THE ARCHAEOLOGY OF COLONIAL MAYA LIVELIHOODS AT TAHCABO, YUCATÁN, MEXICO

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ABSTRACT

Maia Dedrick: The Archaeology of Colonial Maya Livelihoods at Tahcabo, Yucatán, Mexico
(Under the direction of Patricia A. McAnany and C. Margaret Scarry)

Farmers rarely feature prominently in accounts of Spanish colonialism. When they do, it is often because they assisted in staging rebellions. However, in Yucatán, Mexico, and elsewhere, the vast majority of the population consisted of farmers, who lived in places with long histories. The everyday decisions that they made about how to support the well-being of their households and communities influenced colonial trajectories. This dissertation tracks common farmers' livelihood strategies at Tahcabo, Yucatán, throughout the Colonial period as a way of understanding how they negotiated colonial impositions and restrictions.

The research presented in this dissertation included interviews with current farmers, site survey, and excavation within residential and garden areas. Interviews provided information about the factors that farmers consider as they make agricultural decisions, and in particular how they use and understand dry sinkholes called *rejolladas*—landscape features often employed as gardens when located within settlements. The results of excavation within the *rejolladas* of central Tahcabo demonstrated some consistency in their specialized use through time. Excavations also took place at Colonial period residential areas located near the edges of town, where non-elite or recently arrived farmers lived.

Colonial policies enacted violence on rural livelihoods, resulting in food insecurity and inadequate resource access. In particular, they worked to narrow and constrict farming households' activity portfolios, and encouraged dependence on field agriculture. After

forcing many farmers from settlements across the countryside to relocate into designated towns, friars demanded that extended family households break apart into nuclear house lots. Nonetheless, excavation results show that, during the early Colonial period, town residents continued to live in extended family groups and pursued diversified livelihood activities, which included extended hunting and fishing trips. Nuclear family house lots were evident by the middle Colonial period. Heavy demands for commodities imposed as quotas for each adult family member led to activity intensification. Farmers responded to colonial violence through both mobility and place-making—strategies which remained in tension throughout the Colonial period. In short, this project provides new insights into the daily lives and livelihood decisions of ordinary families attempting to survive colonialism in Yucatán, Mexico.

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Iván took on the role of mentor during the summer of 2012, when he welcomed our team to his house for the first time and explained the political landscape of Yucatán. Since then, he and his family have hosted us on innumerable occasions, and he was onsite in Yucatán during excavation. Iván even provided me with office space in Mérida during the spring of 2015 when he directed the Archivo General del Estado de Yucatán. His wife, Norma, has played an integral role in the success of our project, and his children have all contributed meaningfully to the project and research as well, including this dissertation.

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At the end of 2014, I reached out to Germán Carnevali Fernández Concha at the Centro de Investigaciones Científicas de Yucatán (CICY) based on Stephanie Simms'

recommendation. I then corresponded with scientist Ivón Mercedes Ramírez Morillo, who assured me that their staff would be able to assist with plant surveys, and also to press and identify the plants after collection. Soon thereafter, scientist José Luis Tapia Muñoz and Gregorio Amílcar Castillo Herrera joined me on a two-day excursion to Tahcabo to conduct the *rejollada* plant surveys. It was amazing to have their help and expertise employed for the benefit of this project. The scientists and the facilities they have built, including the herbarium, botanical garden, and floral database, are impressive scientific resources.

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CHAPTER 1:

LIVELIHOOD STRATEGIES UNDER COLONIALISM IN YUCATÁN, MEXICO

Accounts of Spanish colonialism in Latin America often focus on the activities of indigenous elites and Spanish colonizers. They imply a trajectory in which Spanish authorities imposed a program of colonization to which indigenous and diasporic peoples adjusted, or from which they fled. However, those who faced colonization experienced it variably and played a part in shaping colonial outcomes. Farmers, often overlooked in historical accounts, could preempt and respond to colonial policies and officials in ways that undercut political decisions and reduced the output of sought-after commodities. Even when subjected to the stark power differentials and violence of Spanish colonialism, farmers exerted agency, though the ways in which they did so warrant further study and theorization.

Today in the northern Yucatán peninsula of Mexico, referred to as the northern Maya lowlands, soils are too shallow to plow. Farmers instead conduct shifting field agriculture well-suited to the tropical landscape and maintain gardens near their homes. To some, it may seem that this type of farming has gone on uniformly and unchanged for centuries. Shallow soils and poor preservation in northern Yucatán have hindered the archaeological detection of changing cultivation strategies (e.g., Dahlin et al. 2005), which have been amply demonstrated elsewhere in the Maya area. Yet agricultural practices and farmers' wider economic strategies were also diverse and dynamic in the northern Maya lowlands (Alexander 2004; Batún Alpuche 2009; Fedick et al. 2008; Fisher 2014; Hutson et al. 2007). In this dissertation, I use archaeological and historical evidence to examine how the activities of non-elite rural farmers changed throughout the Colonial period (ca. AD 1547-1821), and how Spanish colonial conditions and policies constrained farmers' options.

To track farmer's responses to colonial policies, I chose to focus on the inhabitants of a single town, Tahcabo, Yucatán (Figure 1.1). Tahcabo, currently a community of about 500 people, has been continuously occupied since at least the Late Preclassic period (ca. 300 BC to AD 250; Batún Alpuche et al. 2017), with populations fluctuating through time. At points during the Colonial period, Tahcabo's population grew to be much larger than it is today. As a result, reasonably well-preserved residential areas exist at the edges of town, beyond the area where people now live. My excavations for this dissertation took place within and around such residences. While wealthier and established households more commonly lived centrally in Yucatecan communities (Alexander 2012:17), those living at some distance from the town square more likely consisted of newly arrived, newly formed, or non-elite households—those often understudied by both archaeologists and historians.

The research questions for this study are: how did farmers select livelihood strategies amid the violence of colonialism? How did their livelihood portfolios shift through time, and what were the long-term outcomes? My examination of changing farming strategies entailed the study of artifacts and plant remains from cultivated areas and residential deposits. At Tahcabo, eight *rejolladas*, or dry solution sinkholes in which deep soils have collected, can be found within the town limits. When located near homes, *rejolladas* are used for gardens, as they offer greater humidity and more moderate temperatures than surrounding areas (Gómez-Pompa et al. 1990; Munro-Stasiuk et al. 2014). In the search for farmers' activities, I conducted excavation within *rejolladas*, interviewed current Tahcabo residents about how they use the features, and also excavated residential areas.

Research at Tahcabo conducted as part of the archaeological project PACOY (see Chapter 3) has been envisioned since its inception as community archaeology, entailing collaboration between researchers and town residents as well as between investigators from Yucatán and the United States. Through dialogue and participation in research, community members and academic collaborators from both countries have contributed to the development of this study in terms of its theory, method, and content.

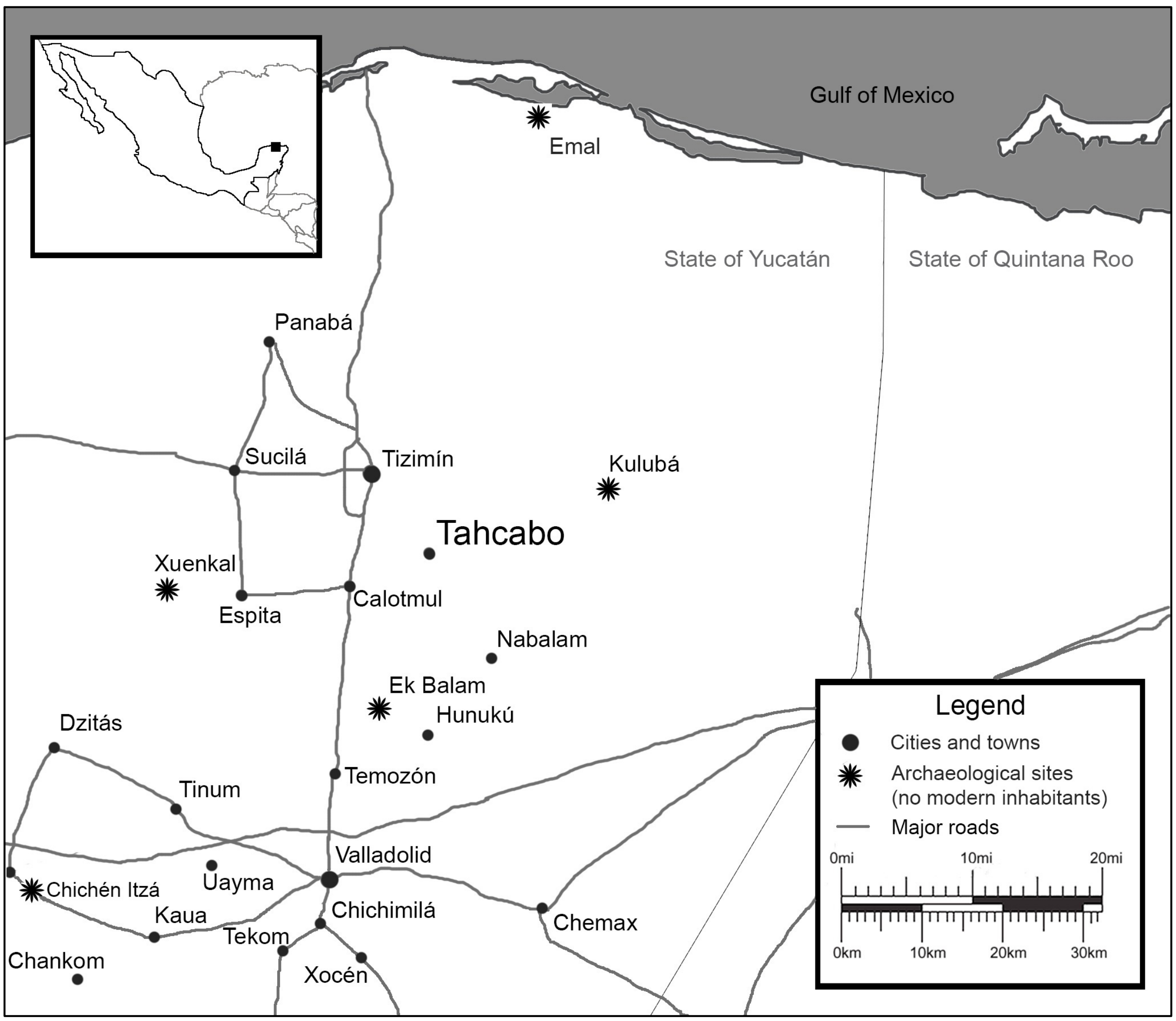


Figure 1.1. Location of Tahcabo relative to nearby cities, towns, and archaeological sites.

Implementation of Spanish Colonialism in Northern Yucatán

Implementation of Spanish colonialism varied by region, as colonial officials were internally diverse and adapted their agendas to local histories, politics, and landscapes. Yucatán is considered to have been conquered by 1547, though rebellions and the presence of unconquered zones continued to interrupt colonial interests for centuries (Andrews 1981:3; Farriss 1984:14). In Yucatán, there were no precious metals to mine, and few commodities for which Spaniards could seize the means of production. Instead, communities in the northern Maya lowlands generally retained control of production, while colonial officials did all they could to extract goods from them. Key commodities that Spaniards wished to obtain included cotton (*Gossypium* sp.) cloth, beeswax, and maize (*Zea mays*). To understand the difficult circumstances imposed on farmers and their constricted livelihood opportunities during the Colonial period, the major systems of colonial extraction in Yucatán are now described.

During the early Colonial period, Spaniards forcefully gathered Maya peoples from settlements dispersed across the countryside into designated mission towns, through a process known as *reducción* or *congregación*. Major campaigns of *congregación* took place in 1565 and 1582 (Quezada 1993:81-102), with the goal of settling indigenous people into communities, organized along gridded streets, where they could more easily be taxed and converted to Catholicism. Spaniards also sought to impose their vision for what small-town, Catholic life should entail. With this in mind, church officials put limitations on travel and hunting, prohibited traditional ceremonies, and banned the presence of fields and forests within settlements (Ancona 1889). Finally, they sought to break apart extended family households into nuclear units.

By 1549, colonial officials in Yucatán had established *encomienda*, a system in which the Spanish Crown granted territories to Spanish conquistadors, then referred to as *encomenderos. Encomienda* territory assignments, which did not respect previously established divisions, contributed to political change over the following century (Alexander 2004:39; Farriss 1984:149; Quezada 2014). The *encomendero* extracted taxes and labor from the people in his assigned area, even as populations dwindled due to disease. These were heavy taxes assessed per tributary (first defined as a married Maya male, but later expanded to include every adult) in goods such as raw cotton, cotton cloth and thread, honey, beeswax, poultry, and maize. By the late 1600s there was a trend toward paying tribute in currency rather than in products (García Bernal 1978:388-394).

Repartimiento de bienes was another system that extracted goods from rural communities. Perpetuated by *encomenderos*, friars, and royal provincial governors, *repartimiento de bienes* involved advancing cash or goods to a community, and in return receiving deeply discounted community-produced commodities. The practice was generally illegal throughout the Colonial period, except for several decades during the mid-1700s (1731-1782; Farris 1984:43). An early example described in historical accounts is that Tahcabo's first *encomendero*, Juan de Contreras, brought cacao (*Theobroma* cacao) to the community and demanded large quantities of raw cotton in return (Quezada 2014:93).

In addition, rural communities faced demands from the church, including alms (*limosnas*) that eventually became mandatory head taxes (*obvenciones*), but also payments for sacraments and catechism classes (Patch 1993:28-29). Communities also raised their own taxes and maintained collective agricultural enterprises that provided them with resources for community activities, such as celebrations for the feast day of a town's patron saint (Farriss 1984:326).

Historian Nancy Farriss (1984:355) called the Bourbon Reforms of the late eighteenth to early nineteenth centuries the "second conquest of Yucatán." These reforms involved the assignment of elected positions, filled with people of Spanish descent, for each municipal seat (Farriss 1984:376; Kaeding 2013:193-201). Community taxes were transferred to the royal Treasury, where they eventually alleviated the Crown's financial needs rather than supporting indigenous communities (Farriss 1984:359). The bishop auctioned off communal lands that had supported community initiatives. Overall, rural communities faced additional assaults on their autonomy during the late Colonial period. At the same time, Spanish-descendant entrepreneurs were encouraged to start businesses, such as *haciendas*, across the countryside, which encroached on community lands and attracted rural wage laborers who often ended up in conditions of debt peonage. Terrible droughts and locusts at the end of the eighteenth century (ca. 1769-1774) pushed people to take up jobs at newly established *haciendas* in exchange for food rations, as maize prices soared (Espinosa Córtes et al. 1987; Peniche Moreno 2009).

Forced relocation, heavy tax burdens, epidemics, famine, and attacks on autonomy all pushed people to flee the area. Those who stayed in the rural communities of Yucatán faced economic exploitation and received little support during times of drought. Their reasons for staying surely varied. Some, especially the elderly and those with illnesses or disabilities, would not have been able to flee the area on foot. They instead had to "make do" within the confines of the places where they lived or to which they were moved (de Certeau 1984:29-42). Early on, those allowed to remain living in their home communities may have wished to sustain claims over desired resources (Wilk 1997:120). Displaced farmers could have sought out opportunities to return to their previous places of residence, or to claim resources that became available within *congregación* communities. As the human population of Yucatán declined, forests likely grew and the number of animals available to hunt may have increased. Introduced plants, animals, technologies, and goods contributed to opportunities for experimentation and innovation. Through time, as people adopted Catholicism and developed hybrid religious practices associated with community organizations, they may well have wished to stay, build their access to resources, and contribute to their social networks. Nonetheless, the conditions of colonialism were harsh in rural Yucatán, and even as late as the year 1784, a community not far from Tahcabo threatened to leave the area altogether, claiming that the local Spanish official made them produce so much cotton "that they had no time to raise food for themselves" (Farriss 1984:78).

Useful Concepts

The challenges that farmers faced under colonialism, including the specific policies outlined above, can be conceptualized as "slow violence" (Nixon 2011). Slow violence refers to structural violence (Galtung 1969) that is diffuse and difficult to represent, but most often imperils poor communities, and accumulates in impact. Farming communities faced persistent injustices under Spanish colonialism that morphed through time and led to long-term negative outcomes for rural livelihoods. Archaeologist Amanda Logan (2016) has employed the concept as a way to explain how colonial processes led to the development of food insecurity in the Banda region of Ghana. She shows that prior to colonialism, people in the area were food secure, and rural livelihoods were much more diverse. Forces similar to those she identified were at play in rural Mexico and in many other areas, where colonial policies challenged autonomy and resilience in food production and other areas of life through assaults on several fronts. James Scott (1976:56-90) draws on his work in Southeast Asia to outline five major reasons that colonialism often leads to food insecurity for small-scale cultivators. They include: (1) market instabilities; (2) weakening of village and kin-group redistribution and risk-sharing practices; (3) loss of secondary food resources; (4) deterioration of landowner-tenant relations; and (5) increased taxes on the cultivating class. Some of these factors also played a role in creating conditions of food insecurity in rural Yucatán, though farmers implemented strategies that defied or lessened the impacts of others.

In this dissertation, I frame farmers' economic decision-making practices in terms of "livelihoods." A livelihood encompasses activities that people undertake for their well-being, helpfully linking food preparation to crafting, agriculture, and other endeavors, such as hunting. By referring to what could be called the ecosystem of household activities, the concept of livelihood provides space to consider how the intensification of some pursuits may lead to decreased allocation of time to others, in a way that incorporates the contributions of diverse household constituents. To clarify, in this dissertation when I refer to farmers, I include in the category all people living in rural households that engage in farming as a major component of their livelihood portfolios. Households vary in composition, and larger households often have an advantage since they can mobilize more labor to pursue diversified livelihood strategies (Clark 1989; Wilk 1997).

The sustainable livelihoods framework from rural development studies centers the farming household as the unit of analysis, though it can be applied at different scales (Scoones 1998:5). It considers the contexts within which farmers work, as well as the assets available to them and accessed through local institutions, to understand which livelihood strategies farmers select and the extent to which they are sustainable (Chambers and Conway 1992; Ellis 2000; Scoones 1998, 2009). Contexts can include trends in the following areas: policy, demography, history, climate, macro-economic conditions, agroecology, and terms of trade (Scoones 1998:Figure 1). Assets considered in the framework include natural capital, such as *rejolladas* and other landscape features; economic or financial capital, in goods, currency, and credit; human capital, including the availability of labor, as well as skills and knowledge; and social capital, or networks of social support. Strategies available to farmers include increased or decreased investment in particular activities, diversification of the overall livelihood portfolio, and mobility or migration (Scoones 1998:9). A sustainable livelihood "can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base" (Scoones 1998:5). In other words, it is resilient. This model provokes consideration of how rural farmers within a single community and across a region make decisions based on their particular local governments, household configurations, social networks, and available resources.

