifacts followed by approximately 30 cm of fill and rocks. The earliest construction episode was represented by a small box made from *laja* stones with a crushed cranium and two femora (Figure 5.11). Preliminary analysis suggests that these remains were a secondary burial or *ofrenda* though I did not identify diagnostic artifacts directly associated with the skeletal materials. A long bone fragment places this individual and plaza construction to the Early Classic period (AA102893 in Table 5.1).

Figure 5.11. Human maxilla and bone fragments as part of an ofrenda in Area A (unit AN18E53, 123 cmbd) that dates to Early Classic period (Table 5.1). The stone alignments around the human remains were probably a box made out of *laja* stones and other materials. Reproduced with permission of LORE-LPB.

Area B

Area B excavations focused on a large Type A room (ED 5128) which we chose for excavation because of its size, preservation, and its potential function as a public building or multi-purpose space (internal dimensions were 4 x 6 m, which is larger than the other rooms excavated at the site). An entrance to the building with four steps was visible on the south side. This entrance opened into a central plaza to the south; platforms and mounds were located to the east and to the north of the building. Access to the building and associated structures were clearly demarcated by various primary and secondary routes. The building was constructed on a 1 m high rectangular platform that was assembled using rock and fill. We estimate that the height of the original walls was approximately 2 m in the exterior and 1.5 m in the interior.

As discussed in Ch. 3, we choose to excavate multiple units at once to gain a more encompassing view of the use and occupation of Area B over time. After clearing away vegetation and identifying connections between the architecture in the area, we used a total station grid to lay out 2 x 2 m units inside and outside ED 5128 (Figure 3.5). We excavated all interior units and several exterior units to the first level; however, we stopped excavating the exterior units due to the potential for instability. We also excavated the small patio area to the south of the building and one 2 x 2 m on the exterior platform to the west (Figure 5.12). Among the artifacts found on the surface was an anthropomorphic figurine fragment similar to another from Loma Alta funerary deposits (Arnauld et al. 1993:Fig. 55c).

For this dissertation, I sampled from three units within the building (BN12E10; BN14E12; BN16E10) and two located outside (BN8E10; BN12E16) (Table 3.1) in order to evaluate any potential differences in the two functional areas. The initial A Horizon of the Area B units revealed stone wall-fall deposition and eroded artifacts that are characteristic of post-abandonment conditions (Pereira et al. 2012). Sediment was yellowish (10 YR 4/2) and grainy and contained roots and small stones. Stratum I (depicted as a *capa* or UE in Figure 5.14) exposed a firm floor of packed earth and artifacts that were a mix of wall-fall and eroded ceramic and lithic artifacts (Figure 5.13). Although preservation was poor and irregular, a small space was intact in the interior. Sediment was dark brown (10 YR 3/3) and approximately 6 cm deep.

In Stratum II we recovered *lajas* in the first two centimeters and darker and more clayey sediment that was very dark greyish brown (10 YR 3/2). Inside the house we recovered a higher density of artifacts than in previous levels, including rim sherds, spindle whorls, and prismatic obsidian blades. Stratum III was formed using internal walls which suggests that this floor was installed after the construction of the walls. This layer consisted of a platform with evidence for two pits which were filled with sediment. The fourth stratum was deepest at 100 cm and full of medium to large angled rocks (Figure 5.14). Sediment was clayey and yellow brown (10 YR 5/4). Though there was archaeological material, it appeared in lower density. Stratum V was sterile and consisted of bedrock.

Figure 5.12. Exterior (foreground) and interior excavation of Strata II-III, Area B (ED 5213). Reproduced with permission of LORE-LPB.

Figure 5.13. Cinthya Cárdenas excavates a floor of packed earth and artifacts in Stratum I of Area B (ED 5213). Reproduced with permission of LORE-LPB.

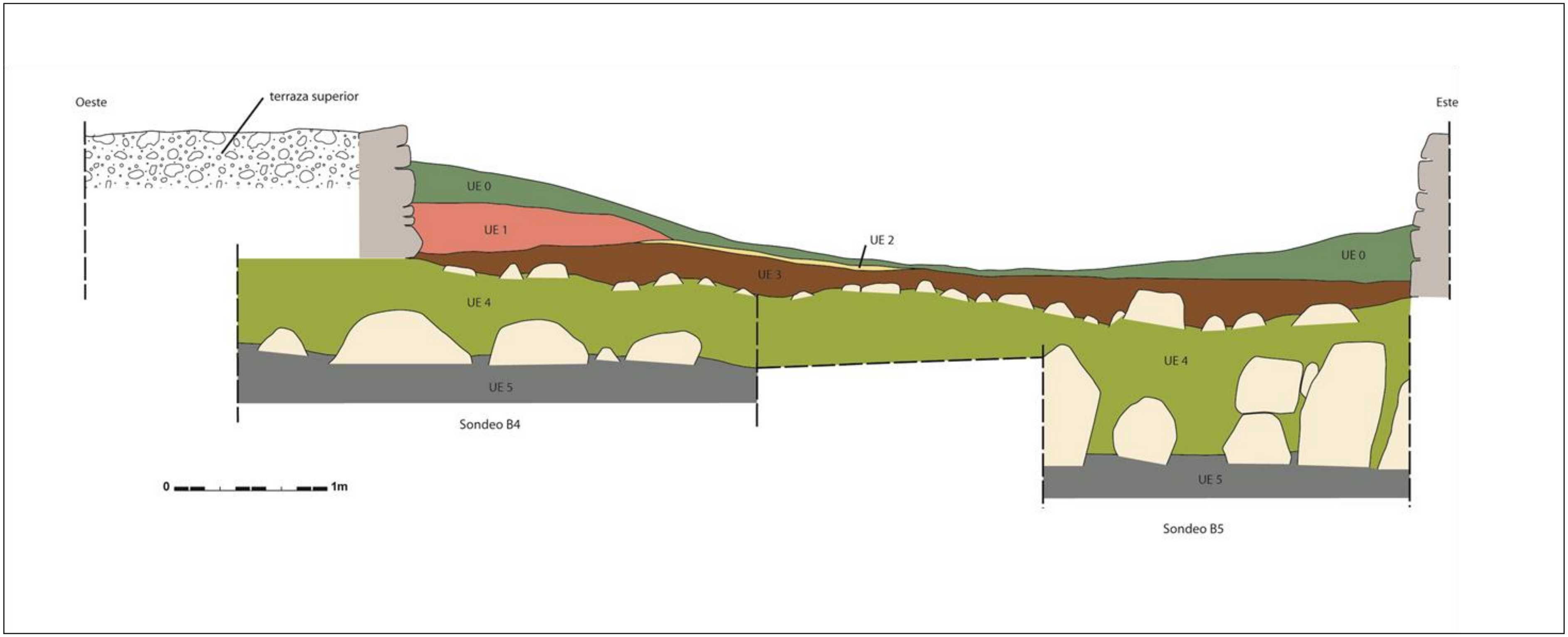

Figure 5.14. Profile of Area B building (ED 5213) north wall showing strata (UE) described in text. Drawing by Karine Lefebvre for LORE-LPB.

Our initial interpretations were that the interior of the building showed a clear sequence of debris on two floors with ceramic materials from the Late Postclassic (1350-1530 CE) and the Middle Postclassic (1200-1350 CE). Highly eroded artifacts including rim sherds, spindle whorls, and prismatic obsidian blades in the upper layers suggest that the building was filled with debris and then abandoned in the upper layer. While this may be the case since I identified ceramic materials that match those from the Postclassic in Area C (see below), one radiocarbon determination from Stratum IV dates to the Pre-Classic or Early Classic period (AA102895 in Table 5.1). This date from charcoal indicates that the building was used for a long period of time, perhaps first as an elite public space and later as a trash pit.

Area C

Area C is defined by a large *yácata* (MO 5037, see Figure 4.5) on the western end of an open plaza which includes two altars. Access to the plaza in front of the pyramid probably occurred through entrances from formalized roadways surrounding the large plaza complex. We excavated this area with an east-west trench in front of the *yácata* and units to the west and south of the first altar (MO or Altar 5001) for a total of 16 units (Figure 5.15). In the course of excavation, we recovered 37 complete or partially complete individuals in 25 burials (defined as one or multiple interments within one context) and additional dispersed human bone for a total Minimum Number of Individuals (MNI) of 71. A summary of the human remains is available in Table 5.9. Since many of the artifacts recovered from Area C were diagnostic and we were able to date human bone, I sampled from all 16 units excavated. Although the units differ in terms of material density and number of human remains, here I discuss the general layout and stratigraphy of several different trench areas within C rather than describing each unit. Each of these sub-areas from in front of the *yácata*, in the center of the plaza, and on the western and southern sides of the altar did show different patterns in terms of interment type and density of artifacts. I show a generalized stratigraphy of the Area C units in Figure 5.16, but I discuss any differences within each sub-area.

Sub-Area in Front of Yácata

In order to understand how the different parts of the plaza were used simultaneously, we excavated units in front of *yácata* 5037 from west to east (Figure 5.15). Excavation of one unit began immediately in front of the pyramid and we opened successive units as we uncovered cultural and human remains.

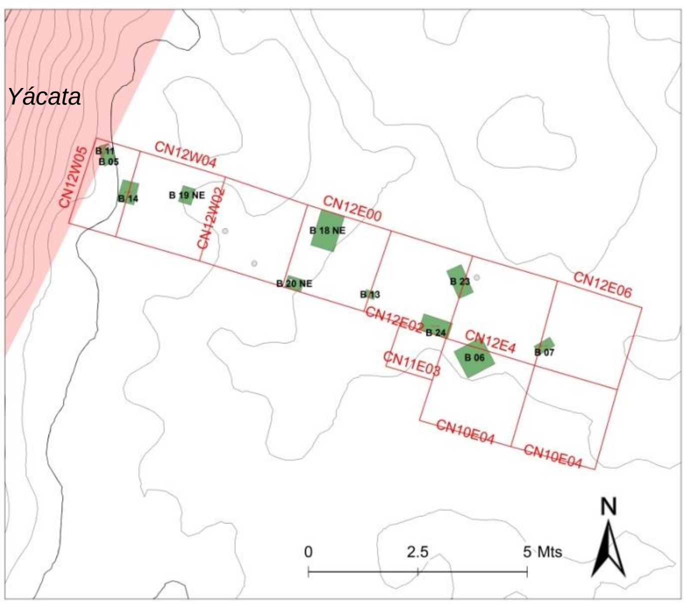

Figure 5.15. East-west trench in Area C with burials noted in green. This trench shows the yácata units and the central plaza units. Contour lines are 5 cm. Modified from map created by Rodrigo Solinis-Casparius for LORE-LPB.

Figure 5.16 shows a profile that was characteristic of the Area C units. Stratum I (levels approximately 20-30 cm deep) was semi-compact organic sediment with a high concentration of cultural materials. Sediment was dark yellowish brown (10 YR 4/4). In many of the units, we documented a 5-10 cm layer of small rocks which may have served as pavement. Stratum II was comprised of dark yellowish brown (10 YR 4/6) silt loam fill related to the construction of the plaza. Some bedrock and large rocks were observed at the bottom of this layer and overall it is similar to what has been considered the top of sterile soil for the rest of Angamuco. In Stratum III, sediment ranged from dark brown loose silt (10 YR 3/3 to 10 YR 3/2). As discussed below, many of the burials and associated mortuary goods were recovered in this layer throughout Area C. A total of 5 burials (MNI = 7) were documented within this *yácata* plaza context.

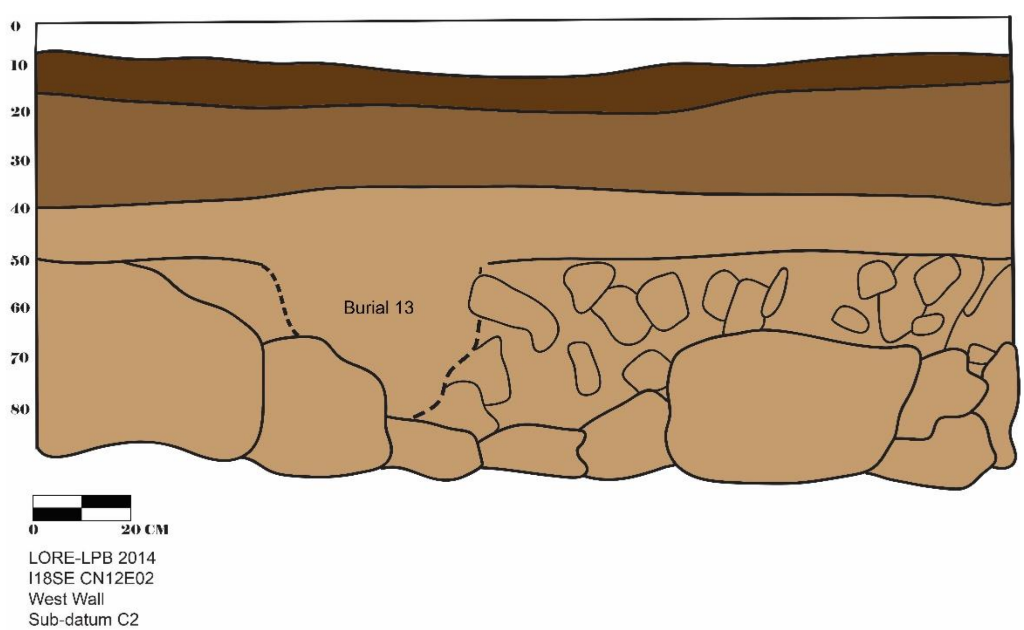

Figure 5.16. Profile of Unit CN12E2 west wall showing three strata described in text. Modified from Fisher et al. 2016.

For the units located in front of the *yácata*, bone from Burials 4 and 14 in CN12W4 date to the imperial Late Postclassic period (AA105514 and AA105511 in Table 5.1). Burial 14 was located between Burial 5 and Burial 4 and consisted of two individuals in an irregular pit delimited by large rocks to the south and smaller ones on the north. The pit limits on the sides were not well-defined. Individual 1 was located in the northern part of the pit and possibly removed to make room for the interment of individual 2 in the southern part of the pit. The bones of individual 1 were fragmented and not as well preserved as the ones from individual 2 (Figure 5.17). A metal ring, which was characteristic of tribute submitted by subjects and Late Postclassic Purépecha elite activities (e.g. Maldonado 2008; Pollard 1993), was found by the right fibula of individual 2.

Figure 5.17. Burial 14 showing individual 2 and bone fragments from individual 1 (CN12W4, Level 5). A metal ring is visible to the left of the small arrow. An AMS date from individual 1 places this burial in the Late Postclassic period (AA105514 in Table 5.1). Reproduced with permission of LORE-LPB.

Table 5.9. Burials documented in Area C based on initial field identifications by Cinthya Cárdenas and Sandra Damas.

Burial	Unit	Level	Associated Feature	Type	Form	Orientation	Type of event	Pit	Offerings	Sex
***1**	CN12E14	5	Feature C1	Primary-indirect	Flexed Ventral D.	N-S	Single	Irregular among rocks	polychrome tripod bowl	F
***2**	CN12E16	6	Altar 5001	Secondary	S anatomical position	N/A	Single	Irregular among rocks		F
3.1	CN14E14	6	Altar 5001	Primary	S anatomical position	N/A	Single	Irregular among rocks		F?
3.2	CN14E14	6	Altar 5001	Primary	S anatomical position	N/A	Single	Irregular among rocks		NID
***4.1**	CN12W4	6	*Yácata* 5037	Primary	S anatomical position	N/A	Collective	Irregular among rocks		F?
4.2	CN12W4	6	*Yácata* 5037	Primary	S anatomical position	N/A	Collective	Irregular among rocks		NID
5	CN12W5	6	*Yácata* 5037	Primary-direct	Flexed Ventral D.	SE-NW	Single	Irregular among rocks		F
***6.1**	CN10E4	7-9	Feature C6	Primary-indirect	Flexed Dorsal D.	W-E	Simultaneous	Circular pit delimited by rocks		M?
6.2	CN10E4	8-9	Feature C6	Primary-indirect	Flexed Dorsal D.	W-E	Simultaneous	Circular pit delimited by rocks		M
***7**	CN12E6	7-9	Feature C2	Primary-indirect	Flexed Dorsal D.	W-E	Single	Circular pit delimited by rocks		F?
8.1	CN12E16	8	Altar 5001	Primary	S anatomical position	N/A	Successive	Irregular among rocks		M
8.2	CN12E17	8	Altar 5001	Primary	S anatomical position	N/A	Successive	Irregular among rocks		F
8.3	CN12E18	8	Altar 5002	Primary	S anatomical position	N/A	Successive	Irregular among rocks		NID
***9.1**	CN12E16	8	Altar 5001	Primary	S anatomical position	N/A	Successive	Rectangular pit delimited by rocks	monochrome	M
9.2	CN12E17	8	Altar 5001	Primary	S anatomical position	N/A	Successive	Rectangular pit delimited by rocks	vessel	M
9.3	CN12E18	8	Altar 5001	Primary	S anatomical position	N/A	Successive	Rectangular pit delimited by rocks		M
10	CN14E14	8	Altar 5001	Primary	Flexed Dorsal D.	NW-SE	Single	Irregular among rocks		F
11	CN14E14	8	Altar 5001	Primary-indirect	Flexed Dorsal D.	W-E	Single	Irregular among rocks		NID
12	CN12E16	8	Altar 5001	Primary	S anatomical position	N/A	Single	Irregular among rocks		F?
13	CN12E0	7	Plaza 5041	Primary	Flexed Ventral D.	W-E	Single	Irregular among rocks		NID
***14.1**	CN12W4	7	*Yácata* 5037	Primary	S anatomical position	N/A	Successive	Irregular among rocks		F
14.2	CN12W5	7	*Yácata* 5037	Primary-indirect	Flexed Ventral D.	SE-NW	Successive	Irregular among rocks	metal ring	F
15	CN10E22	7	Altar 5001	Did not remove						

* Bone sampled for AMS dating.

Burial	Unit	Level	Associated Feature	Type	Form	Orientation	Type of event	Pit	Offerings	Sex
***16.1**	CN10E20-22	7-8	Altar 5001	Secondary	S anatomical position	N/A	Collective	Irregular among rocks	tripod bowl	
16.2	CN10E20-22	7-8	Altar 5001	Secondary	S anatomical position	N/A	Collective	Irregular among rocks		
16.3	CN10E20-22	7-8	Altar 5001	Secondary	S anatomical position	N/A	Collective	Irregular among rocks		
***17**	CN10E20	5	Altar 5001	Bone sample only						
18	CN12W4	9	*Yácata* 5037	Did not remove						
19	CN12W4	8	*Yácata* 5037	Did not remove						
20	CN12E0	8	*Yácata* 5037	Did not remove						
21	CN12E16	12	Altar 5001	Partial excavation						
22	CN12E17	12	Altar 5001	Partial excavation						
23	CN12E02	9	Feature C8	Primary- indirect	Right Lateral Flexed	E-W	Single	Irregular among rocks	2 miniature vessels, 2 pipes, 1 spouted vessel, 1 rattle	M
24	CN12E03	9	Feature C8	Primary- direct	Flexed Ventral D.	E-W	Single	Irregular among rocks		F
***25.1**	CN14E14	8-9	Altar 5001	Primary	S anatomical position	N/A	Collective	Irregular among rocks	2 vessels	NID
25.2	CN14E14	8-9	Altar 5001	Primary	S anatomical position	N/A	Collective	Irregular among rocks		F
25.3	CN14E14	8-9	Altar 5001	Primary	S anatomical position	N/A	Collective	Irregular among rocks		M?

Sub-Area Central Plaza Units

We opened units CN10E4, CN10E6, and CN11E3 as extensions of central trench units CN12E4 and CN12E6 (Figure 5.15). We laid out all units in between Altar 5001 and the *yácata* and excavated in 2 x 2 m blocks except for CN11E3 which was 1 x 1 m. The purpose was to explore the deposition and the possibility for identifying undisturbed features like burials, *ofrendas*, trash pits, hearths, or other cultural activities. This area had a total of eight features, seven of which we considered intrusive circular tombs and two of them (C2 and C6) were excavated because they were best preserved. Within this area and encompassing CN12E2 and CN11E3, we identified another multi-tomb (possibly with a larger architectural structure and vault) as C8 with at least three other individuals, two of which were excavated. Within this central plaza area, we documented six burials (MNI = 7).

The stratigraphic profile was generally similar to the other excavation units in Area C (Figure 5.16) though the matrix of the burial contained a more organic-rich sediment. In Stratum III, we documented a circular pit for Burial 7 (also referred to as C2) and features C8 and C17. The pits – which may have been intrusive from the second layer – were very dark brown (7.5 YR 2.5/2) to dark brown granular loose silt (10 YR 3/3) with some carbon speckles. This sediment type was found on top of each of these circular burial features and five additional features within these trenches, including C6, C14, C15, C16, and C18. Though only three interments were found in two of the circular features (C2 and C6), we believe that these features do represent circular tombs. This suggests a different burial pattern than direct interments elsewhere in Area C, such as units associated with the *yácata* and closer to the altar which exposed individuals in flexed and bundled positions. These circular tombs were probably created by people excavating a round pit into the platform fill and lining the sides with rocks. One or two individuals could have been deposited inside the resulting circular, walled funerary 'vessel.' Large rocks and a thin layer of sediment were used to cover the burials.

We dated two burials from this central area which situate the circular interments within the Middle Postclassic, or the time period immediately before and during imperial influence. A fragment from the right arm from Burial 7 (CN12E4-6, Level 8-9) and a left radius bone from Burial 6.1 (CN10E4, Level 7-9) both date to this period (AA105512 and AA105509 in Table 5.1) (Figure 5.18, Figure 5.19). Burial 7 was a flexed burial deposited in an empty circular rock feature (C2). Burial 6 consisted of two male individuals in a semi-flexed position who were deposited at the same time. Both individuals may have been covered with hard fabric which restricted the body and created an empty space between flexed legs and the rest of the body. Unfortunately I was unable to directly associate any artifacts with these burials.

Figure 5.18. Burial 7 in a flexed dorsal position interred within a circular rock alignment, feature C2 (CN12E4, Stratum 1). A bone fragment from the right arm of this individual dates to the Middle Postclassic (AA105512 in Table 5.1). Reproduced with permission of LORE-LPB.

Figure 5.19. Burial 6 (individuals 6.1 and 6.2) within a circular rock-lined structure (C6, CN10E4, Stratum 1). Individual 6.1 dates to the Middle Postclassic period (AA105509 in Table 5.1). Reproduced with permission of LORE-LPB.

From the available data, the individuals buried in the circular alignments seem to have been treated differently. Since the individuals from these contexts date to the Middle Postclassic period, it is possible that the circular burial practice was associated with an earlier time period than other interments in Area C. Interestingly, however, one of the circular tombs from CN12E2 and CN12E4, C8, was slightly different and included grave inclusions that were not apparent in other burials in the central plaza area. This feature was a vaulted tomb in which at least three individuals were identified in an extended position with two ceramic pipes, two miniature vessels, a polychrome spouted vessel, and metal tweezers and a rattle (Figure 5.21, Figure 5.22, Figure 5.23, Figure 5.24). The structure is larger than 3 m^2 and likely had a vaulted ceiling that collapsed on itself, covering the bodies with larger rocks and damaging both the artifacts and human remains. A small entrance was identified in CN12E4 (facing east) that consisted of an alignment of large rocks creating a narrow portal into the tomb. We identified darker soil similar to Stratum III in the voids of larger rocks. Unfortunately the conservation of the structure was poor and due to time limitations, we exposed approximately 75% of the feature and could not excavate it to sterile.

The mortuary features of the plaza area do suggest re-use of the plaza space in between the *yácata* and altar during the Postclassic which is a pattern similar to earlier elite tombs at Urichu (Pollard 1999; Pollard and Cahue 1999) and Tingambato (Piña Chan and Oi 1982). The radiocarbon dates from nearby Burials 6 and 7 indicate Middle Postclassic interments, but Burials 23 and 24 (within tomb C8) were clearly associated with Late Postclassic grave goods (Figure 5.20, Figure 5.21, Figure 5.22, Figure 5.23, Figure 5.24). For example, the polychrome spouted vessel shown in Figure 5.23 was associated with Purépecha elite activities and several similar examples have been documented at Tzintzuntzan (Cabrera Castro 1996; Castro-Leal Espino 1986:95, 96b, 96d; García García 2009; probably Pollard 1972:296 Fig. D), in the Zacapu Basin

(Arnauld et al. 1993:70–71, Fig. 12), and Huandacareo (Macias Goytia 1990:65–71, Fig. 29–39). Spouted vessels also appear in the RM in association with elite and priestly activities. The other mortuary objects – miniature vessels, long-stemmed ceramic pipes, and copper– are all typically associated with the Late Postclassic empire (see Ch. 2).

Figure 5.20. Burial 23 (CN12E2) at the end of Level 10. This male individual was interred in a right lateral flexed position and associated with tomb feature C8. A metal rattle with fine detail (bottom right) was recovered with this individual. Reproduced with permission of LORE-LPB.

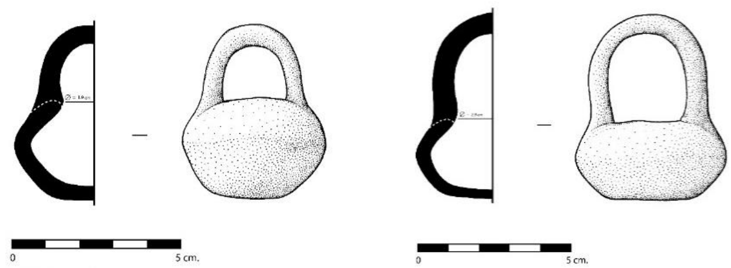

Figure 5.21. Miniature ceramic vessels from Feature C8 in CN12E2 Stratum III. Drawings by Daniel Salazar Lama for LORE-LPB.

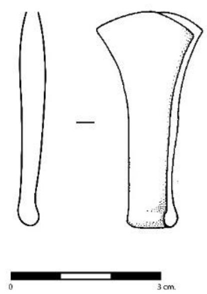

Figure 5.22. Copper tweezers from Feature C8. Drawing by Daniel Salazar Lama for LORE-LPB.

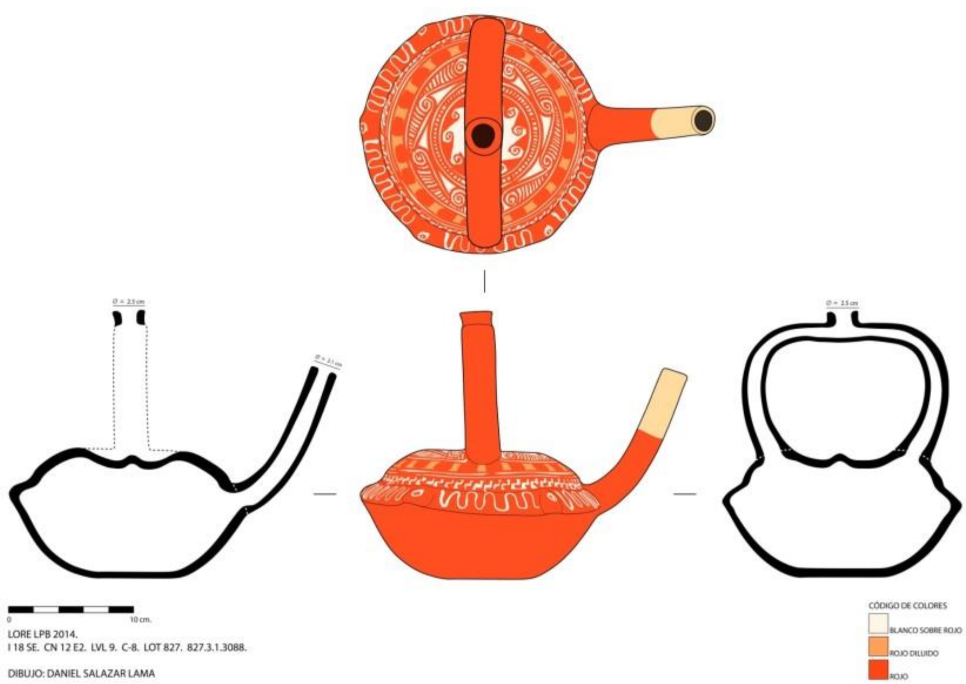

Figure 5.23. Polychrome spouted vessel from Feature C8, Burials 23-24 (CN12E2, Stratum III). This type of vessel is commonly associated with Purépecha elite activities. Drawing by Daniel Salazar Lama for LORE-LPB.

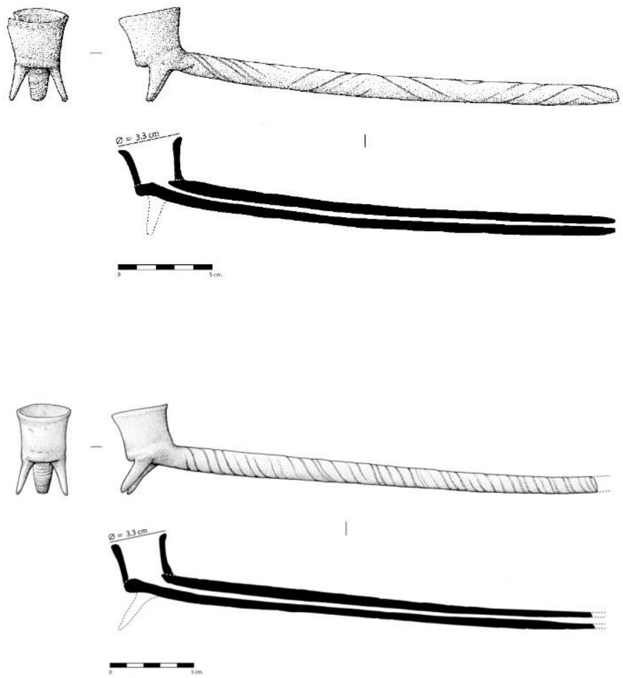

Figure 5.24. Ceramic pipes from Feature C8 (CN12E2, Levels 8 (top) and 9 (bottom)). Drawings by Daniel Salazar Lama for LORE-LPB.

Sub-Area Altar West

In order to contrast the materials that we excavated from the *yácata* and central plaza units, we chose to excavate immediately to the west and south of the main altar. In Mesoamerica, altars have been associated with ritual activities such as sacrifice and incense-burning (Carballo 2012; Wagner et al. 2013). Based on ethnohistoric and ethnographic data, scholars believe that the Purépecha used altars for human and animal sacrifice, to burn *copal* incense, and to keep small fires in honor of the main deity Curicuaeri (Beals and Carrasco 1944; Pollard 1993). The stratigraphy of these units was generally the same as the rest of the plaza (Figure 5.16). We excavated four units to the west of the altar which faced the direction of the *yácata* (Figure 5.25). Almost immediately after we removed the first few centimeters of sediment in CN12E14, we began to recover human bone fragments. The largest number of interments (11 burials and an MNI of 37) was documented within these units which suggest that funerary activities were strongly associated with the altar.

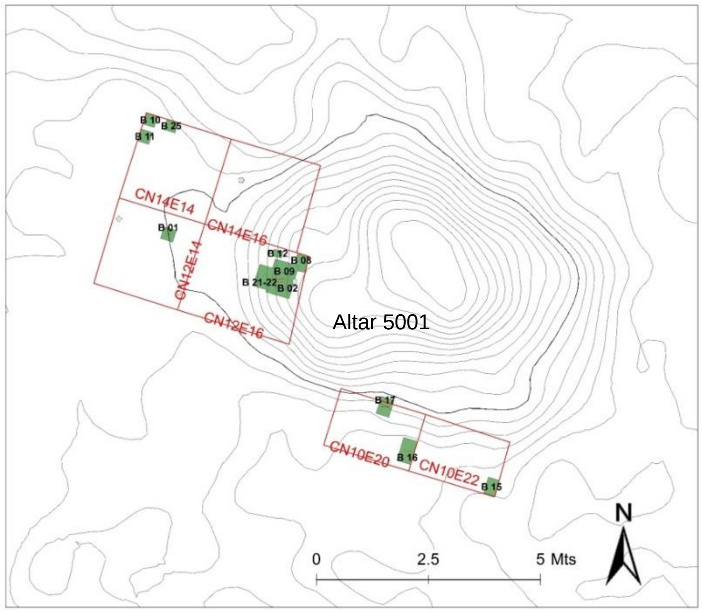

Figure 5.25. Excavation units associated with Altar 5001. Burials are noted in green. Contour lines are 5 cm. Map by Rodrigo Solinis Casparius for LORE-LPB.

Four AMS dates and diagnostic grave goods indicate that the area was used between the Middle and Late Postclassic periods. The earlier period is represented by a single date from Burial 1.1 (CN12E14, Level 5) (AA105510 in Table 5.1). This flexed individual was buried with a fragmented large (29 cm diameter) red, white, black, and negative tripod bowl (Figure 5.28). This vessel has a rounded and slightly outsloping rim that is 6.3 mm thick. The body is 5.7 mm thick, though the base is a more robust 10.3 mm. The three hollow cylinder supports are also painted with red, white, and negative lines. Motifs include spirals, dots, and teeth-like lines in red, white, and black. Tripod bowls with similar dimensions but different designs have been documented in Middle Postclassic contexts at Milpillas and Prieto (Jadot 2016; Pereira et al. 2012; Puaux 1990) and in the Postclassic Chila phase at Apatzingán (Kelly 1947:57–58). Other variations of this large tripod bowl were depicted in Carl Lumholtz's (1987[1902]:384) drawings from Chéran. Interestingly, the Angamuco and Zacapu Basin examples do not show incisions for use as a grinding vessel (*molcajete*) whereas the Apatzingán and Chéran examples and others from nearby northern Guerrero (Cohen 2016), and Tula and Calixtlahuaca (Cobean 1990) do have such lines. There are also some similarities between the designs depicted with *copujo rojo sobre crema con negativo* type sherds from the Late Urichu or Middle Postclassic period at Urichu (Pollard 1999).

In the unit immediately north of Burial 1, Burials 2 and 9 date to the Late Postclassic imperial period (AA105507 and AA105513 in Table 5.1). Burial 2 consisted of a cluster or bundle of bones among rocks immediately next to the altar (Figure 5.26). The clustered bones may constitute a secondary burial because the body was situated in such a way to accommodate long bones on the bottom and pelvic bones on top whereas smaller rib, vertebrae, and foot bones were dispersed. Also found in the same unit as Burial 2, but associated with different burials were a white, red, and negative bottle (Figure 5.29) and copper rattle (Figure 5.30) that were associated with the Purépecha elite at Tzintzuntzan and elsewhere within the Postclassic empire (García 2009; Maldonado 2008; Pollard 1993, 1999). The more recent Burial 9 included the well-preserved bones of three male individuals who all showed signs of trauma to their frontal lobes. One monochrome small jar was recovered with these individuals. The calibrated AMS date for one of the Burial 9 individuals places their interment during the Late Postclassic to Early Colonial periods which could suggest a continuation of pre-European funerary practices during early colonialism. It is tempting to speculate that the visible trauma was the cause of death associated with sacrifice and the altar, but much more skeletal analyses must be undertaken to evaluate this idea.

Figure 5.26. Cluster or bundle of bones in Burial 2 (CN14E16, Stratum I) which dates to the Middle to Late Postclassic periods (AA105507 in Table 5.1). Reproduced with permission of LORE-LPB.

Figure 5.27. Burial 9 (CN14E16, exposed in Level 8) dates to the Late Postclassic-Early Colonial periods (AA105513 in Table 5.1). Reproduced with permission of LORE-LPB.