Households are basic social and economic units relatively easily tracked in development research and also in archaeology, through the study of residential areas (Rathje 1983: Wilk and Ashmore 1988; Wilk and Rathje 1982). They are dynamic and flexible entities suited to address opportunities and challenges generated by internal and external pressures (Hirth 2009:17; Netting 1993). Archaeologists have shown that shifting economic and political circumstances, including incorporation into empires, may be associated to varying degrees with changes in daily life at the level of the household (Bermann 1997; Brumfiel 1991; Cutright 2015; Dorsey Vinton et al. 2009; Robin 2013). Rural populations developed ecological and social strategies to negotiate colonialism and reduce the risk of food insecurity that it often provokes (e.g., Acabado 2018; Langlie 2018; Rosenzweig and Marson 2018:95; Scarry 1993; VanDerwarker et al. 2013). As colonialism enacted slow violence on rural communities, farmers responded with foot-dragging, labor pooling, deception, and feigned ignorance, among many other options (Liebmann and Murphy 2010:4). In fact, "the colonial landscape was a patchwork of domination, resistance, accommodation, and negotiation, as indigenous peoples exerted a variety of strategies in their attempts to adapt to the colonizing and evangelizing efforts of the Spaniards" (Liebmann and Murphy 2010:7). The long-term histories and landscapes of indigenous peoples, as well as the strategies they implemented all played a role in shaping colonial trajectories, and help to explain the diversity of local circumstances that occurred simultaneously under Spanish colonialism (Alexander 2004; Oland 2009, 2012, 2016; Overholtzer 2013:492).

Just as farmers in Tahcabo crafted agricultural strategies while considering the constraints imposed on them by colonial demands, they also were evaluating their responsibilities to extended family and fictive kin, animals, plants, spirits, and gods. This way of being can be described as a "relational ontology," which refers to an existence in which relational identities supersede individualism in the Cartesian sense, and in which culture and nature are not differentiated (Cipolla 2019; Grauer 2019; Harrison-Buck and Hendon 2018; Hutson 2010). Juan Castillo Cocom describes the Yucatec Mayan term *iknal* as one's "embodied and disembodied quality of 'being present' as the *context* and *product* of relationships," demonstrating relationality's local relevance (Castillo Cocom et al. 2017:65; see also Tuz Chi 2009:139-149). As indigenous farmers chose livelihood strategies, they did not work as self-interested actors apart from the landscape, but instead considered the ramifications of their decisions for the relationships that they negotiated to achieve success in cultivation (Ingold 2011:63-64; Richard 2018:37; Tsing 2015:32). As a result, while farmers have agency when it comes to what and how they plant and pursue other activities, they decide how to allocate effort and resources while based within webs of relationship.

Organization of the Dissertation

To investigate how farmers in the northern Maya lowlands responded to colonial policies, I draw on evidence from archaeological research (including site survey, excavation, and laboratory analyses), interviews, and historical documents to identify the livelihood strategies selected through time. Before presenting the results of archaeological study, I first provide background information in Chapter 2 on the specific mechanisms by which direct and slow violence were enacted in rural Yucatán. Some of these can be understood as involving the imposition of coerced trade inequities, or “antimarkets,” which systematically disadvantaged rural, and usually indigenous populations (Pezzarossi 2015a). As colonial policies shifted through time, so did rural innovations designed to cope with them. The chapter presents information from the historical literature about the livelihood strategies pursued and food produced by rural populations, and it outlines demographic and climate trends that may have influenced strategy selection. The introduction of previous archaeological studies of colonialism in the Maya area leads to a discussion of Tahcabo’s specific archaeological remains and colonial history, the latter based on primary and secondary sources. Historical documents indicate that Tahcabo’s population fluctuated greatly throughout the Colonial period.

Chapter 3 provides a timeline of research activities and introduces the broader archaeological project to which this research contributed. It outlines the methods employed in the field and laboratory, resulting in datasets analyzed in Chapters 4-6 and included as appendices. Chapter 4 provides a regional settlement history, focusing on the site survey and demographic trends of Tahcabo leading up to the Colonial period, but also incorporating the results of previous research relevant to farmers' livelihoods. An overview of preceding time periods provides a background for what took place after the Spanish invasion. In addition, the settlement history presents context relevant to understanding earlier finds and features encountered within the *rejollada* excavation units. The chapter concludes with a summary of contemporary regional farming practices and landscapes.

Chapter 5 documents the results of interviews conducted with current residents of Tahcabo about how they use *rejolladas*, within which plant surveys also took place. The interviews produced information about the factors that farmers consider when making cultivation decisions and the specific characteristics of the landscape features. The same chapter also details the results of excavation undertaken within *rejolladas*, highlighting important contexts encountered as well as the results of soil sample (pollen and soil carbon isotope) analyses. The findings show some parallel uses of specific *rejolladas* for specialized purposes in the past and today. However, the *rejollada* excavation results also suggest the intensive use of the features during the Early Classic period, without evidence for corresponding intensification during the Colonial period, when populations grew to similar sizes. Colonial policies may have restricted *rejollada* use.

Chapter 6 presents the results of residential excavations, addressing chronological determinations, house architecture, and the lines of evidence (artifacts, including plant and animal remains) that provide insights into trends in livelihood activities. In order to understand the significance of the Tahcabo findings in regional and temporal context, I compare them to the results of archaeological investigations at other sites in Chapter 7. In that chapter I also respond to the research questions in some depth. Chapter 8 concludes with an account of the impacts of slow violence and the challenges of maintaining a sustainable livelihood in the shadow of repressive colonialism. Finally, I demonstrate the opportunities for resilience and autonomy available to commoner households and their constituents, and reflect on the ways that farmers shaped Colonial period historical trajectories.

The primary livelihood strategies detected through excavation and finds analysis consisted of mobility and participation in food sharing. Farmers employed these techniques, among others, to maintain subsistence autonomy throughout the Colonial period. During the early Colonial period, one extended-family household at Tahcabo pursued livelihood diversity, augmenting their harvests from field agriculture with hunted, fished, and gathered foods, while engaging in craft production and trade across the colonial frontier. Colonial policies had the impact of narrowing livelihood portfolios and pushing people to depend to a greater extent on field agriculture and maize in particular. These effects in turn reduced household resilience. In response, households contributed to community-level religious activities that improved food access and depended in part on the generosity of those who participated in *rejollada* cultivation and large animal husbandry. Even though tax and *repartimiento* demands led people to intensify certain activities at the expense of others, farmers participated in supplemental livelihood efforts such as hunting and gardening. They maintained knowledge of *rejolladas* and other specialized resources and conducted their work in relationship with constituents of the landscape and community despite colonial constraints.

CHAPTER 2:

COLONIAL PERIOD HISTORY AND ARCHAEOLOGY IN THE NORTHERN YUCATÁN PENINSULA

This chapter explores what we know of daily life and livelihoods among rural populations during the Colonial period (ca. AD 1547-1821) in the Maya area, with a specific focus on the northern Yucatán peninsula of Mexico. The archaeological and historical information presented complement each other—and, as Sheptak and colleagues (2010:150) point out, "Documentary archives are a part of the archaeological record." As long as historical documents are contextualized as artifacts created by people with certain identities and objectives, they can work well in concert with other archaeological data. Most of the historical information drawn on here comes from the accounts of Spanish colonizers.

Spaniards first made landfall in the Yucatán peninsula during the 1510s. By the mid-1500s, the population of Yucatán is thought to have dropped by about 70% due to Spanish pathogens (Gerhard 1993:136; Hoggarth et al. 2017:89), though estimates vary (Cook and Borah 1974; Farriss 1984; García Bernal 1978). Spaniards created a tiered settlement hierarchy in which the city of Mérida, founded in 1542, presided over its villas (Campeche, Valladolid, and Bacalar in the first decades). They referred to these as the Spanish settlements (*repúblicas de españoles*), each of which ruled over a province (Gerhard 1993:58). The surrounding towns were known as indigenous settlements, which Spaniards called *repúblicas de indios*. Spanish officials re-structured the indigenous settlements, designating some as *cabeceras* (municipal seats) that governed over auxiliary towns.

The following subsections explain in greater depth the various colonial policies and illegal practices (e.g., *repartimiento*) imposed on communities across Yucatán in order to provide a fuller account of the slow violence they enacted. The chapter continues by addressing historical accounts of the livelihood opportunities available to indigenous and rural communities as they negotiated the impacts of colonial policies, based on secondary sources. It moves on to discuss what we know about the Colonial period activities of indigenous peoples across the Maya area based on archaeological evidence, and concludes with an overview of documentary evidence related to Tahcabo as well as a presentation of the town's prominent archaeological and landscape features.

Colonial Policies and Taxation

Reducción

Reducción, the process also referred to as *congregación*, began in the northern Yucatán peninsula in 1552, when the magistrate (*oidor*) of the court (*audiencia*) of Guatemala, don Tomás López Medel, made a regional inspection (Quezada 2014:57). He began to transform the configuration of populations across the landscape and issued ordinances (*ordenanzas*) detailing correct behavior in the *repúblicas de indios*, or pueblos. His *reducción* campaign focused on relocating populations within 10-12 miles of Valladolid to the location of the nearby convent at Sisal, which was a *doctrina*, or administrative center of evangelical activity and religious education, where friars resided (Hanson 2008:341, 603). This was the first of three major *congregación* campaigns (Quezada 1993:81-102). Although civil law ordered that *reducción* take place, Franciscans enacted the policy as part of the evangelization process (Hanson 2008:362-363).

While *reducción* could involve gathering populations scattered across the landscape into previously occupied town centers, it could also involve moving entire communities to already established areas, especially the new *cabeceras*, or inventing new town centers where none had previously existed (Fernández Tejedo 1990:75; Quezada 2014:57). When Tizimín became a *doctrina* in 1563, Franciscans began transferring pueblos so that by 1582, in Tizimín's sprawling northern district, which had once contained 81 villages, there were now just 31 *congregación* towns (Quezada 2014:71). These missionized towns were referred to as *visitas*—pueblos where friars visited to evangelize but did not reside, and which were assigned to a particular *doctrina*. By the mid-1560s, 190 pueblos had been established across Yucatán (Quezada 2014:58). The number of *doctrinas* had also grown (Hanson 2008:357; Quezada 1993:Table 5; Scholes et al. 1938:55-62). With each *doctrina* established, additional resettlement occurred.

Because people did not wish to leave their homes and patios, where they kept bees and domestic animals, nor their gardens, orchards, fields, or hunting grounds, Franciscans resorted to violent tactics such as burning houses and cutting down orchards to get them to move (Quezada 2014:57). The report (*relación*) written by *encomendero* Juan de Urrutia attests that populations around Chancenote experienced particular destruction, for example in the town of Temaza, where he said that friars burned more than 170 homes in addition to their well-maintained church, and then set fire to the fruit trees in front of the houses before moving everyone to Chancenote, the *cabecera* (de la Garza et al. II:247). These tactics were recorded in several *relaciones* that *encomenderos* composed about their *encomienda* communities. The *encomenderos*, who always had tense relationships with friars in part due to competition for indigenous populations' labor and attention, complained that the *congregación* process imposed by friars had caused many to flee, others to become sick, and had left everyone unhappy because they no longer lived in their preferred places (e.g., de la Garza et al. 1983 II:186; Quezada 2014:58).

As indigenous peoples were moved into *doctrinas* and *visitas*, friars forced them to construct churches and other public buildings. In *encomendero* Diego de Contreras' *Relación de Nabalam, Tahcabo y Cozumel*, he writes that the constituents of his *encomiendas* complained not only about *reducción* and being forced out of their preferred locations of residence, but also about the large buildings they had to construct for the friars (de la Garza et al. 1983 II:186). Specifically, he wrote, "…and these religious people have made many buildings and monasteries in the towns and county seats, and they are more fortresses within which to defend 6,000 Spaniards than anything else, because in each monastery resides no more than 2-3 friars…," after which he complains that the labor of construction has led to the death of many indigenous people (de la Garza et al. 1983 II:186 [my translation]).

In addition to arranging for physical infrastructure, friars established governors (*gobernadores*) and councils (*cabildos*) in *reducción* towns (Hanson 2008:364). The title of *gobernador* was often, at least initially, assigned to the traditional leader of the town, referred to as a *cacique* by outsiders or as a *batab* in Yucatec Mayan language. Nobles in the town, which the Spaniards called *principales*, might take up roles in the *cabildo*, although this structure was more difficult to uphold in the pueblos (Quezada 2014:76-77). *Principales* were often assigned to watch over the households in their neighborhoods to ensure that they attended Mass and returned from extended hunting trips (Hanks 2010:61-62). Eventually, Spanish appointments and limitations on power undermined traditional community leadership (Quezada 2014:99).

López Medel's *ordenanzas* provide a great deal of insight into Spanish expectations for *reducción* communities in northern Yucatán, whether or not they were met (Ancona 1889:538-558). While he outlined the basic expected layout of a community on a gridded road system where everyone would live next to each other and not move to other communities without the express permission of the authorities, his detailed mandates went so far as to describe how families were to eat meals together. With regard to livelihoods, López Medel ordered that residents of *reducción* communities not travel to other communities or gather in large groups—even traders were allowed no more than 30-40 days away from their home communities. He argued that bows and arrows should be burned, because they caused indigenous peoples to go out into the woods to hunt, which, as he saw it, distracted them from their obligations in the community. He indicated that town residents should not plant fields or have forested areas within town limits, and that community representatives should learn how to keep cattle and then go about teaching others how to do so. Since cotton cloth was so valuable, he suggested that men should help women with its production, and in particular that single men should take up weaving and accept pay for their work producing this commodity (Ancona 1889:555). In terms of daily practices, López Medel ordered compliance with Catholic ritual observance and banned polygamy, bride-price, slavery, and traditional ceremonies.

It is useful to compare the detailed expectations that López Medel outlined to the actual capacity of friars to implement and enforce them at the community level. In 1550, there were 15 friars on the peninsula, and the number had increased to about 40 by 1560 (Hanson 2008:349). That number seems to have remained fairly stable (~40-50 friars) throughout the late sixteenth century, and not all of this group even spoke Yucatec Mayan

(Scholes et al. 1938:48-50). During peak missionization, personnel were few and far between. The redevelopment of towns to include churches and gridded streets would have taken some time, especially with divided missionary attention (Millet Cámara et al. 1993). Though little specific information has been found about the establishment of gridded town plans, Restall (1997:105) noted a record from Calkiní (see Barrera Vásquez 1957:111-112) indicating that after three years of construction under the guidance of a Franciscan friar, the road had been opened in 1582—perhaps a reference to the establishment of a Spanish grid in the town, along which the congregated populace would have established their residences. Until the eighteenth century, few Spaniards or people of Spanish descent lived dispersed across the countryside, leaving openings for indigenous farmers to shape their lives and livelihoods in ways distinct from Spanish preferences and expectations.

Encomienda

In Yucatán, a landscape that Spaniards generally considered to be without valuable natural resources, Spaniards, and *encomenderos* in particular, initially survived on the taxes that they demanded from the pueblos. The goods collected included cotton cloth, thread, and raw cotton; beeswax and honey; poultry; and maize and beans (Gerhard 1993:56; García Bernal 1978:378), which would have provided them with surplus that they could sell or trade. The Spanish Crown's expectation for *encomenderos* was that they would ensure that the indigenous people living in the communities assigned to them would be Christianized, in return for receiving certain goods from them (Quezada 2014:43). Franciscan friars worked out the first *encomienda* taxation schedule based on population in 1549, after which visiting magistrates from the *audiencias* of Guatemala and New Spain updated the schedules (Chamberlain 1948:286; García Bernal 1978:198; Hanson 2008:308).

The Crown eventually ruled that *encomenderos* had to live in a city or villa in the province where their *encomiendas* were located (Chamberlain 1948:238; Simpson 1982:131). The rule disallowing Spaniards to live in *encomienda* communities sought to protect indigenous communities from the worst Spanish abuses, protect Spaniards from uprisings, and maintain coherent military forces in Spanish settlements (Chamberlain 1948:238). In addition, the 1542 laws indicated that *encomenderos* were not to enslave indigenous peoples, but were instead supposed to pay them fair wages for any moderate labor beyond tribute quotas (Simpson 1982:130). Production of tribute goods took place within rural communities, so labor drafts were rare in the region, and personal service was abolished by the crown in 1549 and the law enforced in 1552 with López Medel's inspection (Quezada 2014:46). Perhaps to assuage *encomenderos* who were angry about the prohibition of service, when López Medel adjusted the *encomienda* taxation schedule, he increased maize quotas and expanded the array of items demanded in tribute to include chili peppers (*Capsicum* sp.), beans (*Phaseolus* sp.), ceramic vessels, wooden buckets, salt, and henequen (*Agave sisalana*) rope (Fernández Tejedo 1990:52, 140; Hanson 2008:312-313; Pech 1969[1562]:232; Scholes and Adams 1938:II:112-113).

A tributary was originally defined in 1549 as a married male, but in 1583 the definition was expanded to include unmarried adults (defined as 12 years of age for a woman and 14 years of age for a man; Cook and Borah 1974:10), each of whom counted as a half tributary (Quezada 2001a:77). Early on, each town delivered one-third of its annual tribute requirements to the *encomendero* every four months (Hanson 2008:309). Some items were to be collected from each tributary, whereas others were considered the responsibility of the entire community. In the 1560s, each tributary was expected to produced cotton cloth, maize, and a turkey or chicken, while community-generated goods included beeswax, honey, beans, chili peppers, ceramic vessels, and henequen rope (García Bernal 1978:383; Scholes and Roys 1948:152). One can imagine that a town's *gobernador* had to manage relationships among different specialized producers in his jurisdiction to achieve the correct quantities of each good. The *encomendero* paid for the transportation of the goods to the villa or city in which he resided, and there were set prices to guide how much a load should cost based on its value. Specifically, the transportation of commodities such as cotton cloth and beeswax (paid in Spanish *reales*) cost more than that of domestic goods (paid in cacao beans during the early Colonial period; García Bernal 1978:382).

By the 1580s, the tax schedule had changed slightly, along with the definition of a tributary as mentioned above, and tributaries now paid taxes twice annually, on the day of San Juan (June 24) and on Christmas (Fernández Tejedo 1990:140-142; García Bernal 1978:385). The taxes also became more standardized: each tributary paid one-half *manta* (a mantle, or measurement used for cotton cloth that required sixteen pounds of raw cotton [Patch 1993:86]); one *fanega* (approximately 1.6 bushels) of maize; one turkey; and one chicken (Patch 1993:28; Quezada 2001a:77). The *encomienda* system remained important in Yucatán through the late eighteenth century, even though it was phased out much earlier in other regions (Gerhard 1993:56). As mentioned in the introduction, tribute eventually came to be paid in currency (García Bernal 1978:388-394). It was finally abolished and replaced with a head tax in 1785, when dispossessed *encomenderos* received fixed pensions (Patch 1993:33, 163; Quezada 1997:127).

Limosnas and Obvenciones

Conversion in Yucatán began as traditional community leaders expressed their acceptance of the faith in baptismal ceremonies for which the relevant *encomenderos* acted as *padrinos* (godfathers; Hanson 2008:360; Pech 1969[1562]:233). Early on, indigenous donations to the church entailed subsistence goods for the friars (López Cogolludo 1957[1688]:255; Quezada 2001a:76). At first, *encomenderos* paid for the costs of constructing and maintaining the churches, but eventually that responsibility was transferred to each town's *cabildo* (Hanson 2008:358). Another expense that began to be exacted by the church in the year 1581 was an annual tax of one *real* for each adult man and woman, called the *emolumento* (Fernández Tejedo 1990:131-132). At the same time, it became common for indigenous populations to make donations to the local *visita* and regional *doctrina* churches in the form of maize, beeswax, sandals, and cotton cloth (Quezada 2001a:76).

From the 1560s onward, *limosnas* (alms, though not voluntary) were delivered on the significant days of Easter, Christmas, San Francisco's feast day (October 4), and on the feast day of a town's patron saint (Tozzer 1941:75). *Limosnas* were not well-regulated, and were assessed based on the judgment of any given priest, before becoming formalized during the early eighteenth century, when they came to be known as *obvenciones* (Patch 1993:28). Payments consisted of many of the same goods as *encomienda* tribute, and eventually *obvenciones* too were paid in currency (Patch 1993:29). Additionally, married couples paid for the catechism classes of their children, and fees were charged for the performance of sacraments, so that on an annual basis, family payments to the church may well have surpassed tribute requirements (Farriss 1984:40-41; Patch 1993:29).