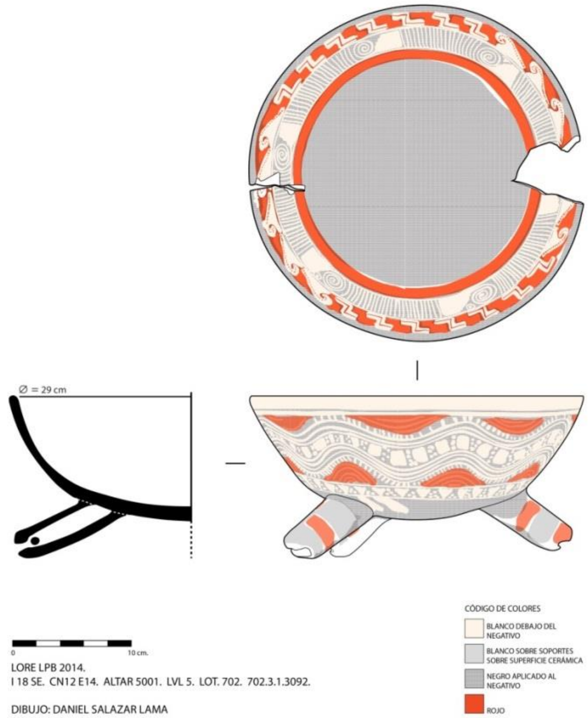

Figure 5.28. Polychrome tripod bowl from Burial 1.1 (CN12E14, Stratum I). An AMS date places Burial 1 within the Middle Postclassic period (AA105510 in Table 5.1). Drawing by Daniel Salazar Lama for LORE-LPB.

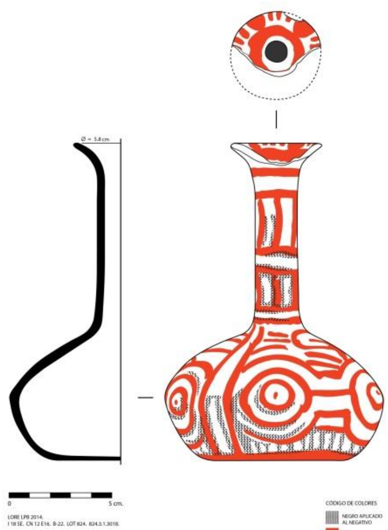

Figure 5.29. Red, white, and negative bottle characteristic of Late Postclassic Purépecha form and decoration from Burial 22 on the west side of Altar 5001 (CN12E16). Drawing by Daniel Salazar Lama for LORE-LPB.

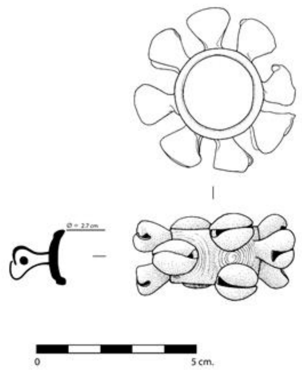

Figure 5.30. Metal rattle with engravings from Burial 18 (CN12E16, Stratum III). Drawing by Daniel Salazar Lama for LORE-LPB.

Finally, Burial 25, which consisted of three individuals interred together that also date to the imperial Late Postclassic period (AA105506 in Table 5.1). It is unclear whether these individuals were buried at the same time or if there were partial disturbances at various stages. A tripod miniature vessel with a scalloped rim and red paint design in the interior was also recovered from the same unit (CN14E14) (Figure 5.31). This style of miniature is characteristic of the Late Postclassic at Tzintzuntzan (Pollard 1993), though the motif seems to have been used since at least the Early Classic period in Loma Alta contexts (Carot 2001, 2013).

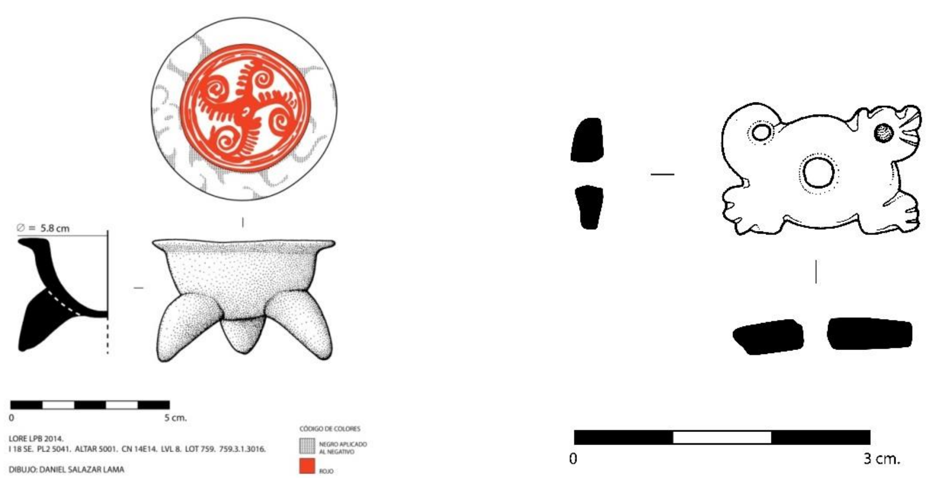

Figure 5.31. Left – Miniature vessel characteristic of the Late Postclassic period in altar unit CN14E14. Right – Zoomorphic shell pendant from Burial 18 (CN14E14, Stratum III). Drawings by Daniel Salazar Lama for LORE-LPB.

We recovered one zoomorphic shell pendant from Burial 18 in unit CN14E14 (Level 9) (Figure 5.31). CEMCA researcher Elodie Más identified the shell as a reddish variety *Spondylus princeps* from the Pacific, which was commonly used in Prehispanic Mexico and Andean societies because the color effectively highlighted decorative motifs (Feinman and Nicholas 1996). Shell pendants in the form of animals or humans have been documented in ritual contexts between the Classic and Postclassic periods at Apatzingán (Kelly 1947), Huandacareo (Macias Goytia 1990), the Zacapu Basin (Pereira 1999), and Tingambato (Piña Chan and Oí 1983). We also found a fragmented shoe-shaped vessel (*patoja*) with a handle in this unit, though it was not associated with a particular burial (Figure 5.32). Red paint is visible around the rim and handle, but the rest of the vessel was unslipped. The *patoja* is a form associated with the Purépecha and variations in miniature and more elaborate zoomorphic forms have been documented throughout the imperial territories, including at Tzintzuntzan (Castro Leal 1986:121, 122, 128; García 2009), in museum collections from the Lake Pátzcuaro area at the National Museum of the American Indian (personal observation), and in drawings from the RM (discussion in Castrol Leal 1986:76-77).

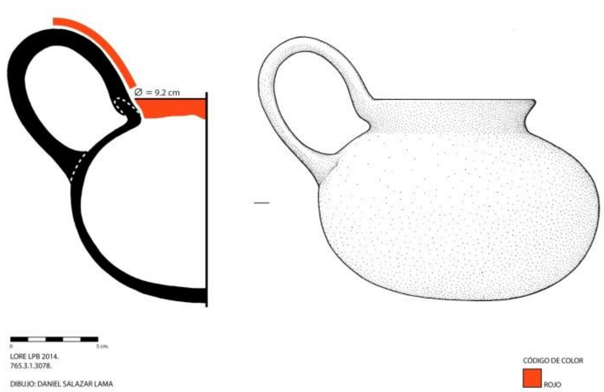

Figure 5.32. A shoe-shaped vessel called a *patoja* that is typically associated with the Purépecha Empire. Initially fragmented, this vessel was refit in the laboratory (CN14E14, Stratum III). Drawing by Daniel Salazar Lama for LORE-LPB.

Sub-Area Altar South

Following excavation of the west altar units, we opened two additional units on the south side of the altar to be able to compare materials and inferred activities. Three individuals with Late Postclassic grave goods were also documented on the south side of the altar demonstrating continuity of ritual around this feature. Units CN10E20 and CN10E22 covered 1.5 m x 2 m and were located in front of the south staircase. Stratum I had the highest concentration of materials, including ceramic, lithic (obsidian and basalt), and human bone fragments. Ceramic materials were collected throughout the 8 levels, but they decreased in number by the start of the second stratum and were almost nonexistent by the final level. We documented the remains of three individuals in Burial 16 (CN10E20, Stratum III) associated with a polychrome vessel (Figure 5.35). These grave goods support the bone AMS determination for the Late Postclassic period (AA105515 in Table 5.1). A second burial (Burial 17) was identified within the north wall of the altar between Levels 5 and 7 and although not completely excavated, AMS determinations on associated bone place the interment within the Late Postclassic period (AA105508 in Table 5.1). The polychrome tripod vessel with hollow globular supports in Burial 16 is typical Purépecha style pottery (e.g. Castro Leal 1986; Macias Goytia 1990; Pollard 1999; García 2009; Museo Nacional de Antropología, Mexico City, personal observation). Together, these data suggest that the altar was primarily in use during the Late Postclassic period.

We noted several interesting architectural changes in this area. Within the first two strata, we exposed and excavated a first step of the altar (Figure 5.33). A possible earlier building episode consisting of large faceted stones was also documented within these layers. At the end of Stratum II (levels 4 and 6), there was a paved pathway that extended from the south wall of units to the base of the first altar step. This 40 cm wide pathway included medium-sized rocks on the sides, fill with smaller rocks, and loose grayish mud that may have been used as mortar. Directly under this pathway was Burial 16, an individual who was likely interred at the time of altar construction. We also exposed the foundation of the south wall of the altar which consisted of fill to flatten the surface after intrusive burial activity.

Based on these excavation data, altar 5001 was associated with ritual activities such as funerary ceremonies and building construction. The deposition of occupation is only 10-30 cm below the surface on the south side of the altar; however, the presence of architectural features and primary and secondary burials accompanied by a polychrome and negative tripod bowl linked to the Purépecha demonstrates a continuity of mortuary ritual within Area C. The excavation of CN12E20 and CN12E22 shows that the plaza platform was first leveled and filled including with primary and second burials. This was followed by at least two additional construction phases. This south side may have been used less intensively for funerary purposes than the west side facing the *yácata*, though additional excavations of units to the south of the altar could evaluate this interpretation.

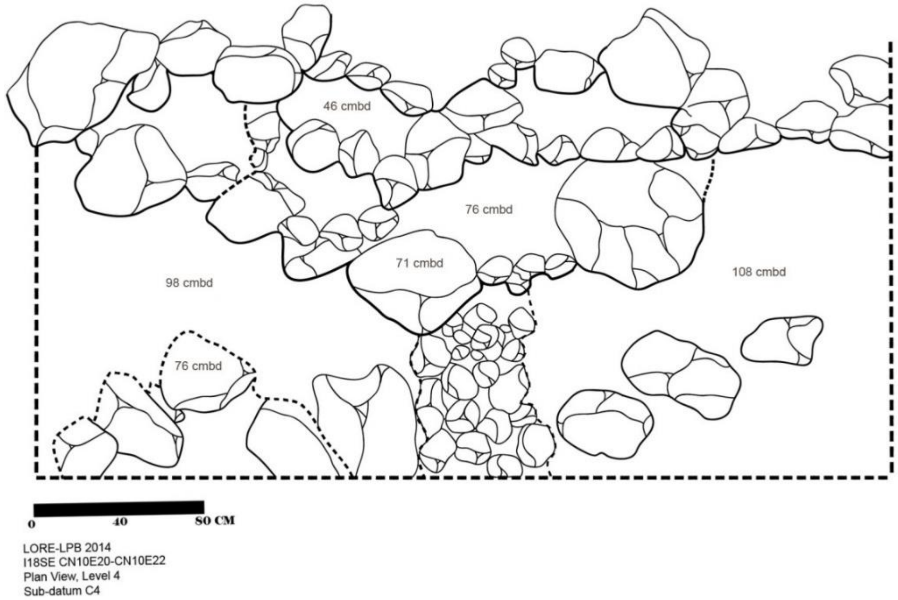

Figure 5.33. Plan view of the south altar units (CN10E20 and CN10E22) showing paved access to the altar and a step for accessing the altar. Modified from drawing by Rodrigo Solinis-Casparius for LORE-LPB.

Figure 5.34. Detail of Burial 16 which includes three individuals interred in the wall and immediately south of the altar (unit CN10E20). A polychrome tripod bowl was recovered to the southwest of this burial (Figure 5.35). Reproduced with permission of LORE-LPB.

Figure 5.35. Refit polychrome and negative tripod bowl from Burial 16 (CN10E20). The hollow globular supports and decoration are similar to other Purépecha elite vessels from Tzintzuntzan and elsewhere in the empire. Drawing by Daniel Salazar Lama for LORE-LPB.

Area D

Area D consists of a built-up terrace (initially coded as PLZ 5013) and associated rooms and buildings that form a complex that closes off one side of the Area C cemetery context. We chose this adjacent area to better understand the architectural features associated with *yácata* 5037, including how PLZ 5013 was constructed and if there were multiple uses and occupations in this broader ceremonial zone. Two 2 x 2 m units, DN0E2 and DN0E8, were excavated to sterile (Figure 5.36Figure 5.37). Both were placed on the southern side of the terrace, in an effort to document plaza construction adjacent to Area C. Also excavated in Area D was the interior of room or building ED 5019 in order to obtain a sample from one of the complex of rooms, private patios, and buildings to the north of PLZ 5013. We speculated that this area was associated with elite and ceremonial habitation areas within Area C.

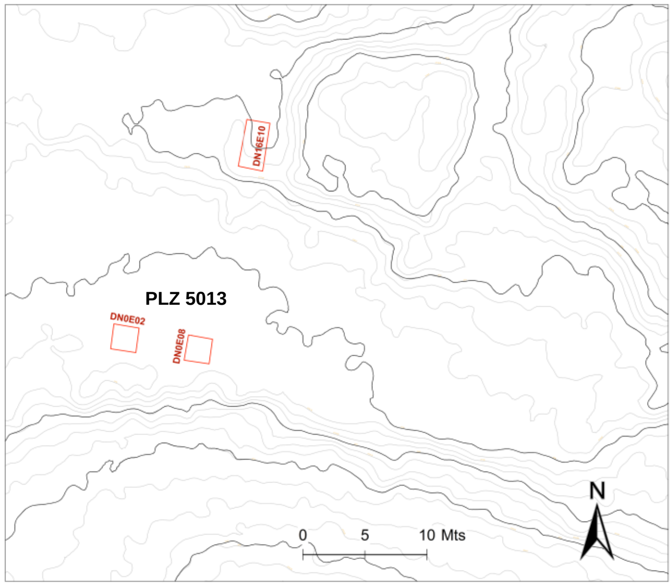

Figure 5.36. Units excavated within Area D: DN0E02 and DN0E08 are located within PLZ 5013; DN16E10 was located within a room to the north. Area C is immediately to the south. Contour lines are 5 cm. Modified from Fisher et al. 2016.

Figure 5.37. Northeast view of Area D excavation context in PLZ 5013: DN0E2 is in the foreground; unit DN0E8 is to the east; ED 5019 is located behind the screen. Photo by author for LORE-LPB.

For the two terrace units, we documented approximately six architectural strata (Figure 5.38). Stratum I represented surface deposition and was roughly 10-12 cm deep. There were few artifacts, a large quantity of roots and other vegetation, and dark brown sediment (7.5 YR 3/2 dark brown). Stratum II was 10-15 cm deep and included packed sediment with some small rocks and a medium density of ceramic (bichrome and polychrome body and rim sherds, including a few glazed colonial fragments) and lithic (obsidian projectile point; basalt debitage and polishing stone) artifacts. In DN0E8, we exposed Feature D1, which was part of a broken jar with associated daub and carbon. Sediment was a similar dark brown color as the previous layer (7.5 YR 2.5/3 very dark brown). Stratum III was up to 30 cm deep and was characterized by loamy sediment and rocks, which may represent a type of fill. Sediment color was darker than the previous layer and ranged from dark brown to black (7.5 YR 3/3 dark brown to 7.5 YR 2/1 black). There were fewer artifacts recovered here than in the previous layer.

Stratum IV was 10-15 cm deep and included a mix of silty loam, some clay-like sediment, and an increase in small to medium-sized rocks which may represent a pavement. Sediment color was similarly dark brown as in the previous layer (10 YR 2/2 very dark brown). Stratum V represented the largest layer (~50 cm) and was comprised of clay and medium-sized rocks. The clay could be formed into balls and was difficult to excavate, but there was no significant difference in sediment color from the previous layer (10 YR 2/2 very dark brown). Within this layer there was an increase in artifact density which in DN0E2 included several large jar pieces and a human rib fragment in the southwest corner in Levels 8 and 9 (~80-100 cmbs). Towards the bottom of this layer in DN0E2, we identified a possible east-west alignment of medium-sized rocks on the north side of the unit which may represent an older partial pavement that was covered over with clay and other fill. Stratum VI was documented in the last 25-30 cm of excavation and consisted of yellow sandy silt (7.5 YR 5/6 strong brown), medium to large rocks, and few artifacts.

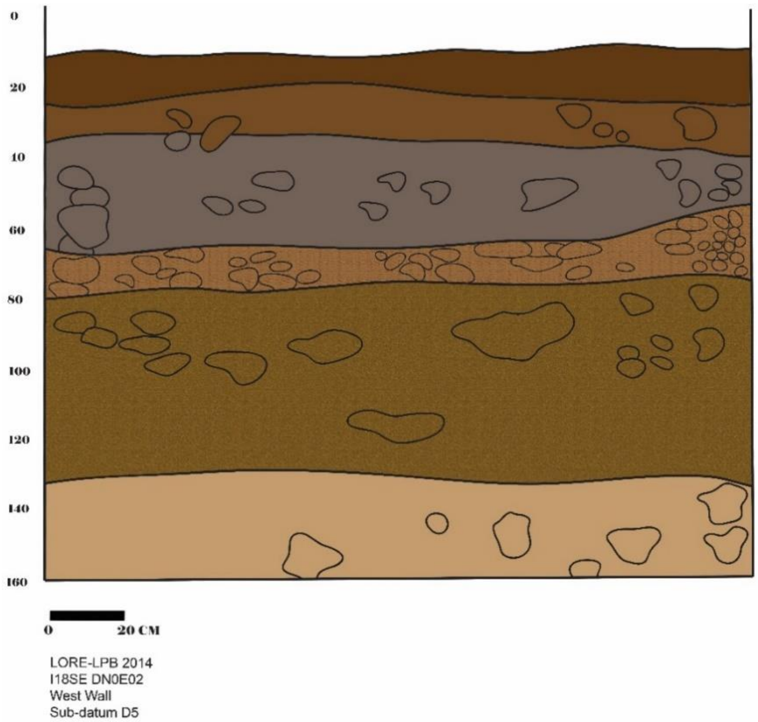

Figure 5.38. Profile of west wall of DN0E02 showing the six strata described in text. Sketch by author for LORE-LPB.

Based on our test excavations, PLZ 5013 was built with a rock wall, sediment, and clay in order to create a distinct space for the plaza and to separate it from the Area C cemetery. The stratigraphic and artifact changes indicate that there were two floors or occupation surfaces and almost a meter of fill. The yellowish platform fill in the earliest levels was probably followed by a rock pavement that was documented in DN0E2. The pavement was later covered with at least 50 cm of clay fill, and another 30 cm of silty sediment and rock fill. A packed earthen floor probably existed right below the surface. Fragmented glazed ceramics in the top level suggest that the area was used in the colonial period.

Also excavated in Area D was a room (ED 5019 or unit DN16E10) adjacent to other rooms and privates patios probably associated with elite occupation in the *yácata* context (Figure 5.39). This room may also be compared to rooms excavated in other areas of the site (AN2E28, AN8E38, E3N0E0, G1E0N0). After first defining the interior floor and walls, we laid out a 4 x 4 m unit. We decided to excavate only the western half of the room as a sample for materials, deposition, and function.

Figure 5.39. ED 5019 before excavation (left) and after excavation (right). Note that only the west side of the room was excavated as a sample of the depositional history and function of the space. Reproduced with permission of LORE-LPB.

We documented four stratigraphic layers in this unit (Figure 5.40). Stratum I was an organic layer which was only a few centimeters deep but showed a reasonable concentration of material (ceramics included polychrome and a few glazed colonial sherds; lithics consisted of obsidian and basalt flakes). Sediment was loose and loamy with medium-sized grains and very dark brown (10YR 2/2). Stratum II was loose, sandy in texture, and dark yellowish brown (10YR 3/4). This soil was found between medium size rocks with a fair amount of roots and a high concentration of materials including polychrome ceramic rims, necks, bases, and handles from jars. Stratum III was a dark yellowish brown (10YR 4/6) with fewer rocks, cultural materials, and bioturbation. Stratum IV consisted of very loose sandy soil with a large number of medium to large rocks that served as part of the fill to flatten for a surface. Sediment color was 10YR 3/6 or dark yellowish brown. This layer was sterile.

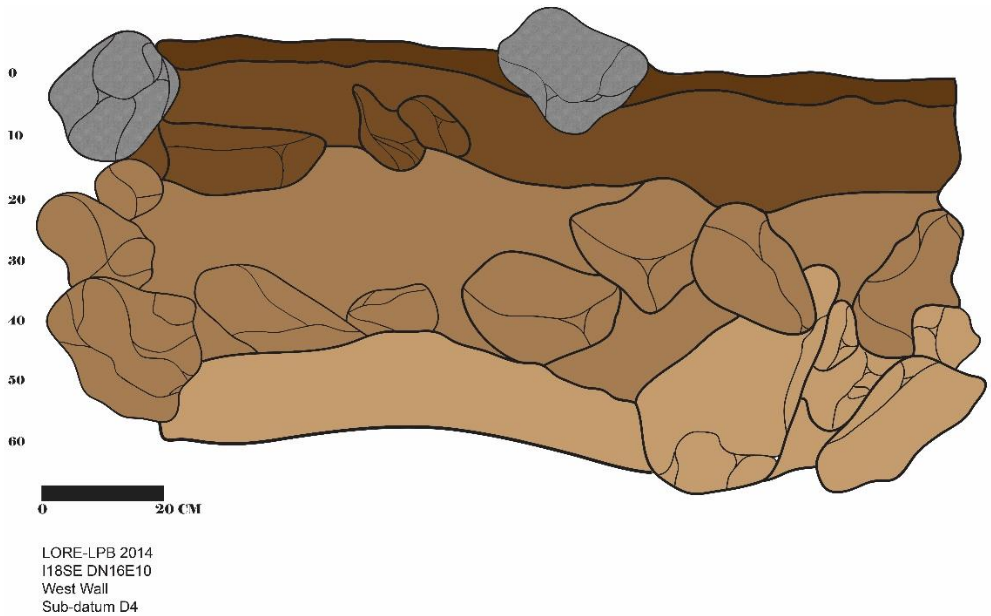

Figure 5.40. North wall profile of DN16E10 showing the three strata described in text. Drawing by Rodrigo Solinis-Casparius for LORE-LPB.

Based on the deposition of occupation, ED 5019 was probably occupied for a short time and constructed following the natural deposition and topography. Similar to the stratigraphy in Area A, E, and G room contexts (see below), builders prepared a platform for the room. The foundation consisted of semi-worked basalt rocks which were buried 10-15 cm into the ground and medium and large rocks were positioned on top to create a wall (approximately 1 m high). Although we did not directly date this room, the large number of polychrome sherds and the proximity to Area C suggests that it was occupied during the Middle to Late Postclassic periods. Interestingly, there was a large number of obsidian prismatic blades recovered in ED 5019 (see

Appendix B:Table 1), which could suggest some kind of specialized production or storage (Darras 2009). Future lithic analyses and obsidian sourcing could evaluate this idea.

Area E

We chose Area E for excavation because it consists of sunken plazas and small rooms and terraces that likely served as domestic spaces. In addition, while surveying in the area in 2010-2011, we documented at least 5 triangular slab supports within a plaza that are similar to supports recovered in Epiclassic Tingambato contexts (Piña Chan and Oí 1982) (Figure 5.41).

Figure 5.41. Triangular slab support found on the surface of Area E in 2010. During survey, we documented five complete or fragmented examples of this form which are similar to Tingambato supports attributed to the Epiclassic period. Photo by author for LORE-LPB.

Thus, this area was chosen for a temporal, socioeconomic, and functional contrast to the elite areas A, B, C, and D. Similar to the methodology for Area A, our strategy was to test different architectural features rather than horizontal excavation due to the variety of structure types. We excavated four units, including a domestic terrace (E2N0E0), a room (E3N0E0), an open plaza (E1N0E0), and a sunken plaza (E4N0E0) (Figure 5.42).

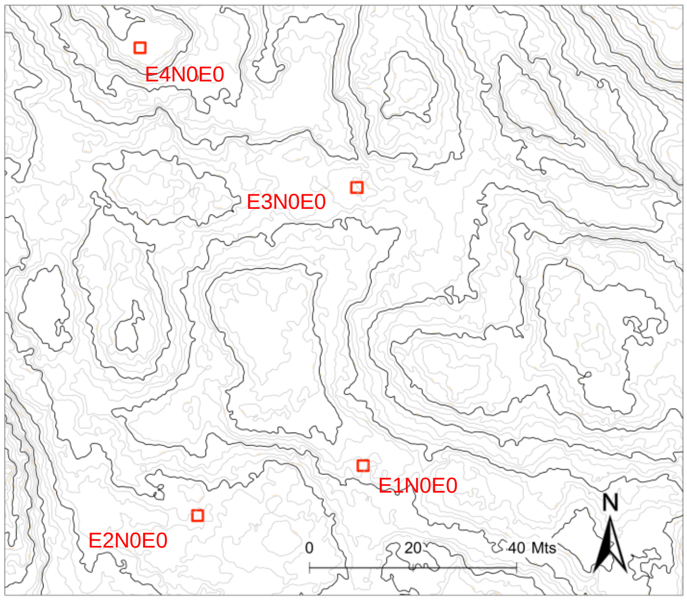

Figure 5.42. Area E excavation units. Contour lines are 5 cm. Modified from Fisher et al. 2016.

We first chose an open plaza (E1N0E0) because of its location at the base of a slope and because it resembled the upper levels of a midden. A large quantity of ceramics – including the triangular slab supports mentioned above – was eroding from the surface of the unit. In this unknit and in E2N0E0 (discussed below), we noted only two stratigraphic layers (Figure 5.43). Stratum I was a brown (10 YR 4/3) silty loam with high organic content and high artifact density, including several ceramic body pieces that may have been part of Epiclassic annular-based vessels. One ceramic ear spool was also recovered within this layer. Lithic artifacts were not as common, but obsidian and basalt flakes and some groundstone was collected in this layer. At roughly 50 cmbs, we noted a gradual transition to Stratum II, which appeared as yellowish brown (10 YR 5/2 and 10 YR 5/4) silty loam sediment in patches and clumps. This layer was also marked by the increasing presence of large stones and decreasing numbers of artifacts. Since this unit was located at the base of a slope, the artifact concentration found near the surface may have resulted from material eroding from uphill, although it was likely deposited in the plaza over the course of its occupation.

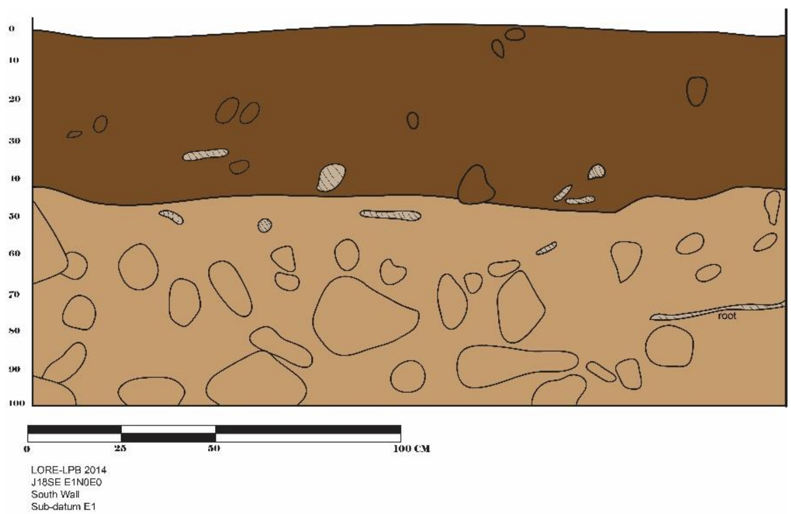

Figure 5.43. South wall profile of unit E1N0E0 showing two strata described in text. Strata for unit E2N0E0 are similar. Sketch by Kyle Urquhart for LORE-LPB.

We chose to excavate another unit (E2N0E0) because of its potential as a residential terrace. The northeast corner of the unit included the southwestern portion of a roughly rectangular 4 x 4 m mound (~10-15 cm high) on the probable terrace. Similar to E1N0E0, we identified two strata in this unit (Figure 5.43). Within Stratum I, we documented a floor at approximately 50 cmbs that seemed to roughly correspond with the boundaries of the rectangular mound, but we did not find daub or other evidence of architecture. It is possible that this floor was part of a perishable structure. At approximately 80 cmbs, we uncovered a pavement of medium-sized stones with a clearly defined edge on the eastern side of the unit. Artifact density and type were similar to unit E1N0E0.

Another domestic context that we chose to excavate in Area E was a well-preserved stone room (unit E3N0E0) which was also associated with an enclosed patio, adjacent rooms, and a sunken plaza (unit E4N0E0). This room is also comparable to others excavated at Angamuco (AN2E28, AN8E38, DN16E10, and G1N0E0). We recorded three stratigraphic layers. Stratum I was roughly 25 cm of humus and organic materials with medium to large rocks used for wall construction (Figure 5.44). Here we documented dark sediment (7.5 YR 2/2 black to 3/2 dark brown) and the majority of artifacts (e.g. ceramic handle; jar pieces; green obsidian blade) in the unit. Stratum II was approximately 40-50 cm deep and consisted of a large amount of vegetation, medium to large rocks associated with room construction, and dark silty loam (7.5 YR 3/2 dark brown). We collected few artifacts in this layer, but one piece of charcoal was dated to the Early Postclassic period (AA105505 in Table 5.1) which confirms our initial interpretation that this area was associated with earlier, pre-imperial occupations. The third stratum comprised the last 50 cm of excavation and included yellow sandy silt (7.5 YR 5/6 strong brown), medium to large rocks, and few to no artifacts. The stratigraphy shows that the platform base was built into the naturally-elevated topography, and that stone walls were constructed on three sides to form a 3 x 3 m room. The builders may have constructed a doorway with perishable materials on the fourth side. Overall, the excavation data indicate that past occupants probably used room E3 for one episode and consumed domestic artifacts such as jars and spoons.

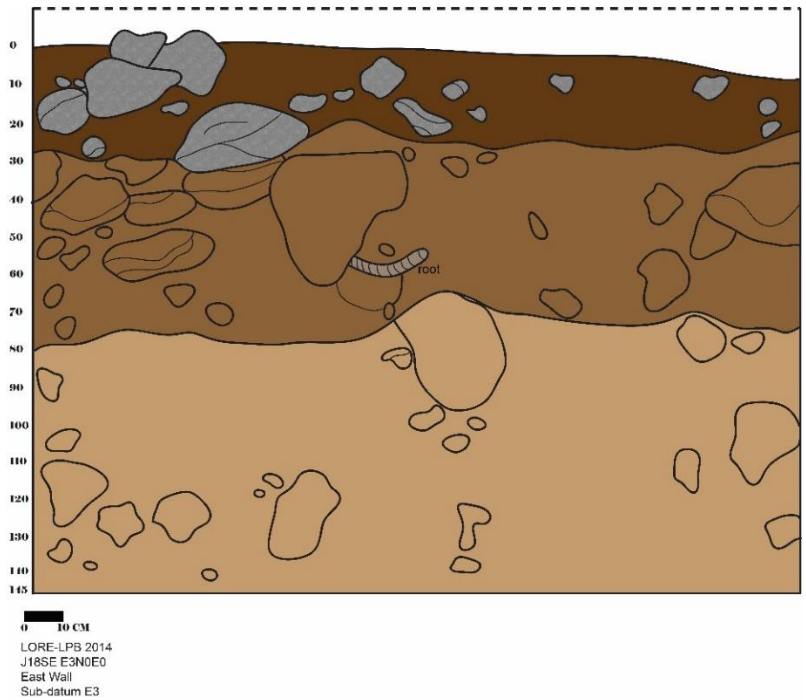

Figure 5.44. East wall profile of domestic room E3N0E0 showing strata described in text. Sketch by author for LORE-LPB.

Finally, we excavated E4N0E0 which was a sunken plaza surrounded by stone terraces in the central western part of the area (Figure 5.45). We chose this particular plaza because of its proximity to room E3 and because we wanted to test one of the many sunken plazas in the upper area of the *malpaís*. We documented three stratigraphic layers. Stratum I was 25-30 cm deep and consisted of surface deposition, dark brown sediment (7.5 YR 3/4 dark brown), and few artifacts (Figure 5.46). Stratum II included 40 cm of increasingly yellow (7.5 YR 5/6 strong brown) silty loam with a few small rocks. We encountered a medium to low density of artifacts that were mainly fragmented monochrome sherds. We identified Stratum III in the last 60 cm of excavation as slightly clay-like yellow sandy silt sediment (7.5 YR 5/6 strong brown), medium to large rocks, and few to no artifacts. Although there were changes between the strata in terms of artifact and rock amounts, the similar soil types throughout the deposit, a lack of rocks, and deep deposit for the site (1.5 m) suggest that it was used for construction materials. The sunken plaza was part of the natural topography of the lava flow, but past occupants may have used rocks and soils in the plaza for construction and then refilling. Overall, the lack of polychrome ceramics, the presence of domestic features (rooms, patios, and plazas), and an AMS date from the Early Postclassic period indicate that Area E was a pre-imperial domestic context.

Figure 5.45. Excavating a sunken plaza, unit E4N0E0, Level 1; view to the northwest. Photo by author for LORE-LPB.

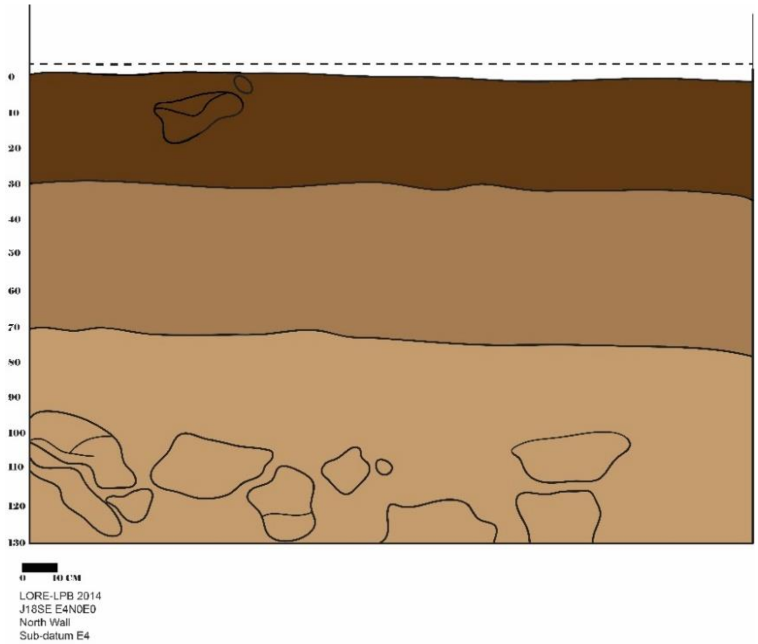

Figure 5.46. North wall profile of sunken plaza unit E4N0E0 showing strata described in text. Modified from Fisher et al. 2016.

Area F

Area F constitutes a neighborhood ritual space removed spatially from the other contexts tested on the upper *malpaís*. We excavated most units around a large stepped rock feature (MO 9858) that may have been a proto-*yácata* and that could be contrasted with elite ritual spaces sampled in Area C (Figure 5.47). We first excavated unit F1S1E0 because of its location immediately south of the stepped mound and along the northern edge of a well-defined plaza (Figure 5.48). Though initially opened as a 2 x 2 m, this unit was expanded one meter south (noted as F6S3E0) in order to sample material from the plaza. Within these two units, we exposed a circular rock-lined feature and documented a large amount of material relative to other units in the upper areas of the site.