Repartimiento

Repartimiento de bienes, a system that forced indigenous communities to sell commodities cheaply, though illegal during most of the Colonial period, was practiced widely among Spaniards in positions of power, such as royal provincial governors and priests (Patch 1993:30). Its purpose was simply to maximize the profits of a Spaniard at the expense of the indigenous producers. Early evidence of this practice, mentioned in the introduction, included records that Juan de Contreras, first *encomendero* of Tahcabo, forced residents of his *encomiendas* to buy cacao beans in exchange for highly-desired cotton during the 1550s (Quezada 2014:93). More records of the practice exist for later times, predominantly during the seventeenth and eighteenth centuries, and the targeted commodities consisted primarily of beeswax, honey, and raw cotton or cotton cloth. In these cases, Spaniards provided goods, cash advances, and even indulgences in exchange for cheap and often under-weighed commodities (Farriss 1984:44; Patch 1993:30-31, 91). The timing of these activities coincided with *encomienda* tribute payments, and town *gobernadores* were also held accountable for *repartimiento* payments (Patch 1994:104). If community leaders needed to acquire commodities in order to meet their various quota obligations, they bought them at high prices or on credit from Spaniards who controlled the trade (Patch 1993:88).

The royal governors worked to impose *repartimiento* of commercial goods through different government officials, eventually settling on war captaincies to carry out *repartimiento* on their behalf (Patch 1993:30-31). Other church and state officials continued to participate in this system as well. Franciscan friars kept records indicating that in the year 1700, all of the *repartimiento* contracts they maintained with communities under their control yielded “between 43,539 and 44,354 *patíes* [measure of cloth requiring six pounds of raw cotton], 1,028 *mantas*, 15,705 pounds of thread, and between 68,282 and 68,882 pounds of wax” (Patch 1993:83). By the mid-1600s, *repartimiento* posed an enormous obstacle to well-being within indigenous communities.

As Kaeding (2013:51) argues in his dissertation, “With *repartimiento* abuses, we see clear evidence of alienation from the fruits of labor.” Coercion in this process is clear, as it involved an intentional act of indebting a community and enforcing subsequent debt repayment (Patch 1994:95). The activity also involved forced market integration. For these reasons, Pezzarossi (2015b:357) uses it as a prime example of an antimarket in the colonial Spanish Americas, as it “drew in and entrapped Maya communities in unequal relations of production, exchange, and debt.” *Repartimiento* created artificial markets for the commodities that Spaniards obtained from indigenous populations (Larson and Wasserstrom 1983:62). As communities experienced the need for currency to pay tribute and taxes, *repartimiento* served as a source of expensive loans (Baskes 2005). In this way, the system could be seen as a precursor to indebted labor on *haciendas*, with the distinction that indigenous populations retained control of the means of production under *repartimiento*.

Apart from *repartimiento* of goods, the *repartimiento* of service, as well as occasional tributary service, replaced the personal service banned in 1552 (Clendinnen 1982; Quezada 1997:128). If a Spaniard needed a certain number of workers (women or men) for a project, he would get permission from the royal authority to hire them for a certain length of time. Later, this system became a weekly work schedule, in which a small number of tributaries from each town spent one day per week or one week per year (for women) in a Spanish settlement, where they would be distributed among the houses of the *encomenderos* and

Spanish colonists. Women often suffered sexual abuse in such arrangements (Clendinnen 1982:432). Indigenous people who participated in *repartimiento* of service were paid, but at bargain rates (Patch 1993:30). Others, who stayed in their communities, spent one day per week working there on various projects (Patch 1993:29). This particular system began in the 1560s and lasted 200 years (Quezada 1997:129).

The Bourbon Reforms

Late in the eighteenth century, the Bourbon reforms transformed rural communities. One tax not yet mentioned was called the *comunidad*, or community tax (Patch 1993:29). Beginning at the end of the sixteenth century, tributaries paid one *real* each for this tax, and the amount increased to four *reales* each by 1668 (García Bernal 1978:389). Most income was spent on festivals and church upkeep, for candles, fees of the cleric, and saint adornments (Farriss 1980:165). This communal resource could also provide grain in case of shortages and famine (Farriss 1980:165). With the Bourbon reforms, community leaders lost control over the community taxes, which were transferred to the royal Treasury in 1777 (Farriss 1984:359). From that point forward, local leaders had to request funds from the Treasury, and such requests were often denied. Instead, people of Spanish descent designed and implemented community projects that they deemed necessary. Few of these projects worked well, with one possible exception consisting of the implementation of cemeteries outside of towns at the turn of the nineteenth century (Farriss 1984:366).

At the same time, the bishop auctioned off lands previously governed by communities called *cofradías* (religious confraternities or brotherhoods). *Cofradía* estates, called *estancias*, were the properties of religious confraternities created and controlled by indigenous elites, who used their profits in part for the annual celebration of the patron saint (Alexander 2003:198; Farriss 1984:267). Archaeological evidence from Yaxcabá showed that *estancias* had been managed by a permanent population of producers (Alexander 1997). After the church appropriated these estates, there were few resources available to communities with which to pay for their festivals.

In 1812, *repúblicas de indios* were transformed into *municipios* governed by town councils (Farriss 1984:376). Spaniards and Spanish creoles (people of Spanish descent), now distributed across the countryside in contrast to the early Colonial period, occupied these positions, known as *subdelegados* and *jueces españoles*. This move, also considered part of the Bourbon reforms, further undermined communities' traditional leadership (Kaeding 2013:193-201).

The Bourbon reforms made land grabs easier, as land between communities was re-classified from Crown land to vacant land (*terreno baldío*), available for sale (Bracamonte y Sosa 1984). *Haciendas* in many cases doubled or tripled in size (Farriss 1984:373). The Bourbon reforms restricted *encomiendas* and promoted *comercio libre*, or free trade, among the Spanish colonies (Alexander 2003:195; Farriss 1984; Patch 1993; Wolf 1982). At this point the production of exportable goods such as sugar (from sugarcane, *Saccharum officinarum*), henequen cordage, meat, lard, hides, salt, maize, beans, and logwood (*Haematoxylum campechianum*) overtook the production of goods previously paid as part of the tribute and *repartimiento* systems. Clearly, the late eighteenth century was a dynamic time in terms of colonial policy and developments in rural livelihoods.

Strategies for Survival and Well-Being

Mobility

Nancy Farriss (1984) argues for the importance of mobility as a strategy that Maya populations used to survive and achieve some degree of freedom throughout the Colonial period. She argues that while there were few protections against exploitation in Yucatán, the biggest threat to Spaniards was that the local peoples on which they depended would leave the area altogether (Farriss 1984:73). Because of that, migration could be seen to some extent as a check on power. Reasons that people might flee included famines, epidemics, political conflicts, high taxes, and debt.

Farriss (1984:73) writes that the colonial Spaniards "in exasperated moments suspected the Maya of deliberately cultivating poverty so that they could escape easily, unencumbered as they were with worldly goods." According to Farriss' assessment of historical documents, the few items a family needed to survive included a grinding stone, a chopping tool such as a machete (which could have been purchased in Spanish markets installed in villages; Farriss 1984:45, 156), and seeds for new crops. The rest they could harvest from the woods—knowledge of hunting and gathering supported families until they were able to plant field crops once again (Farriss 1984:73). In other words, at least by Spaniards' assessments, early colonial populations generally had the flexibility to move. Of course, rebellions and *reducción* raids had likely made mobility a necessary survival strategy.

Farriss (1984:199-214) describes the different types of movement that Maya populations engaged in as dispersal, drift, and flight. Dispersal entailed populations moving to land near the town where they had once lived or to valuable resources, thus dispersing across the landscape from a population center. There may have been little reason to remain in congregated communities, because the lands to which people held rights were located far away from the towns where they were resettled, and it made sense for families to live closer to their land holdings. Shift, on the other hand, refers to movement from one town to another town or to a city, while flight refers to passage to areas across the frontier and outside of colonial control. Populations implemented the survival strategies of drift, dispersal, and flight at different rates throughout the Colonial period.

During the early Colonial period (defined here as ca. 1540-1730; see Patch 1993:137; Scholes and Roys 1948:228), people fled across the frontier, where they practiced traditional religion, and hunted and collected in the forest (Alexander 2006:450; Farriss 1984:75; Scholes and Roys 1948:228). Populations continued to use escape as a strategy throughout the seventeenth century, especially amid the *repartimiento* abuses mentioned above (see also García Bernal 2005:180-182). Populations from one community also drifted to others, where debts from their previous places of residence were less likely to be traced and where limited economic opportunities could be found. For example, by 1583, approximately 2,000 indigenous people lived in the city of Tizimín, a mere 12 km from the research site of Tahcabo (Quezada 2014:67-68). Colonial documents indicate that people arriving at new towns would be warmly welcomed by those sharing a surname (Restall 1997:18, 48; Tozzer 1941:Sec. XXIV). On the other hand, Farriss (1984:220-22) makes the point that while newcomers to town were welcomed, integration into communities and their forms of support could still be difficult (see below, "Community Support").

By the late Colonial period and into the Republican period, *haciendas* had been established primarily by Spanish creoles (Alexander 2006:456). *Ranchos* were private lands used similarly but generally had indigenous owners and mixed the production of subsistence with commercial goods (Morgan-Smith 2019; Rugeley 2009:18). This development created another option of moving to a private estate, which offered consistent food rations in times of drought. However, laborers on *haciendas* and *ranchos* often became indebted for various reasons (Alexander 2003:194; Morgan-Smith 2019).

Drawing on the Extended Family

The extended family, which in Yucatán consisted of three generations of patrilaterally-related kin, provided risk reduction advantages that the nuclear family could not. The shared housing of a traditional extended family consisted of either a single large house or a cluster of smaller dwellings (Farriss 1984:134). As Farriss (1984:133) puts it, the nuclear family "was not the most efficient unit, nor did it afford any protection against illness or injury of self or spouse and the other usual vicissitudes of human life, not least of which is old age." Advantages of the extended family included shared agricultural work, hunting trips, and domestic chores including garden maintenance, child care, and use of objects such as tools and utensils. Thus, at least early on, Spanish clergy's demands that people live in nuclear families often went unmet. As nuclear house lots developed, food sharing and other advantages of the extended family were likely preserved to some extent, as nuclear households composing larger extended families clustered together in neighborhoods.

According to the 1583 census of Espita, the average number of residents per household was 9.4, based on 56 households (Farriss 1984:134). This evidence supports the idea that populations continued to live in extended family residences at least during the early Colonial period. Farriss (1984:170) also found that local populations seemed to "revert" to the extended family household arrangement in places with less priestly supervision. As

Clendinnen (1982:436) put it, "the friars were too remote from the villages, both physically and culturally, to offer a serious alternative to traditional ways of thinking and traditional authority structures." Nonetheless, the requirement of a set tribute amount from each married man would likely have put stress on the extended family (Farriss 1984:170; Scott 1976:46), and later census documents indicate shrinking numbers of average household residents through time, to be considered further below.

Community Support

Farriss (1984:328) famously argued that "the Maya saw survival as a collective enterprise." She details that the community saints were guardians of the community as a whole, and that major spirits had to be petitioned through the extended family corporate group (Farriss 1984:328). Together, communities celebrated and sustained their relationships with the saints through annual events. One must not take the corporate nature of communities too far and imagine that everyone got along—surely drama abounded within small towns. In addition, there was complexity of social status—Restall (1997:Table 7.1) outlined eight social strata based on documents from the indigenous community of Ixil. Nonetheless, populations came together through shared efforts at least once per year in the name of the saints and the well-being of all. This work was the responsibility of Maya *cofradías*.

C*ofradías* required donations of time and goods for the maintenance of the church and the saints, but also provided new opportunities for class distinction including the acquisition of private properties within indigenous communities (Patch 1993:25). *Cofradías* were based originally on income generated from communal *milpa* (field agriculture) plots and eventually from *estancias*, in addition to individual contributions to the collective effort of community saint maintenance (Farris 1980:165).

Banquets and other types of food sharing were features in the celebration of saints' days and other special occasions throughout the year, such as ceremonies for the dead, weddings, and traditional ceremonies such as the *Ch'a' Cháak*, a ceremony which petitioned for rain (Farriss 1984:321). These events provided opportunities for all town members to enjoy foods that might otherwise be unavailable in the diet, such as various meats served with spices and alcoholic beverages such as *balche'* (a wine made with honey and bark from a species of *Lonchocarpus* tree) or *aguardiente* (usually sugarcane liquor; Farriss 1984:322). More on food history can be found in the next section.

Landscape History

Rural Livelihoods

In this subsection I present and evaluate historical accounts of rural livelihood practices during the Colonial period. Farriss (1984:167) and other historians often describe livelihoods in rural Yucatán, both pre- and post-conquest, as undifferentiated and highly dependent on subsistence agriculture. At the same time, they acknowledge specialized skillsets that existed among the population, including stonemasonry and the production of fine woven goods (e.g., Farriss 1984:166). For example, during the Colonial period, Franciscan missionaries hired local stonemasons, who traveled in teams to construct churches in communities across the peninsula. Historians also document socioeconomic status distinctions within Maya communities, indicative of variations in livelihood portfolios that could include a combination of crafting, political engagement, religious activity, and specialized agriculture, horticulture, and animal husbandry, both before and after Spanish conquest. Writing in 1613, Sánchez de Aguilar (1937:148-150) indicated that within indigenous communities could be found occupational specialists such as muleteers, blacksmiths, tailors, shoemakers, painters, and potters (Patch 1993:32).

The items documented within the houses of the rich and poor within rural communities can shed light on livelihood activities pursued, and especially on the crafts produced within communities. According to Farriss (1984:166-167), simple goods that farmers produced before and after the Spanish invasion included: “mats and baskets, henequen cordage, crude deerhide sandals, pottery (although it is rarely mentioned, and gourds and baskets seem to have been more commonly used for everything but cooking), and, above all, the plain cotton cloth that every Maya woman could weave on her backstrap loom.” These items are significant to daily life, and specific town residents would have excelled in the production of each craft. Farriss’ parenthetical note indicates that gourds and baskets dominated over pottery as food serving receptacles. Ceramic data from houses excavated at Tahcabo indicate that while that may have been the case during the late Colonial period, from which more historical documents survive, gourds may not have been as prevalent as receptacles during the early to middle Colonial period (see Chapter 6).

Other Colonial period livelihood activities practiced among all people in a community included hunting, which men performed during the early Colonial period with the bow and arrow (despite Mendel’s *ordenanzas*), which were eventually replaced with firearms when possible (Farriss 1984:167). In particular, Restall (1997:104) notes that shotguns began to appear in wills from Cacalchen and Tekanto as early as 1647. Agriculture, including intensive crop production, was obviously important, for pueblos of the northern Yucatán peninsula produced more cotton than any other region in New Spain (Hanson 2008:322; MacLeod 1973:48). Women spun thread and wove cloth, thus working to pay exorbitant taxes, which would have impacted the time they had to spend on food preparation (Quezada 2001a:76). According to Farriss (1984:167), commoners tended to their small gardens and an occasional fruit tree, and kept turkeys and chickens, raised for tribute and eggs for household use. A great deal of their labor overall went toward paying the Spanish taxes and other "regimes of forced labor" imposed on them (Farriss 1984:167).

Accounts of the resources of the Maya nobility indicate that they lived in large house lots near the center of town and controlled livestock (including cows, horses, and mules), apiaries, orchards, preferred farmland, and access to irrigation features such as *cenotes* and *rejolladas* (Farriss 1984:179-80). Within their homes could be found valuable items such as wooden furniture, including tables, chairs, and trunks with metal locks, along with cushions, silverware, glazed pottery, jewelry, coinage, fine and embroidered cloth, cloaks, hats, firearms, saddles and harnesses, saints' images or statues, and even heirloom idols or greenstone beads. Restall (1997:106) noted that people in Yucatán rarely bequeathed their entire houses, but instead bestowed specific features of residences seen to be valuable, such as a key with a door and frame. He suggests that this represents the importance of metal- and woodworking as specialized crafts ranked above basic masonry work, which many people in a community could have performed.

During the early Colonial period, Spaniards began to raise imported pigs (*Sus scrofa*), horses, and cattle on ranches called *estancias* on indigenous land that had likely fallen out of use due to population declines and was expropriated (García Bernal 2006; Patch 1993:17). Indigenous populations living on these *estancias* paid rent to the estate owner in the form of labor one day per week (Alexander 2018:270). As mentioned above, *cofradías* also maintained *estancias*, where during the seventeenth century they began to raise sheep and goats and eventually focused on cattle raising to generate the resources needed for annual town fairs (Patch 1993:27). *Estancias* under *cofradía* management also produced maize, beans, and honey (Patch 1993:183). This system expanded during the eighteenth century—by 1750, 106 pueblos (out of 203) maintained 137 estancias (Farriss 1980:167); in the year 1780 there were 158 *estancias* in all (Patch 1993:183). All of the *estancias* were built near *cenotes* where animal-powered water wheels (*norias*) drew water for the cattle (Farriss 1980:169). In the case of *cofradías*, this required the cooperation of community elites who generally controlled access to *cenotes*.

Colonial period circumstances would have impacted practices of horticulture and agriculture as well, especially as Spaniards de-valued traditional techniques that were particularly suited to diverse landscapes across the Americas. Throughout the Colonial period in Yucatán, the Spanish government required that each married male plant sixty *mecates* (a mecate is roughly 20 m by 20 m) of maize per year (Farriss 1984:127). In addition to this, López Medel's final *ordenanza* indicated that indigenous communities should grow fields of maize and beans for their *gobernadores*, continuing pre-colonial practices (Ancona 1889:558). Such requirements would have encouraged rural populations to focus their efforts on maize, whether or not they had previously done so. With destroyed orchards fresh in their minds, early Colonial Maya populations may have opted in any case to focus their attention on cultivating plants that they could more easily re-seed to recover from an attack if necessary, especially due to threats posed by ongoing rebellions. Colonial policies demanding high levels of maize and cotton production would have reinforced this course of action. Colonists did not get seriously into the business of producing maize, rice, cotton, and sugarcane until the eighteenth century, when livestock raising also expanded (Patch 1993:17, 34). Cotton was particularly important in the region near Tizimín, but when *repartimiento* was banned again in 1782, the prices and production plummeted (Patch 1993:179).

In some places, as *haciendas* grew during the eighteenth century, they became the focal point of indigenous life in rural communities, as workers became bound to estates through debt peonage, tenancy, sharecropping, and in general the possibility of rations in times of scarcity. In other places, *haciendas* competed for labor and resources with other institutions, such as *encomiendas*, the church, *cofradías*, and independent *ranchos* (the latter of which were organized by groups of indigenous farmers; Alexander 2003:213). As occurred in other areas as well, Alexander (2003:195) found that the population of Yaxcabá parish nearly tripled between 1750 and 1828, with populations increasing in the *cabecera* of Yaxcabá and its pueblos, as well as at independent *ranchos* and *haciendas*.