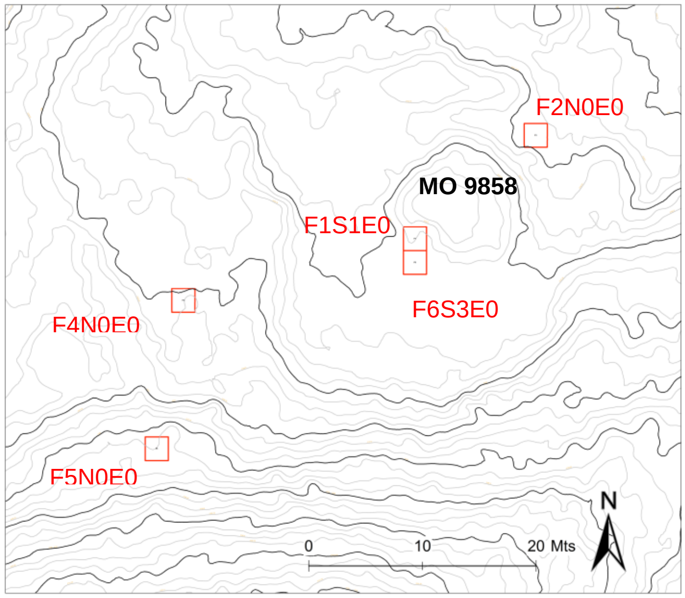

Figure 5.47. Area F excavation contexts. Contour lines are 1 m (black) and 25 cm (light gray). Modified from map by Rodrigo Solinis Casparius for LORE-LPB.

Figure 5.48. Unit F1S1E0 before excavation. F6S3E0 was opened immediately to the south. The stepped mound (MO 9858) – possibly a proto-*yácata* – is located behind the large tree. Reproduced with permission of LORE-LPB.

We documented four stratigraphic layers in the units around the stepped feature (Figure 5.49, Figure 5.50). Stratum I was characterized by a thin A horizon that was cumulic and which consisted of less than 10 cm of dark organic silty loam (10 YR 3/2). In the northwest corner, this layer was much thicker and filled with rubble from the collapsed wall of MO 9858 and compact brown sediment with sherds and small rocks that may have been a floor. Stratum II was approximately 20 cm of brown (7.5 YR 5/4) silty loam with a high artifact density. Near the collapsed wall, we exposed a possible step or embankment. Immediately below the step, we recovered a partial vessel that may have been an *ofrenda* similar to ceramic objects deposited in association with the construction of Altar 5001 in Area C. A thick fill episode, similar to PLZ 5013 in Area D, underlays all of the units around the stepped feature.

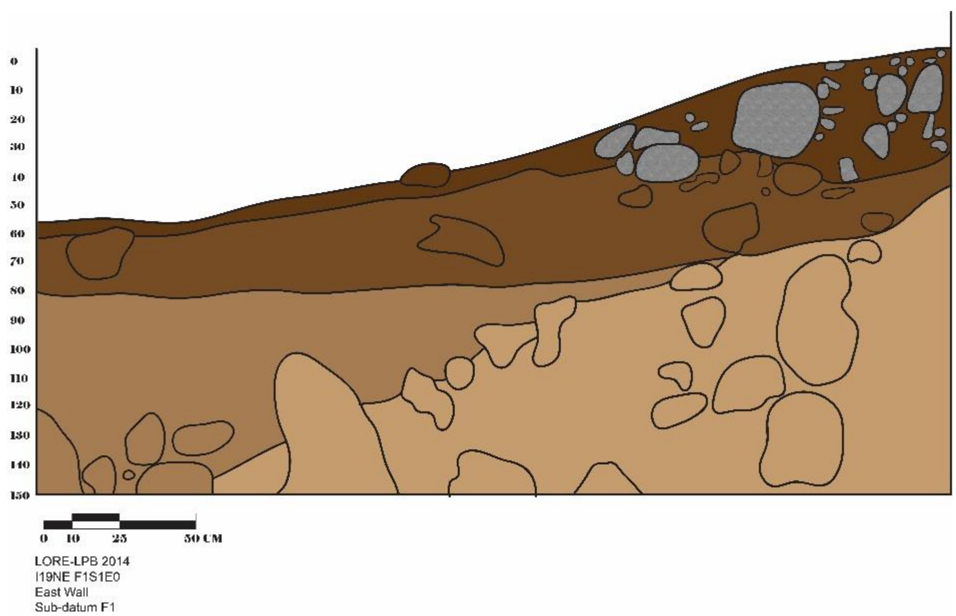

Figure 5.49. Profile of east wall in unit F1S1E0 showing strata described in text. Drawing by Kyle Urquhart for LORE-LPB.

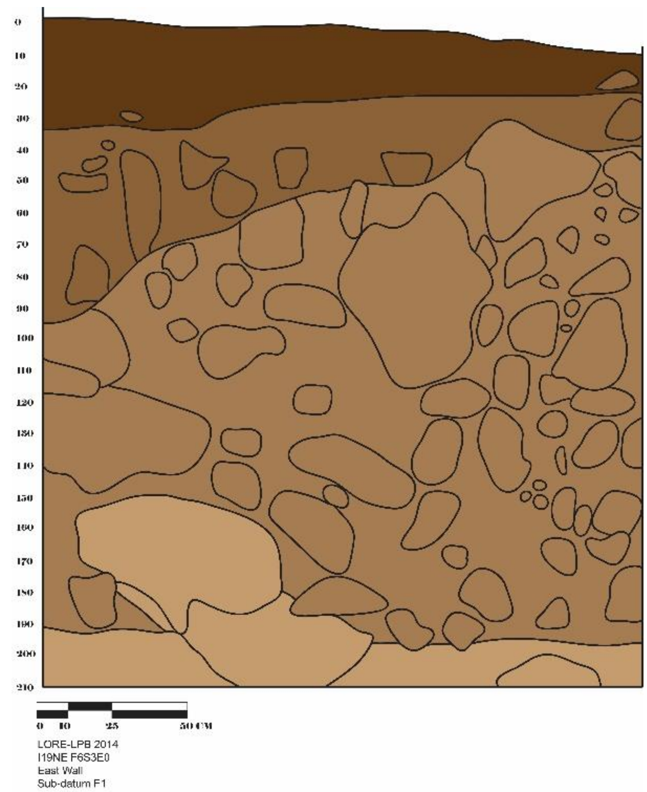

Figure 5.50. Profile of east profile in unit F6S3E0 showing strata described in text. Drawing by Kyle Urquhart for LORE-LPB.

In the southern part of F1S1E0 and much of unit F6S3E0, we exposed the top of a circular stone platform (Figure 5.51). The base of this feature was constructed by aligning large rocks horizontally and then placing smaller rocks on top of them to form a pavement. The exterior of the feature was a ring of rounded large stones. The north side of the feature had a step or embankment, also of large stones which abutted the ring. A very large flat stone was located on the northern side of the ring. The entire ring was slanted about 15 cm southward, with the east side also being slightly higher in elevation than the west. The feature was pedestalled and excavated separately in four quadrants to identify any functional changes. Sediment associated with the pavement was compact brown (7.5YR 5/3) silty loam while the underlying soil was similar but looser.

Figure 5.51. Contrasting levels in circular Feature F1 in units F1S1E0 (north) and F6S3E0 (south). A pavement of small stones is shown on the eastern side of the feature while a preceding layer of larger rocks is shown on the western side. Reproduced with permission of LORE-LPB.

In Stratum III, we documented construction fill with brown (7.5YR 4/4) silty loam and a high concentration of artifacts. There were several large sherds, including in the sediment below F1. A piece of charcoal from this stratum dates to the Preclassic period (AA105504 in Table 1), which could suggest an earlier than anticipated use of the space or use of fill for the feature construction. Stratum IV, a similarly brown (7.5YR 4/6) sandy silty loam, represented the natural sediment and was almost entirely sterile. Due to the low number of materials in F1S1E0, we stopped excavating that unit but continued to excavate within the final layer in F6. In Level 13 (~130 cmbs), we noted a large *mano* on the western side of the unit. While artifact density declined early in Stratum IV, we recovered sherds until Level 20, at which point the sediment became sandier. We stopped excavation at Level 21 which was sterile.

The excavation data suggest that Plaza 9866 was originally a valley with a natural hill located at the same location as building MO 9858. Occupants filled in the valley to create a flat plaza (the fill is represented in Stratum III), and the circular structure was then constructed on the surface above this fill. The layer of compacted sediment identified as a floor in Stratum II was likely created by human activity as people moved around feature F1. Although we need to test the sediment for organic remains, based on its shape and construction, it is possible that F1 could have been a circular granary as discussed in Ch. 4 (Ahrens 2013; Pereira et al. 2013). Although the function of MO 9858 was not clear, its prominent position within Plaza 9866 and its large size relative to other buildings suggest that it may have been a shared community space such as a shrine or temple. A small step or embankment may have surrounded the entire building and a small offering of an undecorated bowl was placed below this step during construction.

In addition to the units described above, we tested a possible large room or patio that was immediately to the west of MO 9858 (F4N0E0) and a well-preserved earthen and stone terrace to the southwest of the plaza (F5N0E0) (Figure 5.42). Both contexts may have been occupied briefly since we only documented two stratigraphic layers until sterile. A single occupation was present in these units represented by a thin layer of cultural material over the C Horizon. The cultural sediment was dark brown (7.5 YR 3/2) and consisted of few artifacts. In unit F5, we recovered a small diagnostic figurine fragment was recovered ~30 cmbs which is similar to one from a Lupe surface context (Epiclassic period), but that is identified as Loma Alta (Preclassic-Classic period) style in the Zacapu Basin (Pereira 1999:123-124, Fig. 70-2) (Figure 5.52). It is possible that this area was used during the Epiclassic period or that the figurine was first made then and then reused at a later date. We also exposed aspects of the terrace construction, which involved building into the natural topography and using medium to large-sized rocks as a platform. The artifacts, which included basalt flakes and obsidian blades, and monochrome and bichrome ceramics, indicate that it was a non-elite space.

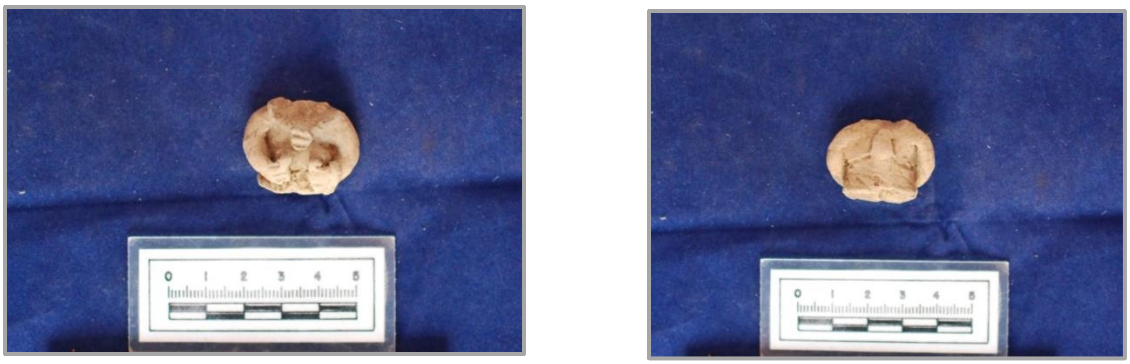

Figure 5.52. Figurine recovered from Level 3 of unit F4N0E0 (~30 cmbs). This figurine is similar to one documented in the Zacapu Basin in a Lupe (Epiclassic) phase surface context. Reproduced with permission of LORE-LPB.

Area G

A final area that we tested was G, which represents a series of stone buildings and patios 250-300 m to the southwest of Area F. This area is on the southern edge of the *malpaís* slope and overlooks the Cerro Colorado and the road between Pátzcuaro and Morelia. Rock walls or terraces surround the architecture in Area G giving it the appearance of a self-contained neighborhood unit. We tested a stone room (G1N0E0) and a patio space (G2N0E0) in addition to an environmental trench unit (G3N0E0) on a terraced hill in order to evaluate terrace construction (Figure 5.53). In this dissertation, I sampled from the room and patio since the terrace unit rendered very few artifacts.

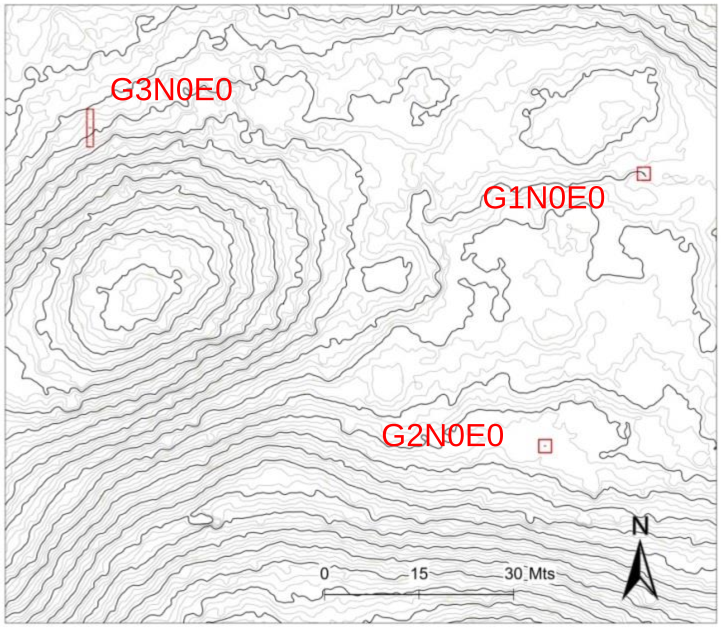

Figure 5.53. Area G excavation units. Contour lines are 1 m (black lines) and 25 cm (gray lines). Modified from Fisher et al. 2016.

Similar to the rooms in Areas A, D, and E, we chose the Area G room (G1N0E0) due to its preservation and to compare with the previously excavated contexts (Figure 5.54). Similar to the strata discussed above for Area F, we identified two strata representing a single occupation over sterile C Horizon material (Figure 5.55). The majority of the artifacts from this unit came from this occupation; however, throughout the five excavation levels, we collected very few artifacts. This room is similar in terms of construction, deposit, and hypothesized length of occupation to the excavated room in Area E (E3N0E0).

Figure 5.54. Left – West view of domestic room G1N0E0 before excavation. Right – Southwest view of G1N0E0 within Area G during excavation. Reproduced with permission of LORE-LPB.

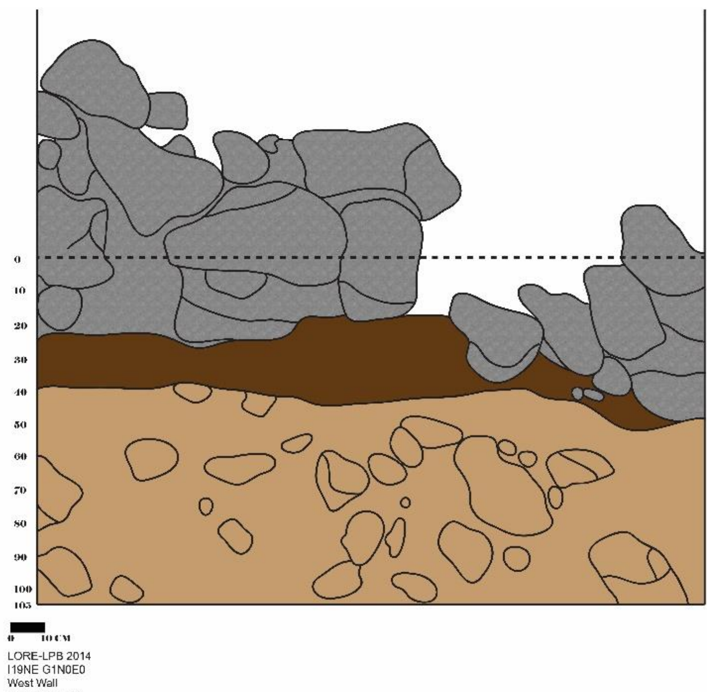

Figure 5.55. Profile of west wall in domestic room G1N0E0 showing stone construction and strata described in text. Drawing by author for LORE-LPB.

As a contrast to G1, we sampled a patio unit (G2N0E0) on the edge of the *malpaís* (

Figure 5.56). We chose this patio in order to catch any potential deposition that may have accumulated from the domestic spaces of Area G. The north side of the patio was defined by a substantial rock wall which separated the patio from the rest of the neighborhood area. The stratigraphy for this space was similar to the room above (Figure 5.57). Throughout all five levels, we collected very few artifacts. Given the location of unit G2N0E0 on a patio overlooking a major road, it is surprising that there was such a short occupation and little evidence for functional activities.

Figure 5.56. Patio context and south view of unit G2N0E0 during excavation of Level 5. Cerro Colorado and the Pátzcuaro-Morelia road are located behind the trees, off the *malpaís* slope. Photo by author for LORE-LPB.

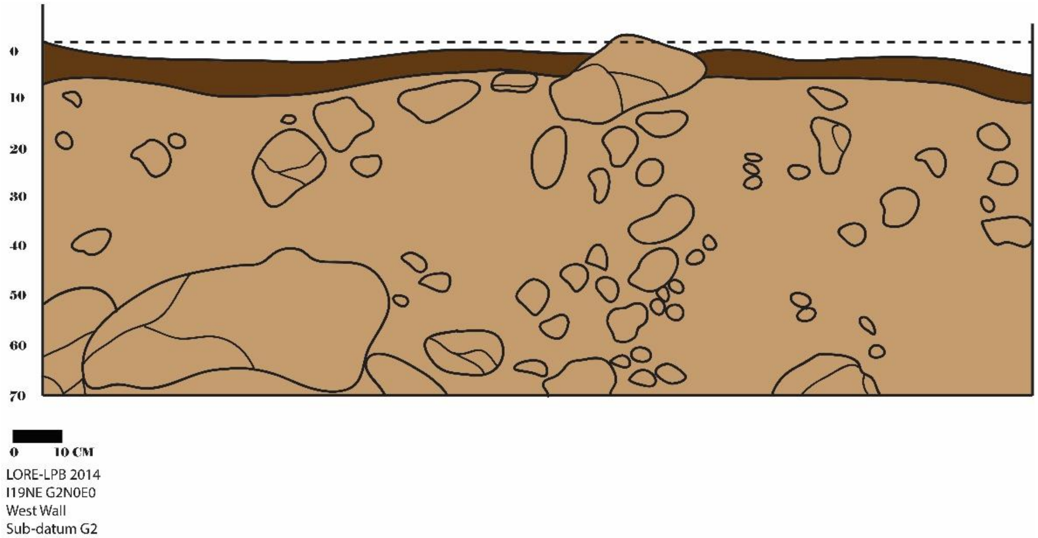

Figure 5.57. West profile of patio unit G2N0E0 showing strata described in text. Drawing by author for LORE-LPB.

Survey Sample

Though I discuss the survey architectural and artifact data earlier in this chapter, in Ch. 4, and in the INAH Materials Analysis from 2009-2011 (Fisher et al. 2011:Appx. A), here I emphasize one key category concerning the ceramic sample. As outlined in Ch. 3, I selected 219 ceramic specimens from each sub-quadrant within the Angamuco survey grid for a representative sample of the entire survey area. I was able to categorize 137 sherds into the basic decorative groups (Table 5.10). When I further categorized the sherds according to where they were recovered at the site (i.e., upper versus lower areas), it is clear that although we collected monochromes, bichromes, and incised examples throughout Angamuco, we exclusively recovered polychromes in the lower areas. Importantly, this follows the pattern from the excavated ceramics. Polychromes, which were only found in Middle to Late Postclassic contexts in Areas A, B, C, and D (with one exception in Area G – see above), likely date to the period during and after imperial consolidation. These excavation areas are all located on the lower portion of the *malpaís*. In other words, these data support the hypothesis that the upper and lower areas parts of the site were occupied at different times and used for different functions.

Table 5.10. Breakdown of decorated survey sample by upper and lower malpaís areas.

	Lower *Malpaís*	Upper *Malpaís*
# Monochromes	7	15
# Bichromes	35	33
# Polychromes	41	0
# Incised/Applique	4	2
TOTAL	87	50

Chapter Summary

In this chapter I presented the results of my ceramic analyses at Angamuco. I first discussed the corpus of excavated Angamuco ceramics from the field sort and highlighted how the greatest material density was documented in the lower elite spaces, Areas A, B, C, and D. Next I considered the sample of sherds analyzed using attributes of form, style, and composition. From this study, I was able to identify specific ceramic forms (bowl, jar, spouted vessel, pipe, figurine, etc.) and decorative categories (monochrome, bichrome, polychrome, and incised/appliqué) in a portion of the ceramic sample. This helped me to gain a basic understanding of the Angamuco ceramic material that can be used for future analyses. In particular, I described each of these ceramic form and decorative categories and documented where they were recovered throughout the seven excavation areas and the full-coverage survey. Following this, I considered the compositional analyses from the NAA data. Four different groups were identified in the ceramic and clay samples, and I broke down where these paste recipes were common at Angamuco in addition to whether they were dominant in certain identifiable forms and decorative categories.

After considering the ceramic dataset as a whole, I discussed AMS dates, stratigraphic profiles, the construction of architectural forms, and materials from each excavation area and sampled context at Angamuco. Use of Area A as an elite domestic space dates to between the Classic and Late Postclassic periods, though the features that I sampled were primarily occupied during the Late Postclassic. Area B was a large elite building that was used between the Classic and Late Postclassic periods, though with a primary use during the Late Postclassic. Area C consisted of an elite pyramid-cemetery context that rendered rich material and skeletal materials from at least the Middle to Late Postclassic periods. The plaza and room contexts excavated in adjacent Area D likely also date to the same chronological periods as C, but with different functional purposes. On the upper portion of the *malpaís*, an AMS date, associated materials, and architectural configurations suggest that Area E consisted of a short domestic occupation during the Early Postclassic while materials and architecture from Area F indicate Early Postclassic use. Area F consisted of non-elite commoner contexts including a neighborhood public space in which we documented a circular stone foundation similar to granaries in the Zacapu Basin. The two units sampled from Area G rendered very few artifacts, but I tentatively place that occupation in the Early Postclassic based on similarities in architecture and ceramic artifacts. Finally, the small survey sample reinforced the finding that polychrome sherds were present almost exclusively in the lower areas of the site and were not commonly found within the earlier upper areas. In the following chapter, I consider what the results of this ceramic analysis reflect about the impacts of Purépecha imperial growth on people living at Angamuco.

CHAPTER 6. CREATING AN EMPIRE: A VIEW FROM THE IMPERIAL HEARTLAND

This dissertation examines Purépecha regime development through analysis of ceramic, architectural, and spatial data at the urban site of Angamuco. The data discussed in Ch. 4 and 5 demonstrate that there are differences in terms of the occupational history and socioeconomic status of Angamuco residents. Primary occupations in lower Areas A, B, C, and D date to the Middle to Late Postclassic periods and served an imperial elite population while upper Areas E, F, and G date to the Epiclassic through Early Postclassic periods and likely served an earlier commoner, pre-imperial population. Data from this preliminary settlement pattern provide insights into how political authority was consolidated in the Purépecha Empire, in addition to furthering our understanding of regime development in archaeological contexts.

In this thesis, I ask how emerging political regimes secure their authority and integrate local communities. I propose that early Purépecha state formation in the heartland was based on bottom-up processes of negotiation at preexisting urban centers such as Angamuco. This can be contrasted with social evolutionary models which suggest that the empire developed through top-down centralizing processes of political economic control. By examining changes in specific ceramic forms, styles, and paste composition within public and private spaces before, during, and after imperial consolidation, I ask whether ceramic production and consumption became either increasingly standardized or more diverse throughout Purépecha regime development and whether these changes are reflected in the consumption of ceramic artifacts. Increasing standardization over time would suggest top-down or more specialized political economic production while in contrast increasing diversity would suggest bottom-up negotiations that articulated existing and imperial political economies.

In this chapter, I first evaluate the Angamuco settlement pattern and chronology discussed in Ch. 4 using the radiometric and ceramic data presented in Ch. 5. Some aspects of the initial chronology can be modified while more work remains to be done on the earlier occupation of the site. Next I evaluate my original model by assessing intra-site diversity of the ceramic artifacts recovered in the different areas. Results show that there is in fact a greater amount of diversity in ceramic forms and styles over time and within elite rather than commoner contexts. In contrast, geochemical groups identified with NAA do not vary substantially over time or by socioeconomic use which suggests that potters were exploiting similar paste recipes regardless of temporal phase or status. This is followed by interpretations of these findings, which include how an emerging empire may have negotiated with local elites. I also revisit the idea that the Purépecha created one of the most centralized empires in Postclassic Mesoamerica. This updated local view of imperial development can be compared with data from projects throughout Purépecha western Mexico so that we can better understand how the emerging empire integrated and consolidated diverse communities in the centuries preceding the Spanish encounter.

Angamuco Chronology

In Ch. 4, I discussed urban settlement patterning based on the LORE-LPB survey and LiDAR data. Drawing upon a synthesis of existing work by Pollard (1993, 2008), the proposed Angamuco model suggests that residents first occupied the upper areas of the site during the Early Postclassic period and that eventually people moved to the lower areas of the site as the empire developed (following Fisher and Leisz 2013). This idea was supported by the sunken plaza complexes on the upper areas that appeared to follow an Epiclassic pattern from the Bajío and larger Purépecha style architecture (e.g. *yácata* pyramids; plazas and altars) in the lower survey zones. Though many aspects of the initial settlement model can be verified, chronometric and artifact data discussed in this dissertation permit some modifications.

Classic Period Evidence

At Angamuco there is a Classic period occupation (150 BCE – 500 CE) based on radiocarbon determinations in Areas A and B, and which is confirmed by material culture in those same areas. The date from Area A is from a bone *ofrenda* that was much deeper than the Late Postclassic contexts, but the associated ceramic artifacts were not diagnostic and so it is unclear at the moment how extensive the early occupation was at Angamuco. The early Area B date is associated with multi-component artifacts that can mainly be attributed to the polychrome styles of the Late Postclassic. According to traditional views of social development in the region (e.g. Pollard 2008), the first documented occupation in the Lake Pátzcuaro area occurred during the Pre-Classic to Classic periods. Five radiocarbon dates and sherds found in Late Postclassic period deposits that are similar to the Loma Alta type site artifacts in the Zacapu Basin are used as evidence of this occupation (Carot 2001:71; Pollard 2004). Pollard (2008) and Haskell (2014) argue that Loma Alta phase settlements are characterized by ritual centers with sunken plazas and a central altar that served small populations. At this point, it is difficult to identify these characteristics of a Loma Alta occupation at Angamuco.

What is interesting is that the bone *ofrenda* within Area A dates to the Early-Middle Classic period (AA102893 in Table 5.1) approximately 1.5 m below a plaza surface. Long bone and cranium fragments were probably purposely deposited during initial construction, which has been documented as a type of consecration ritual elsewhere in Mesoamerica (Carballo 2012). The depth of the bone suggests that the terraced hill landform of Area A was built up over one thousand years and that earlier occupations may be buried well below the Postclassic material. Future work could investigate these deep deposits surrounding the *ofrenda* in an effort to expand our understanding of the Classic phase at the site. Evidence for some kind of Loma Alta phase presence in this lower area of the site suggests that earlier people used the same architectural landscape as the imperial populations, but also that later populations used earlier artifacts in daily activities or as fill. The limited evidence for this phase in the Pátzcuaro area supports the interpretation that sites were located on lacustrine and non-lacustrine basin areas rather than on the uplands, so although Area A is still technically associated with the *malpaís* landform, it is located closer to these lacustrine environments and would thus follow the Classic period settlement proposal in the lake basin (after Fisher et al. 2003 and Pollard 2008). Additional research on the Classic period needs to be done to further evaluate these ideas.

Epiclassic and Early Postclassic Period Patterns

Within the Lake Pátzcuaro Basin, the subsequent Epiclassic Lupe phase (600-900 CE) was characterized by lake regression and possibly a time period of increasing settlements and populations. Although some Lupe phase occupations have been noted in the southwestern lake basin near the former Charahuen *hacienda*, geoarchaeological work in the region suggests that these sites are underrepresented due to later soil erosion (Fisher et al. 2003). At Angamuco I did identify several anthropomorphic figurines that have been attributed to the Lupe phase elsewhere in western Mexico, including in Areas A, B, and F (see Ch. 5). This could be explained as reuse of figurines either for domestic or public ritual, or they could have been used as fill such as at the Temple of the Moon at Teotihuacan (Sugiyama et al. 2013). During the end of this phase, there is evidence for increasing social stratification represented by exotic grave goods at Urichu, Guadalupe in the Zacapu Basin, and at Tres Cerritos in the Lake Cuitzeo area (Pereira 1999; Pollard 2008). The use of shared tombs may have also been common during this time period, though at this point chronometric data from type sites such as Tingambato are lacking.

This pattern is not immediately apparent in the sampled excavation contexts from Angamuco. With the exception of the bone fragments from the *ofrenda* in Area A, the earliest evidence for burials is from the Postclassic period in the Area C plaza. It is possible that a shared tomb does exist in the center of Area C near the circular interments or that Angamuco residents did not have access to elaborate grave inclusions or participate in the same burial traditions as at other Epiclassic sites, but this remains for future excavation.

During the Early Postclassic period (c. 900-1100 CE), communities in the Pátzcuaro and Zacapu Basins may have moved to hilltop defensible positions, such as up onto *malpaís* landforms (Michelet 2008; Migeon 2003). This may have been due to increasing populations as the climate of the Medieval Warm Period led to lake regression in the Pátzcuaro area and elsewhere in central and northern Michoacán (Pollard 2008, 2016b). According to this interpretation, during the Early Postclassic the imperial heartland was composed of several competing chiefdoms which may have had different settlement and elite mortuary patterns. The Angamuco excavation data from Areas E and F do suggest that a large population was living on and around a *malpaís* at this time though the settlement was probably already inhabited. Domestic terraces and associated rooms occur around sunken plazas and patios that may have been organized into spatial units such as neighborhoods (Bush 2012; Urquhart 2015). Thus far the evidence for monumental architecture is limited, though some large buildings or proto-*yácatas* may have been in use such as the public space tested in Area F.

The Area C cemetery was probably used during this period and it is possible that burial practices involved circular interments. Human bone from a circular stone interment dates to the transition between the Early and Middle Postclassic periods (AA105512 in Table 1, Ch. 5). This particular burial was not directly associated with cultural material, so information about status and relative cultural association is speculative. In addition, the Area C cemetery was used during the subsequent Middle to Late Postclassic periods and I am still working to determine how social and interment practices changed over time. According to the ethnohistoric narrative related in the RM, during this period there were episodes of non-Purépecha migrations into the region, but these are not explicitly documented in the archaeological record throughout the lake basin (see Pollard 2016b for discussion).

Middle to Late Postclassic Changes

Environmental reconstructions indicate that during the Middle Postclassic period (1100-1350 CE), lake levels remained low in the basin which suggests that settlements may have continued to expand onto islands and hilltop positions (Fisher et al. 2003; Pollard 2016c:223; Stawkski 2012). During the last decades of this period and during the Late Postclassic period (1350-1530 CE), the lake level was much higher (>2,041 m asl) causing earlier settlements and available agricultural land to be under water. Based on these lake level changes, it is possible that competition between existing communities for shifting resources and land was fierce. Some hills in the lake basin became islands, but the lake did not reach the lower zones of the site such as Areas B and C. These areas had extensive Late Postclassic occupations based on radiocarbon determinations along with metal artifacts and stylistically Purépecha ceramics. Similar artifacts from this period were collected in association with *yácata* and large plaza features during survey of the lower areas.

Although there was an existing urban settlement at Angamuco during this time, at this point it appears that Purépecha elite or ceremonial occupations were restricted to the lower areas of the site. These later occupants probably exploited existing spaces such as the Area C cemetery and the Area A terraced hill for elite Purépecha public and domestic activities. These activities are discernable in the *yácata* and altar, but also in the rooms filled with diverse polychrome, metal, lithic, and other materials surrounding patios in Area A.

Traditional views indicate that during the Late Postclassic, the Purépecha Empire was visible in a distinctive change from non-local high status goods to the use of local, centrally-produced materials (Pollard and Cahue 1999). Pollard (2008, 2016b) maintains that existing chiefdoms in the Pátzcuaro Basin formed alliances and unified under a central Purépecha authority through top-down processes of political economic integration. While it is possible that the city of Angamuco was one of these existing chiefdoms and the lower area settlement pattern and artifacts do reflect symbolic and ideological changes from previous periods, it is not clear whether the emerging polity engaged in top-down centralizing strategies. As discussed below, existing spaces within the city and well-established ceramic production systems were used to integrate Angamuco residents and to advertise Purépecha ritual behaviors and ideas. This suggests co-optation and manipulation on the part of the new regime, but not necessarily a top-down political economic standardization of material production. Additional intra-site analyses of the ceramic production below consider this interpretation in more detail.

Intra-Site Diversity

My initial hypotheses for Purépecha incorporation of Angamuco included bottom-up versus top-down models of political development (see Ch. 1). I proposed that bottom-up processes would be visible in increasing diversity of ceramic forms, decorative styles, and paste recipes indicating wider availability of resources and negotiation with existing communities of potters. In contrast, top-down processes would show decreasing diversity of ceramics resulting from standardization and control of production as depicted in ethnohistoric imperial narratives.

In this section, I evaluate ceramic changes by using the descriptive measure of diversity in mathematical ecology that represents the structure and complexity of living communities. Diversity measures can help evaluate the heterogeneity of a system in terms of its constituent units by using frequencies or counts within nominal categories such as species (papers in Leonard and Jones 1989). This approach is appropriate for evaluating differences in pottery because a large number of production-related attributes can be described at nominal, ordinal, and interval scales of measurement (Hegmon 1995; Lipe and Hegmon 1989). Diversity is commonly expressed as the numbers of categories present in a population ('richness'), as well as the relative abundance of the units within the population ('evenness'). Richness refers to the number of different species present within a community, but it does not take into account species abundance or their relative abundance distributions. Evenness is often defined as a measure of biodiversity within a community and how equal a community is numerically (Rice 1989).

In order to compare the degree of diversity observed between the excavated areas at Angamuco, I used Simpson's inverse Index of Diversity (1-D). Simpson's Index (D) is a measure of ecological dominance and concentration with values ranging from zero to one (Pielou 1975:8-9, 1977:309-311). When all observed samples belong to the same species category, D = 1. For clarity, I used the inverse Index of Diversity so that higher numbers indicate greater diversity (following Hegmon 1995; Torvinen et al. 2015). This index was calculated as 1 - $\frac{\sum n(n-1)}{N(N-1)}$ where n is the total number of ceramic form, decorative, and NAA categories within each excavation area and N is the overall total number of these categories. I used this measure to evaluate the diversity of ceramic forms, decorative categories, and geochemical groups by area reported in Ch. 5. Below I include diversity, richness, and evenness measures for each category within the Angamuco areas.

Table 6.1. Diversity (1-D) of ceramic form, decoration, and paste compositional categories by Angamuco areas.

	Area A	Area B	Area C	Area D	Area E	Area F	Area G*	Survey
Form	0.73	0.59	0.50	0.51	0.24	0.40	0	0.44
Decoration	0.57	0.56	0.63	0.62	0.23	0.44	0	0.64
Composition	0.67	0.70	0.64	0.58	0.61	0.50	1	--

*Area G results reflect the small sample: I could only identify one category of form and decoration; three NAA groups were identified in the three sherds submitted to MURR. Survey sherds were not submitted for NAA.

The diversity measures in Table 6.1 show clear differences between imperial and pre-imperial ceramic use. Ceramic forms and decorative styles are more diverse in the later elite Middle to Late Postclassic contexts (Areas A-D) than in previous pre-imperial Early Postclassic contexts (Areas E-F). In contrast, based on the bulk characterization of the ceramic pastes into distinctive NAA groups, the recipes used for making the pottery did not change as much over time. Forthcoming petrographic data will help to evaluate whether this limited change is similarly visible in tempering agents. Overall, these diversity measures suggest that ceramic producers were using similar paste recipes before and after empire formation, but that new and existing pottery forms and decorations were used during imperial presence.