One of the biggest technological transformations offered by introduced animal domesticates, other than transportation, were the animal-powered *norias* installed into water sources such as *cenotes* (Alexander and Hernández Álvarez 2018:71). By the mid-eighteenth century, equids and cattle could be found as commonly bequeathed property within indigenous communities, although they began to be mentioned by the mid-seventeenth century (Roys 1939:295; Restall 1997:365; Thompson 1999:128-129). Alexander and Hernández Álvarez (2018:72) consider livestock raising to have been a risk-reducing strategy that they compare to the pre-Hispanic practice of garden hunting, especially amid *reducción* policies (see also Alexander 1998:42). Livestock raising was so prevalent that by the eighteenth-century, colonial officials levied tithes on even small-scale animal production in rural communities. In one specific example, by the late seventeenth century in a village near Mérida, 81% of families paid tithes for cattle, while 40% paid tithes for horses and mules (Patch 1993:183). Likely, the tithes discouraged animal husbandry and pushed more people into wage labor, which would have become an important subsequent risk-reducing strategy for rural households. In Yaxcaba's 1841 census, 5% of the adult male population had occupations related to livestock production (mule drivers, blacksmiths, tanners, shoe makers, and cowboys (Alexander and Hernández Álvarez 2018:72).

Food History

Historians note distinctions between the diets of the rich and poor immediately before and after Spanish conquest based on ethnohistorical documents, while archaeologists detect differences based in part on the identification plant remains, including charred seeds such as those discussed later in the chapter and in Chapter 6. Historical sources indicate that the large kitchen gardens of the nobility would have provided them with access to preferred seasonal fruits, such as avocado (*Persea americana*), *zapote* (*Manilkara zapota*), and citrus during the Colonial period (Farriss 1984:178). In addition to maize and beans, they would have had access to "honey, lard, cacao, squash seeds, and spices" (Farriss 1984:179).

On the other hand, common residents of rural Yucatecan towns may not have been able to afford meat on a regular basis. As Farriss (1984: 321-22) writes, "Game was a rare treat; pigs were raised for sale to *vecinos* [Spanish creoles], and cattle served as a form of capital investment, used for food only in times of emergency." She then goes on to say that such conventions were, however, suspended during community festivals, as mentioned above in the section on "Community Support." However, one might consider the role that hunting played in commoners' diets throughout the Colonial period, and how this activity may have yielded particularly high quantities of meat *per capita* for those who lived during times of low population density across the peninsula. At such times, rural populations may have had greater access to protein, although drought also would have impacted animal populations. I will present evidence in Chapter 6 that residents of an early Colonial period house on the outskirts of Tahcabo engaged in hunting. During the early Colonial period, hunting may well have complemented trips into the forest in search of wild beeswax and honey for the payment of tribute and eventually *repartimiento* (Patch 1993:27; Wallace 2019).

Perhaps especially due to an increasing emphasis on maize agriculture, indigenous populations in Yucatán valued a diverse range of cultigens. Restall (1997:Table 15.6) provided a list of plants bequeathed as property or otherwise mentioned in Maya wills, building on Marcus' (1982) previous work that drew on the *Relaciones histórico-geográficas de Yucatán* and colonial dictionaries. Plants bequeathed included the tree fruits hogplum (*Spondias* sp.), cacao, *mamey* (*Pouteria sapota*), and banana and plantain (*Musa* spp.; introduced); crops including henequen, maize, manioc or *yuca* (a tuber; *Manihot esculenta*), and cotton; as well as plants used for construction, rituals, and animal fodder: guano palm or *xa'an* (*Sabal yapa*), gumbolimbo or *chakaj* (*Bursera simaruba*), *copal* (*Protium copal*), and *ramón* (*Brosimum alicastrum*). The list sheds light on the plants that were most highly valued during the Colonial period. Other food-related items in the wills included pigs, chickens, turkeys, beehives, and land.

Spaniards introduced domestic plants and animals to the Americas early on, as evidenced by ship inventories and Spaniards' early establishment of church gardens and *estancias* across the landscape (Deagan and Cruxent 2002; Farriss 1984:321-322). Introduced plants and animals spread across the Americas quickly—in fact, in *Hispaniola* and *Nueva Galicia* banana plants and citrus trees established themselves so rapidly that early visitors believed they were native to the Americas (Dunmire 2004:107; 195). They are among the introduced plants that continue to be most prevalent in the area today. However, a wide variety of plants were introduced to Mexico during the first decades of the Colonial period, from grains to leafy vegetables, stem vegetables, root vegetables, legumes, stone fruits, citrus, other orchard fruits, nuts, herbs, and spices (Dunmire 2004:Table 5.1). While friars and other Spaniards intentionally introduced such plants to their own gardens and orchards, plants could also spread among communities without much Spanish intervention, as Avendaño y Loyola, who visited Tayasal in Petén, Guatemala, prior to Spanish conquest (in 1697), noted the presence of plantains within indigenous gardens, in addition to native plants such as beans, chili peppers, cacao, vanilla (*Vanilla planifolia*), cotton, and indigo (*Indigofera suffruticosa*; Atran 1993:640).

Friars were likely among the first to promote Spanish-introduced cultigens within the Maya communities of Yucatán, where convent and church gardens would have acted as hubs for the cultivation and diffusion of introduced plants (as in South American cases, e.g., Kennedy et al. 2019; see also Alexander 2018:271). A description of Tizimín's convent (approximately 12 km northwest of Tahcabo) based on a visit in 1588 notes the presence of an irrigated garden in which friars cultivated introduced plants including banana, citrus, figs (*Ficus carica*), and grapes (*Vitis vinifera*), as well as local plants including *mamey*, avocado, guava or *guayaba* (*Psidium guajava*), and hogplum (Ciudad Real et al. 1993:323). Friars maintained diets that included the meat of introduced and native animals in addition to the plants observed in the Tizimín convent's garden. As Farriss (1984:324) attests, "The friars did not share the simple diet of their parishioners. Along with the staples of maize and beans, they demanded chickens, turkeys, lard, suckling pigs, and, during Lent and Advent, fish and iguanas." Primary imports to Yucatán include foods preferred by Spaniards, such as wheat, oil, wine, and vinegar (Chamberlain 1948:333).

Due to the early presence of imported plants and animals across the Mexican landscape, we might expect that rural communities immediately began to experiment with these exotics and incorporate them into the cuisine, rituals, and medicines of Yucatán. Many scholars argue that rural communities in the northern lowlands quickly adopted chickens and pigs, and eventually cattle and horses (Alexander and Hernández Álvarez 2018:71; Patch 1993:27). *Encomienda* lists mention that indigenous communities produced high quantities of chickens (Alexander and Hernández Álvarez 2018:72), although this line item in the tribute lists may have referred to poultry more generally (including native turkeys). However, Dunmire (2004:118) indicates that rural communities in New Spain seem to have had little interest in Spanish-introduced plants, with the exception of fruit trees. In Yucatán, too, the adoption of fruit trees seems to have been prioritized within indigenous communities.

The rates and processes by which indigenous communities in Yucatán adopted Spanish-introduced plants and animals is still not entirely clear. Not all Maya communities immediately embraced the entire suite of Eurasian plants and animals, especially as diverse cultigens were introduced through time (e.g., mango [*Mangifera indica*] was a later introduction; Dunmire 2004:Table 5.1). Restall (1997:104) indicates that the distribution of animals across the landscape during the Colonial period "depended upon five related factors: the relative poverty of the community, its location in the province, the incidence of disease among the animals, a famine that would result in their being eaten, and the fact of the steady increase in the number of introduced animals during the colonial period." In fact, adoptions were even more complicated than that, as diverse subject populations' socioeconomic statuses, ethnicities, and experiences with migration and displacement would also have correlated with their choices to incorporate new products into daily practices as well as into special ritual and social functions. Alexander and Hernández Álvarez (2018) point out that agropastoralism exacerbated social difference and helped to produce uneven economic development across the peninsula throughout its 500-year history.

Eventually, a hybrid cuisine did develop in Yucatán, as can be seen in the ingredients of innumerable dishes today including those that play a significant role in annual events, such as banana-leaf wrapped tamales cooked in the *píib*, or earth oven, and the pork present along with turkey in *relleno negro*, a dish often served at town fairs prior to the dance of the pig (*baile de cochino*). Today, banana trees are said to grow particularly well within *rejolladas*, where their leaves are protected from harsh winds, thus preserved for wrapping tamales. Introduced mango trees also grow particularly well within *rejolladas*, and Tahcabo residents continue to experiment with new trees in these features. For example, one town resident heard about the healing properties of the noni (*Morinda citrifolia*) fruit, and cultivates such a tree within his *rejollada* plot. That is to say, experimentation occurred and continues unevenly within and across communities based on the interests, access, and needs of farmers.

Droughts and Demography

The population of Yucatán fluctuated widely throughout the Colonial period, corresponding with droughts, disease, and famine until the Bourbon reforms, when grain imported from other Spanish colonies was made available to the general populace during times of scarcity (Hoggarth et al. 2017; see also Cook and Borah 1974; Farriss 1984:Table 2.2; García Bernal 1978; Restall 1997:Figure 13.1). Hoggarth and colleagues (2017) argue, based on historical records and oxygen and carbon isotopes from a stalagmite in the Yok Balum cave in southern Belize, for a high correlation between drought, plagues of locusts, famine, and recurrent disease epidemics.

Especially devastating drought, famine, and epidemics occurred with the onset of contact and colonialism and also from 1566-1576, 1648-1659, 1711-1715 and 1769-1774 (Chuchiak 2006:Table 1-3). The first time that the population of Yucatán seems to grow after contact is during the 1580s, but some of this growth may reflect more successful efforts at census taking due to *congregación* (Hoggarth et al. 2017:89). During the extreme famines of 1769-1774, eastern Yucatán suffered the largest population losses. For example, there was a 74.8% decrease in the indigenous population of Espita, Tahcabo's parish seat, and a 71.7% decrease in the population of Chemax, a sizeable town east of Valladolid (Farriss 1984:204; AGI, Mexico 3057, *Estado general de todos los tributarios*, 18 Feb. 1774). This was a particularly extreme drought (Hoggarth et al. 2017:Figure 2), but the lack of resilience in eastern communities may also have related to increased food insecurity. From that point on, with the importation of foreign grains that accompanied the Bourbon reforms, populations grew considerably and stayed relatively high until the current day, with exceptions related to the Caste War or Social War of Yucatán during the mid-nineteenth century (Hoggarth et al. 2017:Figure 4). The rural population doubled from the 1780s until 1841, a trend visible archaeologically (Alexander 2018:273; Andrews and Robles Castellanos 2009:121).

In terms of the changing ethnic composition of Yucatán's population through time, a 1586 estimate indicated that 400 households were headed by Spanish men, compared to some

50,000 indigenous married men (Farriss 1984:64). By 1671, people of Spanish descent numbered approximately 1,300, while the indigenous population had declined. During the population growth of the eighteenth century, the growth rate was higher among non-indigenous peoples than among the indigenous population, although this may in part reflect changing categories of ethnicity, as more of the population came to be categorized according to their mixed indigenous-African (*pardo*) or mixed indigenous-Spanish (*mestizo* or Spanish creole) backgrounds (Farriss 1984:64; Kepecs 2018:309; Restall 2009). During the eighteenth century, socioeconomic status tended to divide along ethnic lines that separated indigenous from non-indigenous populations (Alexander 2004:116).

Archaeological Evidence

In this section, I provide an overview of what we know from archaeology about Colonial period life and livelihoods in the Maya area. In their recent review of archaeological research addressing the topic, Oland and Palka (2016) divide their description into three parts: the conquered zones (in Yucatán and Guatemala), the peripheral semi-conquered zones, and the unconquered zone. These divisions make logical sense for presenting research trends, and the authors acknowledge that the categories overlap and that exceptions exist (Oland and Palka 2016:474). Remarkably, incredible diversity of experience can be found within each zone just as shared experiences existed across zones. For example, the histories of Spanish colonialism in what Oland and Palka call the conquered zones of Yucatán, Mexico, and the Pacific piedmont of Guatemala are distinct, in part due to the different cultures, political dynamics, economies, environments, and systems of land tenure that were present in each location prior to Spanish invasions. Colonial officials approached the two areas differently based on what they considered to be the valuable natural resources of each place, and trajectories diverged as colonial and indigenous populations came into contact and became entangled over the long term.

In Yucatán, as described above, early colonizers survived and thrived predominantly on the goods they demanded from the rural populace. Production of these goods took place within rural communities, so labor drafts were relatively rare—instead, Spaniards and local officials implemented systems of community surveillance. On the Pacific slopes of Guatemala, on the other hand, rural populations produced not only subsistence crops and livestock but also valuable commodities such as cacao and sugarcane. They experienced coercive labor drafts that took them away from subsistence agriculture for long stretches of time. As a result of their involvement in cash crop production, as well as the history of the local political economy, rural residents of the Pacific piedmont became integrated into markets much earlier than their counterparts in Yucatán, based on ceramic assemblages (Pezzarossi 2015b). In both cases, however, local populations experienced direct and slow violence imposed on them by similar colonial policies and crafted strategies that impacted local environments and institutions over the long term.

Because this dissertation addresses rural livelihoods in what could be called the conquered zone of the northern Yucatán peninsula, this section focuses on archaeological research from this region. However, few studies of Colonial period residential areas have been conducted in the area—historical archaeology in the northern Maya lowlands has tended to involve standing architecture assessment, regional surveys, and salvage projects conducted primarily in the city of Mérida, while more detailed study of common residences in rural areas has taken place primarily at *hacienda* sites (e.g., Hernández Álvarez and

Zimmerman 2016; Meyers 2012; Sweitz 2012). In this section, I begin with a review of archaeological research relevant to rural livelihoods during the Colonial period in the northern Yucatán peninsula. Then I address archaeological research at Colonial period sites in Belize and the Petén region of northern Guatemala, as these areas are places to which people from Yucatán fled, and where some interesting parallels in rural livelihoods and material culture can be seen.

Colonial Lives and Livelihoods in the Northern Maya Lowlands

Early Colonial Period Livelihoods. The most detailed study of a small, early Colonial period site in eastern Yucatán and across the northern Maya lowlands can be found described in Craig Hanson's (2008) dissertation on the mission at Ek' Balam. This site was particularly well-preserved because inhabitants left the area around AD 1620, and it remained relatively undisturbed in an area adjacent to the Classic period ruins of Ek' Balam. Hanson conducted survey, intensive surface collection, and excavation of structures near a small, Colonial period church in use from about AD 1540-1620. In particular, he located a number of houses clustered near the church and a series of *rejolladas*. Production features associated with the residences near the church included two Castilian-style kilns with a layer of lime thick enough to indicate production intended for market (Hanson 2008:1493). He also located two animal-powered *norias*. One *noria* was eventually used for trash disposal, and the resulting deposit provided a dense sample of animal bone studied for dietary information (deFrance and Hanson 2008). DeFrance and Hanson argued, based on the dense faunal refuse, that Spaniards had successfully restricted the mobility of the early colonial Ek' Balam population and had stymied their exchange networks, thereby reducing local access to hunted and traded animal foods upon which residents had depended in earlier periods. However, they also found that dog continued to be prevalent, and that it was likely prepared in the same ways it had been previously. Residents of early colonial Ek' Balam adopted Spanish-introduced domesticates including equid, pig, and chicken.

The most elaborate houses located near the church at Ek' Balam are of a form not otherwise found in the area, and Hanson considers them to be Spanish in style, and designed for nuclear families (Hanson 2008:1534). The form can be identified archaeologically by a long wall of stones running north-south, dividing the structure into two rooms. Half of the platform served as a patio, while the other half consisted of a perishable building adorned with hinged doors and window shutters (Hanson 2008:1464-1465). Residents of these houses at the Ek' Balam mission appear to have attained relative wealth, as evident from the presence of iron knife handles, blades, forged nails, axes, and other tools; Kraak (Blue-on-White) Chinese porcelain; and Ligurian Blue-on-Blue majolica (glazed pottery, European in style). They likely controlled the production that took place not only in the kilns but also within *rejolladas* at the site, as the larger houses were found to be more closely associated with these landscape features (Hanson 2002:380). The density of imported artifacts increased in residences located closer to the colonial church, a common trend at Colonial period sites in the Maya area (Kaeding 2013:186-193; Oland 2012:189; Pendergast 1993). Wealthy individuals lived near the center of town, while more humble residences could be found as one moved away from the town's main plaza (and away from the *rejolladas*), a trend documented at other sites as well (Alexander 2012:17; Kaeding 2013:70).

One important point to emphasize about Hanson's research is that his most intensive excavations targeted the houses closest to the church. The artifact assemblage of one house located farther from the church (approximately 240 m away), called IT16, had characteristics more similar to the early colonial house I will introduce later in this dissertation, which was also located that distance from the church at Tahcabo. Hanson examined IT16 using intensive surface collection and limited stratigraphic excavation (two 2-x-1-m units excavated to bedrock in 10-cm arbitrary levels). He determined that the platform's dimensions were 26 m by 28 m, with a height 0.4-0.7 m above the ground surface (Hanson 2008:1043). On one side he found preserved an 18-m-long retaining wall, but no retaining walls could be discerned along the other sides of the platform, and bedrock outcrops were apparent in some areas. Finds included chert and obsidian projectile points; chert cores, flakes, and blades; a perforated copper sheet; an amorphous piece of what he identified as iron (but may be hematite); worked limestone; and deer and dog remains (Hanson 2008:1324-1329). The chert projectile points were in various stages of manufacture, including blanks and failures. The ceramic assemblage at IT16 included Columbia Plain, Olive Jar, and Chen Mul Modeled sherds (Hanson 2008:1044-1045). The combination of sherds and artifacts associated with the Late Postclassic and early Colonial period led him to suggest that residents of the platform may have continued to reside there throughout the colonial transition, but another possibility is that some of the artifacts he attributed to the Late Postclassic period were still in circulation during the early Colonial period. Clearly, the finds from this more peripheral house were distinct from those he explored in greater detail near the church.

Finally, Hanson gained some insights into trends in the Colonial pottery relevant to the current study. He noticed many contexts in which Olive Jar and majolica sherds were found not with the traditionally recognized Colonial period earthenware ceramic types of Yucatán (Yuncu Unslipped and Sacpokana Red), but with Postclassic types including Mama

Red and Navula Unslipped. Based on this and other lines of evidence, Hanson argues that Yuncu Unslipped and Sacpokana Red were produced beginning late in the second half of the sixteenth century (Hanson 2008:1508). He mentioned that there were sherds that seemed to be transitional between Postclassic and Colonial period types, and noted the presence of Yuncu Unslipped sherds with groove-hooked rims (Hanson 2008:1515; Kepecs 1998:130).

Settlement Patterns and Livelihoods. Rani Alexander (1993, 1997, 1998, 1999, 2003, 2004, 2006, 2012, 2018), Anthony P. Andrews (1977, 1984, 1986, 1991, 2001; Andrews et al. 2006; Andrews and Robles Castellanos 2004, 2009), and Susan Kepecs (1998, 1999, 2005, 2018), among others (e.g., Gallareta Negrón et al. 1990; García Targa 2000; Kaeding 2013; Millet Cámara et al. 1993; Shaw 2015), have conducted surveys that contribute to our understanding of settlement patterns during the Colonial period in the northern Yucatán peninsula. Each of these scholars paired survey with in-depth examination of structures and residential spaces by creating maps and, in certain cases, conducting intensive surface collection, test pitting, and architectural analysis. This subsection draws on the work of these scholars to discuss long-term livelihood trends in the northern Yucatán peninsula.