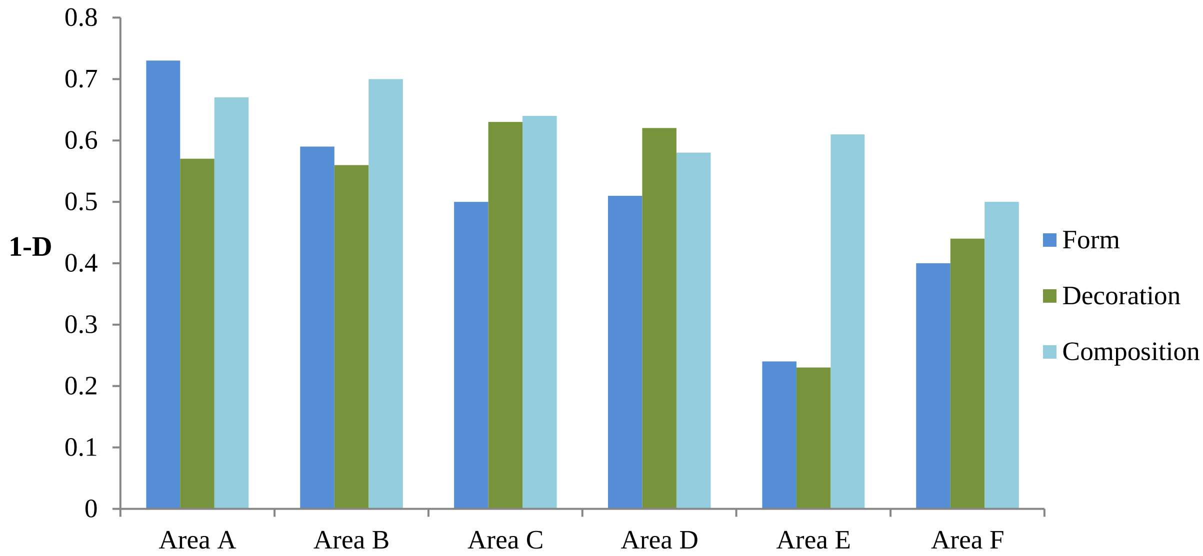

Figure 6.1. Measure of diversity (Simpson's inverse 1-D) in six excavation contexts. The samples from Area G and the survey are not included here due to low sample sizes (see Table 6.1).

Elite versus Commoner, Domestic versus Public

A comparison of the best-defined elite (Areas A and C) and commoner (Areas E and F) samples shows socioeconomic differences in terms of the types of ceramic artifacts consumed within the site (Figure 6.2). The most diverse groups of ceramic forms and decoration occur in the elite domestic area while the least variation occurs in the commoner domestic area. Within the elite context, this is interesting because this suggests that elite activities used a diverse but distinctive set of artifacts in ritual activities such as interment practices and building dedication. In contrast, the domestic zone is even more diverse possibly because occupants had access to an array of materials that included vessels for daily use, serving vessels for meals, and other prestige items available to people with broad social networks. Within the commoner contexts, the public areas may have been more diverse because the shared space was one in which occupants pooled their resources. This could also be a reflection of different public practices between the pre-imperial residents who consumed resources in common while the resources of imperial period inhabitants were primarily within a domestic space, or in the possession of a few elites. I discuss these outcomes in more detail below.

Table 6.2. Diversity of forms by Angamuco areas.

	A	B	C	D	E	F	G	Survey
D	0.27	0.41	0.50	0.49	0.76	0.60	1	0.56
1-D	0.73	0.59	0.50	0.51	0.24	0.40	0	0.44
N	8	8	10	7	6	4	1	4
Evenness	0.83	0.67	0.56	0.60	0.29	0.53	--	0.59
Richness	8	8	10	7	6	4	1	4

Table 6.3. Diversity of decorative groups by Angamuco areas.

	A	B	C	D	E	F	G	Survey
D	0.43	0.44	0.37	0.38	0.77	0.56	1	0.36
1-D	0.57	0.56	0.63	0.62	0.23	0.43	0	0.64
n	4	4	4	4	3	3	2	4
Evenness	0.57	0.56	0.63	0.62	0.23	0.43	0	0.64
Richness	4	4	4	4	3	3	2	4

Table 6.4. Diversity of NAA groups by Angamuco areas. Unassigned sherds were excluded.

	A	B	C	D	E	F	G
D	0.33	0.30	0.36	0.42	0.39	0.50	0.33
1-D	0.67	0.70	0.64	0.58	0.61	0.50	0.67
N	4	4	4	4	4	4	3
Evenness	0.84	0.88	0.81	0.72	0.76	0.63	0.89
Richness	4	4	4	4	4	4	3

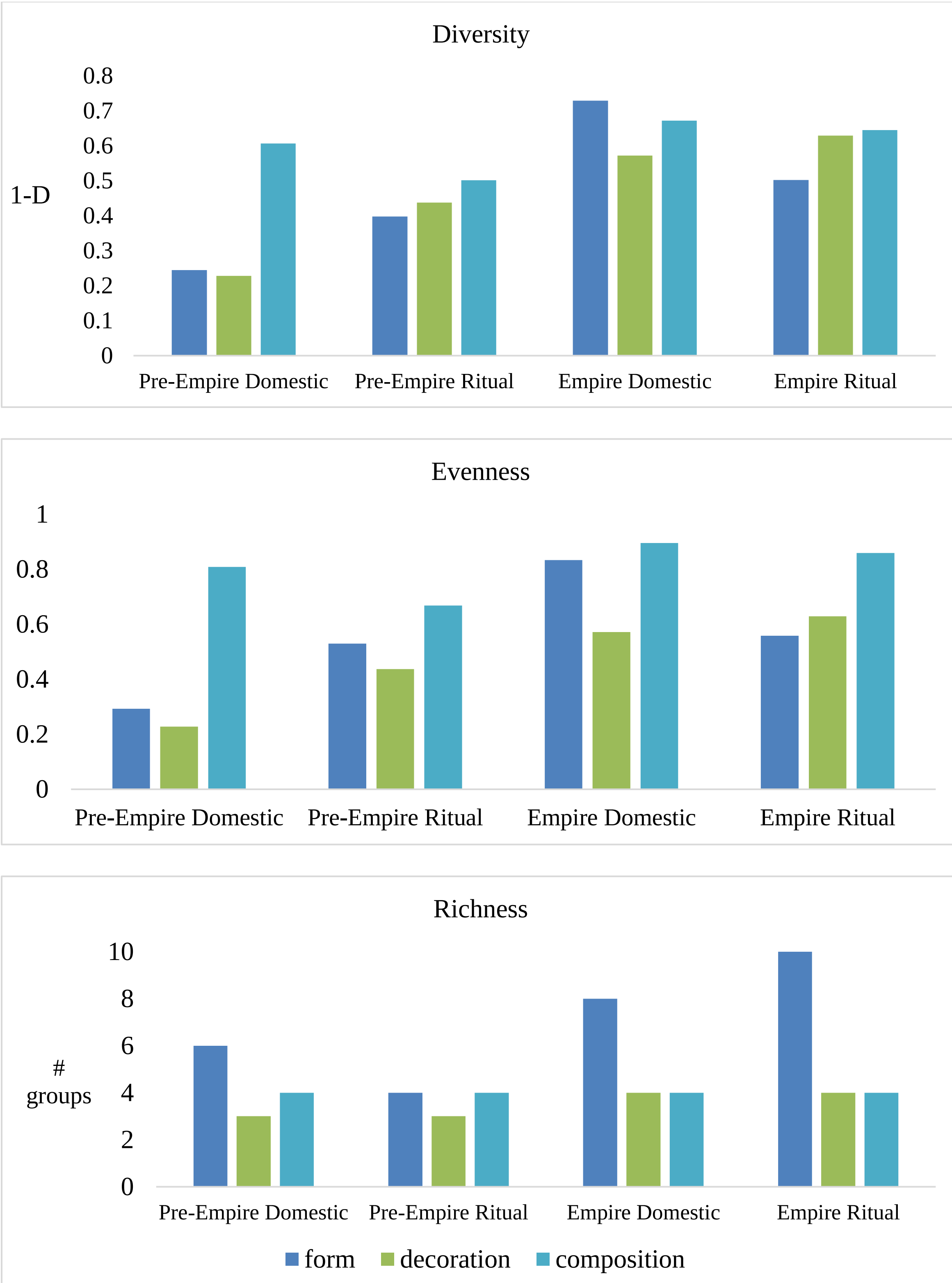

Figure 6.2. Diversity, evenness, and richness in pre-imperial and imperial contexts.

Domestic Contexts

The domestic contexts used here can be associated with a primarily elite Middle to Late Postclassic (Area A) and commoner Early Postclassic (Area E). The ceramic forms associated with the two areas show an inverse degree of diversity: the elite context exhibits higher diversity (0.73) than the commoner context (0.24) (Figure 6.2, Table 6.2). Within the elite space, there are eight form categories present, but their proportions relative to the entire sample are greater than the six different forms evident in the commoner context which makes the former more diverse than the latter. Notably, a large number of worked sherds (i.e., semi-circular, or circular) was documented in the imperial elite context. These worked sherds may have been used as game pieces, fishing weights, among other interpretations, but they do not look like wasters signifying a kiln or production area (Rice 1987:177). Regardless of function, it is possible that these sherds represent some kind of specialized manufacturing. A similar pattern of greater diversity in the elite rather than the commoner zones occurs in terms of basic decoration: all four categories are present in the elite zone while only three – not including polychrome – are available in the commoner zone (Table 6.3). Using basic decorative categories does not take into account specific motifs and symbols displayed on the ceramic artifacts, which could be another measure of variation and/or continuity between the areas. Based on my visual examination of artifacts with motifs, a similar pattern seems to occur in that the imperial artifacts show much more variety than those in pre-imperial period. Finally, similar to the overall pattern with compositional groups, there is limited paste diversity between the two socio-functional areas (Table 6.4). Compositional group A (provisionally sourced to the southern lake basin based on NAA data in Hirshman and Ferguson 2012, see Ch. 5 and Appendix B) does dominate the imperial elite context pastes while group C (provisionally sourced to the northern lake basin) dominates the pre-imperial commoner context pastes. Overall, however, the compositional diversity does not vary between the two contexts.

Public Contexts

The public contexts used here are associated with the imperial elite during the Early to Late Postclassic (Area C) and with pre-imperial commoners during the Early Postclassic (Area F). The imperial samples reflect more diverse forms and basic decorative categories than the pre-imperial. The imperial context has 10 form categories and all decorative categories – including a large proportion of polychromes – while the pre-imperial has four forms and only monochromes and bichromes. Polychromes again do not appear in the upper area of the *malpaís*. For the paste composition, there is limited variation between the diversity measures: both ceramic samples are dominated by Group A, but all other compositional groups are present. Since the two areas are on opposite sides of the *malpaís*, it is interesting that the dominate paste group can be linked to the previously established Main Pottery Group (MPG) that may derive from a southern basin procurement zone (Hirshman and Ferguson 2012). In the later imperial occupations, potters seem to have used similar clay recipes – which may have procured resources further away from the *malpaís* than readily available local clays – as their predecessors. As discussed in Ch. 5, the locally available clays around the site do match the Angamuco NAA Group D. It thus seems as though Angamuco potters were already using a well-established ceramic materials production system by the time imperial influence appears in the archaeological record.

Evaluating Imperial Integration: Local Elites and Exporting Ideology

Based on my model of imperial integration outlined in Ch. 1, the results of this ceramic analysis trend toward bottom-up processes of negotiation rather than top-down consolidation. As the empire increased its control over the region, ceramic form and decoration become increasingly diverse within both domestic and ritual public contexts. There were some changes in paste composition, but not as much as the other two analytical categories suggesting that existing raw material procurement strategies and paste recipes did not change drastically before and after imperial influences. Although I expected that paste composition would become more heterogeneous during and after Purépecha control as a reflection of increasing access to clay sources, the data here indicate that empire formation did not impact preexisting systems of raw material procurement and paste mixing. In sum, the data do not support top-down processes of imperial integration through any reduction in diversity over time in terms of form, decoration, and paste composition.

Importantly, bottom-up processes of imperial integration do not imply that the new empire had no direct impact on existing communities. One interpretation of the Angamuco data is that as the Purépecha consolidated power of the Pátzcuaro region, imperial leaders co-opted local elites and ideologies through the export of ritual practices and belief systems. The greatest variation in the Angamuco pottery and architecture is found in the elite contexts that primarily date to the Middle to Late Postclassic periods. The major changes before and after imperial development are the appearance of elaborate serving and spouted vessels and the construction of *yácata* pyramids, altars, and associated cemeteries that were probably used in ritual activities. These new practices would have been designed specifically for the local elites who the Purépecha must have had to negotiate with and employ in order to govern the large urban population at Angamuco. People were living at Angamuco in dense neighborhoods long before the Purépecha and this suggests that the emerging empire had to work with local communities in some capacity. During the imperial periods, ritual practices such as offerings for consecration events and deities, feasts, and burials, occurred in association with *yácatas* and large plazas in Area C. These activities would have been important for instituting a Purépecha ideological system and for consolidating existing communities through public performances and face to face interaction. By putting local elites in charge of these practices and providing them with high-status items, the regime would have been able to integrate new subjects within an already diverse and regionally well-connected society.

This integration strategy probably occurred elsewhere in the imperial territories by exporting a similar material "package" that could be used by local elites at key towns and cities. *Yácatas* and associated monumental architecture and Late Postclassic style artifacts start to appear at conquered towns and cities throughout the territories during the fifteenth century. Purépecha style architecture was distinctive and included rubble-filled platforms and flat *laja* stones which was in contrast to the extant sunken plaza and domestic structures. Similar to the materials consumed at Angamuco and at the capital Tzintzuntzan, other materials within this Purépecha "package" included polychrome globular tripod bowls, large tripod serving vessels, bottles, spouted vessels, metal rattles and rings, and cemetery-style interments (Cruz Robles et al. 2014; Goggin 1943; González 2013; Gorenstein 1985; Macias Goytia 1990; Pepper 1916; Pollard 1993, 2016a, 2016b; Ramírez Urrea and Cárdenas 2006). To the northeast in the Cuitzeo Basin, local elites at the city of Huandacareo may have been coopted in this way since similar Purépecha materials were recovered in association with local elite materials in cemetery and monumental architecture contexts (Macias Goytia 1990, 2005). Settlements around Lake Cuitzeo had a long history of monumental architecture, craft production, and interaction with powerful central

Mexican polities such as Teotihuacan (Filini 2004; Filini and García 2013), so it was particularly important for the Purépecha to work with local elites to integrate existing communities. A similar process also probably occurred at Urichu in the imperial heartland where pre-Purépecha prestige items were derived from long-distance exchange while subsequent imperial items included the locally-produced material package described above (Pollard and Cahue 1999).

Since the Purépecha are often viewed as a politically economically centralized empire, previous studies of consolidation strategies have focused on the potential growth of politically-driven market economies. For example, Pollard (1980, 1993, 2003a) has argued that the empire was responsible for expanding a market-based system in the Pátzcuaro Basin that is visible in evidence for craft production. Within this framework, the increasing ceramic diversity at Angamuco may be explained as an increasingly open market system in which communities had continued access to previous resources, and additional access to imperial and non-local styles and materials (Hirshman 2008; Hirth 1998). Imperial incorporation thus enabled wider availability of multi-status and non-local artifacts, such as those found in the imperial domestic contexts. This market-based interpretation supports some aspects of the traditional view of sociopolitical development as the Purépecha were thought to facilitate the development of market-based systems for tribute and exchange purposes. Elsewhere in Mesoamerica, a market-based interpretation has been used to explain a pattern of elite vessels and artifacts in multi-status contexts, including at the nearby site of Urichu (Hendon 2009; Hirshman 2003:131, 234-235; Pool 2009; Pyburne 2008).

This model may not, however, account for the existence of the long-term use of similar clay sources before and after empire formation. By the time that the Purépecha Empire is visible in the archaeological material, Angamuco potters were already engaged in some kind of market system in terms of paste recipes and possibly clay procurement. This means that the empire did not impact ceramic production at the level of raw material manufacturing and must have exploited the existing networks to produce Purépecha style pottery. In addition, while Late Postclassic artifact symbols and forms change and look like the Purépecha package documented at the imperial capital, it is not clear whether the items recovered at Angamuco represent intra-basin trade wares; i.e. whether they were formed and decorated elsewhere in the lake basin or beyond. At this point, it appears that the Late Postclassic artifacts reflect the grafting of Purépecha ideas onto an already connected exchange system within the lake basin.

Implications for Purépecha Complexity

The data presented in this dissertation suggest several key implications for Purépecha complexity discussed below.

Cities Existed in the Imperial Heartland before Empire Formation

As the settlement pattern and chronological data from Angamuco demonstrate, urban configurations existed in the Purépecha heartland before the empire developed. Although it is often noted that Postclassic material evidence resulted from successive styles and forms throughout Purépecha western Mexico (e.g. Carot 2013; Michelet 2013; Pollard 2008), the presence of a well-established city before the Late Postclassic empire problematizes the idea that small polities or chiefdoms characterized pre-imperial lake basin political complexity (e.g. Pollard 2003a, 2008, 2016b; see below). The documentation of Angamuco and its large size on the eastern side of the lake basin were unexpected, but a brief review of the available evidence within the imperial territories shows that it is in fact unsurprising that urban sites existed before empire formation. Within the lake basin, published material from Urichu and Erongarícuaro indicate that they were probably urban sites with evidence for social differences and long-distance trade before imperial consolidation and that they may have maintained some degree of autonomy under Purépecha control (Haskell 2008; Pollard and Cahue 1999; Rebnegger 2013). South of the lake basin, at the border between the highlands and resource-rich Tierra Caliente, Cruz-Robles et al. (2014) report that the strategically-located site of Lagunillas includes a *yácata* and Purépecha style polychrome ceramics from the Late Postclassic, but also that the site consisted of an urban settlement that likely dates to pre-Purépecha control. Although the domestic architecture was not fully documented, the researchers noted that buildings were constructed on rock outcrops and large platforms along the nearby El Ortigal River and on a *malpaís* to the northeast of the *yácata*. As discussed in Ch. 2, existing urban settlements were integrated into the empire throughout western Mexico such as in the Cuitzeo, Sayula, and Zacapu Basins. Moreover, it seems increasingly likely that cities had been built in the imperial heartland – a region with a long but understudied history of occupation – well before the presence of new political power.

The Purépecha Negotiated With and Exploited Existing Populations and Networks

Institutions often attain political power through warfare and/or manipulation of existing political, economic, and social networks. Though examples of top-down imperial processes in which some kind of erasure of past customs or cultural genocide do exist throughout history (e.g. the Wari and Inka in some cases; Soviet Russia; Han China; the Taliban; most recently Daesh or the Islamic State), imperial subjugation can also be accomplished by means of other strategies. An imperial narrative that relays swift and top-down consolidation was designed to glorify and legitimize an imperial Uacúsecha lineage as the RM was recited in front of subjects during festivals (Alfanador-Pujol 2015). Though this official history mentions intermarriage and manipulation of certain chiefs or headmen living in the Pátzcuaro area, the existing RM text focuses on military conquest, tribute payments and hierarchies of tax collection, and a few key imperial ideologies such as the linking of the local Xarátanga deity with the [outsider] Chichimec god Cuerauaperi (Martínez Gonzalez 2009 in Pollard 2016b:228). In its current form, the text glosses over the likely importance of daily negotiations that must have served the Purépecha imperial elite, how the Purépecha probably relied on negotiations between existing elites and commoners, political economic systems, and the introduction of ritual activities in an effort to integrate diverse populations.

At Angamuco, the Purépecha were visible in differential ceramic production and consumption at the level of form (and potentially the foods that were consumed) and symbols through decoration and iconography, but not necessarily through a change in the political economic production of ceramic items. This suggests that while imperial ideology and images were introduced during at least the Middle Postclassic period, the empire exploited aspects of an existing clay procurement and ceramic production system that existed from at least the Early Postclassic period. In addition, architectural data from Angamuco and other sites in the region such as Lagunillas and Parangaricuato indicate that a *yácata* and associated altars and plazas were constructed when the Purépecha regime attained control of a settlement (Cruz Robles et al. 2014). The construction process and symbol of the imperial pyramid may have been demonstrations of power, but these were erected next to large populations of individuals and the new regime must have had to negotiate with and/or manipulate its new urban subjects.

Was the empire thus a conglomeration of "altered states" such as Angamuco (Yoffee 2004:Ch. 9)? In altered states, a new regime creates socio-economic and government roles, recombines differentiated social units, and consolidates ideologies. It is unclear whether

Angamuco was a state in the traditional centralized sense. As Yoffee (2004) and others (e.g. A.T. Smith 2003; Stein 2005) have pointed out, however, a central myth about the study of ancient states is that there was always an incipient archaic state which ruled as a totalitarian regime over large territories. Research has shown that in fact different regions experienced political, economic, and social change in different ways and that traditional models of state and empire formation may not be applicable in many contexts (e.g. Emberling 2015; Parker 2003; Parkinson and Galaty 2007). Cultural interconnectedness and negotiation between existing communities may be more applicable themes to examine within the Purépecha Empire rather than top-down domination. Although the extent of pre-imperial communities is not well known in the Pátzcuaro area, given the later Postclassic purported sizes of Tzintzuntzan, Urichu, Erongarícuaro, and now Angamuco, it would be worthwhile to examine how these cities were integrated into the concept of the Purépecha Empire.

Revisiting Central Places and the "Centralized" Purépecha Empire

As discussed in Ch. 1, the concept of the archaeological and historic state as a machine of socioeconomic integration can be linked to post-Westphalian Euro-American political configurations. Theories positing the existence and central role of cities in political development also dates back to V. Gordon Childe's concept of the city-state in which surrounding areas were subject to a centralized urban power. Some twentieth century archaeologists were influenced by World Systems Theory, whose advocates argued that international political economy can be explained by the relationship between core states and various peripheral states which are subject to these cores (Wallerstein 1974). Though many have critiqued the use of this approach in archaeology and more recently have discussed urban-hinterland models which show how hinterland communities were not passive agents, the city is often still considered as the political and social center of a broader region (Schortman and Urban 2011; Stein 2002; Yoffee 2004).

In the Lake Pátzcuaro Basin in particular, the use of central place theory – which assumes that settlements all possess certain basic economic functions such as agriculture – has been used to support traditional social evolutionary models of political change. Derived from geography, central place theory posits that higher ranked places have all of the functions of lower-ordered places in addition to new functions unique to the higher tier (Blanton 1978; Crumley 1979). Urbanism is measured by the degree of concentration of economic activity in one location. Based on this theory and discussion of tribute in the RM, Pollard (1980, 1993, 2003a) has proposed that the imperial bureaucracy of the Late Postclassic period created specialized administrative centers and facilitated inter-settlement trade within the lake basin. These administrative centers acted as central places and drove the nucleation of larger settlements – an argument which reinforces the idea that the Purépecha Empire created urbanism in the region. This approach is further mirrored in the traditional chronology within the lake basin: (1) small settlements first operated around ritual spaces; (2) larger agricultural chiefdom societies then focused on external sources of prestige; (3) these were followed by a centralizing Purépecha elite culture that pushed existing populations and new migrants into urban centers which paid tribute to the imperial capital at Tzintzuntzan.

The existence of a large urban center in the Pátzcuaro Basin prior to the formation of the empire forces us to re-examine and modify aspects of this traditional model. Several cities probably already existed in the lake basin and while Angamuco shows clear evidence of Purépecha influence in terms of ceremonial and domestic wealth and practices, the data from this dissertation show that this influence required some negotiation with existing urban residents that already engaged in some kind of basin-wide economic system. Central place theory has been criticized on the grounds that the model is too hierarchical and places too much emphasis on economic factors for defining urbanism (Crumley 1979; Potter and King 1995). While some urban landscapes may conform to the central place model, there are also examples of heterarchical organizations where different social groups form mutually beneficial exchange relationships that are not explicitly hierarchical.

Arguably, the idea that the Purépecha Empire was the most centralized and consolidated in Postclassic Mesoamerica is derived largely from one ethnohistoric text. Some archaeological data show state control over aspects of metal production and obsidian sources (Darras 2008; Maldonado 2008), but parts of the imperial narrative remain unsubstantiated within an archaeological context. In addition, the portions of the text that discuss how the Purépecha rulers consolidated new subjects is not clear in the material record. Should archaeologists continue to consider the empire as highly centralized? What is this centralization based upon? If emerging archaeological data can be used to infer pre-imperial contexts in which existing settlements were integrated into the emerging regime through various negotiations and potentially bottom-up processes (Haskell and Stawski 2016; Hirshman 2008; Rebnegger 2013), we can modify our understanding of the complexities of Purépecha development and consolidation. The RM highlights the tribute that was extracted from lake basin settlements and throughout the territories to Tzintzuntzan, and control over craft production, but these political economic strategies are not immediately apparent at Angamuco.

Within archaeology, perhaps we should revisit the claim that the Purépecha Empire was one of the most centralized and consolidated in Postclassic Mesoamerica. The Purépecha did connect certain existing traditions, such as religion, symbols, and daily activities such as pottery production, but it is unclear whether such integrating practices resulted in centralization. We could take a hint from our Aztec colleagues who have in recent years sought to critically evaluate the impacts of the emerging empire in difference provinces. While Aztec textual evidence is more substantial and there is a longer history of Aztec scholarship, recent work has shown that the empire impacted settlements in different ways that are not always apparent in texts; e.g. local residents retained some independence in the Oaxaca Valley; household archaeology in the Toluca Valley shows distinctive differences in ritual practices (Fargher et al. 2011; Huster 2016). Similar approaches for evaluating political economic life at the scale of local households and public ritual throughout imperial territories may be useful for western Mexico. In addition to the preliminary interpretations discussed in this dissertation, the data from different excavation areas at Urichu and Erongaricuaro could be compared with the Angamuco materials. Comparison of data from throughout the territories at Sayula, Apatzingán, Acámbaro, Lagunillas, etc. can help to evaluate changes in the domestic and public contexts and to see how daily life changed before and after Purépecha influence.

Household archaeology in particular has not been common in Purépecha archaeology, but would provide an important comparative context for existing information about Purépecha monumental architecture. The differences in domestic contexts before and after imperial influence discussed in this dissertation suggest that additional work on households would be important for understanding regime impacts in terms of craft production, wealth, status, and household ritual. Urban settlement patterning that includes both elite monumental architecture and domestic and neighborhood-level structures could be compared at sites throughout the imperial territories. Much of the information about pre-imperial and imperial houses remains undocumented as early efforts focused on the ceremonial contexts and identifying the Purépecha material package discussed in this chapter. Changes in domestic contexts can be used to further evaluate whether imperial consolidation was most visible in elite co-option strategies through public ceremonies rather than in the household.

Chapter Summary

In this chapter, I addressed how the emerging Purépecha Empire integrated existing communities such as Angamuco and ultimately consolidated political power throughout western Mexico before European contact. First I modified the Angamuco settlement pattern and chronology based on ceramic, radiometric, and architectural data included in this dissertation. In particular, parts of the ancient city were occupied from at least the Early Classic period, but larger architectural configurations and neighborhoods are most visible during the Early Postclassic through Late Postclassic periods. This was followed by study of the ceramic formal, decorative, and compositional diversity within the site and over time. Results suggest that while there is greater diversity in terms of form and decoration in the later and elite contexts than in the earlier commoner spaces, paste composition does not change substantially throughout the site. My interpretation of these findings is that the Purépecha influenced a set of elite and ritual production and consumption practices, but that they also exploited an existing ceramic system in place probably since at least the Epiclassic period. Key implications of this study for Purépecha complexity include the presence of urban sites before imperial development, the imperial elite strategy of negotiating with existing urban leaders throughout consolidation processes, and a need to revisit the centralized city and state approach long applied to Purépecha archaeology. In the concluding chapter, I consider how these interpretations and implications may be further evaluated and how they may be related to ongoing processes of regime change today.

CHAPTER 7. CONCLUSIONS

In this dissertation, I examine how emerging political regimes secure their authority and integrate local communities through political, economic, and ideological practices within an imperial heartland. I approach this question through an analysis of Angamuco, a large city that was occupied before, during, and after the development of the Purépecha Empire in the Lake Pátzcuaro Basin heartland. Since political projects are often first evident in the imperial core, Angamuco provides a window into regime development and consolidation over time. I specifically examine local changes within domestic and public contexts at Angamuco in order to assess the micropolitics of new regime-subject relations. Studies of state and empire formation are important for determining the impacts of a new group on a broad region, but it is equally critical to consider local contexts as existing communities may have responded differently to sociopolitical incorporation.

The ethnohistoric text, the *Relación de Michoacán*, continues to shape much of our current understanding of political change during the Postclassic period in western Mexico. In this narrative, the Purépecha created a highly centralized empire that operated from the Pátzcuaro Basin and that controlled resources, production, and direct tribute from client towns and cities throughout their expansive territory of at least 75,000 km^2 (Pollard 1993, 2008). Centralization included control over craft production through access to materials, manufacturing, distribution, and consumption of polychrome pottery, stone artifacts, metal, and other items (Alcalá et al. 2000:558-572). While recent research has questioned this political economic centralization in terms of obsidian materials and metallurgy (Maldonado 2008; Rebnegger 2013), the Late

Postclassic empire is believed to have facilitated increasingly integrated market-based economies and the development of urban centers in the imperial heartland (Hirshman 2008; Pollard 1980, 2003a). A paucity of work on the communities living in the core region before political consolidation has limited our understanding of how people were integrated into the emerging empire and how Purépecha consolidation affected the daily lives of new subjects.

To evaluate these gaps in the research, my dissertation focuses on intra-site variation in the production and consumption of ceramic artifacts and the impacts of imperial influence on these activities. My intra-site analysis of different socio-functional areas at Angamuco and attribute and geochemical analyses of ceramic artifacts address the following questions:

Who was living in the imperial heartland before the empire? What did these communities look like?

People were living at the city of Angamuco from at least the Classic (c. 300 CE) through the Late Postclassic periods (c. 1530 CE). Based on the data in this dissertation, the city was most clearly occupied on the upper areas of the *malpaís* landform during the Early Postclassic period (c. 900-1200 CE). Occupants lived in stone rooms and other perishable structures on top of stone and earthen terraces that surrounded sunken plazas. High resolution data derived from LiDAR show that these sunken plaza units and other architecture extend over 26 km^2 on the *malpaís* with a population of at least 40,000 individuals living at Angamuco probably during the Postclassic period (Fisher et al. 2016, in press). Although this hypothesis must be field-verified, the data show that the entire landform was modified by humans and that large urban communities existed within the pre-Purépecha landscape. Based on the excavation areas and artifacts discussed in this dissertation, Purépecha imperial style artifacts (e.g. polychrome ceramics; metal) were not consumed on the upper areas of the site. During the Middle to Late Postclassic periods (1200-1530

CE), imperial influence is evident in the lower areas of the site, where architecture was comprised of shared patio spaces, large open plazas, *yácata* pyramids, and public cemeteries and altars.

Did ceramic production and consumption become increasingly standardized or more diverse throughout regime development?

Ceramic attribute and geochemical analyses from seven excavation areas and 64 survey lots distributed over 16 sub-quads indicate that forms and decoration became increasingly diverse over time. In contrast, paste recipes and possibly clay sources remained fairly constant over time including throughout regime development. This suggests that existing raw material procurement strategies did not change drastically before and after imperial influence. The data do not support top-down processes of political integration as suggested in the official imperial narrative through any reduction in diversity over time in terms of form, decoration, and paste composition. In contrast, these data support a more bottom-up model of incorporation in which existing spaces within the city and established ceramic production systems were used to integrate Angamuco residents and to advertise Purépecha ritual behaviors and ideas. Ultimately, co-option and manipulation – rather than top-down political economic standardization of material production – were likely key incorporation strategies in the imperial heartland.

Are there changes in the public and private consumption of ceramic artifacts? If so, when did these changes occur?

Ceramic forms and decorative styles are more diverse in the later elite and ritual Middle to Late Postclassic contexts (Areas A-D) than in previous domestic and ritual Early Postclassic contexts (Areas E-G). Similar to the overall chronological pattern discussed above, the ceramic paste groups did not change very much between the socioeconomic contexts. The most diverse groups of ceramic forms and decoration occur in the elite domestic area while the least variation occurs in the commoner domestic area. This suggests that imperial elite domestic residents had access to an array of materials that included vessels for daily use, serving vessels for meals and feasts, and other prestige items available to people with broad social networks. Slightly less variation in the ceremonial context indicates that imperial elites used a diverse but distinctive set of artifacts in ritual activities such as interment practices and building dedication. In the pre-imperial and commoner contexts, I found more ceramic variation in public rather than domestic areas possibly because earlier populations pooled their resources for public events or because residents did not have access to the same variety of materials as their imperial descendants. Overall, the pattern shows that imperial domestic and public ritual activities were more diverse than pre-imperial domestic and public activities, but that domestic contexts show the greatest differences over time.

Overview of the Dissertation

Throughout this dissertation, I considered the evidence and implications of sociopolitical change within the Pátzcuaro Basin. I first situate this dissertation within the literature on anthropological and archaeological theories of the state, and the ways in which studies have examined state and empire formation and integration. I emphasize the importance of local approaches to imperial incorporation, such as intra-site spatial dynamics and craft production and consumption. Contrary to the traditional view of top-down empire formation, my model for Purépecha political change proposes bottom-up processes of imperial incorporation through the study of ceramic artifacts in domestic and public ritual contexts. I then consider the archaeological and ethnohistoric evidence for Purépecha governance within the imperial heartland and throughout the imperial territories. Here I point out that it is critical to focus on the archaeological evidence first rather than granting primacy to ethnohistoric records and that scholars should try to sample sites that will provide a more fine-grained understanding of change throughout imperial incorporation. In addition, I highlight that with some exceptions Purépecha archaeology has focused on elite ceremonial settings and that the study of domestic zones can provide an important contrast within urban contexts in particular. Building off of these prior studies and interpretations, I engaged in 18 months of field and laboratory work in Mexico, utilizing full-coverage survey and excavation, attribute analyses and sherd and radiocarbon sample selection, and geochemical analyses at the University of Missouri Archaeometry Laboratory. From the combined field and laboratory analysis of the collected data, I discuss the architectural typology developed by the LORE-LPB team for documenting spatial arrangements during the survey phase, a chronological overview of the seven excavated socio-functional areas, and discussion of clay and ceramic form, decoration, and geochemical paste composition. I evaluate the results of this study within the context of localized political changes including the urban settlement plan for Angamuco and intra-site ceramic measures of diversity. Results show that ceramic forms and decoration become increasingly diverse throughout imperial development, but that paste recipes and clay sources do not change suggesting that rather than instituting top-down control over the local political economy, imperial leaders integrated existing ceramic production systems. The implications suggest that the emerging Purépecha Empire had to negotiate with existing social and economic networks in order to consolidate its political control, and that top-down narratives of development should be critically evaluated within local communities throughout the imperial territories.

Ongoing and Future Research

Throughout this dissertation, I have argued that within a holistic study of regime-subject relations, scholars should consider intra-site activities within pre-imperial and imperial settlements. Here I discuss a few key directions for research that are in progress and in the planning stages.

Petrography

The analytical technique known as petrography or thin section analysis will be important for identifying mineralogical inclusions in the Angamuco ceramics and for comparison with the bulk characterization already completed via INAA (Rice 1987:372–382; Shepard 1965:139; Stoltman 1989, 2001). Petrographic analysis involves making a single 30 µm thick cross-section of a material and viewing the sample through both plane- and cross-polarized transmitted light to identify mineral inclusions with a high degree of accuracy. By analyzing both ancient sherds and briquettes made from local clays, archaeologists can determine the materials added to clays in a paste recipe and the likely source area for the clays used in pottery manufacture (Fargher 2007; Galaty 1999; Rice 1987:372, 379; Stoltman 2001).

Samples from the Angamuco sherds and briquettes analyzed via NAA have already been selected and professionally sectioned. Based on initial qualitative evaluation by a specialist, Dr. Michael Galaty, and based on the NAA groups identified by MURR, I selected 30 sherds and 9 clay briquettes for petrographic analysis that crosscut feature types, levels, and information regarding form and decoration. The unassigned sherds were removed from the sampling dataset. In addition, I chose specimens that exhibited the greatest Mahalonobis membership probabilities (over 78%, but most 90% or more) for each group to ensure that the samples were most representative of that geochemical group (Appendix B).