During the early Colonial period, pre-colonial trade continued in copper, chert, indigenous wares (e.g., Yuncu Unslipped and Sacpokana Red and preceding types), and other materials (salt, cacao, fish, cloth, beeswax, and honey), although it shrank given demographic collapse, colonial policies, and Spanish control over the sources of copper, silver, and cacao (de la Garza et al. 1983:I:82, 149, 218; Jones 1989:106; Kepecs 1999:544, 2018; Roys 1957:164; Scholes and Roys 1948:244-246). Kepecs (1999:548) explains, based on her research in Chikinchel, a region located along the northeastern coast of Yucatán, that indigenous populations in the northern Yucatán peninsula were “practiced experts, able to produce enough for subsistence, Spanish tribute, *and* trade." However, she notes that the subjugated indigenous populations did not have enough time to make high-quality items for exchange given their new tribute requirements. Kepecs (2005:132), Oland (2009, 2012:187), and others (Wiewall 2009:40) have found evidence that Colonial period indigenous pottery was more diverse in terms of forms and pastes, even as sites became fewer in number and shrank in size due to outmigration (Kepecs 1999:558), suggesting more localized production. The pottery was of lower quality, and fewer vessels were slipped. Kepecs (2005:133) also argues that gourds, mentioned as eating and drinking vessels in Spanish *relaciones* and still used today as such, likely became more prevalent as Colonial period populations struggled with the demands on their time (de la Garza et al. 1983:I:75, II:60).

Settlement in Yucatán throughout the Colonial period involved a pattern of cyclic nucleation and dispersal (Alexander 2004; Kaeding 2013). In particular, during times of demographic loss, populations tended to cluster together and engage in more diverse, extensive livelihood strategies, while population increases resulted in more intensive production distributed across the landscape at advantageous locations for agriculture and other pursuits (Alexander 2004:46). Throughout the eighteenth century and after 1750 in particular, populations dispersed to *estancias*, *ranchos*, and unauthorized villages to live and work (Alexander 2004, 2018; Andrews and Robles Castellanos 2009; Patch 1993:52). Dispersal allowed people to avoid Spanish civil and church authorities as well as excessive taxation, as taxes (including the tithes on animal husbandry) were the responsibility of estate owners (Alexander 2004:155). House lot configurations also changed within villages, *ranchos*, and other sites depending on the livelihood activities pursued, population size and density, land stress and ownership rules, integration with the regional economy, influence of civil and church authorities, and tax structure at each location. For example, Alexander (2004, 2006, 2018) found at sites near Yaxcabá that a strategy of maize agriculture de-intensification related to limited land and labor co-occurred with the intensification of agricultural production within the settlement, represented by high numbers of features in house lots related to animal husbandry, gardening, and horticulture (see also Alexander and Hernández Álvarez 2018:73). Overall, her work demonstrates the variable agrarian strategies that indigenous populations pursued based on different sets of pressures and opportunities across the landscape.

Colonial Lives and Livelihoods in Belize and the Petén

Belize. Indigenous communities in Belize were located farther from nodes of colonial power and tended to exploit aquatic resources rather than adopting Spanish-introduced cultigens or domesticated animals (Oland 2009; Wiewald 2009). Kitty Emery (1990; 1999) reported that during the Colonial period at Tipu, populations became increasingly reliant on armadillo and turtle, but that otherwise they continued to rely on diverse animals, as they had before. At Lamanai, use of riverine fish and birds increased before and during the Colonial period, while use of large animals and overall species diversity decreased. At both sites, trends in place during the Colonial period had begun during the preceding Late Postclassic period. Species in use at both sites included turkey, cervids, turtles, and dog. At colonial sites in Belize, quantities of animal bone deposits around residences often correlated with the wealth of the residents (Oland 2012:189; Emery 1990). The largest houses at Lamanai and Tipu could be found associated not only with animal bone, but also with copper artifacts, Spanish glass beads, and majolica pottery (Graham 2011:224). A study of commoner households at Lamanai showed that few items of Spanish origin other than Olive Jar sherds existed in the humbler residential areas (Wiewall 2009).

Differences between trends at Tipu and Lamanai could also be detected based on the burials located in and around two different churches studied at Lamanai and one church at Tipu (Graham 2011). Surprisingly, more artifacts of Spanish origin could be found in burials at Tipu than at Lamanai, even though the latter site was likely more involved in trade, communication, and interaction with Spanish officials. Perhaps this relates to Tipu's economic position in a cacao-producing area, as cacao was a major colonial tribute good. Residents of Tipu could acquire Spanish trade goods in exchange for cacao, and then sell those items to communities in the Petén lakes region (Graham 2011:203). Evidence for health differences among the burial populations at Tipu and Lamanai could also be detected. Residents of Lamanai, who participated in trade and experienced influxes of people fleeing from the north, exhibited high levels of anemia, enamel defects, and lesions (Graham 2011:234-235). Tipu populations, which remained relatively stable during the Colonial period, maintained higher levels of health (Emery 1999:76-78; Graham 2011:234).

Christopher Morehart (2003) conducted preliminary analysis of charred plant remains from the Colonial period site at Progresso Lagoon, Belize, called Chanlacan—Maxine Oland's (2009) dissertation site, also referred to as the western shore of Progresso Lagoon. This was one of the first attempts to recover and analyze archaeobotanical material from a lowland Maya site dating to the Colonial period (Morehart 2003:126). Finds included maize cupule and kernel fragments, squash family (Cucurbitaceae) rind, calabash (*Crescentia cujete*) rind, two cotton seeds, a hogplum seed, a *mamey* seed, and palm endocarps (*Attalea cohune*, *Acrocomia aculeata*, and *Bactris* sp.), which were by far the most abundant archaeobotanical remains encountered, and were found in 46% of sampled contexts (Morehart 2003:128). Some of the plants found in the Chanlacan sample were also identified within an early Colonial period midden at Tahcabo—this evidence is presented in Chapter 6. Additional finds from the site of Chanlacan can be found compared to finds from Tahcabo in Chapter 7.

Projectile points were the predominant tool found within Colonial period contexts at Tipu, Belize (Simmons 1995). They included especially small, side-notched forms, but also basal-notched, stemmed, and unnotched forms no longer than 4 cm in length (Simmons 1995:137). Projectile point manufacture began with prismatic blades and flake blanks, which were pressure-flaked with shallow, narrow, flakes along the lateral edges. Simmons (1995:143) mentions the wide variety of basal forms observed, suggesting this was not entirely related to tool hafting and function, but also to unconscious cultural traditions expressed in toolmaking. By the mid-sixteenth century, there was an influx of people from Yucatán who had fled from areas under Spanish control, especially to Lamanai, where the variability of tools' basal forms was greater than at Tipu (Graham et al. 1989:1258; Simmons 1995:143). Finally, Simmons notes that projectile points served as tools of violence, warfare, and rebellion in addition to hunting. Projectile points are commonly found at early Colonial period and Postclassic period sites (e.g., Oland 2012:184).

Copper production appears to have occurred at Lamanai during the Late Postclassic through early Colonial period (called Yglesias Phase), and 76% of copper artifacts from the site dated to that timespan (Simmons et al. 2009). Copper-alloy artifacts were found in association with Spanish glass beads, majolica, and Olive Jar sherds (Simmons et al. 2009:64). All of the utilitarian copper artifacts at Lamanai (axes, axe blanks, axe fragments, chisels, wedges, fish hooks) come from Yglesias Phase contexts (Simmons et al. 2009:65). Based on the lack of such artifacts at earlier Mayapán, where only copper bells, ornaments, ring, needles, and tweezers could be found (Paris 2008), copper axes and chisels may begin in circulation across the Maya area during the Late Postclassic period, after the fall of Mayapán. At both Mayapán and Lamanai, evidence for copper production included the presence of copper pigs, failed bells, prills, and fragments of sheet metal, while crucibles were found only at Mayapán. The copper itself would have been imported from western Mexico or Honduras, but once in the Yucatán peninsula, craftspeople melted it down and re-cast it. At Mayapán, wealthy households cast simple bells for widespread consumption (Paris 2008). A similar pattern appears to have been in place at Lamanai, where the majority of copper artifacts and manufacturing evidence was found at the wealthiest residence and in the vicinity of the Spanish churches (Simmons et al. 2009:66-67).

The Petén. In the distant Petén lakes region of northern Guatemala, populations similarly relied predominantly on wild animal resources. Pugh (2009a; Pugh et al. 2012:17) found a cow mandible and European metal artifacts in ceremonial contexts at Zacpetén, and more broadly, small numbers of cow, equid, and pig bones could be found at sixteenth and seventeenth century sites, often in special contexts (Freiwald and Pugh 2018). Spanish-introduced domesticates did not become more widespread there until the eighteenth century, when Spaniards built missions in the area. Freiwald and Pugh (2018:80) point out, as do Alexander and Hernández Álvarez (2018), that a transition to the husbandry of Eurasian animals required many changes, restructuring space, daily activity patterns, and levels of integration into the colonial economic system. Outside of the controlled mission areas of

Guatemala, Belize, and Mexico, wild game remained the principal fauna eaten into the nineteenth century (Emery 1990; Palka 2005).

Pugh and colleagues (2016:50) point out that the material features of colonial control at Mission San Bernabé included church bells, used to organize time, and the grid system, which facilitated surveillance, labor drafts, and tribute collection. Burial practices changed according to Catholic expectations—as at other colonial sites, the burials at the Mission San Bernabé faced the east in extended supine position (Pugh et al. 2016). The human skeletal remains provided evidence that mission inhabitants experienced physiological stress and hard labor. The burials showed evidence for re-entry, with new burials placed within older graves. The latest burial was appropriately positioned according to Catholic tradition, while the older burials were a bit mixed up, but at least the skulls were positioned to face east (Pugh et al. 2016:56). Burial goods included a blue glass bead and an obsidian projectile point, while a cache at the mission church included a ceramic drum, fish bones, net sinkers, snails, an obsidian projectile point and other artifacts (Pugh et al. 2016:55, 64).

Other material evidence characteristic of Colonial period contexts at San Bernabé included hybrid ceramic wares, which are indigenous wares that appropriate characteristics of European pottery, while other indigenous earthenware, majolica, and Olive Jar sherds could also be found (Pugh et al. 2016:60). Two Spanish silver *real* cobs were found (Pugh et al. 2016). Such coins may suggest involvement in wage labor, which may have been necessary by the late eighteenth century, when tribute was paid primarily in currency. Wage labor could have easily led to debt peonage, as laborers received minimal pay while taxes were heavy and food was expensive (Pugh et al. 2016:62; Schwartz 1990:39-45). Ceramic and stone spindle whorls provide evidence for cotton spinning. Thirty-seven spindle whorls were found at the site of Tayasal, one of which, from the San Bernabé mission, consisted of a reworked Leonor Polychrome (majolica) dish (Pugh et al. 2016:60). Apart from Tayasal, Colonial period sites in the Yucatán peninsula have yielded consistently low numbers of spindle whorls, at least based on the published literature including recent dissertations (Hanson 2008:1536; Oland 2009:129; Wiewall 2009). This may suggest that Maya thread spinners used whorls made of perishable materials.

Tahcabo's Colonial History

Historical records indicate Tahcabo's long history as a tributary community, first to Ek' Balam, and then to Spaniards. According to *encomendero* Diego de Contreras' account, Tahcabo paid tribute to the ruler of Ek' Balam, named Namon Cupul, prior to Spanish arrival in products such as maize, turkeys, fish, cotton, and cloth (de la Garza et al. 1983 II:186). Tahcabo was also long a place of apiaries, as indicated by the town's ancient name (*tah cab*, which can be translated as the place of honey or as honey of the *tajonal* [*Viguiera dentata*] flower; Roys 1933:26). The demand for wax to produce church candles may have increased the importance of beekeeping at Tahcabo during the Colonial period.

During the early Colonial period, Tahcabo sat near the frontier of colonial control on the road between Tulum, Nabalam, and Tizimín (Farriss 1984:77; Roys 1952:135, Figure 1). Throughout the Colonial period, Tahcabo was never located far from the frontier. Roys (1952:167) describes Nabalam as "always a frontier town. This was true in the sixteenth century and a map dated 1766 still shows unpopulated country from there to the east coast."

In the 1549 *encomienda* lists, the first year for which tribute quotas were recorded, Tahcabo shows up as or in association with an *encomienda* called Enteçud (García Bernal

1978; Roys 1957:125). In that year, Juan de Contreras was the *encomendero* of Tahcabo, and there were 120 tributaries reported as living in the town—that refers to 120 married men associated with a larger residential community (likely of about 500). The remaining *encomenderos* of Tahcabo ("Tahcab") recorded in published historical documents can be found in Table 2.1. While there is little evidence that the *reducción* of Tahcabo was ever moved from its original congregated location, the other town now subsidiary to Calotmul, called Pocoboch (or "Pocboch" in colonial records), was apparently incorporated as a *barrio* of Calotmul for some time before returning to its current location (Gerhard 1993:137).

Table 2.1. Recorded *encomenderos* of Tahcabo, indicating the total population of married men for all towns controlled by a single *encomendero* (adapted from García Bernal 1978:Appendix 1).

Encomendero	Year	Other *encomiendas* controlled	Pop. married men[a]
Juan de Contreras (father)	1549	Nabalam, Cozumel	120[b]
Diego de Contreras (son)	1579	Nabalam, Cozumel	
Juan de Contreras Sigüenza	1607	Nabalam, Yaxkukul	520
D. Juan de Ayala Dávila	1609	Yaxkukul	380
D. Fernando de Ayala		Yaxkukul	
Real Contaduría	1666	Yaxkukul	158
Francisco Menéndez Morán	1667	Yaxkukul	

[a] A common multiplier for an estimate of total population is 4.5.
[b] In this case, the estimate appears to be solely for Tahcabo rather than for all towns controlled by the *encomendero*.

Originally, the Spanish Crown granted Juan de Contreras an *encomienda* that encompassed Tahcabo, nearby Nabalam, and the island of Cozumel. While Diego de Contreras was *encomendero*, he received Yaxkukul near Mérida in exchange for Cozumel (García Bernal 1978:530). Between 1607 and 1609, Nabalam became a separate *encomienda.* For that reason, during most of the Colonial period, Tahcabo formed part of an encomienda with Yaxkukul alone, which was quite distant, located near Mérida.

Historical records mention that established and newly appointed elites vied for power at Tahcabo as Spaniards attempted to subvert traditional power structures (Quezada 2014, 114). Specifically, in 1563, don Diego de Quijada issued the title of *gobernador* to both Juan Tun, the traditional *batab* or *cacique*, and Juan Pantí (Quezada 2014:161 [Appendix B]). It seems that Juan Tun had been in the position, and Diego de Quijada also granted the title to Juan Pantí. He did this as part of a focused effort to oust Juan Tun from power along with other traditional leaders in a number of towns (including Calotmul), adding to this tactic the establishment of town councils (Quezada 2014:93). Juan Tep is listed as *gobernador* in 1571.

While few documents relating to Tahcabo survive from the seventeenth or eighteenth centuries, a *repartimiento* list from 1664 indicates that Tahcabo residents collectively paid tribute of 50 cotton cloths (*mantas*) and 8 blocks (*arrobas*) of beeswax three times that year, as well as 80 bales of raw cotton at least one time (García Bernal 2005:245). Such lists also reported the number of people who had fled from each town in a given year due to the hardships induced by *repartimiento* (García Bernal 2005:238). In 1664, a year infamous for governor Rodrigo Flores de Aldana's *repartimiento* excesses, 30 residents of Tahcabo are said to have fled town (García Bernal 2005:245; Solís Robleda 2009:20). Records for the *repartimiento* in beeswax from the Tizimín region during the year 1716 provide evidence that populations in and around Calotmul and its *visitas*, including Tahcabo, were particularly dispersed across the landscape at that time. Specifically, the amount of wax demanded from *estancias* and *ranchos* (at 608 pounds of wax, usually based on population) exceeded the demands from the villages (at 550 pounds; Patch 1993:Table 3.4). In that same year, the total population of Tahcabo was said to be 106 residents based on the textile *repartimiento* (20 *patíes*; Patch 1993:Appendix A). This suggests an approximate 60% population loss from 1664.

In terms of the Church, until 1563, Franciscan friars visited Tizimín and the towns in its vicinity, including Tahcabo, from the convent of San Bernardino of Sisal, near Valladolid (Gerhard 1993:135). In 1563, Franciscans established the Tres Reyes convent in Tizimín, and that became the doctrinal center for the region (Scholes and Adams 1938:I:xiv). The *doctrina* of San Esteban in Calotmul was established in 1612, at which point Tahcabo was a *visita* of that center. Sometime after secularization in 1680, the convent of San José in Espita became parish seat (Gerhard 1993:135), and that is still the parish seat for Tahcabo today.

Insights from Nineteenth-Century Population Records

According to surviving census documents, the population of Tahcabo (including nearby *haciendas* and *ranchos*) fluctuated rapidly during the 1800s (Table 2.2; AGEY 1841a; AGEY 1841b; Dumond and Dumond 1982). By this point, populations across rural Yucatán were ethnically diverse, as families with Spanish and African descent lived in both *cabeceras* and pueblos (Alexander 2004:51, 115, 2018:272). Growth in populations living at *ranchos* and *haciendas* was a major trend of the nineteenth century. For instance, the population of the parish of Calotmul living at *ranchos* and *haciendas* numbered 300 people in 1806 and reached almost 1,700 people by 1897. Meanwhile, the population of the town of Tahcabo itself grew to well over 1,000 people prior to the onset of the Caste War, at which point it shrank considerably and remained low or non-existent for the remainder of the nineteenth century. In 1897, the total population of Tahcabo was recorded as 78 people. Calotmul, the county seat (a *municipio*, in the 1812 system of *ayuntamientos*), also suffered population losses during and immediately preceding the Caste War of Yucatán. Rugeley (2009:1) explains population losses in nearby Tizimín and its surroundings—which began in the mid-

1830s—as attributable to Mexican military recruitment for wars with Texas, which prompted many people to leave for the woods—and perhaps for Tahcabo and nearby *haciendas* (Rugeley 2009:1). Population loss in Tizimín and surrounding areas also followed the 1836 Rebellion of Santiago Imán y Villafaña based in Tizimín, which foreshadowed the Caste War (Rugeley 2009:2).

Table 2.2. Population estimates for Tahcabo, Calotmul, and nearby *ranchos* and *haciendas* (adapted from AGEY 1841a; AGEY 1841b; Dumond and Dumond 1982; García Bernal 2005; Patch 1993).

Year	Total Est. Pop. of **Calotmul**	Total Est. Pop. of **Tahcabo**	Pop. of the *Ranchos* and *Haciendas* of Calotmul Parish[a]
1664	743	266[b]	
1716	398	106[b]	515
1806	2608	624	290
1828	3241	750	1029
1841	1395	1538[c]	1124
1851	298[d]		
1897	3035	78	1698

[a] In most cases, this includes the population of *ranchos* and *haciendas* located near Tahcabo.
[b] Estimates based on *repartimiento* in cotton cloth *patíes* (García Bernal 2005; Patch 1993).
[c] This number includes the population of nearby Hacienda Yokpita.
[d] Source indicates the presence of 298 *contribuyentes*, or tax payers, in all of Calotmul parish at that time.

Population fluctuations at Tahcabo can also be noted in changing surnames. As mentioned above, in 1563 the names of the two Tahcabo *gobernadores* were recorded as Juan Tun and Juan Pantí (Quezada 2014:161). Neither of these names can be found in the community today, nor in extant historical records dating primarily to the nineteenth century. The 1841 census for Tahcabo is populated with many Spanish and Maya surnames that can no longer be found in the community today. However, a subset of family surnames found in the 1841 census continues to be found in the community today, including Aguayo, Balam, Chimal, Dzul, May, Medina, Poot, Puc, Uh, Un, and Sulu. Although there were extreme population drawdowns in the region during the late nineteenth century, re-population of the area during the early twentieth century apparently could have included descendants of families that had lived there previously, based strictly on the repetition of surnames in town documents through time.

The 1841 census is particularly rich, because apart from listing the names of the residents of Tahcabo, Calotmul, and surrounding *ranchos* during that year, it also includes the age of each person and the profession of many adult males, and it seems to separate residents according to household. The census lists a remarkable 1,538 people living in Tahcabo. Only eight people named in the census, residing in three different dwellings, were granted *don* or *doña* titles. Those eight people were listed in households with merchants and a painter, and all have Spanish last names. At each of the three residences where the titled individuals lived there were also listed at least one and up to seven young people with distinct, Maya surnames—these young people may have served as domestic servants and field hands to wealthier families. Due to the larger size of the community, the population of Tahcabo residents in 1841 included musicians, blacksmiths, painters, muleteers, and merchants, in addition to farmers (called *labradores*).

In addition to the 1841 census, I was able to locate eight baptismal records and a wedding notice dating to the 1890s that involved participants from Tahcabo during a short day at the Archivo General del Arzobispado de Yucatán (AGAY) in Mérida. In the baptismal records, maternal and paternal grandparents of the baptized infant were listed, and I determined that small children from the 1841 census could potentially have been the correct age to be grandparents mentioned in the baptismal records. By the 1890s, Tahcabo had shrunk considerably. Only one name for a grandparent listed in the baptismal documents could be found on the 1841 list. This was Simona Dzib, perhaps the same Simona Dzib listed as eight years old in 1841. There was, in fact, another Simona Dzib listed in the 1841 census who was 60 years old, and, while living in a different house, possibly her grandmother. On the other hand, neither Simona nor Dzib were uncommon names, so while this is not incontrovertible evidence that previous Tahcabo residents returned, it does suggest the possibility of that occurrence.

While this dissertation for the most part does not address the majority of the nineteenth century, these population fluctuations show that mobility was the norm in Tahcabo. Amid unrest, threats of taxation and coercion, and disease and famine, populations in Yucatán moved for survival as necessary. When we consider Tahcabo as a community, it is important to appreciate population ebbs and flows, and recognize that there may not have been one or more lineages with long-term ties to this particular place. Nonetheless, newcomers recognized certain elements of the landscape from other places they had lived, came with understandings of how to interact with environments, plants, animals, and other non-humans, and quickly grew to create relationships with each other and with the specific features of Tahcabo as a population center and farming area, no matter how fleeting their interaction with the place might have been. As in many other locales, this is a story of remarkable continuities amid constant change.

An Introduction to Tahcabo's Archaeology

Central Tahcabo

In central Tahcabo (Figure 2.1), the ruins of the colonial church (Structure 100) abut a large pre-Hispanic shrine (Structure 101). The sanctuary of the church was constructed of stone, as was the colonial façade, while the side walls uniting the two may have consisted originally of wooden posts and the roof of perishable materials such as the *guano* palm

(Figure 2.2). Today, the contemporary cinder-block church makes use of the original façade, but is small, reaching only partway to the original sanctuary. Possibly the most spectacular feature of the original stone sanctuary is its arch preserved in the central western side of the structure. The arch would have opened to the *ramada* where the congregation gathered. Above the arch, there is a carved-stone inset that looks like a Ten Commandments tablet.

Figure 2.1. Archaeological structures in central Tahcabo and along the street grid.

Stone sidewalls were added to the colonial sanctuary at some point after original construction. Remnants of these walls abut the west wall of the sanctuary and on the south side intrude upon a stone niche that appears to have been built into the original structure. Many alterations were made to the church through time—doors were sealed and windows opened, among other changes. Nestled between the current church and the three-room ruins of the colonial church sanctuary is a bull-fighting ring constructed primarily of wood that is used annually leading up to and on the Feast Day of Saint Bartholomew (August 24). Another wall runs up the side of the mound to the south of the sanctuary ruins, reaching more than halfway to the top. It matches the sanctuary walls in terms of its construction materials and thickness. It is unclear whether this feature represents the ruins of a courtyard wall, the foundations for a bell tower (mentioned by town residents), or something else entirely. An additional entrance to the church yard from the town square can be seen in the form of two upright boulders preserved in the wall of a house lot located south of the church. Town residents relate that the entire area beneath and around the colonial church footprint, and in particular areas to the south of the church and the west of the mound formed part of a colonial cemetery, and so we interpret the stones as marking the entrance to the cemetery.

Figure 2.2. Artist's reconstruction of the colonial, *ramada*-style church at Tahcabo (drawing by M.K. Smaby).

Immediately to the south of the colonial church sanctuary rises a pre-Hispanic mound, Structure 101, approximately seven meters tall and extending 92 m to the south. It is unclear whether the church originally intruded slightly into the side of the mound or if the mound has since collapsed to its current lateral extent. Undoubtedly the shrine is much smaller vertically than it once was, as those who constructed the church used it as a ready source of cut stone. Surface collections indicate that the structure was in use beginning during the Middle Preclassic period.

North of the town square can be found Structure 102 (Figure 2.1), which is a large platform approximately two meters tall and 44 m long by 28 meters wide. Surface collections were made primarily along the eastern end of the mound, where greater artifact densities were found likely due to erosion from the frequent cleanings that section of the mound experiences due to its location on the grounds of the contemporary clinic property. Ceramics from surface collection indicate a similarly long history of use as Structure 101, with sherds found dating from the Middle Preclassic through the Colonial period. In particular, this sample includes the widest range of Colonial period types encountered in any surface-collected structure at Tahcabo and may have served as an elite residence at that time.

East of the ruins of the church sanctuary and across the street can be found Structure 103, which stands at a height of 3.5 meters and measures 42 by 43 meters along its base. The top platform surface is expansive and flat, in a style characteristic of early structures, and encompasses an area 26 meters east to west and 29.5 meters north to south. On the southeast side of the platform surface can be found the remnants of a foundation for a small structure measuring approximately 10 by 13 meters (Figure 2.1). Surface collections suggest this structure dated to the Middle Preclassic to Early Classic periods.

Along the Grid

Today and in the past, roads lined with dispersed dwellings radiate out from the main plaza in front of the church. The grid was modified to accommodate natural resources characteristic of the town—the diagonal main street passes by both *cenotes*, important water sources, while street blocks of uneven rectangles accommodate six *rejolladas* so that streets pass by their edges rather than crossing through them. It seems likely that the colonial street grid made use of paths established during earlier periods, while also reconfiguring the overall system. Along the contemporary gridded streets can be found a few colonial structures. In this section I will also describe *cenotes* and *rejolladas* located in town.

Two stone apsidal houses dating to the Colonial period still stand in Tahcabo today—one is located to the west of the town center (Structure 104), and the other to the south (Structure 407). Both are surrounded by shallow bedrock, providing challenges for excavation, and the property surrounding Structure 104 has been disturbed a great deal during recent modifications made to a house patio. Sherds found in the area around Structure 104 dated to the Postclassic and Colonial periods. Structure 407 yielded Colonial period sherds during surface collection, and excavations took place around this structure. Apart from these two colonial structures that are apsidal in shape, the ruins of an old stone building with a rectangular form are located on the near south side of town (Structure 105; Figure 2.1). The building collapsed during Hurricane Gilbert and was used as a chapel in the past.

There are six *rejolladas*, ranging from 60-110 m in diameter and 2.5 to 6 m deep (see Table 2.3; Figure 2.3), located in central Tahcabo. Two additional *rejolladas* were located and mapped during systematic survey (although they were, of course, already well known by town residents): one in the western quadrant (Rejollada G), and another in the northern quadrant (Rejollada H). Most of them have gradually descending walls, while one has sheer cliff walls and an overhang (Rejollada H). These eight *rejolladas* make up 5% of the total town land, but likely contribute more than that proportion of the overall biomass within and immediately around the town center. Apart from *rejolladas*, caves and *cenotes* are additional bedrock features that dot the town land of Tahcabo and seem to fall within a similar conceptual category, as places where water and soil accumulate and greater interaction with supernatural beings can be facilitated.

Table 2.3. Dimensions of *rejolladas* within the town limits of Tahcabo.

Rejollada Name	Approx. dimensions east to west (m)	Approx. dimensions north to south (m)	Approx. depth (m)
Rejollada A	100	80	6
Rejollada B	65	70	4
Rejollada C	70	60	3
Rejollada D	65	60	3
Rejollada E	75	90	2.5
Rejollada F	70	65	2.5
Rejollada G	110	110	5
Rejollada H	50	50	4

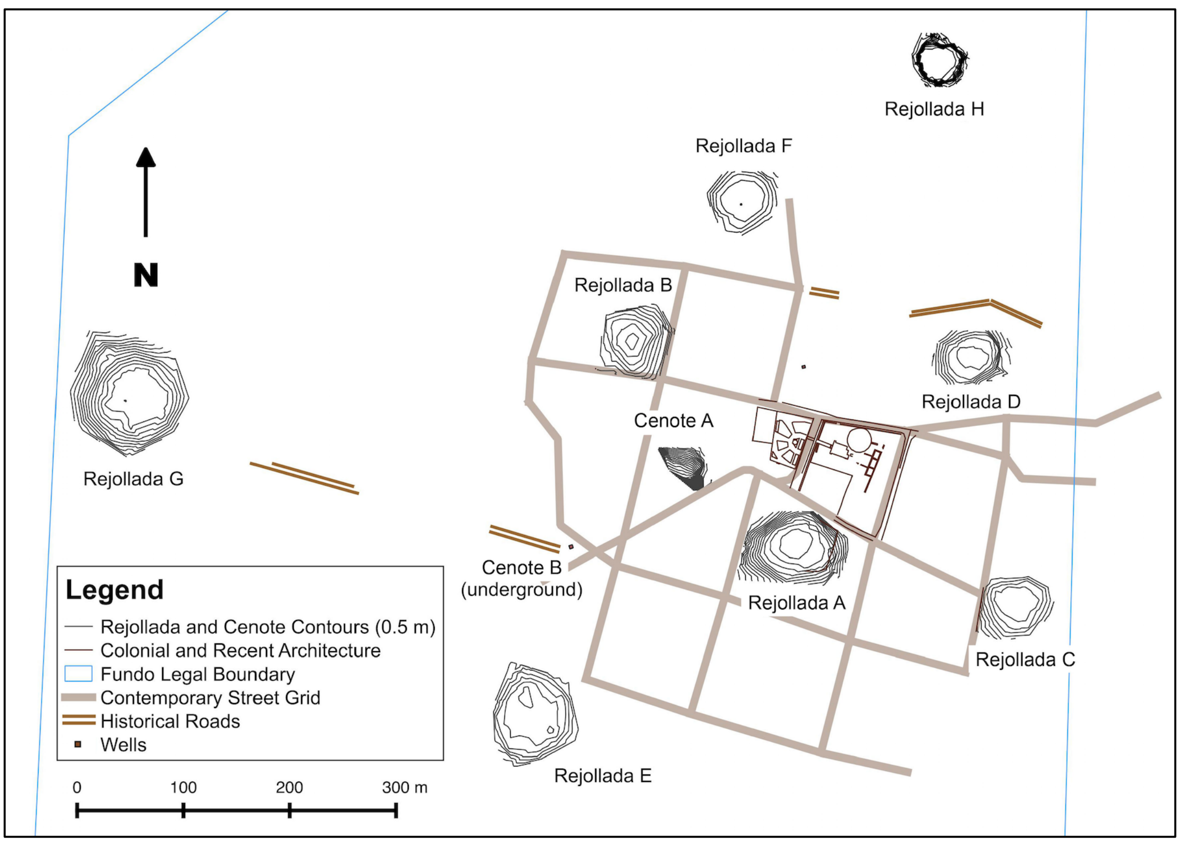


Figure 2.3. Tahcabo's street grid with *rejolladas* and *cenotes* labeled.

Two *cenotes*, or deep sinkholes that hold water year-round, are located on the north side of the main road that runs diagonally into Tahcabo from Calotmul to the southwest (Figure 2.3). Cenote B is an enclosed cave, which holds clear water that can be accessed from a well. No sherds were collected from the cave. Cenote A is more easily accessed, with a trail that winds through an amphitheater-like approach to the water, located under an overhang (Figure 2.4). We collected a few ceramic sherds from the area descending to the water in the *cenote*, which consists mostly of bedrock. Sherds dated to the Late to Terminal Classic, Postclassic, and Colonial periods.

Figure 2.4. View into Tahcabo's Cenote A. At the bottom there is an overhang with water beneath (photograph by Patricia A. McAnany).

This chapter addressed the slow violence that colonial policies enacted on the rural communities of the northern Maya lowlands and the livelihood strategies that farmers used to negotiate their impact, drawing on historical and archaeological research findings. It also introduced the history of the research site of Tahcabo and the visible ancient and colonial architecture as well as *cenotes* and *rejolladas* located centrally in the community. The next chapter introduces the archaeological project that has been based in Tahcabo, and the methods used to expand our understanding of the site's past.

CHAPTER 3:

PROJECT HISTORY AND METHODS

In this chapter, I describe the methods used to conduct research in the field and laboratory as well as the reasons for selecting them. Methods for this project included site survey, mapping, and excavation within *rejolladas* and residential contexts. Soil samples collected from excavated contexts were studied for their soil carbon isotopes, the presence of charred seeds (in the light fractions from flotation), and pollen. Site survey and mapping, results of which are introduced in Chapter 4, show changes in settlement patterns at Tahcabo that help to contextualize Colonial period livelihood strategies. Excavation within *rejolladas* (Chapter 5) provides a window into horticultural practices and other activities that took place within them. Excavation of colonial residences (Chapter 6) can reveal variations in the livelihood portfolios that farmers in Tahcabo pursued. In this chapter, I first introduce the larger archaeological project, then explain the field and laboratory methods and their objectives. The field and laboratory activities took place over a number of years—a timeline of project activities can be found in Table 3.1.

There tends to be a dearth of studies regarding the early Colonial period in Yucatán, as well as a lack of paleoethnobotanical studies from archaeological sites. These gaps increasingly relate more to preservation deficiencies than a lack of interest, since studies of the Postclassic and Colonial periods as well as plant use are becoming more prevalent within Maya archaeology. Challenges to locating early Colonial period residences in the northern Maya lowlands include the extremely shallow bedrock of Yucatán, usually within 20-30 cm of the surface. In addition, once Colonial period towns were established through the process of *reducción*, people continued to reside in those areas, with their gridded street plans and churches, mixing earlier archaeological deposits with later ones as populations fluctuated through time. Within the central areas of communities, people continued to live in old stone homes or remodeled them, adding concrete features and often basketball courts to town parks. At the outskirts of towns, where people were more likely to live in perishable structures, few architectural remains exist to indicate the existence of past residences.

Table 3.1. Timeline of project activities.

Year	Months	Activity (in Tahcabo unless otherwise indicated)
2012	May-June	Regional survey and site selection
2013	July-August	Rough site mapping, opportunistic site survey and surface collection
2014	June-July	Site mapping, opportunistic site survey and surface collection
2015	February	Study of surface-collected artifacts at Centro INAH Yucatán
2015	March	Plant survey with José Luis Tapia Muñoz
2015	March-April	Interviews about *rejollada* use with José Miguel Kanxoc Kumul
2015	June-August	Systematic site survey and surface collection (west and south quads)
2015	November-December	Systematic site survey and surface collection (north quad)
2016	March-April	Excavation units in Rejolladas A, E, and G
2016	April-August	Excavation of Structures 310, 311, and 317; initial labwork
2016	October-November	Initial labwork in Calotmul
2017	January-May	Excavation of Structures 403, 400, 206, 407; initial labwork
2017	June-September	Main laboratory season in Tahcabo
2017	September-December	Microbotanical laboratory research at McMaster University
2018	January-May	Macrobotanical laboratory research at UNC-Chapel Hill
2018	July-August	Final laboratory season in Tahcabo
2018	June, August-October	Final botanical research at Northwestern University

Plant remains preserve especially poorly in the northern Maya lowlands, due both to shallow soils and the stark disparities between wet and dry soil conditions on an annual basis. On the other hand, off the edges of raised platforms, there can be opportunities for preserved charred plants remains embedded within midden scatters, especially in contexts dating to more recent periods. Several scholars have excavated within *rejolladas* or in ancient residential areas in the northern Maya lowlands hoping to study ancient plants and soil characteristics, and some studies have been published (more on this topic in the next chapter). However, in other cases, when studies proved unsuccessful, scholars understandably cast aside failed methods without publishing instances in which data were non-existent, leaving the door open for others to unknowingly repeat the same mistakes. In this chapter and throughout the dissertation, I strive to document the methods that did not work and the archaeological remains that seem not to have preserved in addition to what worked to pass along the information to scholars who might attempt similar studies. For example, I found that ancient charred seeds rarely preserve in the *rejolladas* of central Tahcabo, a finding that I will elaborate on further below and in Chapter 5.

Project Development and Initial Purpose

Co-Directors of the Proyecto Arqueológico Colaborativo del Oriente de Yucatán (PACOY), Adolfo Iván Batún Alpuche and Patricia A. McAnany, originally developed the collaborative project of which this research formed a part. They proposed that their project would promote collaboration not only between researchers in the United States and Mexico, but also among scholars, students, and community members residing near the archaeological site(s) of interest. Initial project funding—a Catalyzing International Collaborations grant from the National Science Foundation awarded to McAnany and Batún Alpuche—included a budget and timeline that allowed for meetings with community leaders and larger groups of community members to introduce them to the project and get feedback and a sense of their levels of interest in working together with members of the archaeological project. Members of the project surveyed towns located reasonably near to Valladolid (and our affiliated university, the Universidad de Oriente) that featured colonial churches and wells, with the goal of finding Colonial period Maya dwellings. We embarked on this survey during the summer of 2012.

The objective, to find Colonial period residences, posed a challenge. As mentioned above, people generally continue to live in the towns created and authorized during the Colonial period, mixing shallow archaeological contexts. The best options available were: 1) to identify places in a community where archaeological remains had for some reason been protected from later disturbance and preserved; 2) to identify areas around a community where people may have resided during the Colonial period (especially if past populations were higher), but where populations no longer live; or 3) to encounter a site with ruins dating to the Colonial period that was left behind at some point in the past. Our hope to find contexts preserved in house lots where people continue to live today became untenable as we realized that thin soils combined with ubiquitous bedrock outcrops precluded the presence of buried deposits in house lots, or *solares*. Also, the care with which people clean, maintain, and renovate house lots works against preservation of earlier occupational evidence. When entering a community, we always sought out the sources of water (the *cenote* and wells) as places where Colonial period houses would have clustered, and we also found ourselves drawn to *cenotes*, *rejolladas*, and caves, since community members treasure these features and shared stories about them. After visiting sites across Yucatán, we narrowed down our list of places to work to three (Figure 3.1) based on the site characteristics found in Table 3.2.