The specifics of this procedure were carefully chosen in order to address any variation between the clay and sherds submitted for mineralogical and geochemical analysis (see Bishop 2014; Rice 1987:421–442; Stark et al. 2000; Stoner and Glascock 2012). The combination of petrographic and geochemical analyses in both the raw clay briquettes and sherds will further help to combat these problems. For example, in the INAA analysis, chemical inhomogeneities can be correlated with the kind and size of particles. Did potters retain large-size grades of particulate matter or did they remove this material? If feldspars, heavy minerals, and dark-colored mafic materials were removed, the trace-element composition could change. Petrography will be able to identify any differences between the raw clay and sherds and to determine what particulate matter – if any – was removed. Similarly, the combination of these approaches will identify whether potters added coarse particulate matter to the clay for enhanced performance such as an open pore structure, reduced stickiness, quicker drying, etc. (see Feathers et al. 2003). Since tempering agents can have different effects on the chemical composition of the product, petrographic analysis can assess the differences between the raw clay and pastes used in processed vessels (Stoltman 2001, 2011).

Related Studies of Angamuco Artifacts

Additional lines of material evidence could provide information for evaluating the arguments discussed in this dissertation. For the ceramic data, iconography and motifs on the decorated vessels could be used to further distinguish changes over time within the Angamuco areas and between different sites in the Pátzcuaro area. How much iconographic variation is there within the polychrome, bichrome, and incised decorated ceramics? Based on my personal observation, I anticipate that there is the most variation in the red on pale brown bichromes because the decorative category appears throughout the site during all time periods, but this remains to be more thoroughly evaluated. From an inter-site perspective within the region, if existing pre-imperial cities did consolidate under the Purépecha authority, perhaps they maintained distinctive identities and practices that are visible in the material culture. For example, iconography on pottery, figurines, and burial practices might be different at Angamuco and at other nearby sites such as Urichu, Erongaricuaro, and Prieto as a form of information exchange that relays social difference (following Hegmon 1995; Weissner 1983). Future work is necessary to evaluate these differences, but based on my personal observation of the Postclassic materials, the iconographic variation is not immediately apparent which could suggest that aspects of the same imperial iconography were adopted everywhere. Other lines of evidence, such as obsidian sources and metal composition, could also be useful. If the Angamuco obsidian was derived from multiple sources during the pre-imperial period, but from the state-controlled Ucareo source during the Late Postclassic period, this would follow previous interpretations of obsidian manufacturing before and after imperial control (Darras 2008; Pollard and Vogel 1994; Rebnegger 2013). Finally, trace element analyses of the few metal pieces recovered at Angamuco could indicate whether they were made using pre- or post-empire techniques (Hosler 1988).

Comparative Studies throughout the Imperial Territories

In order to further our understanding of local imperial consolidation strategies, scholars in western Mexico could pursue additional intra-site analyses and work towards a comparative approach. Some critical classificatory and chronological work has occurred throughout the imperial territories (e.g. Carot 2013; Pollard 1993), but it would be valuable to put the data into a comparative framework. Imperial strategies likely differed between the imperial heartland and the borderlands – what were some of the key differences? Were the Purépecha style ceramics found at the hinterland and borderland sites in the Sayula area and at Acambaro a continuation of local production processes as in the case of Angamuco, or were they exported to these regions from the imperial core? Though it is well-documented that the empire constructed monumental architecture and a distinctive cemetery during the Late Postclassic period at northern Michoacán Cuitzeo Basin sites (Macías Goytia 1986, 1990, 2005), what changes – if any – occurred within domestic contexts? Similarly, *yácatas* seem to have been constructed at sites south of the Pátzcuaro Basin that can potentially be linked to place-names in the RM, but how did these semi-circular pyramids change existing ritual practices (Cruz Robles et al. 2014; Espejel 2008)? One recent study (González 2013) has tabulated some of the known Purépecha burials within imperial cemeteries and tombs and compared the interments with information about Purépecha cosmology and belief systems. This comparative approach shows for example that infant ceramic vessel interments may have been more common at Las Milpillas (Zacapu) than elsewhere, and that individuals were interred in flexed, elongated, and cremated positions with Purépecha pottery and symbols at Huandacareo (Cuitzeo). These preliminary comparisons could suggest that local populations retained pre-empire burial practices, but that Late Postclassic elites used Purépecha symbols within grave inclusions. As I highlight in Ch. 6, the archaeology of domestic contexts has not been widespread in Purépecha studies and would benefit from intra-site examination of pre and post imperial impacts and activities. Such comparative intra-site studies have the potential to provide a basis for evaluating whether the empire instituted different practices based exclusively on monumental architecture and ceremonial activities, or whether it impacted daily domestic life as well.

Another important area of research is in the hinterland and borderland regions where regime-subject relations may have played out differently than in the areas closer to the heartland. Scholars have moved beyond Victor Turner's idea that the frontier is the "edge of society" and consider it rather as a setting for innovation and the formation of novel relationships between people and the material world (e.g. Schon and Galaty 2006; Lightfoot and Martinez 1995; Naum 2010). James Scott (2009) has pointed out that these so-called peripheral frontier communities signified "shatter zones" which were human shards of state formation and rivalry that accumulated and engendered ethnic, linguistic, and material complexity. How did frontier landscapes associated with the Purépecha Empire facilitate integration, innovation, and/or resistance within communities living in such areas? As historical studies have shown (e.g. Clastres 1987; Pred 1985; Scott 2009), people living in frontier areas sometimes purposefully constructed subsistence routes, social organizations, settlement patterns, and material culture that sought to minimize state integration, but regimes have also exploited existing socio-political units through manipulation and alliances.

Along the eastern border with the Aztecs, recent studies suggest that in fact the Aztec and Purépecha empires worked with existing sociopolitical units in pursuit of strategic goals (K. Lefebvre 2012; Silverstein 2000). Both empires built up their borders with forts and road systems that used diverse local populations as gate-keepers, spies, and interpreters. At the same time, however, Karine Lefebvre (2011) observes a "discrete [Purépecha] acculturation" of the Acambaro area frontier communities through imperial style polychrome pottery and pipes in the absence of imperial style architecture such as *yácatas*. Based on these archaeological data and her reading of the colonial era documents, she argues that while Purépecha elites collected taxes for tribute to the imperial core, local communities did not adopt Purépecha religious practices. Additional study of settlement patterns and distributional study of artifact patterning and sourcing data could further evaluate the changes in pre and post empire practices and the role of such frontier landscapes in the development of imperial control and state behavior.

The Impacts of Emerging Regimes: Broader Implications

For western Mexico, this study of regime development contributes to our understanding of socio-political complexity in the region by providing a more refined chronology of occupation and urban settlement. Although the Purépecha defeated the better-known Aztecs in battle and their descendants currently live in western Mexico, imperial incorporation strategies are not well understood especially within the Lake Pátzcuaro Basin imperial heartland. This study uses ceramic artifacts at the ancient city of Angamuco to test some of the basic assumptions concerning Purépecha development models including how political economic control and ideological changes occurred on the ground. Results indicate that imperial elites negotiated with existing communities that already had well-developed social and economic networks and that this negotiation likely involved local elites and accommodated new ritual practices. This study contributes to anthropological studies of political change that highlight the differing impacts of new regimes on local political, economic, and social activities.

Regime changes and the reactions of certain populations are visible through protest and resistance, immigration trends, and altered socioeconomic status in several parts of the world today. Yet, much is still unknown about how political development and consolidation occurs as well as their impacts on local communities. Understanding past political economic processes can provide models for interpreting current events. For example, the independence of countries behind the Velvet Curtain in post-Cold War Eastern Europe facilitated both increasingly stable and highly unstable economic systems (e.g. Croatia versus Albania) while eventually Bosnia was the setting of a civil war due in part to the breakup of the centralized Soviet sociopolitical machine. Since the early 2000s, new regimes within the Middle East have sought to carve out spheres of influence and control through revolution and democratic elections in the case of Egypt or through top-down authoritarian tactics such as the Taliban and Daesh. Thus far, millions of people have left their homes as refugees from the regional turmoil which has changed the geopolitical map of the Middle East and Europe in recent years. Though less clearly top-down, a comparable situation is occurring in parts of Latin America where unstable governments, violence, and a lack of economic opportunities has led many people to immigrate to the U.S. The long-term impacts of these political fluctuations are unknown, but we can gain insight into these complex processes by studying how they transpired in the past.

All new political systems must establish legitimacy, which amalgamates old and new practices to perpetuate existing political order and generate new subjects. As archeologists, we cannot observe past conversations and negotiations that are part of the processes through which institutions wielded power. We can, however, document material markers of legitimacy and power that are manifest today and in the archaeological record. Material markers can be reified through memorialization of past symbols of authority in association with newer symbols, forms that shape how we move through an environment, and accessibility to certain spaces (H. Lefebvre 1974; A. Smith 2003, 2011). This articulation of older forms and newer practices has been documented in many contexts, including at Vijayanagara, India where monuments and inscriptions of past Hindu rulers were combined with new architecture and consumption practices from the Mughal Empire (Sinopoli 2003b), and in Inka feasting locations in which rulers used existing ritual spaces to redistribute and consume new Inka foods (Kosiba 2010). More recently, the Mexican flag (first used in 1821) references both the modern nation state *tri-color* and Aztec symbols of empire formation. In both archaeology and contemporary settings, the study of such symbols of power and associated practices provides understanding into how political entities seek to legitimate themselves within diverse contexts.

In the heartland of the Late Postclassic Purépecha Empire, elites used iconography and symbols derived from earlier traditions in western Mexico, and they also exploited existing communities and social systems. When the Spanish first arrived in the Purépecha kingdom in the early 1520s, they met a powerful empire who controlled at times more than 75,000 km^2 of western Mexico and who had managed to restrict advances by their Aztec neighbors. The official imperial narrative emphasizes top-down regime control over political, economic, and social life throughout their territories. As this dissertation shows, however, the processes of imperial development and consolidation were more complicated than previously thought and future studies must consider the potential alternative pathways to imperial power.

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APPENDIX A:

CERAMIC CODING CATALOGUE USED FOR ATTRIBUTE ANALYSIS

Basic Identification

1. Date [date]: Date that sherd is documented and initials; e.g. 052213ASC

2. Catalogue Number [cat_no]: Number assigned to artifact in Access database

3. Provenience [prov]: Excavation area and unit; e.g. AN5E31

4. Level [lev]: Excavated level

5. Analytical Entity [an_ent]: Object being coded

00 – cannot be determined
01 – whole vessel; rim + body + base; 50% or more complete
02 – incomplete vessel; rim + body + base supports; less than 50% complete
03 – rim and body
04 – body and base with or without supports; no rim
05 – rim
06 – body
07 – base
08 – appendage; support with no substantial base fragment attached, handle, spout
09 – neck
10 – figurine; anthropomorphic or zoomorphic; whole or partial
11 – pipe; whole or partial
12 – circular sherd
13 – spindle whorl
14 – spoon
15 – other

Vessel Form

6. Lip Attributes (lip = the upper edge or margin of the rim or mouth of the vessel)

a) Tapering/Thickening [lip_a]
00 – not applicable
01 – tapered
02 – thickened
03 – constant

b) Symmetry [lip_b]
00 – not applicable
01 – flat
02 – round
03 – round with flattened top

c) Flaring [lip_c]
00 – not applicable
01 – exterior
02 – interior

d) Lip thickness [lip_d]: measured with calipers across the upper surface of the lip (mm)
00 – not applicable

7. Rim Attributes (rim = area between the change of orientation of the lip and the side or neck of the vessel. Where no change of orientation is present, a vessel is defined as having a direct or straight rim.)

a) Maximum orifice diameter [rim_a]: measurement of mouth of the vessel at the uppermost edge of vessel walls (mm)
00 – not applicable

b) Rim thickness at body [rim_b]: measurement of the vessel wall at the articulation point of the rim and the upper body using caliphers (mm).

c) Rim form [rim_c]
00 – not applicable
01 – convex: insloping rim that curves inward
02 – direct/straight: does not exhibit change in orientation from body
03 – outsloping: rim that curves out from body

8. Neck [neck] (neck = restriction of the orifice of the vessel, beginning above the point of maximum diameter of the body)
00 – not applicable
01 – curved
02 – curved, inverted
03 – curved, everted
04 – straight, inverted
05 – straight, everted

10. Body (portion of the vessel between the orifice and body that includes the maximum diameter of the vessel or the region of greatest enclosed volume)

a) Body form [body_a]
00 – not applicable
01 – incurved (probably closed)
02 – outcurved (probably open)

b) Wall thickness [body_b]: measurement at the thickest point of sherd (mm)

c) Vessel height [body_c]: measurement of maximum height of vessel if 50% or more complete (mm)

11. Base: underside of vessel

a) Base form [base_a]
00 – not applicable
01 – annular
02 – flat
03 – convex
04 – rounded

b) Base thickness [base_c]: measurement as closely as possible to center of base (mm)

12. Appendages [app]: type of support, handle, or spout; based on pilot research (6/2013) and Pollard (1972, 1993).

00 – Not applicable
01 – Support, fragment, unknown form
02 – Support, hollow ball (*Hueco pelota*)
03 – Support, hollow cone (*Hueco cónico*)
04 – Support, hollow cylinder (*Hueco cilíndrico*)
05 – Support, hollow mammiform (*Hueco mamiforme*)
06 – Support, hollow spider (*Hueco araña*)
07 – Support, slab trapezoidal/ with or without serrated edges (*trapezoidal*)
08 – Support, miniature solid (*Sólido miniatura*)
09 – Support, solid ball (*Sólido botón*)
10 – Support, solid cone (*Sólido cónico*)
11 – Support, solid cylinder (*Sólido cilíndrico*)
12 – Handle, lug (*asa oreja*)
13 – Handle, strap – diagnostic Tariacuri phase
14 – Handle, solid
15 – Handle, spoon

16 – Handle, support
17 – Spout (*vertedera*)
18 – Handle, circular (square LPC spouted vessel)

13. Figurines [fig]: anthropomorphic and zoomorphic miniature sculptures

00 – not applicable
01 – head
02 – arm
03 – leg
04 – body
05 – foot
06 – other (expand in notes)

14. Pipes: Specific attributes were recorded if available. The predicted range of attribute variation was initially identified by me, Marion Forest, and Florencia Pezzutti in a private collection in the Pátzcuaro area, and by consulting descriptions and illustration of pipes from central and western Mexico (Kelly 1947; Lefebvre 2012; Seler 1993; Pollard 1972:297-299, 1993:217-220; Porter 1948).

a) Portion [pipe_a]
00 – not applicable
01 – bowl
02 – stem
03 – parts of bowl, stem, supports, etc.
05 – complete

b) Pipe type [pipe_b]
00 – not applicable
01 – circular opening
02 – oval opening
03 – square opening
04 – X opening

c) Pipe decoration [pipe_c]
00 – not applicable
01 – no decoration
02 – one twist
03 – two twists
04 – incisions, dots
05 – incisions, lines
06 – pinched

15. Vessel type [ves_t]: These types were identified using: (1) the collection of 14 complete or almost-complete vessels from excavation; (2) comparison with standard vessels that are documented throughout Mesoamerica, but also specific to Late Postclassic Purépecha contexts such as the spouted vessel (see Balfet et al. 1992; Hernández 2000; Pollard 1993); (3) observations throughout attribute analysis.

00 – not applicable
01 – Bottle
02 – Bowl
03 – Grater
04 – Incense burner
05 – Jar
06 – Plate
07 – Sieve
08 – Spouted vessel
09 – Miniature

16. Vessel type 2 [ves_t2]: If possible, sherds were classified more specifically within each morphological type. These types are defined by: (1) pilot research on excavated sherds from Areas A and B in 2013; (2) consultation of available materials at the CEMCA laboratories from the Zacapu Basin, Michoacán; (3) comparison with various regional references (Arnauld et al. 1993; Castrol Leal 1986; Carot 2001, 2013; Cobean 1990; Darras 1998; Garcia 2009; Gorenstein 1982; Hernández 2000; Kelly 1947; Macias Goytia 1987, 1989, 2005; Michelet 2013; Pereira 1999; Pereira et al. 2011; Piña Chan and Oí 1980; Pollard 1972, 1993, 1999; Ramírez and Cárdenas 2006; Seler 1993; Williams 2007; E. Jadot, S. Ramírez Urrea, pers. comm.).

00 – not applicable
01 – Bowl, composite silhouette
02 – Bowl, convex wall
03 – Bowl, everted rim
04 – Bowl, incurved rim
05 – Bowl, large shouldered (see Prieto funerary bowl/covering)
06 – Bowl, outsloping wall
07 – Bowl, tripod
08 – Bowl, tripod *yacata* – polychrome and negative tripod
09 – Incense burner, brasero – applique circles or pellets, coarse
10 – Incense burner, sahumador – excision (may or may not have handle)
11 – Incense burner, tecomate style – incurved rim with two holes near top
12 – Jar, everted rim
13 – Jar, incurved rim
14 – Jar, incurved rim, *tecomate*
15 – Plate, convex wall
16 – Plate, flat base (*comal*)
17 – Sieve

18 – Spouted Vessel, shoe-shape (*patoja*) – may be decorated or unslipped
19 – Spouted Vessel, LPC polychrome gourd-like
20 – Spouted Vessel, square with spout, long neck, and small handle
21 – Miniature, tripod
22 – Miniature, handled
23 – Miniature, other (e.g. jar)

Attributes of Technology

17. Inclusion types [inc_t]: to be determined post-petrographic analysis
00 – cannot be distinguished
01 – basalt
02 – quartz
03 – grog
04 – uirás (no inclusions apparent)

18. Overall characterization of paste [pas]
00 – cannot be determined
01 – fine
02 – medium
03 – coarse

19. Paste Color [pas_c]
00 – not applicable OR
– Munsell color (coded as follows: 7.5R=2, 10R=3, 2.5YR=4, 5YR=5, 7.5YR=6, 10YR=7, 2.5Y=8; i.e. 7.5YR 5/4 brown = 654)

20. Source Group [so_g]: to be determined post-INAA analysis

21. Firing Core [fire]
00 – not applicable
01 – no core
02 – gray core present
03 – dark black core present
04 – burned

22. Finish [fin]: The process that occurs after the pottery vessel has attained its final shape and after any irregularities have been eliminated.
00 – cannot be determined, due to erosion or breakage
01 – smoothing: smoothed with a soft tool such as cloth, leather, a bunch of grass, or a hand; performed when vessel was wet or re-wet.
02 – scraped: striations from scraping tool are present; performed when vessel was still wet or soft.

03 – burnished: surface was rubbed repeatedly with a smooth, hard object, such as a pebble, bone, horn, or seeds. Could show narrow parallel or criss-crossing linear facets, careless burnishing results in irregular and streaky luster; done when vessel was dry.
04 – polished: surface was rubbed with a smooth, hard object; luster is uniform; performed on dry surface.
05 – roughened: surface is less unsmoothed through striating, combing, stamping, impressing; may improve grip and heat transfer.

23. Slip [slip]
00 – cannot be determined
01 – no slip OR
– single slip color (Munsell code)

24. Secondary Slip [slip_2]
00 – cannot be determined OR
– slip color (Munsell code)

Decorative Attributes

25. Subtractive Decoration [sub_d]: An implement was used to remove clay from the formed vessel. Most subtractive decoration is executed when the clay is plastic or leather-hard; some may be done when the clay is dry, and some after firing.
00 – not applicable
01 – incising: A tool is applied to the surface of the vessel and cuts it with pressure.
02 – combing: A form of incising using a multi-pronged tool.
03 – fretwork: The vessel is pierced to make the decoration.

26. Displacement/Joining [di_j]: process by which embellishments are cut from or impressed into the surface; joining involves attaching pieces of clay.
00 – not applicable
01 – impressing: stamping or paddling techniques in which an impression is left by applying a tool of some kind (e.g. fingernails, fingers, molds, seals).
02 – appliqué: shaped pieces of clay are bonded to the surface using pressure (e.g. conical spikes; bumps). Functional elements such as handles and spouts are not types of appliqué.
03 – modeling: pieces of clay are added to an existed form, and are shaped to produce a three-dimensional design.

27. Painted Decorations [pa]
00 – not applicable
01 – simple, 1 color
02 – simple, 2 colors
04 – simple, 3 colors
05 – negative: use of a resist to define a design in a reduced firing environment

06 – negative + 1 color
07 – negative + 2 colors or more
08 – other (expand in notes)

28. Motifs [mot]: note the number associated with motif picture in motif catalog
00 – not applicable
01 – motif 1 catalog number (e.g. 01-11)
02 – motif 2 catalog number
03 – motif 3 catalog number
04 – other (e.g. panel on a complete vessel; expand in notes)

29. Comments [comments]: place to put unique attributes, particulars about artifact location and associated artifacts.

APPENDIX B:

NAA REPORT FROM MURR

Archaeometry Laboratory

NEUTRON ACTIVATION ANALYSIS OF CERAMICS FROM ANGAMUCO, LAKE PÁTZCUARO BASIN, MICHOACÁN, MEXICO

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INTRODUCTION

This project involves the analysis of 300 pottery samples and 30 raw clay samples from the site of Angamuco in the state of Michoacán, Mexico. The primary goal of this research is to address compositional variability within the sample and to better understand the consumption and production patterns based on differential source usage. In this report we describe sample preparation, data collection, statistical procedures, address chemical group assignments, and examine possible matches with other pottery in the MURR database to identify possible geographic origin of compositional groups.

This report describes the preparation, analysis, and interpretation of 300 samples of pottery (LPB001-300) and 30 raw clay samples (LPB301-330) from Epiclassic and Postclassic contexts at Angamuco site in the Lake Pátzcuaro Basin. Specifically, the researcher intends to examine how ceramic production and consumption patterns reflect changes in Purépecha (Tarascan) Regimes. The sample derives from collections obtained during recent excavations as part of the project entitled Legacies of Resilience: The Lake Pátzcuaro Basin Archaeological Project and is to be used for analysis towards completion of a doctoral dissertation. The sample consists of an array of decorative styles, vessel forms, and from multiple contexts.

Table 1. Angumuco samples used for the current analysis.

Ceramic Type	Count
Bowl	70
Brasero	3
Grater	3
Jar	25
undefined	199
Raw Clay	30
Total	330

The sample was first analyzed in isolation to examine the chemical structure of the dataset. This serves several purposes. First, the chemical data must be analyzed for the purposes of accurately describing the chemical structure of the dataset. However, while it may indicate an exotic origin of clays, strong chemical divergences such as enrichment or depletion may be explained by differences in mixing clays and temper into a paste. Strong chemical patterning with regard to the site may also indicate local production and consumption at the site scale when compared to previous studies. Second, many of the statistical techniques employed to compare the current data to previously identified Mesoamerican reference groups have shortcomings that are more readily identified with detailed knowledge of the sample in isolation. Discriminant analysis, for example, has become the standard for ceramic comparison in the Mesoamerica. Discriminant analysis creates new axes that maximize the elemental differences among predefined groups. The current sample may, however, be differentiated from known Mesoamerican reference groups according to elements that are not heavily weighted in the existing discriminant analysis. In this case, one must examine possible group structure through different means (e.g Mahalanobis calculations, principal component analysis, inspection of bivariate plots, and Euclidian distance searches) and then recalculate the discriminant analysis based on compositional group assignments.

SAMPLE PREPARATION

Ceramic samples were prepared for INAA using procedures standard at MURR. Fragments of about 1 cm2 were removed from each sample and abraded using a silicon carbide burr in order to remove glaze, slip, paint, and adhering soil, thereby reducing the risk of measuring contamination. The samples were washed in deionized water and allowed to dry in the laboratory. Once dry, the individual sherds were ground to powder in an agate mortar to homogenize the samples. Archival samples were retained from each sherd (when possible) for future research.

Two analytical samples were prepared from each source specimen. Portions of approximately 150 mg of powder were weighed into clean high-density polyethylene vials used for short irradiations at MURR. At the same time, 200 mg of each sample was weighed into clean high-purity quartz vials used for long irradiations. Individual sample weights were recorded to the nearest 0.01 mg using an analytical balance. Both vials were sealed prior to irradiation. Along with the unknown samples, Standards made from National Institute of Standards and Technology (NIST) certified standard reference materials of SRM-1633a (coal fly ash) and SRM-688 (basalt rock) were similarly prepared, as were quality control samples (e.g., standards treated as unknowns) of SRM-278 (obsidian rock) and Ohio Red Clay (a standard developed for in-house applications).

Irradiation and Gamma-Ray Spectroscopy

Neutron activation analysis of ceramics at MURR, which consists of two irradiations and a total of three gamma counts, constitutes a superset of the procedures used at most other NAA laboratories (Glascock 1992; Neff 1992, 2000). As discussed in detail by Glascock (1992), a short irradiation is carried out through the pneumatic tube irradiation system. Samples in the polyvials are sequentially irradiated, two at a time, for five seconds by a neutron flux of 8 x 1013 n cm-2 s-1. The 720-second count yields gamma spectra containing peaks for nine short-lived elements aluminum (Al), barium (Ba), calcium (Ca), dysprosium (Dy), potassium (K), manganese (Mn), sodium (Na), titanium (Ti), and vanadium (V). The samples are encapsulated in quartz vials and are subjected to a 24–hour irradiation at a neutron flux of 5 x 1013 n cm-2 s-1. This long irradiation is analogous to the single irradiation utilized at most other laboratories. After the long irradiation, samples decay for seven days, and then are counted for 1,800 seconds (the "middle count") on a high-resolution germanium detector coupled to an automatic sample changer. The middle count yields determinations of seven medium half-life elements, namely arsenic (As), lanthanum (La), lutetium (Lu), neodymium (Nd), samarium (Sm), uranium (U), and ytterbium (Yb). After an additional three- or four-week decay, a final count of 8,500 seconds is carried out on each sample. The latter measurement yields the following 17 long half-life elements: cerium (Ce), cobalt (Co), chromium (Cr), cesium (Cs), europium (Eu), iron (Fe), hafnium (Hf), nickel (Ni), rubidium (Rb), antimony (Sb), scandium (Sc), strontium (Sr), tantalum (Ta), terbium (Tb), thorium (Th), zinc

(Zn), and zirconium (Zr). The element concentration data from the three measurements are tabulated in parts per million.

INTERPRETING CHEMICAL DATA

The analyses at MURR, described above, produced elemental concentration values for 33 elements in most of the analyzed samples. Nickel was removed from all statistical techniques due to the high number of missing values within the dataset.

Statistical analysis was subsequently carried out on base-10 logarithms of concentrations on the remaining 30 elements. Use of log concentrations rather than raw data compensates for differences in magnitude between the major elements, such as calcium, on one hand and trace elements, such as the rare earth or lanthanide elements (REEs). Transformation to base-10 logarithms also yields a more normal distribution for many trace elements.

The interpretation of compositional data obtained from the analysis of archaeological materials is discussed in detail elsewhere (e.g., Baxter and Buck 2000; Bieber et al. 1976; Bishop and Neff 1989; Glascock 1992; Harbottle 1976; Neff 2000) and will only be summarized here. The main goal of data analysis is to identify distinct and relatively homogeneous groups within the analytical database. Based on the provenance postulate of Weigand et al. (1977), different chemical groups may be assumed to represent geographically restricted sources. With pottery, however, chemical composition additionally varies according to the paste recipes that potters employ. A paste recipe reflect the cumulative pottery production steps from the selection of raw materials, preparation of those materials, the mixing of temper and clay, and even the firing of the pottery can affect the final recipe as changes in color and mineral structure can take place. For lithic materials such as obsidian, basalt, and cryptocrystalline silicates (e.g., chert, flint, or jasper), raw material samples are frequently collected from known outcrops or secondary deposits and the compositional data obtained on the samples is used to define the source localities or boundaries. The locations of sources can also be inferred by comparing unknown specimens (i.e., ceramic artifacts) to knowns (i.e., clay samples) or by indirect methods such as the "criterion of abundance" (Bishop et al. 1982) or by arguments based on geological and sedimentological characteristics (e.g., Steponaitis et al. 1996). The ubiquity of ceramic raw materials usually makes it impossible to sample all potential "sources" intensively enough to create groups of knowns to which unknowns can be compared. Lithic sources tend to be more localized and compositionally homogeneous in the case of obsidian or compositionally heterogeneous as is the case for most cherts.

Compositional groups can be viewed as "centers of mass" in the compositional hyperspace described by the measured elemental data. Groups are characterized by the locations of their centroids and the unique relationships (i.e., correlations) between the elements. Decisions about whether to assign a specimen to a particular compositional group are based on the overall probability that the measured concentrations for the specimen could have been obtained from that group.

Initial hypotheses about source-related subgroups in the compositional data can be derived from non-compositional information (e.g., archaeological context, decorative attributes, etc.) or from application of various pattern-recognition techniques to the multivariate chemical data. Some of the pattern recognition techniques that have been used to investigate archaeological data sets are cluster analysis (CA), principal components analysis (PCA), and discriminant analysis (DA). Each of the techniques has its own advantages and disadvantages which may depend upon the types and quantity of data available for interpretation.

The variables (measured elements) in archaeological and geological data sets are often correlated and frequently large in number. This makes handling and interpreting patterns within the data difficult. Therefore, it is often useful to transform the original variables into a smaller set of uncorrelated variables in order to make data interpretation easier. Of the above-mentioned pattern recognition techniques, PCA is a technique that transforms from the data from the original correlated variables into uncorrelated variables most easily.

PCA creates a new set of reference axes arranged in decreasing order of variance subsumed. The individual PCs are linear combinations of the original variables. The data can be displayed on combinations of the new axes, just as they can be displayed on the original elemental concentration axes. PCA can be used in a pure pattern-recognition mode, i.e., to search for subgroups in an undifferentiated data set, or in a more evaluative mode, i.e., to assess the coherence of hypothetical groups suggested by other criteria. Generally, compositional differences between specimens can be expected to be larger for specimens in different groups than for specimens in the same group, and this implies that groups should be detectable as distinct areas of high point density on plots of the first few components. It is well known that PCA of chemical data is scale dependent, and analyses tend to be dominated by those elements or isotopes for which the concentrations are relatively large. This is yet another reason for the log transformation of the data.

One frequently exploited strength of PCA, discussed by Baxter (1992), Baxter and Buck (2000), and Neff (1994, 2002), is that it can be applied as a simultaneous R- and Q-mode technique, with both variables (elements) and objects (individual analyzed samples) displayed on the same set of principal component reference axes. A plot using the first two principal components as axes is usually the best possible two-dimensional representation of the correlation or variance-covariance structure within the data set. Small angles between the vectors from the origin to variable coordinates indicate strong positive correlation; angles at 90 degrees indicate no correlation; and angles close to 180 degrees indicate strong negative correlation. Likewise, a plot of sample coordinates on these same axes will be the best two-dimensional representation of Euclidean relations among the samples in log-concentration space (if the PCA was based on the variance-covariance matrix) or standardized log-concentration space (if the PCA was based on the correlation matrix). Displaying both objects and variables on the same plot makes it possible to observe the contributions of specific elements to group separation and to the distinctive shapes of the various groups. Such a plot is commonly referred to as a “biplot” in reference to the simultaneous plotting of objects and variables. The variable inter-relationships inferred from a biplot can be verified directly by inspecting bivariate elemental concentration plots. [Note that a bivariate plot of elemental concentrations is not a biplot.]

Whether a group can be discriminated easily from other groups can be evaluated visually in two dimensions or statistically in multiple dimensions. A metric known as the Mahalanobis distance (or generalized distance) makes it possible to describe the separation between groups or between individual samples and groups on multiple dimensions. The Mahalanobis distance of a specimen from a group centroid (Bieber et al. 1976, Bishop and Neff 1989) is defined by:

$$D^2_{y,X} = [y - \overline{X}]^t I_x [y - \overline{X}]$$

where y is the 1 x m array of logged elemental concentrations for the specimen of interest, X is the n x m data matrix of logged concentrations for the group to which the point is being compared with $\overline{X}$ being it 1 x m centroid, and I_x is the inverse of the m x m variance-covariance matrix of group X. Because Mahalanobis distance takes into account variances and covariances in the multivariate group it is analogous to expressing distance from a univariate mean in standard deviation units. Like standard deviation units, Mahalanobis distances can be converted into probabilities of group membership for individual specimens. For relatively small sample sizes, it is appropriate to base probabilities on Hotelling's T^2, which is the multivariate extension of the univariate Student's t.

When group sizes are small, Mahalanobis distance-based probabilities can fluctuate dramatically depending upon whether or not each specimen is assumed to be a member of the group to which it is being compared. Harbottle (1976) calls this phenomenon "stretchability" in reference to the tendency of an included specimen to stretch the group in the direction of its own location in elemental concentration space. This problem can be circumvented by cross-validation, that is, by removing each specimen from its presumed group before calculating its own probability of membership (Baxter 1994; Leese and Main 1994). This is a conservative approach to group evaluation that may sometimes exclude true group members.

Small sample and group sizes place further constraints on the use of Mahalanobis distance: with more elements than samples, the group variance-covariance matrix is singular thus rendering calculation of I_x (and D^2 itself) impossible. Therefore, the dimensionality of the groups must somehow be reduced. One approach would be to eliminate elements considered irrelevant or redundant. The problem with this approach is that the investigator's preconceptions about which elements should be discriminate may not be valid. It also squanders the main advantage of multielement analysis, namely the capability to measure a large number of elements. An alternative approach is to calculate Mahalanobis distances with the scores on principal components extracted from the variance-covariance or correlation matrix for the complete data set. This approach entails only the assumption, entirely reasonable in light of the above discussion of PCA, that most group-separating differences should be visible on the first several PCs. Unless a data set is extremely complex, containing numerous distinct groups, using enough components to subsume at least 90% of the total variance in the data can be generally assumed to yield Mahalanobis distances that approximate Mahalanobis distances in full elemental concentration space.

Lastly, Mahalanobis distance calculations are also quite useful for handling missing data (Sayre 1975). When many specimens are analyzed for a large number of elements, it is almost certain that a few element concentrations will be missed for some of the specimens. This occurs most frequently when the concentration for an element is near the detection limit. Rather than eliminate the specimen or the element from consideration, it is possible to substitute a missing value by replacing it with a value that minimizes the Mahalanobis distance for the specimen from the group centroid. Thus, those few specimens which are missing a single concentration value can still be used in group calculations.

SUMMARY OF INTERPRETIVE TECHNIQUES

Typically, the approach used to interpret chemical data for pottery involves hierarchical cluster analysis (CA) and principal components analysis (PCA) to establish initial groupings within the sample. To chemically characterize the sample, principle component analyses were useful in identifying which elements are the most significant in creating variation within the sample. After constructing base groups through CA and PCA, bivariate plots were used to refine groups. Next, Mahalanobis distance based probabilities were calculated to assess likelihood of group membership. Initially, raw clay samples were excluded from compositional group construction. Later raw clay samples were integrated to see if they fit any compositional groups. This could indicate a local origin of that group. Finally, the groups were then compared to previously defined groups in the area by Hirshman and Ferguson (2012).

To establish chemical groups, we first used a CA to identify clusters of chemically similar samples using 32 of the 33 total recorded elements for each sample. Nickel (Ni) was excluded due to a high frequency of missing values. From this analysis, four rough groups were identified. Following the CA, principle component analyses were used to define the sources of variation between specimens and maximize said variation. Through this, groups were further refined through visual inspection of PC loading plots. Finally, the intersections of individual elements were projected on bivariate plots to better visually assess group membership. To evaluate these groups, Mahalanobis distance calculations then tested each group member against its own group for robustness.

To identify possible geographic source areas for each group, we first considered previous groups identified in earlier studies by Hirshman and Ferguson (2012) through both visual inspection of bivariate and PC loading plots, as well as Mahalanobis distance calculations. Using a similar technique, we projected the raw clay samples onto the identified compositional groups to identify local production potential. Finally, the remaining unsourced group was compared to the entirety of MURR's NAA database to identify the most similar specimens relying on the provenience postulate to possibly identify the geographic source of the compositional group using a Euclidian Distance search.

RESULTS AND SOURCE ASSIGNMENTS

The primary questions addressed here are: 1) What is the chemical group composition of the dataset? 2) Can we identify where each compositional may have originated geographically? 3) Does there seem to be preferential usage of specific clays for certain pottery types?

The compositional groups are presented below. All plots below depict all specimens submitted for analysis. The complete results of source assignment for each specimen, can be found in Appendix A.

General Chemical Structure of the Pottery Sample

As an initial step toward interpreting the pottery sample, the dataset was considered in isolation. This allowed perusal of the general structure of the chemical data and identification of important variables for group formation. A PCA was conducted without Ni, (Figure 1). Ni has produced many missing values in the sample because the values were below detection limits

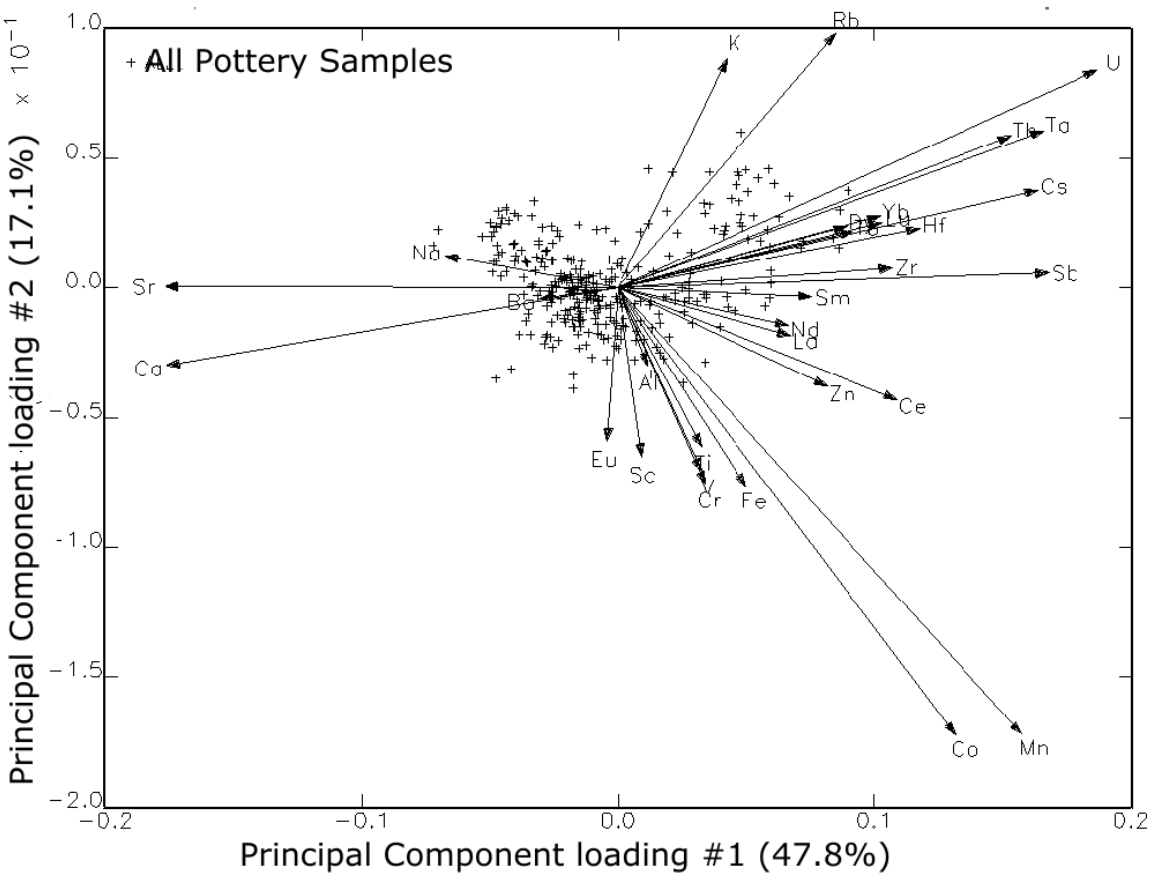

Figure 1. R-Q Mode biplot of the sample on Principal Component 1 and Principal Component 2.

The principal component loadings are presented in Figure 1 through an R-Q mode biplot of the principal component analyses found in Table 2. On PC1 (representing over 47 percent of the total sample variation), all elements display positive loadings except Ca, Sr, Na, Ba, and Eu. High values among these elements have generated high PC1 values. It should be noted that cations of the alkaline earth metals (Ca, Sr, and Ba) commonly substitute for one another in the chemical structure of many clays (Ca and Sr in particular). All Alkali earth metals are negatively loaded, as well as Ba and Eu being negative as well, though values are approaching zero. The first seven principal components alone explain approximately 89.99 percent of the variability in the sample.

Table 2. Elemental Loadings for the pottery sample on Principal Component Axes 1 through 5. *Values in bold explain the greatest amount of variation within each component. Those in italics explain a significant portion of the variation, but less than those in bold.*

Variable	Mean	PC1	PC2	PC3	PC4	PC5	PC6	PC7
Na	9080.5319	-0.112	0.035	0.312	-0.079	-0.309	-0.416	0.092
Al	99937.0999	0.019	-0.083	-0.012	0.070	0.148	-0.088	-0.056
K	8159.2828	0.071	0.245	0.293	-0.229	-0.060	-0.154	0.461
Ca	15976.4139	-0.293	-0.083	0.502	0.064	0.017	-0.277	-0.147
Sc	16.1869	0.016	-0.181	0.007	0.188	0.139	-0.152	-0.004
Ti	5761.9504	0.054	-0.171	0.000	0.132	0.239	-0.209	0.021
V	123.5603	0.054	-0.197	-0.027	0.038	0.185	-0.137	0.061
Cr	131.1960	0.056	-0.210	-0.120	0.107	0.193	-0.111	0.641
Mn	750.1330	0.262	-0.479	0.216	-0.342	-0.275	0.190	-0.014
Fe	49883.9481	0.083	-0.213	0.032	0.102	0.216	-0.203	-0.012
Co	19.6319	0.219	-0.480	0.154	-0.201	-0.091	0.071	0.036
Zn	79.5429	0.136	-0.105	0.133	0.096	0.191	-0.188	-0.096
Rb	49.0637	0.141	0.273	0.305	-0.251	0.150	0.195	0.069
Sr	301.6935	-0.294	0.001	0.471	0.081	0.226	0.162	-0.038
Zr	155.3031	0.178	0.021	0.019	0.013	0.166	-0.079	0.055
Sb	0.1913	0.279	0.015	0.013	-0.102	0.261	-0.129	-0.162
Cs	1.7929	0.272	0.105	-0.036	-0.291	0.188	-0.086	-0.390
Ba	652.3306	-0.051	-0.012	0.229	0.100	0.418	0.558	0.099
La	22.9783	0.112	-0.051	0.071	0.227	-0.045	0.054	0.020
Ce	52.9144	0.181	-0.120	0.070	0.009	-0.141	0.201	0.032
Nd	22.5990	0.110	-0.040	0.074	0.275	-0.087	0.086	-0.018
Sm	5.2837	0.126	-0.009	0.072	0.244	-0.102	0.034	-0.021
Eu	1.1930	-0.007	-0.164	0.006	0.262	-0.047	0.050	-0.023
Tb	0.7340	0.152	0.060	0.129	0.262	-0.192	0.041	-0.097
Dy	4.3398	0.148	0.066	0.104	0.288	-0.142	0.004	-0.065
Yb	2.4404	0.170	0.077	0.105	0.211	-0.150	0.048	-0.073
Lu	0.3418	0.172	0.070	0.088	0.228	-0.135	0.047	-0.063
Hf	6.5779	0.195	0.063	0.052	0.011	0.109	-0.104	0.006
Ta	1.2189	0.276	0.169	0.137	0.021	0.082	-0.147	-0.084
Th	5.7424	0.255	0.163	0.047	0.016	0.132	-0.062	-0.002
U	1.4572	0.311	0.234	0.010	0.105	-0.093	0.029	0.314
Eigenvalues:		0.361	0.129	0.091	0.034	0.028	0.022	0.015
Total Variation explained:		47.79%	17.09%	12.04%	4.52%	3.70%	2.92%	1.92%

Visual inspection of principal component biplots resulted in clearly defined chemical groups which were used to refine groupings from the PCA (Fig 2.) Based on this PCA, it appears that Strontium (Sr), Calcium (Ca), Potassium (K), Rubidium (Sb), and Sodium (Na) explain the greatest amount of chemical variation across the first 5 PC's. Other elements have also been found to be useful in visualizing the sample into distinct groups (Figs. 3-6). However, it is apparent that significant chemical overlap between specimens necessitates a confirmation of group membership through other means. Visual inspection alone does not appear sufficient for confident group identification. For this reason, Mahalanobis distance calculations were also used for group final group assignment (Appendix B).

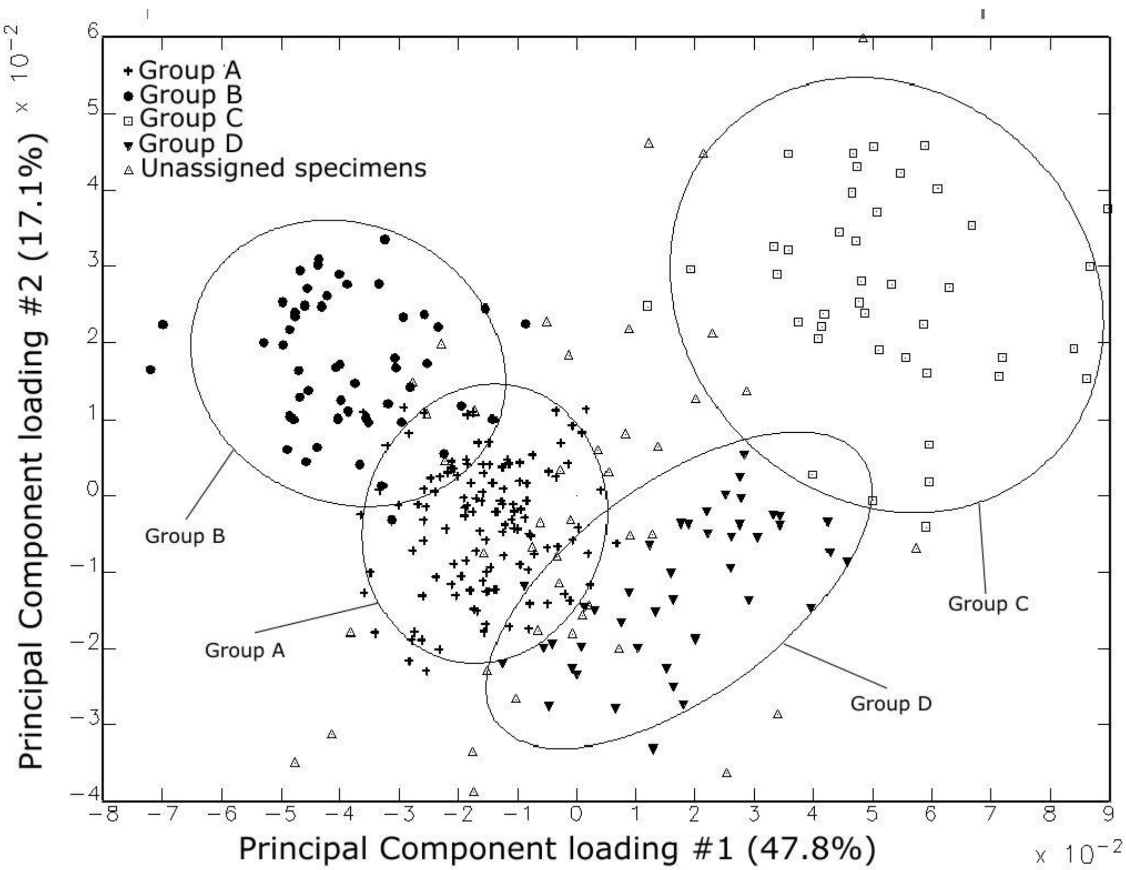

Figure 2. Results of PCA including compositional group assignment.

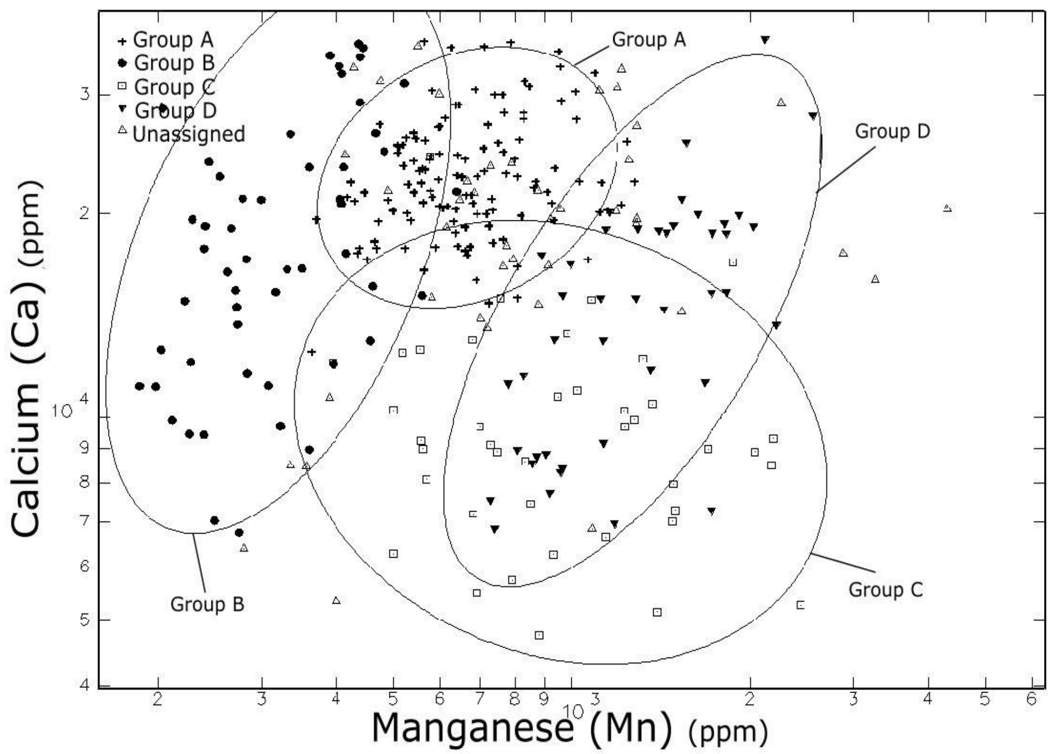

Figure 3. Bi-variate plot of the sample showing the chemical composition of sample on axes of Mn and Ca.

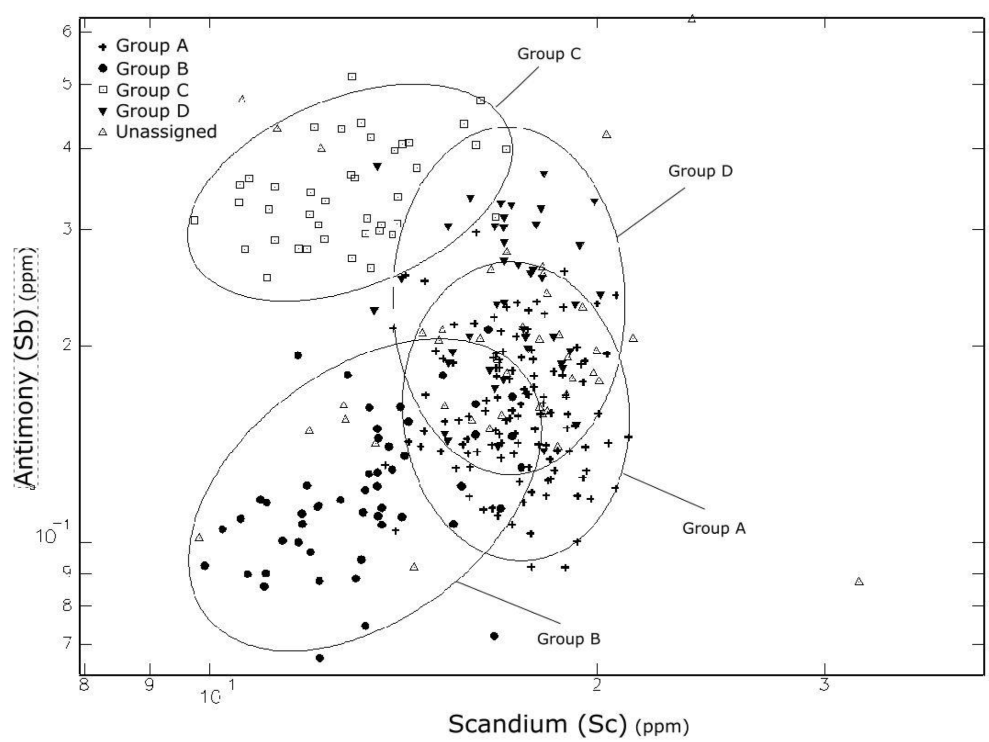

Figure 4. Bi-variate plot of the sample showing the chemical composition of sample on axes of Sc and Sb.

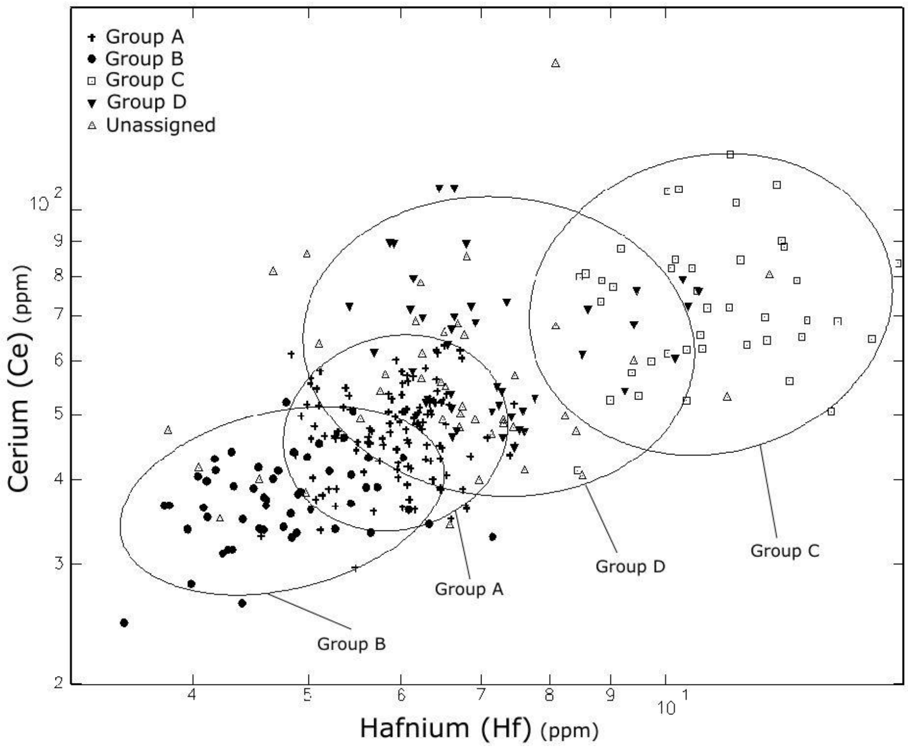

Figure 5. Bi-variate plot of the sample showing the chemical composition of sample on axes of Hf and Ce.

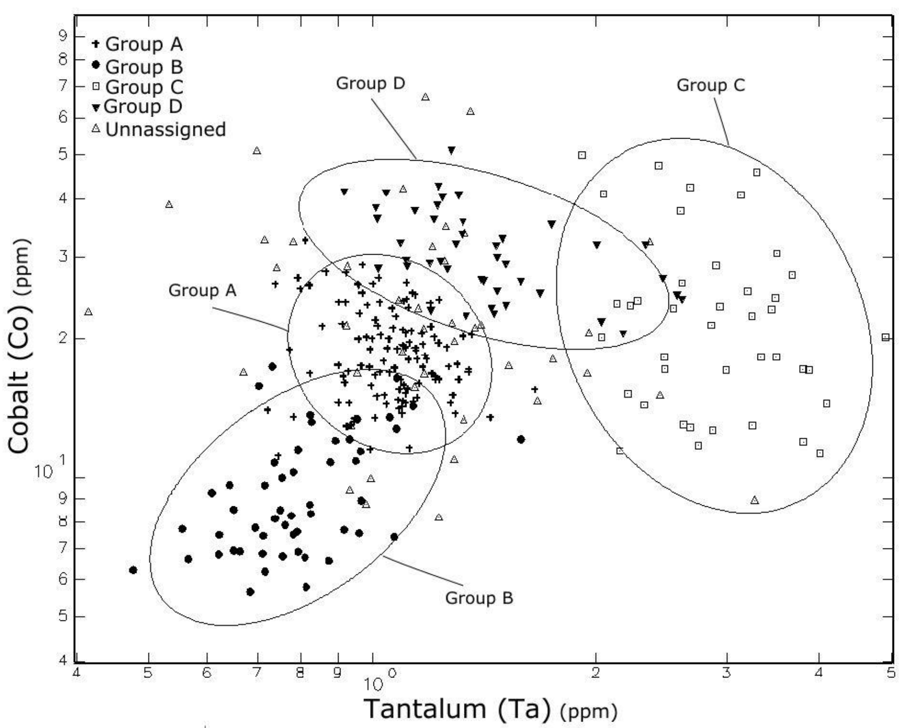

Figure 6. Bi-variate plot of the sample showing the chemical composition of sample on axes of Ta and Co.

GROUP FORMATION BASED ON MULTIPLE FORMS OF ANALYSIS

Groups were formed within the current sample through multiple analyses as described above and confirmed through the use of Mahalanobis distance calculations. The purpose for this is to provide a consistent, replicable characterization of the pottery sample. After defining chemical groups, a Discriminant Analysis (DA) was conducted using the identified groups (Table 3). This analysis maximizes the variation between groups by maximizing the internal homogeneity as well as external heterogeneity between groups (Fig. 7).

Table 3. Canonical Discriminant Analysis of four identified source groups in the Angamuco sample.

Element		CD1	CD2	CD3
		69.96047	22.05456	7.984977
Sm	2.675431	1.230384	1.34316	-1.95959
La	1.226121	-0.10062	-1.10177	0.528541
Yb	1.054719	-0.95308	0.38858	0.230392
Hf	1.003912	-0.50697	-0.26201	-0.82594
Eu	0.980783	0.641345	-0.65898	0.341119
Fe	0.761268	0.006212	-0.63612	0.418146
Ti	0.713186	-0.39389	-0.5627	-0.19196
Dy	0.659219	-0.25732	-0.11767	0.595406
Al	0.628643	0.061829	0.600183	-0.17649
Ca	0.508144	0.487465	-0.05535	-0.13238
Zn	0.490881	-0.18225	-0.45453	0.033944
Sc	0.470016	0.364814	-0.26698	-0.12864
Lu	0.448175	-0.09662	-0.43311	0.062782
Mn	0.445892	-0.05103	-0.36102	0.256669
Ta	0.437332	0.404845	-0.04178	0.160045
Ce	0.422192	-0.18889	0.019875	0.377055
Rb	0.420367	-0.26443	0.320097	0.065735
Co	0.402492	-0.24815	-0.10236	-0.2999
V	0.365822	0.355378	-0.05647	0.065906
Th	0.333258	-0.05487	0.165926	0.283758
Nd	0.318775	-0.18705	0.153179	-0.20776
Ba	0.31509	0.145841	0.249189	0.126164
Na	0.294445	-0.22591	0.056699	-0.18013
Sr	0.292171	-0.29155	-0.00677	0.017825
Tb	0.254238	-0.17402	0.177249	-0.05418
Sb	0.241199	-0.17761	-0.15154	-0.06055
K	0.219413	0.01016	-0.08837	-0.20058
U	0.185319	-0.18531	0.001721	0.000372

Cr	0.163174	0.03873	0.115208	0.108871
Cs	0.136077	-0.02215	-0.07269	0.112882
Zr	0.132362	0.081254	0.098925	0.033635
		Wilk's lambda:		0.011308
		Approx. F:		26.61769
		p-value:		3.4E-177

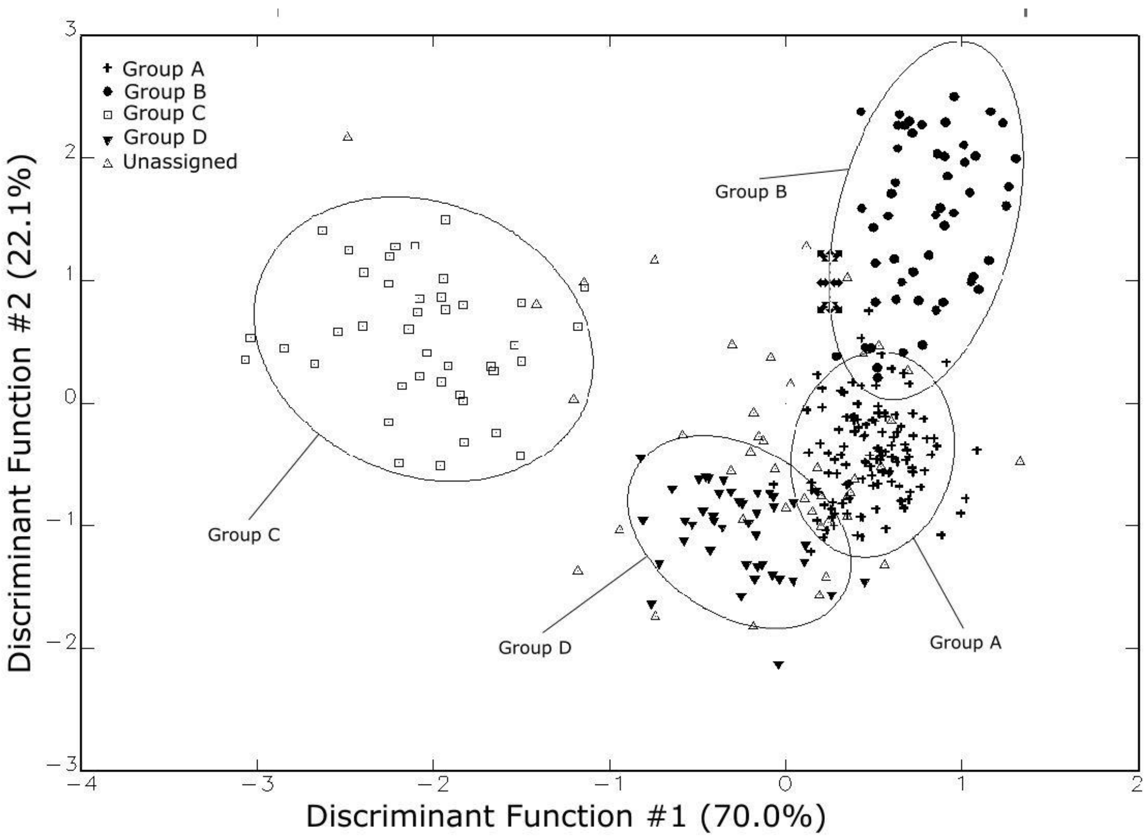

Figure 7. Bi-variate plot of the sample on axes of Discriminant functions 1 and 2.

As indicated here, some overlap occurs between the groups. However, this overlap is minimal and Mahalanobis distance calculations further substantiate group assignments (Appendix B).
After conducting this DA to maximize variation between groups, we have then a Mahalanobis distance calculations comparing the current sample to itself. The sample was tested jackknifed, as the likelihood of each specimen being a member of each chemical group was calculated by comparing said specimen to each identified group with that specimen removed. This tests confirmed cohesive group assignment.

In general, our approach to group formation requires that the groups hold together when presented through multiple statistical techniques and multiple elemental and PCA plots. Since the first two principal components explain nearly 65% percent of the variability within the sample, we did not rely heavily on the less influential components to formulate compositional groups. It is now believed that the samples do in fact represent separate source groups despite retaining some chemical overlap, as these results demonstrate.

Finally, the combination of Principle Component Analysis, visual inspection of bivariate elemental plots, Mahalanobis Distance Calculations, and Discriminant Analysis provided us with the final group assignment (Appendix A). However, it should be noted that no single type of analysis was in and of itself conclusive in all cases and informed decisions were made considering all analyses. Unassigned specimens were either dissimilar to all groups or may have been chemically consistent with more than one group. However, assignment of over 86.3% of the specimens is sufficiently high, with minimal unassigned specimens. In an attempt to geographically identify these chemical groups, further analysis was then conducted by comparing the identified compositional groups in the region, collected raw clay samples, and Euclidian distance searches.

Geographic identification of source groups

The sample was first compared to previously analyzed samples by Hirshman and Ferguson (2012). In this earlier publication, they identified two major compositional groups (Main Group and Pottery Group 1). They also identified three other smaller groups which were poorly defined due to few members. In comparing these groups to the current compositional groups, we have found that two of the current groups do in fact match the two previously defined major groups (Fig. 8). The clear similarities between Group A -Tarascan Main Group (MPG), and Group C -Tarascan Pottery Group 1 (PG1) were then confirmed through Mahalanobis calculations (Appendix C).

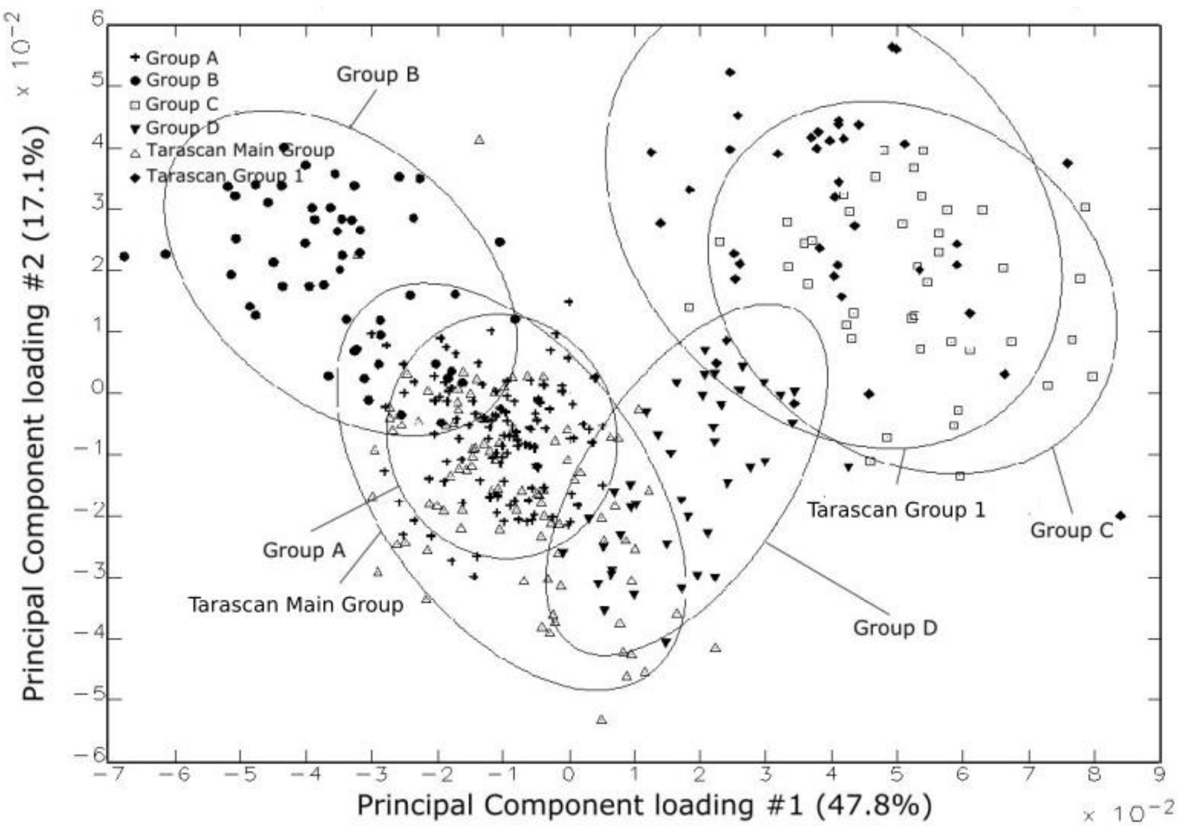

Fig. 8. Comparison of current sample with Hirshman and Ferguson (2012) groups.

Next, we compared the four identified source groups, with the collected raw clay sample (Fig 9). Through visual inspection of the bivariate plot, it appears that only Group D is reflected in the raw clay sample.

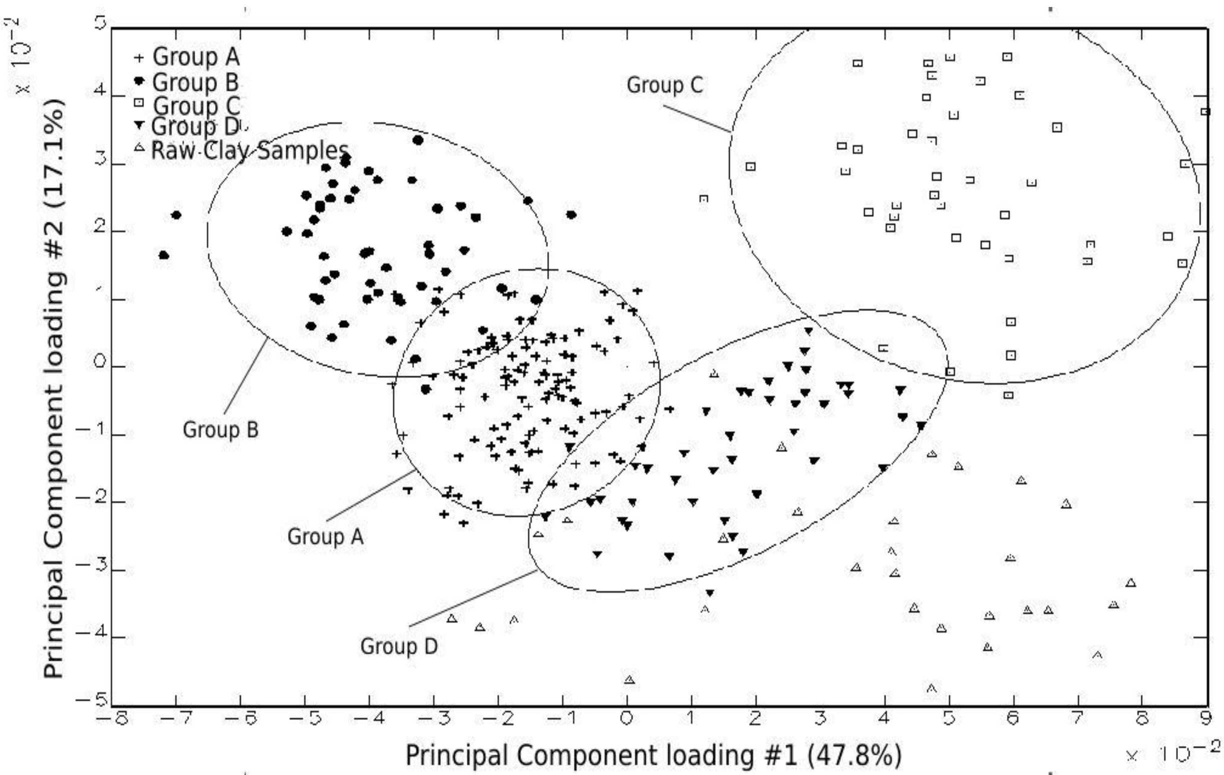

Fig 9. Comparison of Raw clay samples to compositional groups.

To confirm the inclusion of clay samples in compositional group D, a Mahalanobis distance analysis was conducted (Table 4). From these analyses, we can conclude that of the assignable raw clay specimens, the compositional Group D appears to be the closest match. In earlier comparisons above, Group D was found to not match previous compositional groups (Figure 8). For this reason, we believe that the ceramics in group D, are in fact likely of local origin from the immediate area.

Table 4. Mahalnobis distance calculations for raw Angamuco clay samples.