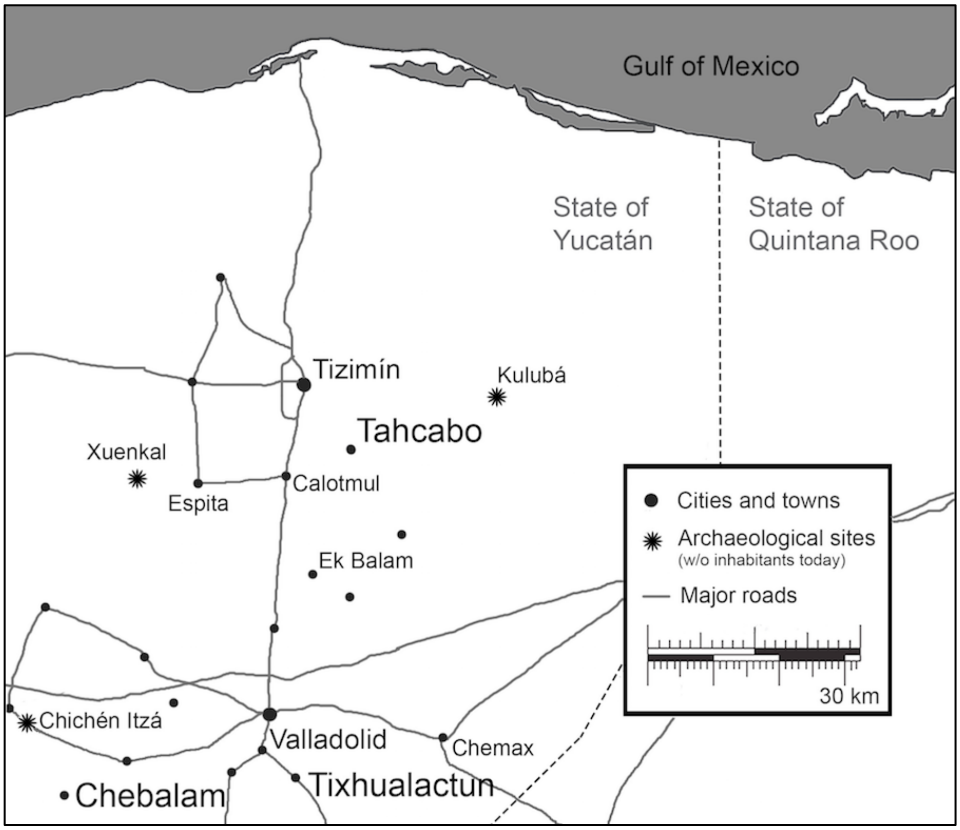


Figure 3.1. Locations of original project sites.

Table 3.2. Characteristics considered during the 2012 site selection process.

Themes of Interest	Categories of Interest
Occupation	Nineteenth century and beyond
	Colonial
	Prehispanic
Collaboration	Personal contacts
	Presence of a bilingual school
	Community interest
Existing Research	Oral histories
	Theses and dissertations
	Publications
Church	Knowledge of year built
	Current use
	Characteristics
Other	Distance from Valladolid
	Likelihood of encountering Colonial period house foundations

Field Methods

Initial Surface Collection and Mapping

During the 2013 and 2014 summer field seasons, we used surface collection to detect the location of colonial dwellings and other colonial features as part of an opportunistic survey strategy. We maintained spatial control of collection proveniences either by installing a 2-x-2-m grid or by recording the UTM coordinates of an isolated artifact or small artifact cluster. During the 2013 and 2014 field seasons, a mapping-grade GPS device (Topcon GR-3) was employed to collect the UTM coordinates of surface-collected artifacts as well as archaeological features. During surface collection, team members focused on gathering diagnostic artifacts as defined in Table 3.3. We sought artifacts with the greatest potential to yield information about site chronology, geographic associations (through trade), or specific activities that took place at the site. In total, we collected 1,374 artifacts (606 during the 2013 field season and 768 during 2014).

Table 3.3. PACOY surface artifact collection criteria.

Artifact Category	Collection criteria
Indigenous Earthenware	Rim sherd
	Identifiable vessel element other than rim
	Large body sherd, if distinctive in any way
	Recognizable decoration
Historical Ceramics	Any porcelain, whiteware, creamware, etc. with decoration or maker's mark
	To maintain focus on materials older than 50 or so years, not Corelle ware
Lithics & Groundstone	Any obviously chipped or ground stone
	Worked glass (both obsidian and historical), especially tools
Glass & Metal	Glass demonstrating advanced opalescence
	Opalescent glass with any identifying features
	Metal with an identifiable function that demonstrates earlier technology

During the summer of 2014, professional surveyor Alf Berry set up the Tahcabo grid aligned to the UTM system and taught me to use the Total Station Topcon CTS-3005 and mapping-grade GPS to continue building the site map going forward. Collaboratively with

Alf, we created a detailed Total Station map of the central area of Tahcabo, and in particular the Colonial period church ruins, the newer church, the pre-Hispanic shrine now reduced to a mound, the town square, and the street grid. We also mapped the five *rejolladas* located within the contemporary street grid.

At the Ceramoteca of the Centro INAH Yucatán in Mérida, during the month of February of 2015, I became familiar with the ceramic types present in eastern Yucatán and identified the majority of surface finds from 2013 and 2014 surface collections. Although I am not a ceramicist, my identifications were close enough to approximate the date ranges of occupation for each structure; these estimates proved correct for structures later excavated. A table summarizing the results of the study of surface-collected ceramics can be found in Appendix A.

The surface collection and survey that we conducted were distinct from how they might typically be conducted at archaeological sites due to the contemporary population living in the site center of Tahcabo. A great deal of the survey necessarily focused on the outskirts of the present-day town, where intact remains are more likely to preserve. Survey undertaken within residential patios where we received permission to enter demonstrated that while sherds dating to a wide range of chronological periods can be found within these spaces, ongoing construction and cleaning activities taking place amidst shallow bedrock in continuously occupied residential spaces have removed nearly all artifacts from their original contexts. Even in the areas surrounding Tahcabo, town members mentioned a great deal of interaction with archaeological remains across the landscape. For example, after Hurricane Gilbert in 1988, when crops had been destroyed and economic opportunities were scarce, town residents went to the outskirts of town to collect large stones that they could sell to a gravel company. The practice likely disturbed a great number of ancient structures, while providing a needed source of income for community members.

Systematic Survey

In 2015, I selected three 200-x-400-m quadrants for systematic survey (Figures 3.2-3.4). The purpose of this survey was to gather information about how population density and configuration at Tahcabo had changed through time. In each survey block, oriented around the center of town but within town limits, employees from Tahcabo cut *brechas*, or straight paths through the forest, at 20-m intervals. Behind each person cutting *brechas* with a *machete*, a project intern or I trailed behind to document any structures or artifacts encountered. Because platforms were often built to expand a natural bedrock rise, we spent a great deal of our time trying to decide whether or not a raised and flat area was only natural or also had architectural additions. We rarely found artifacts on the surface due to vegetation density. It was easiest to see structures and artifacts in the forest—when we passed through grassy areas it was nearly impossible to detect anything except for large mounds. A large swath of the southern quadrant was grass, and therefore most of our finds in that quadrant were extremely large platforms. As we walked the *brechas*, we carried handheld GPS devices to map our routes and mark finds of interest. After that stage of survey, we returned with a Total Station or mapping-grade GPS unit to create a detailed topographical map of each located structure (Figures 3.2-3.4).

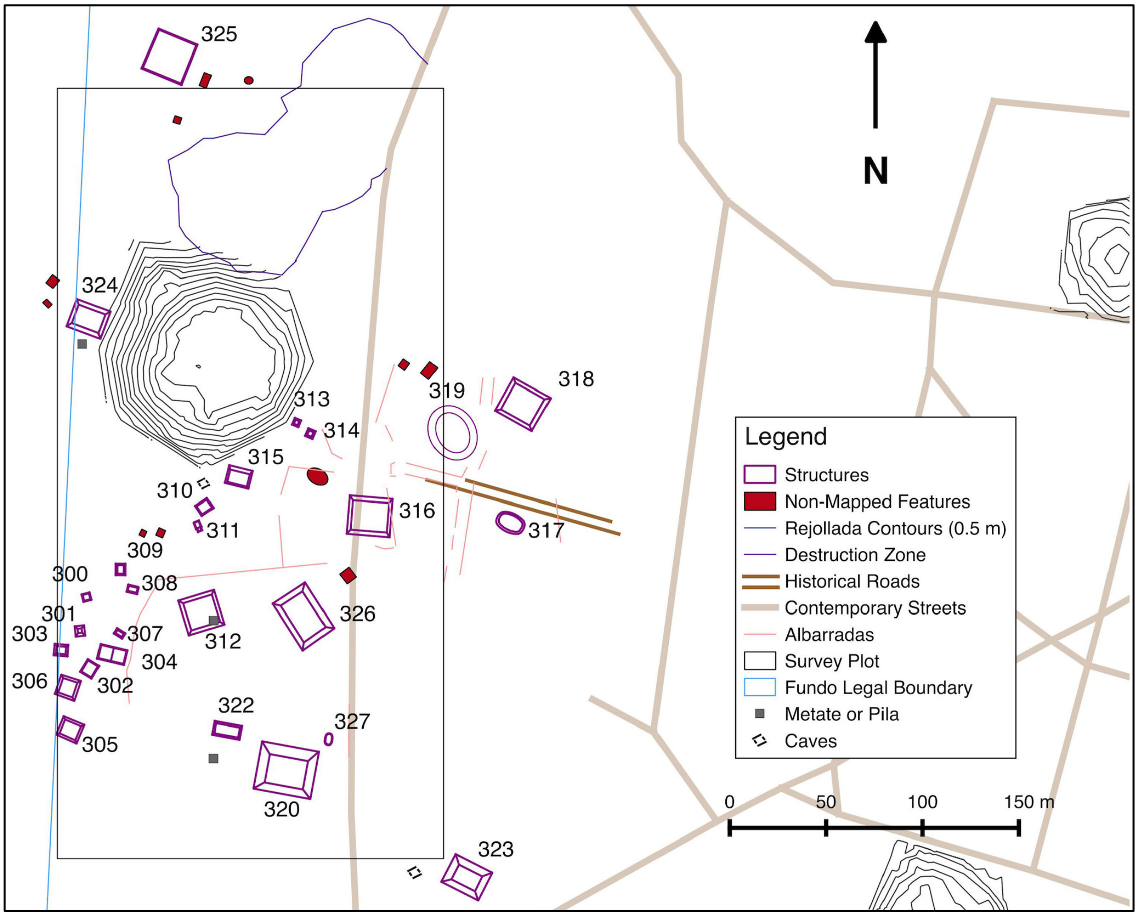


Figure 3.2. Western survey quadrant in the town land (*fundo legal*) of Tahcabo.

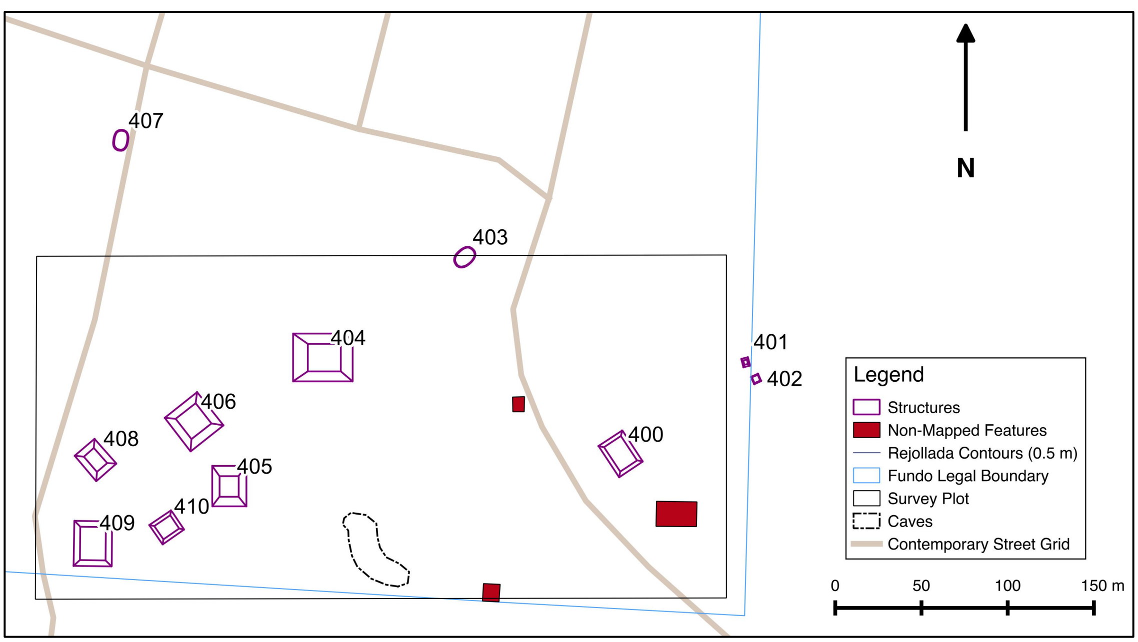


Figure 3.3. Southern survey quadrant in the town land (*fundo legal*) of Tahcabo.

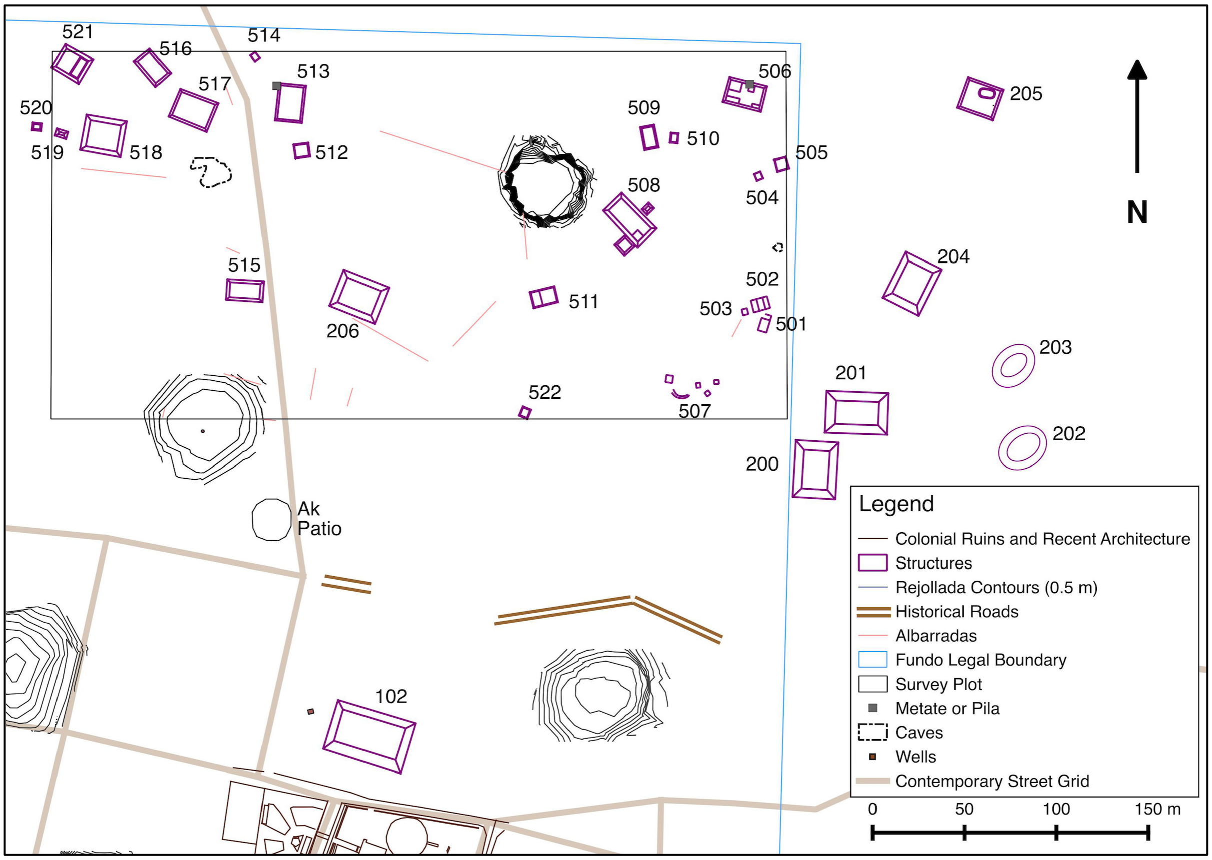


Figure 3.4. Northern survey quadrant in the town land (*fundo legal*) of Tahcabo.

For the last (northern) quadrant (Figure 3.4), and upon further reflection on the survey method, I implemented a standardized recording system that prompted surveyors to take detailed notes on designated forms about what we found at each location. This system replaced a simple categorical naming system for GPS points, with supplementary notes taken in a field notebook. While this system required more meticulous note-taking and consumed greater amounts of time, it did improve study quality and created documentation useful for future research. Another change I made to the survey methodology for the northern quadrant was that I allocated a full week in the field before beginning the survey to speaking with the many Tahcabo residents who own land in the quadrant, in order to get their permission to enter their properties and also to explain the work we were doing and our goals. In conducting the survey of the southern quadrant, I had been in a rush and let my permissions gathering process become sloppy, thinking the town leadership had taken care of it, and thus offended one landowner when I entered his property without permission. Each of these quadrants contained land owned by many different individuals, and this process needed to take place in the most conscientious way possible.

Botanical Survey

The goals of plant surveys within the *rejolladas* of Tahcabo were to learn more about the plants that grow well within *rejolladas* and to create a database of both economic and weed species that we could expect to find when studying charred seeds, pollen, and phytoliths extracted from *rejollada* soils. Because of this latter goal, we were primarily focused on gathering as much information as possible on the diversity of plants growing in *rejolladas*, rather than focusing on plants we repeatedly came across that had been intentionally cultivated. I also added to a comparative collection to aid in the identification of archaeological plant remains. I conducted plant surveys in four of Tahcabo's *rejolladas* during March of 2015 with botanists from the Centro de Investigación Científica de Yucatán (CICY), with special help from herbarium technician José Luis Tapia Muñoz, who later pressed and identified the collected plants at the herbarium of CICY in Mérida, Yucatán. Technician Gregorio Amílcar Castillo Herrera also participated in the surveys. At that point I knew of five *rejolladas* in Tahcabo (Rejolladas A-E), and we received permission to enter four of them.

We conducted the plant collections over the course of two days. Our method was to walk a transect of the *rejollada* from one side to the other, systematically collecting plants as we went. I numbered each plant collection and took a point at its location with a 2003 Trimble GeoXT GPS device and also took a photograph of each plant. We made note of plant characteristics and names when known. After finishing a transect of a *rejollada*, we walked around its base looking for plants that we might have missed, adding them to our collections. Because we conducted this work in March, during the dry season, not many plants were flowering or fruiting at the time that collections took place. Luckily, none of the plant species found were too rare, so this meant they could be identified, although Tapia Muñoz did mention that he had to struggle with a couple of the specimens before coming up with their identifications.

Ethnographic Interviews

Interviews about *rejollada* use took place during March and April of 2015 with the assistance and collaboration of José Miguel Kanxoc Kumul, then an undergraduate student in Maya linguistics and culture at the Universidad de Oriente. The interviews were designed to help us learn how people use *rejolladas* today in order to better understand how they might have been used in the past, and also to consider different disturbance factors that could mix layers and archaeological deposits within the *rejolladas*. As we conducted the interviews, I also realized that they would be helpful for teaching me about the different factors that Tahcabo residents take into account when deciding which agricultural strategies to pursue. We interviewed fifteen Tahcabo residents who owned land within five *rejolladas* located in town. Our interviews, for which we received informed consent (using forms approved by

UNC-Chapel Hill IRB, submission no. 14-3001), were semi-structured and generally took place in the interviewee's home, after which we walked through *rejollada* gardens and made a list of the plants located within each property. The combined plant lists generated from both plant surveys and interviews can be found in Appendix B. Permission to audio record the interview was requested but not required for participation, and was granted in all but one instance. Interviews took place in a mix of Spanish and Yucatec Maya depending on the preference of the interviewees. Kanxoc Kumul conducted and translated the interviews that took place in Yucatec Maya. A copy of the interview questions (in English) can be found in Appendix C.