MURRID	ANID	Group A	Group B	Group C	Group D	Best Group	Source assignment
LPB301	JAG1	0.000	0.017	0.114	18.933	Group D	Group D
LPB302	ANG1	0.000	0.000	0.007	0.003	Group C	unassigned
LPB303	ANG2	0.000	0.001	0.149	0.194	Group D	unassigned
LPB304	ANG3	0.000	0.000	0.000	0.000		unassigned
LPB305	ANG4	0.000	0.172	0.234	0.214	Group C	unassigned
LPB306	ANG5	0.001	0.471	0.098	13.963	Group D	Group D
LPB307	ANG6A	0.000	0.000	0.292	0.084	Group C	unassigned
LPB308	ANG6B	0.000	0.000	0.040	0.008	Group C	unassigned
LPB309	ANG7	0.000	0.001	0.431	21.447	Group D	Group D
LPB310	ANG8	0.000	0.002	0.408	3.438	Group D	Group D
LPB311	ANG9	0.000	0.017	1.466	10.200	Group D	Group D
LPB312	ANG10	0.000	0.000	0.080	1.206	Group D	unassigned
LPB313	ANG11	0.000	0.019	2.621	47.022	Group D	Group D
LPB314	ANG12	0.000	0.000	0.003	0.010	Group D	unassigned
LPB315	ANG13	0.000	0.000	0.083	0.047	Group C	unassigned
LPB316	CHA1	0.000	0.031	7.536	36.518	Group D	unassigned
LPB317	COR1	0.000	0.000	0.000	0.015	Group D	unassigned
LPB318	ANG16	0.000	3.926	0.107	11.338	Group D	unassigned
LPB319	ANG17	0.000	0.038	1.869	47.141	Group D	Group D
LPB320	ANG18	0.000	0.000	0.093	1.418	Group D	unassigned
LPB321	ANG19	0.000	0.021	3.403	27.509	Group D	Group D
LPB322	CC1	0.000	0.000	0.001	0.000		unassigned
LPB323	CC2	0.000	0.000	0.024	0.503	Group D	unassigned
LPB324	FONT1	0.000	0.000	1.111	2.333	Group D	unassigned
LPB325	FONT2	0.000	0.001	0.172	8.024	Group D	Group D
LPB326	LP1	0.000	0.006	1.429	1.951	Group D	unassigned
LPB327	LP2A	0.000	0.000	0.064	0.022	Group C	unassigned
LPB328	LP2B	0.000	0.003	0.077	0.054	Group C	unassigned
LPB329	ANG20	0.001	0.003	0.869	3.838	Group D	unassigned
LPB330	ANG21	0.000	0.001	0.001	7.992	Group D	Group D

Finally, to assess the fourth group yet to be assigned geographically, a Euclidian distance search checked the entirety of the MURR ceramic database to find the most similar samples. Using this method, we can use the provenance postulate to propose a potential source location. If all of the most compositionally similar specimens originate from the same area, a strong argument can be made that compositional Group B does, in fact, originate in that area as well. However, results of this analysis indicate that the most similar specimens originate in a wide array of locations across

Mesoamerica. Therefore, we cannot confidently assign compositional Group B to any specific geographic region.

Final Group Assessment

Unfortunately, the final group designation is often blurry when only individual elements are considered as illustrated in the biplots above. However, some generalizations can be made for each group by using a multi-method approach of group construction.

Group A (n=123) is the largest of the four identified compositional groups. It is a relatively homogenous and tightly clustered group when considering the PC loadings. Though with some individual elements it is more varied group, it is easily distinguishable from the other groups when considering the elements in aggregate. Specimens in this group are comparatively high in Sodium (Na), Scandium (Sc), and Iron (Fe). Based on comparisons with earlier compositional groups established by Hirshman and Ferguson (2012), this group appears to be the same as the "Main Group" in their sample. Importantly, in their analysis, they have identified this source group as originating in the southwestern portion of the Lake Patzcuaro by comparing this group to collected raw clay samples. Therefore, we can conclude that Group A in the current sample also originates in the southwest portion of the Basin as well (Fig. 10). Of the 32 sherds in which ware types could be identified, this group is relatively evenly split between bowls (n=17) and jars (n=13).

Group B (n=52) is also easily distinguishable in the PC plot (Fig. 2). When considering elements in isolation, Group B is comparatively low in many elements including Samarium (Sm), Hafnium (Hf), Cerium (Ce), Manganese (Mn), and Tantalum (Ta), while comparatively high in Calcium (Ca) and Strontium (Sr). After comparing this group to the previously identified 2012 compositional groups, it is clear that this group is unique in its composition, indicating a different source. This group was equally distinct from the Angamuco clay samples. In hopes of identifying a geographic source based on the provenience postulate, we compared this group to the entirety of the MURR database using a Euclidian distance search. In this analysis, the most similar specimens were diverse indicating an unidentifiable origin for this group. However, the inability to identify a geographic source does not preclude the possibility that the source may be local Interestingly, of the 27 Group B specimens of which ware could be identified, 25 of them are bowl fragments (92.5%), while the remaining two have been identified as jar fragments.

Group C (n=41) is the smallest of the groups but is easily distinguishable by numerous elements. For example, this group is comparatively high in the elements of Rubidium (Rb), Thorium (Th), Ytterbium (Yb), Hafnium (Hf), Uranium (U), Terbium (Tb), Tantalum (Ta), Dysprosium (Dy), and Lutetium (Lu). Conversely, it is low in Calcium (Ca), and Scandium (Sc). Comparisons to the sample of Hirsman and Ferguson (2012) indicated strong similarities between this group and their "Group 1". In their study, the have argued that this group has an origin of the southeastern or southern portion of the Basin. We therefore propose a possible similar origin for artifacts in Group C of this sample (Fig. 10). Interestingly, of the identifiable wares, 100% have been identified as bowls (n=14).

Group D (n=43) is the most heterogonous of all groups when considering individual elements. In aggregate through PCA and discriminant functions, however, the group is rather tightly constructed and distinct. In general, it is higher in Cobalt (Co) and Vanadium (V). It is also high in Iron (Fe), Scandium (Sc), and Tin (Ti), however, levels overlap with Group A. On the other hand, specimens are not significantly low in any individual element compared to other groups, although they trend a bit lower in Sodium (Na). When compared to the raw clay samples, this group appears to be of local origin due to the overlap of samples with this compositional group as demonstrated above. Also, similar to Group A, this group is generally evenly split between bowls and jars (n=6 and 7 respectively).

Finally, the unassigned specimens (n=18) were left unassigned due to either being significantly different from all four chemical groups or being chemically consistent with more than one group. In some occasions, specimens were left unassigned to due to conflicting likelihoods based on the different analyses performed. There is little similarity between the unassigned specimens and they likely originate from various source locations.

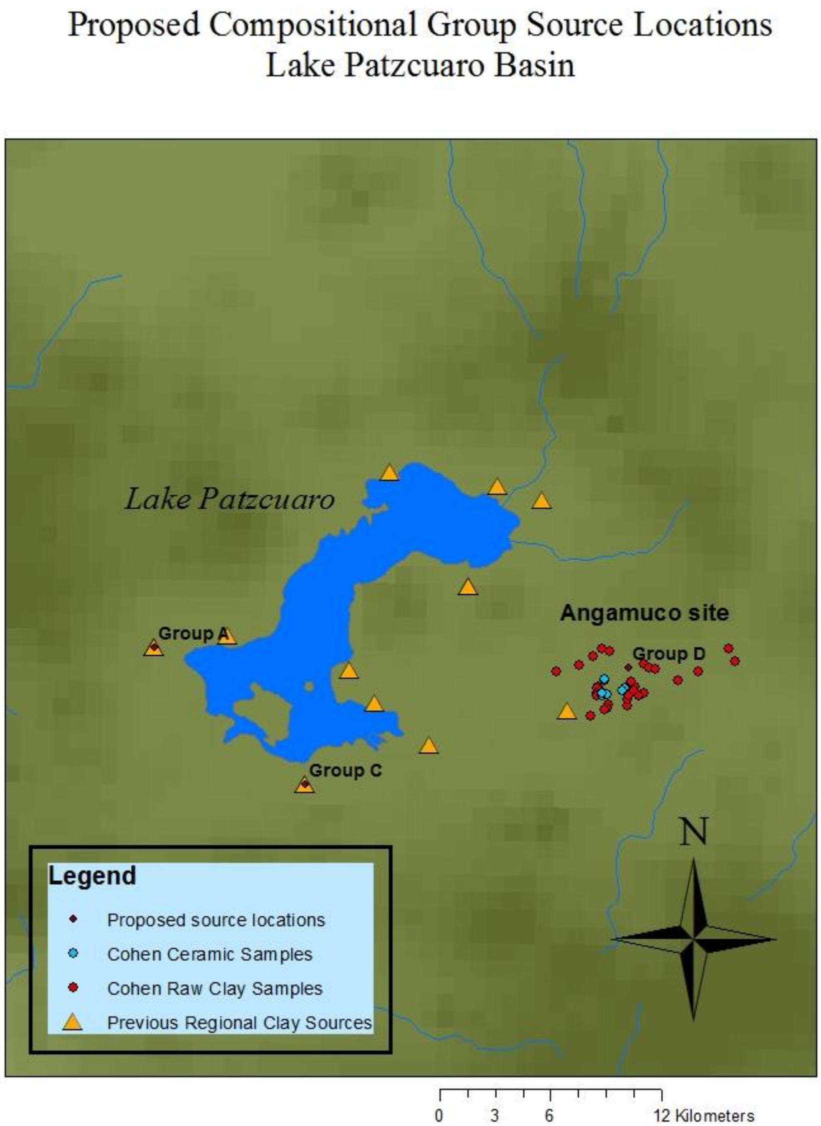

Fig 10. Proposed geographical source locations for Groups A, C, and D.

CONCLUSIONS

The above discussions regarding NAA of Angamuco ceramics has utilized multiple types of analysis to not only define compositional groups within the sample, but to attempt to identify geographically the source location. We feel that we were successful in these goals. However, identify source location can be a complicated matter. The locations proposed here will require further analysis to confirm.

In this study, we first used Principal Component analysis to identify the compositional structure of the sample. Next we used the PC loadings in combination with various elemental biplots to separate the sample into four clear mutually exclusive source groups; which were then confirmed through Mahalanobis distance calculations.

To get at the potential locations of origin, we have employed various methods. We first compared this sample to previous samples and data from Hirshman and Ferguson (2012). We then confirmed the association between their groups and the ones proposed here through Mahalanobis distance calculations. We also compared the ceramic samples here to the submitted raw clay samples, which have allowed us to identify a potential location of a third compositional group (Group D). Finally, in an attempt to identify potential sources for the fourth group (Group B), we compared the included specimens to the entirety of the MURR database in a Euclidian distance search. This analysis resulted in a wide array of similar specimens chemically, indicating that no clear point of origin can be concluded for this group.

It is clear that we have four distinct compositional groups here. The sampling strategy precludes a better understanding of specific descriptive and contextual variables as to how they relate to source groups. However, there does appear to be some correlation between ware type (e.g. Bowl vs. jar) and source group, indicated preferential usage for specific paste recipes for specific types of ware.

ACKNOWLEDGMENTS

We acknowledge Shilo Bender, Bianca Tomaszewski, and Maggie Gallagher for their role in preparing the samples for irradiation. This project was supported in part by NSF grant BCS-1415403 to the Archaeometry Laboratory at the University of Missouri Research Reactor. We ask that any publication of this material, please include the authors of this report and this grant number.

Appendix A.
Final compositional group assignment for Angamuco sample

MURR ID	Alternate ID	Material	Vessel Form	Context	Provenience	Compositional Group
LPB001	INAH001	pottery	Jar	DN0E8	5	Group A
LPB002	INAH002	pottery	Jar	DN0E8	7	Group B
LPB003	INAH003	pottery	Bowl	DN0E8	8	Group A
LPB004	INAH004	pottery	n/a	DN0E2	2	unassigned
LPB005	INAH005	pottery	n/a	DN0E2	5	unassigned
LPB006	INAH006	pottery	n/a	DN0E2	6	Group A
LPB007	INAH007	pottery	Bowl	DN0E2	9-12	Group B
LPB008	INAH008	pottery	n/a	DN0E2	10	Group B
LPB009	INAH009	pottery	n/a	DN16E10	1	Group A
LPB010	INAH010	pottery	Jar	DN16E10	2	Group A
LPB011	INAH011	pottery	Jar	DN16E10	2	Group D
LPB012	INAH012	pottery	Jar	DN16E10	2	Group A
LPB013	INAH013	pottery	Bowl	DN16E10	3	Group C
LPB014	INAH014	pottery	n/a	DN16E10	5	unassigned
LPB015	INAH015	pottery	Jar	CN12W5	2	unassigned
LPB016	INAH016	pottery	Bowl	CN12W5	4	Group D
LPB017	INAH017	pottery	n/a	CN12W5	6	Group A
LPB018	INAH018	pottery	Jar	CN12W5	5	Group D
LPB019	INAH019	pottery	Jar	CN12W5	6B5	Group A
LPB020	INAH020	pottery	n/a	CN12W4	1	Group B
LPB021	INAH021	pottery	Jar	CN12W4	3	Group D
LPB022	INAH022	pottery	Bowl	CN12W4	4	Group B
LPB023	INAH023	pottery	Jar	CN12W4	5	Group A
LPB024	INAH024	pottery	Jar	CN12W4	5	Group B
LPB025	INAH025	pottery	n/a	CN12W4	6	Group A
LPB026	INAH026	pottery	Bowl	CN12W4	6	Group A
LPB027	INAH027	pottery	Bowl	CN12W4	7	Group A
LPB028	INAH028	pottery	Jar	CN12W2	1	Group A
LPB029	INAH029	pottery	n/a	CN12W2	2	unassigned
LPB030	INAH030	pottery	n/a	CN12W2	3	Group A
LPB031	INAH031	pottery	n/a	CN12W2	3	Group A
LPB032	INAH032	pottery	Bowl	CN12W2	4	Group B
LPB033	INAH033	pottery	Bowl	CN12W2	4	Group B
LPB034	INAH034	pottery	n/a	CN12W2	5	Group B
LPB035	INAH035	pottery	n/a	CN12W2	5	Group A
LPB036	INAH036	pottery	Jar	CN12W2	6	Group D
LPB037	INAH037	pottery	n/a	CN12W2	8	Group D
LPB038	INAH038	pottery	Bowl	CN12W2	8	Group B

LPB039	INAH039	pottery	Bowl	CN12E0	4	Group B
LPB040	INAH040	pottery	Bowl	CN12E0	4	Group A
LPB041	INAH041	pottery	Bowl	CN12E0	5	Group A
LPB042	INAH042	pottery	Bowl	CN12E0	5	Group A
LPB043	INAH043	pottery	Bowl	CN12E0	7	Group B
LPB044	INAH044	pottery	Bowl	CN12E0	9	Group C
LPB045	INAH045	pottery	Bowl	CN12E2	3	Group A
LPB046	INAH046	pottery	Bowl	CN12E2	3	unassigned
LPB047	INAH047	pottery	n/a	CN12E2	4	Group A
LPB048	INAH048	pottery	Bowl	CN12E2	5	Group A
LPB049	INAH049	pottery	Bowl	CN12E2	5	Group B
LPB050	INAH050	pottery	Bowl	CN12E2	7	unassigned
LPB051	INAH051	pottery	n/a	CN12E4	2	Group A
LPB052	INAH052	pottery	Bowl	CN12E4	2	Group A
LPB053	INAH053	pottery	n/a	CN12E4	3	Group A
LPB054	INAH054	pottery	n/a	CN12E4	5	Group A
LPB055	INAH055	pottery	n/a	CN12E4	10	unassigned
LPB056	INAH056	pottery	n/a	CN12E6	3	Group A
LPB057	INAH057	pottery	Bowl	CN12E6	4	Group B
LPB058	INAH058	pottery	n/a	CN12E6	6	Group A
LPB059	INAH059	pottery	n/a	CN12E6	7	Group A
LPB060	INAH060	pottery	n/a	CN10E4	2	unassigned
LPB061	INAH061	pottery	n/a	CN10E4	3	unassigned
LPB062	INAH062	pottery	n/a	CN10E4	6	Group A
LPB063	INAH063	pottery	Bowl	CN10E6	2	Group B
LPB064	INAH064	pottery	n/a	CN10E6	3	Group D
LPB065	INAH065	pottery	Jar	CN12E14	1	Group A
LPB066	INAH066	pottery	n/a	CN12E14	2	unassigned
LPB067	INAH067	pottery	n/a	CN12E14	3	Group D
LPB068	INAH068	pottery	n/a	CN12E14	3	Group B
LPB069	INAH069	pottery	n/a	CN12E14	3	Group D
LPB070	INAH070	pottery	n/a	CN12E14	4	Group B
LPB071	INAH071	pottery	n/a	CN12E14	5	Group B
LPB072	INAH072	pottery	Bowl	CN12E14	7	Group B
LPB073	INAH073	pottery	n/a	CN12E14	8	Group B
LPB074	INAH074	pottery	n/a	CN10E20	3	Group A
LPB075	INAH075	pottery	n/a	CN10E20	4	Group C
LPB076	INAH076	pottery	Bowl	CN10E22	4	Group B
LPB077	INAH077	pottery	n/a	CN14E16	1	Group A
LPB078	INAH078	pottery	Brasero	CN14E16	2	Group D
LPB079	INAH079	pottery	Bowl	CN14E16	2	Group A
LPB080	INAH080	pottery	Jar	CN14E16	2	unassigned
LPB081	INAH081	pottery	Brasero	CN14E16	3	unassigned

LPB082	INAH082	pottery	n/a	CN14E16	3	Group A
LPB083	INAH083	pottery	n/a	CN14E16	3	Group A
LPB084	INAH084	pottery	n/a	CN14E16	3	unassigned
LPB085	INAH085	pottery	Jar	CN14E16	4	Group A
LPB086	INAH086	pottery	Bowl	CN14E16	4	Group B
LPB087	INAH087	pottery	n/a	CN14E16	5	Group B
LPB088	INAH088	pottery	n/a	CN14E16	5	Group B
LPB089	INAH089	pottery	n/a	CN14E16	6	Group A
LPB090	INAH090	pottery	n/a	CN14E16	7	Group C
LPB091	INAH091	pottery	Brasero	CN14E16	7	Group A
LPB092	INAH092	pottery	n/a	CN14E16	8	Group D
LPB093	INAH093	pottery	Jar	CN14E14	3	unassigned
LPB094	INAH094	pottery	n/a	CN14E14	3	Group A
LPB095	INAH095	pottery	n/a	CN14E14	3	Group D
LPB096	INAH096	pottery	n/a	CN14E14	4	Group A
LPB097	INAH097	pottery	Bowl	CN14E14	5	Group B
LPB098	INAH098	pottery	n/a	CN14E14	5	Group B
LPB099	INAH099	pottery	n/a	CN14E14	6	Group B
LPB100	INAH100	pottery	n/a	CN14E14	8	unassigned
LPB101	INAH101	pottery	n/a	CN14E14	8	Group B
LPB102	INAH102	pottery	Jar	CN12E16	2	Group D
LPB103	INAH103	pottery	n/a	CN12E16	5	Group B
LPB104	INAH104	pottery	n/a	CN12E16	5	Group B
LPB105	INAH105	pottery	Bowl	CN12E16	6	unassigned
LPB106	INAH106	pottery	Bowl	CN12E16	7	unassigned
LPB107	INAH107	pottery	n/a	CN12E16	8	Group B
LPB108	INAH108	pottery	Bowl	CN12E16	8	unassigned
LPB109	INAH109	pottery	n/a	CN12E16	10	unassigned
LPB110	INAH110	pottery	n/a	E1N0E0	0	Group C
LPB111	INAH111	pottery	n/a	E1N0E0	1	Group C
LPB112	INAH112	pottery	n/a	E1N0E0	1	Group C
LPB113	INAH113	pottery	n/a	E1N0E0	1	Group C
LPB114	INAH114	pottery	n/a	E1N0E0	3	Group A
LPB115	INAH115	pottery	n/a	E1N0E0	4	Group C
LPB116	INAH116	pottery	n/a	E1N0E0	5	Group C
LPB117	INAH117	pottery	Bowl	E2N0E0	2	Group C
LPB118	INAH118	pottery	Bowl	E2N0E0	2	Group C
LPB119	INAH119	pottery	n/a	E2N0E0	3	Group C
LPB120	INAH120	pottery	n/a	E2N0E0	4	Group C
LPB121	INAH121	pottery	n/a	E2N0E0	4	Group A
LPB122	INAH122	pottery	n/a	E2N0E0	5	Group C
LPB123	INAH123	pottery	n/a	E2N0E0	6	Group C
LPB124	INAH124	pottery	n/a	E2N0E0	7	unassigned

LPB125	INAH125	pottery	Bowl	E2N0E0	7	Group C
LPB126	INAH126	pottery	n/a	E2N0E0	7	Group D
LPB127	INAH127	pottery	n/a	E2N0E0	8	Group C
LPB128	INAH128	pottery	Bowl	E3N0E0	3	Group A
LPB129	INAH129	pottery	Jar	E3N0E0	3	Group A
LPB130	INAH130	pottery	Bowl	E3N0E0	4	Group C
LPB131	INAH131	pottery	Bowl	E3N0E0	4	Group C
LPB132	INAH132	pottery	Bowl	E3N0E0	5	Group C
LPB133	INAH133	pottery	n/a	E3N0E0	5	Group D
LPB134	INAH134	pottery	n/a	E4N0E0	2	Group B
LPB135	INAH135	pottery	Bowl	E4N0E0	3	Group B
LPB136	INAH136	pottery	n/a	E4N0E0	7	Group B
LPB137	INAH137	pottery	Bowl	E4N0E0	9	Group B
LPB138	INAH138	pottery	Bowl	E4N0E0	10	Group B
LPB139	INAH139	pottery	Bowl	E4N0E0	12	unassigned
LPB140	INAH140	pottery	n/a	E4N0E0	12	Group A
LPB141	INAH141	pottery	n/a	E4N0E0	12	Group A
LPB142	INAH142	pottery	n/a	F6S3E0	3F1	unassigned
LPB143	INAH143	pottery	Jar	F1S1E0	3F1	Group A
LPB144	INAH144	pottery	Jar	F1S1E1	3	Group A
LPB145	INAH145	pottery	Jar	F1S1E1	4	Group D
LPB146	INAH146	pottery	n/a	F1S1E1	4	Group D
LPB147	INAH147	pottery	Bowl	F1S1E1	5	Group D
LPB148	INAH148	pottery	n/a	F1S1E1	5	Group D
LPB149	INAH149	pottery	n/a	F1S1E1	6	Group A
LPB150	INAH150	pottery	n/a	F1S1E1	6	Group D
LPB151	INAH151	pottery	n/a	F1S1E1	9	Group A
LPB152	INAH152	pottery	n/a	F6S3E0	4	Group C
LPB153	INAH153	pottery	Bowl	F6S3E0	4	Group B
LPB154	INAH154	pottery	n/a	F6S3E0	7	Group D
LPB155	INAH155	pottery	n/a	F6S3E0	7	Group D
LPB156	INAH156	pottery	n/a	F6S3E0	8	Group B
LPB157	INAH157	pottery	n/a	F6S3E0	10	Group D
LPB158	INAH158	pottery	n/a	F6S3E0	10	Group A
LPB159	INAH159	pottery	n/a	F6S3E0	10	Group A
LPB160	INAH160	pottery	Bowl	F6S3E0	11	Group A
LPB161	INAH161	pottery	n/a	F6S3E0	11	Group A
LPB162	INAH162	pottery	n/a	F6S3E0	11	Group A
LPB163	INAH163	pottery	Jar	F6S3E0	11	Group A
LPB164	INAH164	pottery	n/a	F6S3E0	11	Group A
LPB165	INAH165	pottery	n/a	F6S3E0	12	Group D
LPB166	INAH166	pottery	n/a	F6S3E0	12	Group A
LPB167	INAH167	pottery	n/a	F6S3E0	12	Group A

LPB168	INAH168	pottery	n/a	F6S3E0	12	Group A
LPB169	INAH169	pottery	n/a	F6S3E0	12	Group D
LPB170	INAH170	pottery	n/a	F6S3E0	12	Group A
LPB171	INAH171	pottery	n/a	F6S3E0	12	Group A
LPB172	INAH172	pottery	n/a	F6S3E0	13	Group A
LPB173	INAH173	pottery	n/a	F6S3E0	13	Group A
LPB174	INAH174	pottery	n/a	F6S3E0	13	Group A
LPB175	INAH175	pottery	n/a	F6S3E0	13	Group A
LPB176	INAH176	pottery	Bowl	F6S3E0	14	Group B
LPB177	INAH177	pottery	Bowl	F6S3E0	15	Group A
LPB178	INAH178	pottery	Bowl	F6S3E0	15	unassigned
LPB179	INAH179	pottery	n/a	F6S3E0	15	Group A
LPB180	INAH180	pottery	n/a	F6S3E0	16	Group A
LPB181	INAH181	pottery	n/a	F6S3E0	16	Group A
LPB182	INAH182	pottery	n/a	F6S3E0	17	Group A
LPB183	INAH183	pottery	Bowl	F6S3E0	18	Group C
LPB184	INAH184	pottery	n/a	F6S3E0	18	Group A
LPB185	INAH185	pottery	n/a	F6S3E0	18	Group A
LPB186	INAH186	pottery	n/a	F6S3E0	19	Group D
LPB187	INAH187	pottery	n/a	F6S3E0	21	Group A
LPB188	INAH188	pottery	Bowl	F5N0E0	2	Group A
LPB189	INAH189	pottery	n/a	F5N0E0	5	Group A
LPB190	INAH190	pottery	n/a	F5N0E0	5	Group A
LPB191	INAH191	pottery	n/a	F5N0E0	6	Group A
LPB192	INAH192	pottery	n/a	F5N0E0	7	Group D
LPB193	INAH193	pottery	Grater	F4N0E0	1	Group A
LPB194	INAH194	pottery	n/a	G1N0E0	3	Group A
LPB195	INAH195	pottery	Bowl	G1N0E0	3	Group C
LPB196	INAH196	pottery	Bowl	G2N0E0	4	unassigned
LPB197	INAH197	pottery	Bowl	G2N0E0	4	Group B
LPB198	INAH198	pottery	Bowl	BN12E10	1	Group C
LPB199	INAH199	pottery	n/a	BN12E10	1	unassigned
LPB200	INAH200	pottery	n/a	BN12E10	2c3	unassigned
LPB201	649.4	pottery	Jar	BN12E6	5c4	Group A
LPB202	INAH202	pottery	n/a	BN12E10	2c3	Group A
LPB203	INAH203	pottery	Bowl	BN12E10	2c3	Group C
LPB204	INAH204	pottery	n/a	BN12E10	2c3	Group A
LPB205	629.1	pottery	n/a	BN12E6	3	Group A
LPB206	INAH206	pottery	Bowl	BN12E10	2c3	Group A
LPB207	INAH207	pottery	n/a	BN14E12	1c3	Group D
LPB208	INAH208	pottery	n/a	BN14E12	1c3	Group B
LPB209	INAH209	pottery	Bowl	BN14E12	2c3	Group C
LPB210	552.1	pottery	n/a	BN12E12	3	Group B

LPB211	INAH211	pottery	n/a	BN14E12	2c3	Group A
LPB212	INAH212	pottery	n/a	BN14E12	2c3	Group A
LPB213	INAH213	pottery	n/a	BN14E12	3c3	Group A
LPB214	INAH214	pottery	n/a	BN14E12	3c3	Group A
LPB215	INAH215	pottery	Bowl	BN14E12	4c3	Group B
LPB216	INAH216	pottery	Bowl	BN14E12	4c3	Group B
LPB217	INAH217	pottery	Bowl	BN14E12	4c3	unassigned
LPB218	INAH218	pottery	Bowl	BN14E12	4c3	Group B
LPB219	INAH219	pottery	n/a	BN14E12	4c3	Group C
LPB220	INAH220	pottery	n/a	BN14E12	4c3	unassigned
LPB221	546.1	pottery	n/a	BN12E12	2	Group A
LPB222	633.1	pottery	n/a	BN8E10	9	Group C
LPB223	656.4	pottery	n/a	BN12E6	6c4	Group A
LPB224	INAH224	pottery	n/a	BN8E10	7	Group B
LPB225	INAH225	pottery	n/a	BN8E10	7	unassigned
LPB226	INAH226	pottery	n/a	BN8E10	7	Group D
LPB227	INAH227	pottery	n/a	BN8E10	7	Group D
LPB228	INAH228	pottery	n/a	BN8E10	7	Group C
LPB229	INAH229	pottery	n/a	AN10E25	2	Group D
LPB230	INAH230	pottery	n/a	AN10E25	2	Group D
LPB231	INAH231	pottery	n/a	AN10E25	3	unassigned
LPB232	INAH232	pottery	Bowl	AN10E25	5	Group A
LPB233	INAH233	pottery	n/a	AN10E25	5	Group D
LPB234	INAH234	pottery	n/a	AN10E25	5	Group C
LPB235	INAH235	pottery	Bowl	AN10E25	6	Group B
LPB236	677.5	pottery	n/a	AN18E52	6	Group A
LPB237	INAH237	pottery	Bowl	AN10E26	3	Group D
LPB238	INAH238	pottery	n/a	AN10E26	3	unassigned
LPB239	677.5b	pottery	n/a	AN18E53	6	Group A
LPB240	686.8a	pottery	n/a	AN18E53	7	Group A
LPB241	INAH241	pottery	Bowl	AN8E26	5	Group D
LPB242	INAH242	pottery	n/a	AN8E26	5	unassigned
LPB243	734.1	pottery	n/a	AN18E53	9	Group A
LPB244	INAH244	pottery	n/a	AN8E38	1	Group A
LPB245	495.9-92	pottery	n/a	AN8E38	1	Group C
LPB246	INAH246	pottery	n/a	AN8E38	1	Group D
LPB247	INAH247	pottery	n/a	AN8E38	1	Group B
LPB248	INAH248	pottery	n/a	AN8E38	1	Group C
LPB249	INAH249	pottery	n/a	AN8E38	3-EAST	Group D
LPB250	INAH250	pottery	n/a	AN8E38	3-EAST	Group C
LPB251	INAH251	pottery	n/a	AN8E38	3-WEST	Group B
LPB252	INAH252	pottery	n/a	AN8E38	3-WEST	Group A
LPB253	INAH253	pottery	n/a	AN8E38	3-WEST	Group D

LPB254	INAH254	pottery	Bowl	AN8E38	4-EAST	Group C
LPB255	INAH255	pottery	n/a	AN8E38	4-EAST	Group A
LPB256	INAH256	pottery	n/a	AN8E38	4-EAST	Group A
LPB257	INAH257	pottery	n/a	AN8E38	4-EAST	Group A
LPB258	INAH258	pottery	n/a	AN8E38	4-EAST	Group B
LPB259	INAH259	pottery	n/a	AN8E38	4-WEST	Group A
LPB260	INAH260	pottery	n/a	AN8E38	4-WEST	Group A
LPB261	INAH261	pottery	n/a	AN8E38	4-WEST	Group A
LPB262	653.6	pottery	n/a	AN8E38	5-EAST	unassigned
LPB263	INAH263	pottery	Grater	AN8E38	5-EAST	Group D
LPB264	INAH264	pottery	n/a	AN8E38	5-EAST	Group A
LPB265	INAH265	pottery	n/a	AN8E38	6	Group A
LPB266	INAH266	pottery	Bowl	AN2E28	1	Group B
LPB267	INAH267	pottery	n/a	AN2E28	1	Group A
LPB268	INAH268	pottery	Grater	AN2E28	1	unassigned
LPB269	INAH269	pottery	n/a	AN2E28	2	unassigned
LPB270	INAH270	pottery	n/a	AN2E28	2	Group A
LPB271	INAH271	pottery	n/a	AN2E28	2	unassigned
LPB272	INAH272	pottery	n/a	AN2E28	2	Group A
LPB273	INAH273	pottery	Bowl	AN2E28	2	Group D
LPB274	486.1	pottery	n/a	AN2E28	3	Group C
LPB275	INAH275	pottery	n/a	AN2E28	3	unassigned
LPB276	486.1a	pottery	n/a	AN2E28	3	Group A
LPB277	INAH277	pottery	Bowl	AN2E28	3	Group D
LPB278	INAH278	pottery	n/a	AN2E28	3	Group C
LPB279	INAH279	pottery	n/a	AN2E28	4	Group A
LPB280	INAH280	pottery	n/a	AN2E28	4	Group C
LPB281	495.9-221	pottery	n/a	AN2E28	4	Group A
LPB282	INAH282	pottery	n/a	AN2E28	4	unassigned
LPB283	INAH283	pottery	n/a	AN2E28	4	unassigned
LPB284	INAH284	pottery	n/a	AN2E28	4	Group A
LPB285	INAH285	pottery	n/a	AN2E28	4	Group C
LPB286	INAH286	pottery	n/a	AN2E28	5	Group A
LPB287	INAH287	pottery	n/a	AN2E28	5	Group A
LPB288	531.2-1	pottery	n/a	AN2E28	7	unassigned
LPB289	INAH289	pottery	n/a	AN4E36	2	unassigned
LPB290	INAH290	pottery	n/a	AN4E36	2	Group A
LPB291	INAH291	pottery	n/a	AN4E36	3	Group B
LPB292	INAH292	pottery	n/a	AN4E36	3	Group A
LPB293	INAH293	pottery	n/a	AN4E36	3	Group C
LPB294	INAH294	pottery	n/a	AN4E36	4	Group A
LPB295	INAH295	pottery	n/a	AN4E36	4	Group C
LPB296	INAH296	pottery	n/a	AN4E36	4	Group D

LPB297	INAH297	pottery	Jar	DN0E2	2	Group D
LPB298	INAH298	pottery	n/a	DN0E2	3	Group A
LPB299	INAH299	pottery	n/a	DN0E2	3	Group A
LPB300	INAH300	pottery	n/a	DN0E2	4	Group A
LPB301	JAG1	clay	clay	ElJaguey	1m bs	Group D*
LPB302	ANG1	clay	clay	Angamuco1	1m bs	Unassigned*
LPB303	ANG2	clay	clay	Angamuco2	1m bs	Unassigned*
LPB304	ANG3	clay	clay	Angamuco3	1m bs	Unassigned*
LPB305	ANG4	clay	clay	Angamuco4	1.5m bs	Unassigned*
LPB306	ANG5	clay	clay	Angamuco5	0.75m bs	Group D*
LPB307	ANG6A	clay	clay	Angamuco6A	2m bs	Unassigned*
LPB308	ANG6B	clay	clay	Angamuco6B	1.25m bs	Unassigned*
LPB309	ANG7	clay	clay	Angamuco7	1m bs	Group D*
LPB310	ANG8	clay	clay	Angamuco8	1m bs	Unassigned*
LPB311	ANG9	clay	clay	Angamuco9	1.5m bs	Group D*
LPB312	ANG10	clay	clay	Angamuco10	0.3m bs	Unassigned*
LPB313	ANG11	clay	clay	Angamuco11	0.5m bs	Group D*
LPB314	ANG12	clay	clay	Angamuco12	3m bs	Unassigned*
LPB315	ANG13	clay	clay	Angamuco13	surface	Unassigned*
LPB316	CHA1	clay	clay	Chapultepec	0.5m bs	Group D*
LPB317	COR1	clay	clay	Corrales	0.1 m bs	Unassigned*
LPB318	ANG16	clay	clay	Angamuco16	<0.3m bs	Unassigned*
LPB319	ANG17	clay	clay	Angamuco17	0.2m bs	Group D*
LPB320	ANG18	clay	clay	Angamuco18	0.2m bs	Unassigned*
LPB321	ANG19	clay	clay	Angamuco19	1m bs	Group D*
LPB322	CC1	clay	clay	CerroColorado1	2m bs	Unassigned*
LPB323	CC2	clay	clay	CerroColorado2	<0.3m bs	Unassigned*
LPB324	FONT1	clay	clay	Fontezuelas1	1m bs	Unassigned*
LPB325	FONT2	clay	clay	Fontezuelas2	0.3m bs	Unassigned*
LPB326	LP1	clay	clay	LasPilas1	0.75m bs	Unassigned*
LPB327	LP2A	clay	clay	LasPilas2A	0.3m bs	Unassigned*
LPB328	LP2B	clay	clay	LasPilas2B	0.1m bs	Unassigned*
LPB329	ANG20	clay	clay	DN0E2	0.75m bs	Unassigned*
LPB330	ANG21	clay	clay	CN12W2	0.85m bs	Unassigned*

Appendix B

Mahalonobis results confirming group membership

Membership probabilities (%) for samples in group: Group_A

Probabilities calculated after removing each sample from group.

ANID	Group_A	Group_B	Group_C	Group_D	Best Group
LPB001	46.591	3.442	0.000	0.298	Group_A
LPB003	88.834	7.550	0.000	0.088	Group_A
LPB006	71.352	3.260	0.000	0.023	Group_A
LPB009	44.322	16.089	0.000	0.001	Group_A
LPB010	37.889	0.862	0.003	7.033	Group_A
LPB012	56.933	1.065	0.000	2.435	Group_A
LPB017	76.368	14.841	0.000	0.003	Group_A
LPB019	92.402	2.690	0.000	0.269	Group_A
LPB023	93.740	4.715	0.000	0.027	Group_A
LPB025	44.528	1.810	0.000	0.004	Group_A
LPB026	11.014	2.587	0.025	0.343	Group_A
LPB027	17.120	0.386	0.000	7.583	Group_A
LPB028	6.434	0.178	0.000	0.056	Group_A
LPB030	46.461	2.308	0.000	0.003	Group_A
LPB031	34.902	3.213	0.000	0.071	Group_A
LPB035	70.574	15.679	0.000	0.004	Group_A
LPB040	0.201	0.073	0.001	13.804	Group_D
LPB041	84.754	2.480	0.000	0.130	Group_A
LPB042	70.992	6.493	0.000	0.002	Group_A
LPB045	55.964	13.232	0.000	0.002	Group_A
LPB047	91.358	4.345	0.000	0.040	Group_A
LPB048	96.359	10.068	0.000	0.015	Group_A
LPB051	39.037	9.847	0.003	0.085	Group_A
LPB052	60.380	3.223	0.000	0.227	Group_A
LPB053	39.673	4.540	0.000	0.002	Group_A
LPB054	10.986	8.127	0.000	0.000	Group_A
LPB056	64.773	2.728	0.000	0.006	Group_A
LPB058	86.957	4.866	0.000	0.019	Group_A
LPB059	76.526	15.573	0.000	0.009	Group_A
LPB062	54.249	15.813	0.002	0.019	Group_A
LPB065	73.751	3.915	0.000	0.276	Group_A
LPB074	76.233	3.211	0.000	0.053	Group_A
LPB077	33.511	0.776	0.000	5.167	Group_A
LPB079	71.617	3.244	0.002	1.074	Group_A
LPB082	49.147	1.156	0.000	0.230	Group_A
LPB083	64.615	5.745	0.000	0.096	Group_A
LPB085	86.417	5.518	0.000	0.150	Group_A

LPB089	39.076	17.300	0.001	0.002	Group_A
LPB091	42.966	13.952	0.002	0.008	Group_A
LPB094	78.287	10.955	0.001	0.049	Group_A
LPB096	3.811	0.717	0.000	0.000	Group_A
LPB114	3.812	0.124	0.000	0.002	Group_A
LPB121	22.449	0.505	0.002	14.240	Group_A
LPB128	3.166	5.573	0.023	0.031	Group_B
LPB129	36.983	6.882	0.004	0.047	Group_A
LPB140	62.356	2.469	0.000	0.182	Group_A
LPB141	95.714	3.221	0.000	0.456	Group_A
LPB143	11.006	0.820	0.000	0.005	Group_A
LPB144	11.385	2.207	0.000	0.051	Group_A
LPB149	14.290	35.611	0.000	0.000	Group_B
LPB151	81.581	2.855	0.000	0.090	Group_A
LPB158	90.284	4.754	0.000	0.042	Group_A
LPB159	10.703	6.220	0.001	0.004	Group_A
LPB160	81.976	5.741	0.000	0.013	Group_A
LPB161	49.694	2.798	0.000	0.002	Group_A
LPB162	55.235	2.272	0.000	0.009	Group_A
LPB163	43.214	1.073	0.000	0.015	Group_A
LPB164	32.538	12.910	0.000	0.001	Group_A
LPB166	8.102	0.184	0.000	17.718	Group_D
LPB167	25.831	0.386	0.001	15.510	Group_A
LPB168	60.803	1.062	0.000	2.197	Group_A
LPB170	98.689	4.770	0.000	0.123	Group_A
LPB171	51.916	6.037	0.004	0.256	Group_A
LPB172	37.449	20.458	0.000	0.000	Group_A
LPB173	70.989	2.305	0.000	0.412	Group_A
LPB174	92.709	4.194	0.000	0.088	Group_A
LPB175	54.512	1.531	0.000	0.264	Group_A
LPB177	34.233	2.033	0.000	0.001	Group_A
LPB179	73.696	10.661	0.001	0.037	Group_A
LPB180	41.448	6.174	0.000	0.001	Group_A
LPB181	88.290	2.896	0.000	0.131	Group_A
LPB182	27.825	0.473	0.001	12.796	Group_A
LPB184	41.191	3.120	0.000	0.067	Group_A
LPB185	40.923	1.184	0.002	3.419	Group_A
LPB187	47.440	0.801	0.001	6.967	Group_A
LPB188	70.714	1.385	0.000	0.683	Group_A
LPB189	60.793	13.549	0.001	0.031	Group_A
LPB190	5.083	0.162	0.028	23.232	Group_D
LPB191	46.997	2.582	0.000	0.019	Group_A
LPB193	88.732	5.643	0.001	0.183	Group_A
LPB194	95.294	8.113	0.000	0.032	Group_A
LPB201	7.846	0.577	0.000	0.738	Group_A

LPB202	85.760	6.352	0.000	0.006	Group_A
LPB204	84.769	14.777	0.000	0.006	Group_A
LPB205	1.143	26.145	0.000	0.000	Group_B
LPB206	69.971	9.968	0.000	0.012	Group_A
LPB211	95.946	5.506	0.000	0.023	Group_A
LPB212	66.836	2.261	0.002	2.055	Group_A
LPB213	0.743	15.233	0.000	0.000	Group_B
LPB214	57.957	1.869	0.003	2.748	Group_A
LPB221	29.710	0.646	0.000	3.680	Group_A
LPB223	15.313	42.156	0.001	0.000	Group_B
LPB232	78.904	11.361	0.001	0.027	Group_A
LPB236	24.738	9.150	0.000	0.002	Group_A
LPB239	72.024	5.861	0.000	0.003	Group_A
LPB240	92.598	10.974	0.000	0.018	Group_A
LPB243	86.601	10.243	0.001	0.057	Group_A
LPB244	65.253	2.112	0.000	0.014	Group_A
LPB252	89.284	8.372	0.000	0.039	Group_A
LPB255	91.016	12.982	0.000	0.013	Group_A
LPB256	5.111	18.917	0.000	0.000	Group_B
LPB257	16.921	0.592	0.002	9.986	Group_A
LPB259	69.757	3.546	0.002	0.499	Group_A
LPB260	6.020	0.360	0.000	0.437	Group_A
LPB261	26.408	0.915	0.001	5.915	Group_A
LPB264	48.803	1.033	0.000	0.052	Group_A
LPB265	39.324	2.925	0.000	0.002	Group_A
LPB267	81.314	15.945	0.000	0.008	Group_A
LPB270	88.693	8.304	0.000	0.005	Group_A
LPB272	17.169	0.438	0.000	0.189	Group_A
LPB276	22.974	1.249	0.014	3.163	Group_A
LPB279	55.978	1.475	0.000	0.228	Group_A
LPB281	7.240	4.275	0.003	0.280	Group_A
LPB284	13.730	0.879	0.000	0.512	Group_A
LPB286	45.637	0.868	0.001	6.636	Group_A
LPB287	83.612	8.095	0.000	0.038	Group_A
LPB290	30.206	4.709	0.001	0.244	Group_A
LPB292	4.583	0.145	0.000	0.006	Group_A
LPB294	78.072	2.195	0.001	1.805	Group_A
LPB298	30.052	1.128	0.000	1.730	Group_A
LPB299	55.683	1.300	0.000	0.041	Group_A
LPB300	49.550	8.633	0.000	0.001	Group_A

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Membership probabilities (%) for samples in group: Group_B
Probabilities calculated after removing each sample from group.

ANID	Group_A	Group_B	Group_C	Group_D	Best Group
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LPB002	18.170	31.602	0.001	0.001	Group_B
LPB007	0.000	45.456	0.000	0.000	Group_B
LPB008	0.021	18.514	0.000	0.000	Group_B
LPB020	0.435	59.169	0.000	0.000	Group_B
LPB022	0.000	50.364	0.000	0.000	Group_B
LPB024	0.000	99.396	0.000	0.000	Group_B
LPB032	0.108	80.862	0.000	0.000	Group_B
LPB033	0.000	13.646	0.000	0.000	Group_B
LPB034	0.000	8.238	0.000	0.000	Group_B
LPB038	0.000	49.792	0.000	0.000	Group_B
LPB039	0.000	71.752	0.000	0.000	Group_B
LPB043	0.008	46.511	0.000	0.000	Group_B
LPB049	16.516	28.853	0.000	0.000	Group_B
LPB057	0.000	61.900	0.000	0.000	Group_B
LPB063	0.000	97.515	0.000	0.000	Group_B
LPB068	3.331	10.074	0.010	0.005	Group_B
LPB070	0.017	65.665	0.000	0.000	Group_B
LPB071	2.650	15.628	0.002	0.005	Group_B
LPB072	0.000	38.861	0.000	0.000	Group_B
LPB073	0.000	59.474	0.000	0.000	Group_B
LPB076	0.000	64.315	0.000	0.000	Group_B
LPB086	0.582	52.308	0.000	0.000	Group_B
LPB087	0.027	94.185	0.000	0.000	Group_B
LPB088	15.205	25.172	0.001	0.000	Group_B
LPB097	1.621	28.783	0.000	0.000	Group_B
LPB098	0.000	48.086	0.000	0.000	Group_B
LPB099	0.000	40.939	0.000	0.000	Group_B
LPB101	8.373	28.178	0.000	0.000	Group_B
LPB103	0.000	28.953	0.000	0.000	Group_B
LPB104	0.000	0.760	0.000	0.000	Group_B
LPB107	0.000	6.884	0.000	0.000	Group_B
LPB134	0.000	31.863	0.000	0.000	Group_B
LPB135	0.000	70.543	0.000	0.000	Group_B
LPB136	0.000	85.518	0.000	0.000	Group_B
LPB137	0.000	26.309	0.000	0.000	Group_B
LPB138	0.031	15.834	0.001	0.000	Group_B
LPB153	0.000	66.634	0.000	0.000	Group_B
LPB156	0.000	30.411	0.000	0.000	Group_B
LPB176	0.009	38.777	0.000	0.000	Group_B
LPB197	0.000	93.746	0.000	0.000	Group_B
LPB208	0.001	27.543	0.000	0.000	Group_B

LPB210	0.000	13.548	0.000	0.000	Group_B
LPB215	1.319	58.238	0.000	0.000	Group_B
LPB216	0.000	68.330	0.000	0.000	Group_B
LPB218	0.000	20.292	0.000	0.000	Group_B
LPB224	0.000	75.787	0.000	0.000	Group_B
LPB235	0.000	55.759	0.000	0.000	Group_B
LPB247	0.000	72.635	0.000	0.000	Group_B
LPB251	0.000	79.230	0.000	0.000	Group_B
LPB258	0.000	38.891	0.000	0.000	Group_B
LPB266	0.000	68.295	0.000	0.000	Group_B
LPB291	0.017	70.015	0.001	0.000	Group_B

Membership probabilities (%) for samples in group: Group_C
Probabilities calculated after removing each sample from group.

ANID	Group_A	Group_B	Group_C	Group_D	Best Group
LPB013	0.000	0.000	77.397	0.002	Group_C
LPB044	0.000	0.000	82.918	0.000	Group_C
LPB075	0.000	0.000	30.333	0.000	Group_C
LPB090	0.000	0.000	1.686	0.001	Group_C
LPB110	0.000	0.000	97.186	0.000	Group_C
LPB111	0.000	0.000	9.155	0.000	Group_C
LPB112	0.000	0.000	4.885	0.000	Group_C
LPB113	0.000	0.000	85.017	0.000	Group_C
LPB115	0.000	0.000	68.970	0.000	Group_C
LPB116	0.000	0.000	5.191	0.000	Group_C
LPB117	0.000	0.000	32.690	0.004	Group_C
LPB118	0.000	0.000	39.242	0.000	Group_C
LPB119	0.000	0.000	24.533	0.000	Group_C
LPB120	0.000	0.000	54.312	0.000	Group_C
LPB122	0.000	0.000	49.611	0.000	Group_C
LPB123	0.000	0.000	91.054	0.000	Group_C
LPB125	0.000	0.000	84.045	0.000	Group_C
LPB127	0.000	0.000	84.627	0.001	Group_C
LPB130	0.000	0.000	81.755	0.001	Group_C
LPB131	0.000	0.000	44.567	0.014	Group_C
LPB132	0.000	0.000	54.750	0.000	Group_C
LPB152	0.000	0.000	44.010	0.000	Group_C
LPB183	0.000	0.000	25.000	0.000	Group_C
LPB195	0.000	0.000	55.200	0.000	Group_C
LPB198	0.000	0.000	87.576	0.000	Group_C
LPB203	0.000	0.000	26.998	0.000	Group_C
LPB209	0.000	0.000	70.560	0.000	Group_C
LPB219	0.000	0.000	85.285	0.000	Group_C

LPB222	0.000	0.000	23.996	0.000	Group_C
LPB228	0.000	0.000	22.718	0.089	Group_C
LPB234	0.000	0.000	85.776	0.000	Group_C
LPB245	0.000	0.000	48.499	0.000	Group_C
LPB248	0.000	0.000	10.648	0.000	Group_C
LPB250	0.000	0.000	89.261	0.000	Group_C
LPB254	0.000	0.000	25.760	0.000	Group_C
LPB274	0.000	0.000	12.323	0.000	Group_C
LPB278	0.000	0.000	39.491	0.000	Group_C
LPB280	0.000	0.000	35.826	0.000	Group_C
LPB285	0.000	0.000	26.360	0.000	Group_C
LPB293	0.000	0.000	42.165	0.000	Group_C
LPB295	0.000	0.000	55.251	0.000	Group_C

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Membership probabilities (%) for samples in group: Group_D
Probabilities calculated after removing each sample from group.

ANID	Group_A	Group_B	Group_C	Group_D	Best Group
LPB011	2.295	0.043	0.004	58.811	Group_D
LPB016	0.011	0.001	0.144	90.044	Group_D
LPB018	0.000	0.000	0.128	38.084	Group_D
LPB021	0.000	0.000	0.206	49.849	Group_D
LPB036	0.000	0.000	0.255	71.008	Group_D
LPB037	0.270	0.006	0.063	95.461	Group_D
LPB064	0.011	0.001	0.334	84.954	Group_D
LPB067	0.373	0.066	0.016	19.668	Group_D
LPB069	0.001	0.000	0.033	62.449	Group_D
LPB078	0.016	0.003	0.047	70.271	Group_D
LPB092	0.665	0.022	0.002	43.146	Group_D
LPB095	0.035	0.001	0.135	97.217	Group_D
LPB102	0.000	0.000	4.129	6.501	Group_D
LPB126	0.212	0.004	0.007	77.792	Group_D
LPB133	0.018	0.001	0.072	76.404	Group_D
LPB145	0.000	0.000	0.017	31.859	Group_D
LPB146	0.000	0.000	1.087	54.646	Group_D
LPB147	0.000	0.000	1.122	28.372	Group_D
LPB148	0.657	0.019	0.088	63.701	Group_D
LPB150	0.000	0.000	0.165	69.794	Group_D
LPB154	0.000	0.000	0.160	38.497	Group_D
LPB155	0.000	0.000	0.001	0.211	Group_D
LPB157	0.065	0.003	0.227	80.891	Group_D
LPB165	5.077	0.071	0.001	37.784	Group_D
LPB169	0.060	0.012	0.000	8.488	Group_D
LPB186	0.015	0.001	0.539	61.524	Group_D

LPB192	0.000	0.000	0.240	18.356	Group_D
LPB207	0.666	0.012	0.025	87.665	Group_D
LPB226	0.038	0.004	0.001	24.163	Group_D
LPB227	1.441	0.054	0.024	48.294	Group_D
LPB229	0.000	0.000	0.044	29.146	Group_D
LPB230	0.003	0.000	0.112	83.915	Group_D
LPB233	0.006	0.001	0.000	1.558	Group_D
LPB237	0.000	0.000	0.025	1.665	Group_D
LPB241	0.000	0.000	0.173	59.675	Group_D
LPB246	0.346	0.017	0.057	65.550	Group_D
LPB249	0.837	0.016	0.002	54.017	Group_D
LPB253	0.978	0.053	0.000	11.249	Group_D
LPB263	0.031	0.002	0.528	41.339	Group_D
LPB273	0.001	0.000	0.024	58.275	Group_D
LPB277	1.014	0.031	0.059	56.786	Group_D
LPB296	0.008	0.000	0.219	96.854	Group_D
LPB297	0.014	0.001	0.074	88.387	Group_D

Appendix C
Mahalanobis distance calculations comparing Angamuco groups A and C with previous Hirshman and Ferguson (2012) groups.

Membership probabilities (%) for samples in group: Group_A
Probabilities calculated by projecting unknowns against reference groups.

ANID	Main Group	Group 1	Best Group
LPB001	85.281	0.083	Main Group
LPB003	96.925	0.036	Main Group
LPB006	71.750	0.010	Main Group
LPB009	42.450	0.293	Main Group
LPB010	29.236	0.515	Main Group
LPB012	93.415	0.019	Main Group
LPB017	78.522	0.034	Main Group
LPB019	95.011	0.042	Main Group
LPB023	72.821	0.006	Main Group
LPB025	75.781	0.056	Main Group
LPB026	23.325	0.628	Main Group
LPB027	90.051	0.012	Main Group
LPB028	65.027	0.006	Main Group
LPB030	53.630	0.004	Main Group
LPB031	94.846	0.034	Main Group
LPB035	56.885	0.157	Main Group
LPB040	73.466	0.094	Main Group
LPB041	87.496	0.038	Main Group
LPB042	79.205	0.020	Main Group
LPB045	77.496	0.064	Main Group
LPB047	96.997	0.018	Main Group
LPB048	81.759	0.054	Main Group
LPB051	86.656	0.079	Main Group
LPB052	92.605	0.051	Main Group
LPB053	56.386	0.025	Main Group
LPB054	87.468	0.042	Main Group
LPB056	23.491	0.002	Main Group
LPB058	78.098	0.094	Main Group
LPB059	73.825	0.078	Main Group
LPB062	9.792	1.442	Main Group
LPB065	36.167	0.002	Main Group
LPB074	83.095	0.015	Main Group
LPB077	93.449	0.023	Main Group
LPB079	94.350	0.027	Main Group
LPB082	50.183	0.003	Main Group
LPB083	89.227	0.012	Main Group

LPB085	32.042	0.001	Main Group
LPB089	91.671	0.015	Main Group
LPB091	82.746	0.083	Main Group
LPB094	85.753	0.076	Main Group
LPB096	26.998	0.001	Main Group
LPB114	24.091	0.001	Main Group
LPB121	68.583	0.086	Main Group
LPB128	26.086	0.570	Main Group
LPB129	8.223	1.211	Main Group
LPB140	67.952	0.106	Main Group
LPB141	67.956	0.143	Main Group
LPB143	43.972	0.286	Main Group
LPB144	9.186	1.516	Main Group
LPB149	45.668	0.031	Main Group
LPB151	84.255	0.067	Main Group
LPB158	66.304	0.102	Main Group
LPB159	28.656	0.064	Main Group
LPB160	63.242	0.012	Main Group
LPB161	54.173	0.095	Main Group
LPB162	56.386	0.119	Main Group
LPB163	57.683	0.195	Main Group
LPB164	20.716	0.261	Main Group
LPB166	30.023	0.508	Main Group
LPB167	97.591	0.032	Main Group
LPB168	42.296	0.221	Main Group
LPB170	80.783	0.086	Main Group
LPB171	96.444	0.017	Main Group
LPB172	33.239	0.065	Main Group
LPB173	67.398	0.101	Main Group
LPB174	54.044	0.212	Main Group
LPB175	65.962	0.057	Main Group
LPB177	40.562	0.017	Main Group
LPB179	11.676	1.104	Main Group
LPB180	44.474	0.189	Main Group
LPB181	95.077	0.032	Main Group
LPB182	71.237	0.096	Main Group
LPB184	40.512	0.120	Main Group
LPB185	86.479	0.080	Main Group
LPB187	81.388	0.093	Main Group
LPB188	93.721	0.017	Main Group
LPB189	30.954	0.423	Main Group
LPB190	32.649	0.432	Main Group
LPB191	55.931	0.021	Main Group
LPB193	79.960	0.100	Main Group
LPB194	51.112	0.038	Main Group

LPB201	26.749	0.579	Main Group
LPB202	56.255	0.143	Main Group
LPB204	61.041	0.029	Main Group
LPB205	56.995	0.035	Main Group
LPB206	43.877	0.283	Main Group
LPB211	68.206	0.140	Main Group
LPB212	46.841	0.285	Main Group
LPB213	15.317	0.010	Main Group
LPB214	77.800	0.045	Main Group
LPB221	76.153	0.050	Main Group
LPB223	21.440	0.013	Main Group
LPB232	2.498	2.396	Main Group
LPB236	83.409	0.074	Main Group
LPB239	73.727	0.048	Main Group
LPB240	74.974	0.098	Main Group
LPB243	43.265	0.318	Main Group
LPB244	99.599	0.027	Main Group
LPB252	34.568	0.335	Main Group
LPB255	55.781	0.040	Main Group
LPB256	31.447	0.016	Main Group
LPB257	97.212	0.019	Main Group
LPB259	95.954	0.045	Main Group
LPB260	76.994	0.112	Main Group
LPB261	57.617	0.205	Main Group
LPB264	92.879	0.014	Main Group
LPB265	29.956	0.005	Main Group
LPB267	36.967	0.077	Main Group
LPB270	38.514	0.010	Main Group
LPB272	98.878	0.023	Main Group
LPB276	42.400	0.318	Main Group
LPB279	72.783	0.080	Main Group
LPB281	93.620	0.040	Main Group
LPB284	20.433	0.736	Main Group
LPB286	77.954	0.109	Main Group
LPB287	31.534	0.419	Main Group
LPB290	90.171	0.053	Main Group
LPB292	31.728	0.001	Main Group
LPB294	13.851	0.842	Main Group
LPB298	89.620	0.060	Main Group
LPB299	17.032	0.001	Main Group
LPB300	72.112	0.028	Main Group
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Membership probabilities (%) for samples in group: Group_C
Probabilities calculated by projecting unknowns against reference groups.

ANID	Main Group	Group 1	Best Group
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LPB013	0.000	94.452	Group 1
LPB044	0.000	61.167	Group 1
LPB075	0.000	61.971	Group 1
LPB090	0.045	20.460	Group 1
LPB110	0.000	37.695	Group 1
LPB111	0.000	8.757	Group 1
LPB112	0.000	8.290	Group 1
LPB113	0.000	60.955	Group 1
LPB115	0.000	67.920	Group 1
LPB116	0.000	4.712	Group 1
LPB117	0.000	5.993	Group 1
LPB118	0.000	77.322	Group 1
LPB119	0.000	8.262	Group 1
LPB120	0.000	57.590	Group 1
LPB122	0.000	89.789	Group 1
LPB123	0.000	98.304	Group 1
LPB125	0.000	16.951	Group 1
LPB127	0.000	53.743	Group 1
LPB130	0.000	14.055	Group 1
LPB131	0.001	8.931	Group 1
LPB132	0.000	57.315	Group 1
LPB152	0.000	53.757	Group 1
LPB183	0.000	65.083	Group 1
LPB195	0.000	42.448	Group 1
LPB198	0.000	20.353	Group 1
LPB203	0.000	5.967	Group 1
LPB209	0.000	81.009	Group 1
LPB219	0.000	35.501	Group 1
LPB222	0.000	29.871	Group 1
LPB228	0.000	14.068	Group 1
LPB234	0.000	63.398	Group 1
LPB245	0.000	71.410	Group 1
LPB248	0.000	48.758	Group 1
LPB250	0.000	76.331	Group 1
LPB254	0.000	96.667	Group 1
LPB274	0.001	50.112	Group 1
LPB278	0.000	60.062	Group 1
LPB280	0.000	66.295	Group 1
LPB285	0.000	91.709	Group 1
LPB293	0.000	29.110	Group 1
LPB295	0.000	82.007	Group 1

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APPENDIX C: PRELIMINARY DECORATIVE CLASSIFICATION

A. Monochrome (n = 902)

1. Fine Red (n = 277)

   Forms

   Mainly jars, some bowls and spouted vessels

   Technology

   Paste description: granular structure of the paste was fine (1-2 mm diameter); color ranged from yellowish red (5 YR 5/6) to brown (7.5 YR 5/4).

   Firing: thin gray core; no core

   Finish and Slip: polished red (2.5 YR 5/6, 4/6 red to 2.5 YR 5/4 reddish brown)

   Decoration

   N/A

   Context at Angamuco

   Areas A, B, C, D, F; survey sub-quadrants I18NE, I18SW, J17SE, J18NW, J20SW

   Other References

   Cuitzeo Basin: Macias Goytia 2005:324; Tzintzuntzan: Cabrera 1996; Castro Leal 1986; Macias Goytia 1990; Pollard 1972, 1993; Urichu: Pollard 1999

   Status and Chronological Association

   Elite/public and domestic, Middle to Late Postclassic

2. Pale Brown (n = 365)

Forms

Bowls, Jars

Technology

Paste description:	granular structure was fine to medium (1-2 mm to 2-5 mm diameter); Color ranged from light brown (7.5 YR 6/4), though the gray firing core was occasionally so wide that it was recorded as the paste color (7.5 YR 4/1 dark gray).
Firing:	thick gray core; no core
Finish and Slip:	polished pale brown (7.5 YR 6/4 light brown to 10 YR 7/4 very pale brown)

Decoration

N/A

Context at Angamuco

Areas A, B, C, D, F; survey sub-quadrant J20SW

Other References

Cuitzeo Basin: Macias Goytia 2005:324; Tzintzuntzan: Cabrera 1996; Pollard 1993; Urichu: Pollard 1999

Status and Chronological Association

Elite/public and domestic, Middle to Late Postclassic

3. Dull Red (n = 149)
    Variation: Dull Red Exterior, Pale Brown/White Interior

Forms

Jars, circular sherds

Technology

Paste description: medium-grained (2-5 mm diameter) and primarily brown (7.5 YR 5/4) and light brown (7.5 YR 6/4)

Firing: no core, gray core

Finish and Slip: polished, dusky red (2.5 YR 3/2) to weak red (2.5 YR 4/2)

Decoration

N/A

Context at Angamuco

Evenly distributed through areas A, B, D, and F circular feature (F6S3E0)

Other References

Architecture of the circular feature is similar to Prieto example from Zacapu (Pereira et al. 2011; Puaux 1989)

Status and Possible Chronological Association

Elite/public and domestic, Middle Postclassic though possibly older

4. Fine Reddish Gray (n = 49)

Forms

Jars, Miniature Vessels (handled)

Technology

Paste description: medium-grained (2-5 mm diameter) and 7.5 YR 5/4 brown

Firing: gray core (7.5 YR 4/1 dark grey)

Finish and Slip: polished, 2.5 YR 4/6 red and 5 YR 5/2 reddish gray

Decoration

N/A

Context at Angamuco

Dominant in Area F circular feature (F6S3E0), Levels 7-16; also present in Area A and survey sub-quadrant J18SW.

Other References

Tzintzuntzan: Cabrera 1996; Castro Leal 1986 Pollard 1993; Urichu: Pollard 1999; Milpillas: Jadot 2016

Status and Chronological Association

Elite/public and domestic, Early-Late Postclassic

5. Polished Black (n = 62)

Forms

Bowls, Jars, Pipes

Technology

Paste description: fine granular structure; brown (7.5 YR 5/4)

Firing: no core and thin gray

Finish and Slip: polished; 7.5 YR 3/1 very dark gray to 7.5 YR 2.5/1 black

Decoration

N/A

Context at Angamuco

Area A, B, D, E, F, survey sub-quadrants H18NE, I18NW, I18SW, I18SW, J20SW

Other References

Tzintzuntzan: Cabrera 1996; Castro Leal 1986; El Palacio and Milpillas: Jadot 2016

Status and Chronological Association

Multi-status/public and domestic, Epiclassic to Middle Postclassic

B. Bichrome (n = 1287)

6. Red on Pale Brown (n = 1114)

Form

Bowls ranging in miniature to large convex, some jars

Technology

Paste description: inclusions range from coarse to fine; color ranges from a light brown/brown (10yr 7/4 very pale brown to 7.5yr 5/3 or 5/4 brown) basalt-grog to a reddish-yellow (5yr 5/6 yellowish red) basalt-grog.

Firing: no core and dark grey cores

Finish and Slip: polished; base slip: 10yr 7/3-7/4 very pale brown, 10yr 6/2 light brownish gray, 10yr 6/3 pale brown, 7.5yr 6/4-6/3 light brown;
secondary slip: 2.5yr 4/3-4/4 reddish brown, 2.5yr 4/6 red, 2.5yr 4/8 red, 2.5yr 3/3 dark reddish brown, 2.5yr 3/2 dusky red

Decoration

Red cross-hatch, dots, parallel lines, zig-zag, swirl, and zoomorphic imagery (e.g. birds (see Carot 2001))

Context at Angamuco

Ubiquitous: Areas A, B, C, D, E, F, G; survey sub-quadrants H18NE, H18NW, I18NE, I18NW, I19SW, J17NE, J17SE, J18NE, J18NW, J18SE, J18SW, J20SW, K18SE

Other References

Cuitzeo Basin: Macias Goytia 2005:325; Tzintzuntzan: Cabrera 1996; Castro Leal 1986; Pollard 1993; Urichu: Pollard 1999 [possibly Loma Alta: Carot 2001]

Status and Chronological Association

Multi-status/public and domestic, Early Classic – Late Postclassic

7. Red on Orange (n = 45)

Forms

Small Jar, Bowl, Spouted Vessel (*patoja*)

Technology

Paste description: inclusions range from coarse to fine; color ranges from 5 YR 5/6 yellowish red and 7.5 YR 5/4 brown

Firing: no core, light gray core

Finish and Slip: polished; base slip: 5 YR 5/6 yellowish red, 7.5 YR 6/6 reddish yellow; secondary slip: 2.5 YR 4/6 red

Decoration

N/A

Context at Angamuco

Areas A, B, C, D, E, F; survey sub-quadrants I18SW, J17SE, J18NE, J18SW

Other References

Tzintzuntzan: Cabrera 1996; Castro Leal 1986; Pollard 1993; Urichu: Pollard 1999

Status and Possible Chronological Association

Multi-status/public and domestic, Early through Late Postclassic

8. Dark Red on Gray (n = 23)

Forms

Bowl

Technology

Paste description: color reflects uneven firing, 10 YR 4/1 dark gray

Firing: dark gray core (10 YR 4/1)

Finish and Slip: polished; base slip: 10 YR 5/1 gray; secondary slip: 2.5 YR 3/2 dusty red

Decoration

No clearly defined design

Context at Angamuco

Areas A (primarily), B, D, E, F; survey sub-quadrant J18SW

Other References

Tzintzuntzan: Cabrera 1996; Castro Leal 1986; Pollard 1993

Status and Possible Chronological Association

Multi-status, Early-Late Postclassic

9. White on Red (n = 22)

Forms

Bowls, Bottle

Technology

Paste description: granular structure of the paste was fine (1-2 mm diameter); color ranged from yellowish red (5 YR 5/6) to brown (7.5 YR 5/4).

Firing: mainly no core, some dark gray cores (10 YR 4/1)

Finish and Slip: polished; slip color 2.5 YR 4/6 red

Decoration

White paint, motifs include spirals

Context at Angamuco

Area A, B, and C; survey sub-quadrants I18NE, J17SE, J18SW, J19SE

Other References

Cuitzeo Basin: Macias Goytia 1990, 2005:325; Tzintzuntzan: Cabrera 1996, Castro Leal 1986, Pollard 1993; Urichu: Pollard 1999

Possible Chronological Association

Elite/public, Middle to Late Postclassic

10-12. Bichrome-Negative/Positive (n = 37)

Forms

Bowls (possibly including tripod)

Technology

Paste description: fine to medium inclusions; various brown (7.5 YR 4/3 dark brown, 7.5 YR 5/4 brown)

Firing: no core, thin gray core

Finish and Slip: polished, negative or positive; slip color dusky red (2.5 YR 3/2) to reddish-brown (2.5 YR 4/4)

Decoration

Red rim band, white vertical stripes on black, possible coyote design (see Pollard's (1999) *Arocutín Rojo Negativo*)

Context at Angamuco

Areas A, B, C, D (DN16E10, Level 4), E, F (F6S3E0, Level 15 and 20)

Other References

Prieto: CEMCA comparative collection (*Rojo sobre Negro Negativo*, Milpillas phase)
Tzintzuntzan: Cabrera 1996; Castro Leal 1986; Pollard 1993,
Urichu: Pollard 1999 (*Arocutín Rojo Negativo*, Early and Late Urichu phases);

Possible Chronological Association

Multi-status/public and domestic, Early-Middle Postclassic

C. Polychrome

13. Red, White, on Yellowish Red/Reddish Brown (n = 449)
    Variation: Red, White, and Negative on Yellowish Red/Reddish Brown

Forms
Bottle, Bowl, Jar, Spouted Vessel, Miniature Tripod

Technology
Paste description: fine to medium inclusions; color ranges from yellowish red (5 YR 5/6) to brown (7.5 YR 5/4)

Firing: mainly no core, also light and dark gray cores

Finish and Slip: polished; primary slip is light brown (7.5 YR 6/4) to very pale brown (10 YR 7/4), secondary slip is red (2.5 YR 4/4 and 4/6)

Decoration
Negative, paint (black, white); motifs vary (García 1999; Pollard 1993; Versluis 1994)

Context at Angamuco
Areas A, B, C, D, G; survey sub-quadrants H18NE, H18NW, I18NW, I18SW, I19SW, J17NE, J17SE, J18NW, J18SW, K18SE

Other References
Cuitzeo Basin: Macias Goytia 1990, 2006:325-326;
Tzintzuntzan: Cabrera 1996; Castro Leal 1986; García 1999; Pollard 1993 (Tariacuri Café engobes guinda, crema, rojo, Tariacuri Café Rojo, Blanco y Negativo sobre Crema; Yaguarato Crema Rojo y Blanco sobre Crema, Yaguarato Crema Rojo y Negativo sobre Crema; Sipiho Gris Rojo y Blanco y Negativo sobre Crema; Tarerio Crema; Tecolote Narajada – Tariacuri phase);
Urichu: Pollard 1999 (Copujo Rojo y Blanco sobre Crema, Copujo Rojo y Blanco sobre Crema con Negativo – Late Urichu);
Zacapu Basin: CEMCA *bodega* (Malpaís Polícromo – Milpillas phase); Arnauld et al. 1993 (depicts looted gourd spouted vessel)

Status and Possible Chronological Association
Elite/public, possibly some domestic exceptions, Middle-Late Postclassic

D. Incised and Appliqué

Forms

Bowl, Jar, Incense Burner (*brasero*)

Technology

Paste description: medium to coarse grains; color primarily yellowish red (5 YR 5/6) and brown (7/5 YR 5/4)

Firing: no core, thin gray and dark gray cores

Finish and Slip: polished; unslipped in some cases, some browns (7.5 YR 5/6), very pale brown (10 YR 7/4)

Decoration

Incised: parallel lines, V, semi-circle, dots, waves
Appliqué: circular, conical,

Context at Angamuco

Areas A, B, C, D, E, F; survey sub-quadrants I18NE, I18SW, J17NE, J18SW

Other References

Huandacareo: Macias Goytia 1990 (incised waves);
La Pena, Sayula Basin: Liot et al. 2006 (Middle Postclassic *brasero*);
Zacapu: Loma Alta incised V (Carot 2001); Milpillas phase *brasero*;
National Museum of the American Indian, Smithsonian Institution, personal observation 2015

Possible Chronological Association

Multi-status/public and domestic, Classic – Late Postclassic