Interviews began with questions about the portion of the *rejollada* that the interviewee owns, the types of plants grown there, and their uses. We asked whether each owner purchased or inherited his or her *rejollada* parcel, and asked landowners to identify the previous owners. Interviews continued with discussions of how the plants are sustained through different seasons, and who does the related work. We learned about the timing and rationale of maintenance strategies such as the use of fire, pruning techniques, and other mechanisms by which owners enhance plant growth within *rejolladas*. This line of questioning helped me to understand the daily practices involved in *rejollada* cultivation and to model the ways in which various botanical remains might become incorporated into the archaeological record.

The next set of questions addressed the extent to which *rejolladas* provide unique cultivation conditions for various plant species. We learned about the characteristics of *rejolladas* and asked which plants grow better or worse in *rejolladas* versus in patio areas directly surrounding the house, or in fields. Are there plants that only grow within *rejolladas*? To what extent do plants grown in *rejolladas* contribute to the overall diet of landowners and their families? The latter question was more difficult for interview participants to answer, and was later dropped from the list because interviewees found dietary contributions difficult to estimate. We were able to ascertain from owners how they choose plants to grow in their *rejolladas* and we got a general idea about the extent to which plants grown and fruits produced in *rejolladas* serve as food for the family versus for sale. We also asked interview participants if they knew what plants were grown in *rejolladas* when their parents or grandparents were tending them. Finally, interviewees were asked to explain other ways in which *rejolladas* are used and describe the plants involved.

After a few interviews, research collaborator José Miguel Kanxoc Kumul provided me with some helpful feedback. He commented that the interview questions seemed a bit surface-level, and he encouraged me to ask more about the ceremonies and cosmological understandings of *rejolladas*. I invited him to design supplemental questions related to this theme, which he ended up asking the interview participants during short, follow-up interviews that we had told research participants to expect during the informed consent process, and during which we delivered small gifts to the participants and also asked whether they were satisfied with how we had conducted our study. Initial interviews varied from a half hour in length to three hours, while follow-up interviews tended not to extend beyond a half hour in duration.

Interviews were transcribed and analyzed for thematic content with help from José Miguel Kanxoc Kumul and fellow Universidad de Oriente student, and now graduate, Alejandro Tuz Bacab. We then jointly developed a code book and coded all of the interview transcripts on paper, comparing codes and making observations about the interview outcomes. I input the codes we had agreed upon into the qualitative data analysis software ATLAS.ti at a later point for easier reference and navigation between interview transcripts. Kanxoc Kumul and I continued to work on the interview data together, presenting a conference paper about the results at the 2016 American Anthropological Association meetings in Minneapolis, MN.

Excavation

Residences. The goal for residential excavations was to find midden material and activity areas that would provide information about the livelihood activities that took place at dwellings. Excavations targeted houses at the outskirts of town, which may have been the residences of more marginalized populations than those living centrally in town, as described in Chapter 2. Before beginning excavation of eight residential areas with structures numbered 206 (Operation 15), 302 & 304 (Operation 10), 310 & 311 (Operation 8), 313 & 314 (Operation 11), 317 (Operation 9), 400 (Operation 13), 403 (Operation 12) and 407 (Operation 14), we removed vegetation that covered the surface and created a grid for each residential area (see previous Figures 3.4-3.6 for residence locations). Using the Total Station, we set grids by selecting appropriate origin points located southwest of the platforms to be excavated, oriented to the cardinal directions given that it was difficult to determine the axes of platforms that had been disturbed through time. The units within each grid were 2-x-2-m in size and were assigned names based on a system of letters and numbers. The numbers of units in the grids were assigned moving from west to east and the letters ran from south to north. The grids allowed us to record the locations of all archaeological materials obtained during excavation.

Units were excavated in arbitrary levels of 10 cm, called *incrementos* in the field and denoted by alphabetic letters, unless there was a soil change or feature that required an earlier division as a new layer, or *capa*, represented with a Roman numeral. For example, excavations began at the surface as Capa 1, Incremento A, becoming Capa 1, Incremento B, if no matrix change could be detected but the excavation continued deeper than 10 cm. If within the top 10 cm a change in the matrix was detected, then Capa 1, Incremento A, became Capa 2, Incremento A. Excavators followed surface elevation changes rather than leveling out each unit as they worked. Depths were measured using the Total station at points near the corners and at the center of each unit in order to determine the depth of each location in relation to the original surface elevations. Only at one point during the excavation of Operation 14 did we need to substitute a dummy level for the Total Station. If midden material was located beneath the first 10 cm below the surface, we divided the units into 1-x-1-m units to better control for artifact location. This was done simply by assigning artifact bags to each quadrant of the 2-x-2-m unit (SW, SE, NW, NE). For each increment excavated below the top 10 cm from the surface, we also took scatter samples for phytolith study (4-x-6" bag) and for flotation (20-L, or 5 L per 1-x-1-m quadrant, in a single sack—generally a fertilizer or animal feed bag). We could not excavate on or around Structure 102 (this was the canceled Operation 7) as originally planned given that we found pieces of broken asbestos *lamina* scattered on and just beneath the ground surface. In addition, we only conducted limited test excavations at Operations 10 and 11.

At Operations 8, 9, 12, 13, 14, and 15, we executed fairly consistent excavation strategies. The one exception was that at Operation 8, the first residential area excavated, we conducted complete excavation of Structure 310, and quickly realized that the method of full-grid excavation on and around each platform would be too time-consuming to continue for the rest of the study. For the remaining excavations, the method for excavation consisted of opening units along the retaining walls of the platform, on each of the four sides. The goal was to clarify any retaining wall architecture and locate midden deposits that might be present along the base of the walls. In addition, we placed units around the corners of the platforms in order to search for midden material. Finally, we excavated an axial trench, or at least a trench crossing the structure from one side to the other (if not down the center of the platform), to examine any remaining architecture that might preserve on the surface of each platform. An idealized representation of the excavation strategy can be seen in Figure 3.5. Of the operations excavated in this manner, Operations 9 (Str. 317), 12 (Str. 403), 14 (Str. 407), and 15 (Str. 206) yielded the best evidence of Colonial period occupations and are the focus of this dissertation. Operation 8 was not well-preserved, may not even have served as a residential area, and contained artifacts primarily dating to the Middle Preclassic through Early Classic periods. The two major chronological components of Operation 13 dated to this early timespan and also to the Late to Terminal Classic period.

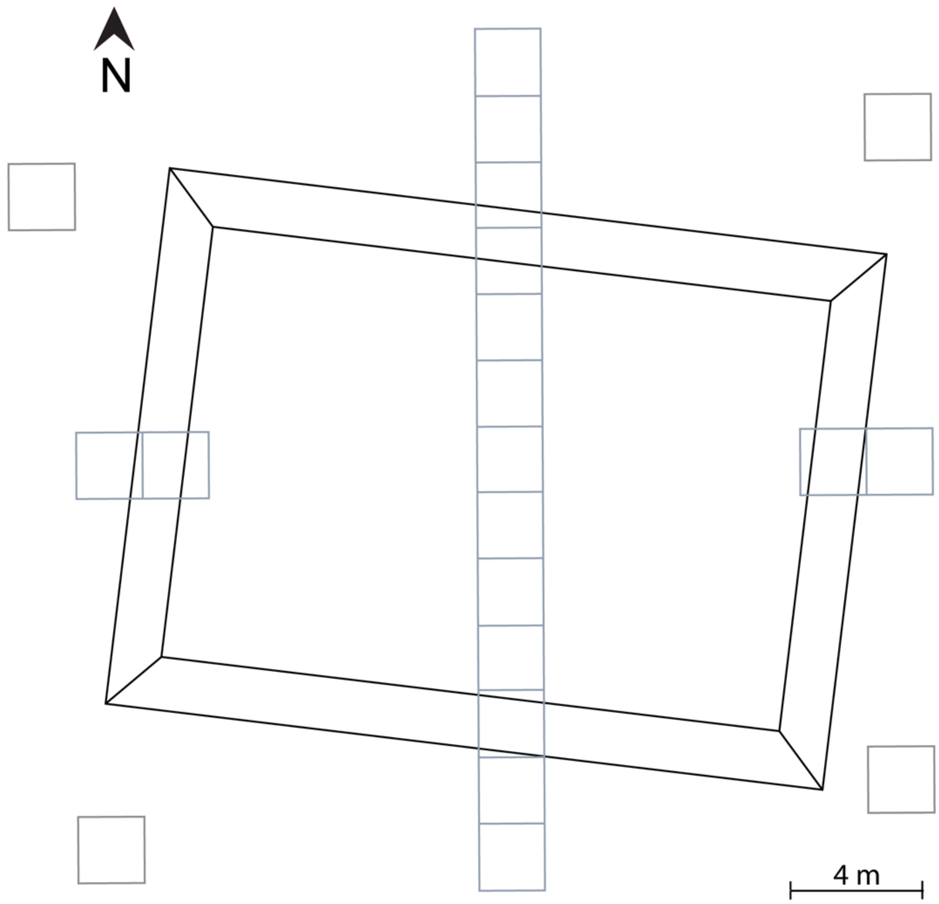


Figure 3.5. Idealized schematic of the excavation strategy for residential platforms. Black lines denote the structure, while gray lines outline excavation trenches set according to an arbitrary grid oriented to the cardinal directions.

All of the artifacts collected during excavation were placed in bags and labeled with unique lot numbers as well as other context information, including the name and year of the project, the operation number, the unit identifier (number and letter within the grid), the number of the *capa*, associated with visible changes in stratigraphy, and the letter corresponding to the increment, or arbitrary level excavated within the *capa*. Excavation took place using trowels. All excavated sediment was passed through screens that had openings no larger than ¼”. During the excavation of select features or contexts, especially burials, we decided to pass the excavated material through 1/16” screens. The screening of materials occurred in the field. Once excavation at each operation had concluded, we backfilled each unit, leaving covered all of the pits that we had opened in the process of our archaeological investigation.

Rejolladas. As mentioned above, it was hoped that *rejollada* excavations would reveal how horticultural practices in Tahcabo had changed through time, contributing to our understanding of farmers' livelihood strategies and how they changed during the Colonial period. Excavations took place within five of the eight *rejolladas* located in the town land of Tahcabo. We began the 2016 field season by excavating within Rejolladas A, E, and G, which became Operations 1-3, while we concluded the 2017 field season with excavations in Rejolladas D and B, which became Operations 4 and 5. We did not have time to excavate within Rejollada C, which would have resulted in the existence of an Operation 6. Each operation consisted of one 2-x-2-m excavation unit placed within the bottom flat area, but not in the middle of each *rejollada*. It seemed that the water would rush to the lowest point of each *rejollada* and that soils would be more mixed in those locations, which is why we avoided them. In each *rejollada*, a 2-x-2-m trench was placed in a location judged to be relatively free of large trees and roots, animal burrows, or recent pits used as earth ovens—a challenging prospect in some *rejolladas* (exact locations of the five *rejollada* excavation units can be found in Figure 5.1).

The units were mapped and elevations recorded using a Total Station set over a *rejollada* datum (marked with rebar). For one short period of time during the excavation of Operations 4 and 5, elevations were taken with a dummy level. Excavators first leveled *rejollada* trenches and then excavated to a soil change or until a maximum depth of 20 cm below the previous level, whichever came sooner. As in the residential excavations, the name given in the field for each arbitrary 20-cm level within a *rejollada* unit was an *incremento* (arbitrary level), while a soil change was labeled a change in the *capa* (layer). Because the soil tended to change gradually from dark brown to red, some excavators did not indicate all of the soil changes with *capa* changes, but instead continued solely with the arbitrary level system. This can be seen in Operation 2, where excavators did not separate the increments with dark reddish brown and dark red colors into different *capas*, assigning them the names Capa 2E and Capa 2F, even though in hindsight these increments could have been designated Capa 2E followed by the excavation of Capa 3A. This has been accounted for and corrected in Chapter 5 (Table 5.2). Each 2-x-2-m unit was excavated to 2 m in depth (after which excavation had to be discontinued due to safety concerns) or to bedrock or impenetrable rock, whichever came first.

Equipment used to excavate within rejolladas included shovels and picks, since most of the context was soil containing little to no rock. All excavated sediment was sifted through ¼-inch screens. We took samples for pollen study, soil carbon isotopes, phytoliths and starch grains, and macrobotanical analysis (flotation). As excavation proceeded, 30-L soil samples were collected in large sacks from each increment as scatter samples for flotation. Scatter samples were also taken during excavation from each increment for phytolith study and were kept in 4-x-6" 4-mil-thick plastic bags. Once each increment had been excavated, samples for soil carbon isotope and pollen study were taken. In order to maintain a regular procedure, and due to the likeliness of pollen contamination, pollen samples were collected first, from the northeast corner along the eastern wall of the unit. First, the surface was scraped with a clean trowel. Next, the excavator took the pollen sample by digging into the unit wall and putting the resulting soil into a 200-mL Whirl-Pak bag, until approximately half full. After cleaning the trowel again, the excavator repeated the process in the northwest corner along the western unit wall, collecting a sample for soil carbon isotope analysis, also collected in a 200-mL Whirl-Pak bag. Soil carbon isotope and phytolith samples were allowed to dry in the field house with the tops of the plastic bags left open, while pollen sample bags remained sealed and refrigerated until sent for study.

Recording System. As mentioned above, each residential area or *rejollada* was assigned an operation number, within which each unit received an identifier, and contexts were subdivided by arbitrary levels as well as layers. Lot numbers, designed to be unique numbers that could be employed easily to track contexts, were assigned using a six-number identifier beginning with the year (e.g., 16), followed by the excavator identifier (3 in my case), and then the number assigned, beginning with 001. The first lot excavated during the 2016 field season, at the surface of the excavation unit in Rejollada A, was 163001. Each subsequent context received its own lot number, whether or not the division occurred due to a layer change or an arbitrary level. In the case of midden contexts excavated below 10 cm in depth within residential areas, when I subdivided 2-x-2-m contexts into 1-x-1-m quadrants, there were up to four separate quadrants assigned a single lot number. That was the only case in which artifact bags from different locations (different quadrants) received the same lot number.

Field notes and observations were recorded on lot forms, and on feature forms when appropriate (Appendix D). Features, which included for example stone alignments, pits, burn features, or burials, were assigned numbers sequentially within each operation. Information recorded on lot forms included dates of excavation; initials of excavators; elevations of lot as it began and ended; estimated number of buckets of dirt excavated; rock and other inclusions found; types of material found; types of samples collected; descriptions of soil color, texture, and moisture; a general description of the lot; and a list and description of photographs taken. An area with graph paper was also available for sketching on field forms, and every lot with any stone architecture was drawn with measurements. Once *rejollada* excavation units were complete, we drew a profile map of each unit wall (Appendix E). Lists were also maintained to track special finds and sample bags as they arrived in the laboratory at the end of each day of fieldwork.

Laboratory Methods

There were several components of laboratory study that contributed to the results of this dissertation. While our field crew worked in the laboratory part time throughout the course of excavation, dedicated laboratory seasons took place in Tahcabo during the summers of 2017 and 2018, during which we cleaned, processed, and analyzed materials recovered from the 2016-2017 excavations. The analysis of plant remains, including macrobotanicals from flotation and starch grains from groundstone tools, took place in laboratories at McMaster University, University of North Carolina at Chapel Hill, and Northwestern University, beginning during the fall of 2017 and concluding at the end of the fall of 2018. Apart from and concurrent with these laboratory studies that I conducted, other specialists participated in the analysis of materials from excavation such as the ceramics, animal bone, carbon for AMS dates, and soil for pollen and carbon isotope studies. Goals of the laboratory studies were to establish the time periods and lengths of occupation for each residential area, and to document the economic activities that occurred at each residence. The analytical goal was to track the extent to which house residents specialized in particular activities or diversified their economic portfolios, and to document the diversity of plants cultivated in gardens and plant and animal species used within residences. Because artifacts tended not to be located *in situ*, but instead within sheet middens around the edges of the residential platforms, the exact locations at which activities took place across each residential area could not be pinpointed.

Ceramic Study

The study of ceramics was designed to further the following research goals: identify the chronology of residential occupation of each house, understand how food preparation and serving practices differed among them, and determine the size of household groups and their degrees of access to local and foreign markets. The study of ceramics from residences was not comprehensive—instead, I selected the most promising contexts for complete analysis by Teresa Ceballos Gallareta (Table 3.4; see Appendix F for her chronological assessments of ceramic types and Appendix G for a complete table of analyzed ceramics from excavation). She analyzed 24,188 sherds from the primarily Colonial period Operations 9, 12, 14, and 15, and another 9,000 or so sherds from Operations 8 and 13, dating primarily to the Early through Terminal Classic periods. In selecting contexts for analysis, I prioritized lots that seemed to contain denser midden debris, featured grinding tools and other special finds, or included particularly diverse or well-preserved ceramic sherds. Ceramic sherds from unselected contexts were simply weighed and counted in bulk.

After analysis of the selected contexts, I calculated the outcomes seen in Table 3.4, including, for each residential area, the count of sherds studied, the count of sherds total, the average weight per sherd studied, the average weight per sherd total, and the percentage of the total number of sherds that were studied. With the exception of Structure 407 (with mixed Colonial period contexts), analyzed sherds from each structure made up more than 50% of the total ceramic assemblage excavated by both count and weight (Table 3.4). I also calculated the average number and weight of sherds per cubic meter at each residential area for comparison.

Table 3.4. Counts, average weights, percentages, and densities of ceramics by residence.

Structure (Colonial Phase)	No. Studied	Wt./Ct. Studied	No. Total[a]	Wt./Ct. Total	% Studied by Ct.	Avg. no. sherds/m^3	Avg. wt. sherds/m^3
206 (Early)	12,079	3.80	19,279	3.33	62.65	742	2,466
317 (Middle)	3,660	4.57	4,127	3.78	88.68	229	866
407 (Mixed)	2,587	3.34	5,415	2.82	47.77	451	1,274
403 (Late)	5,862	5.16	8,366	4.88	70.07	669	3,265

[a] "No. Total" refers to the total count of ceramic sherds found at each residence, both studied and understudied.

Table 3.4 shows that the highest quantity of sherds excavated, with more than twice as many sherds as the next highest residence, came from the early Colonial period Structure 206. While early colonial Structure 206 also had the greatest total sherd weight, the assemblage only weighed 1.5 times the assemblage from late Colonial period Structure 403, the latter of which contained larger and heavier sherds, overall. When accounting for volume excavated, early colonial Structure 206 had the greatest density of ceramics per cubic meter by count. However, late colonial Structure 403 excavations contained the highest average weight of ceramics per cubic meter (Table 3.4). The lowest average ceramic densities by count and weight were found at middle Colonial period Structure 317.

One possible reason that early Colonial period Structure 206 and late Colonial period Structure 403 had high densities of ceramics was that they were occupied longer than Structure 317. Other factors that could have impacted the quantity of ceramic sherds found at each residential area include household size, wealth, and vessel stockpiling; food preparation techniques; average vessel size and likelihood of breakage; and taphonomic processes (Nelson 1991; Tani 1994; Varien and Mills 1997). In the case of early colonial Structure 206, the size of the residential area is much larger than later ones, suggesting that more people may have lived there and used greater quantities of ceramic vessels simultaneously. At late colonial Structure 403, the high number of large vessels suggests an emphasis on feasting, which can correlate with vessel stockpiling. These factors complicate assessments of occupation span made by comparing ceramic densities across residences.

Structure 407 excavations had the smallest sherds on average, which may be explained in part by the area's extended use as a residential area throughout the twentieth century. Excluding Structure 407, the smallest sherds could be found at the early colonial residence (Structure 206), while the largest sherds could be found at the late colonial house (Structure 403). This distribution makes sense if sherds continue to break through time at a fairly consistent rate given various disturbance factors, including field agriculture and animal grazing. The differences could also reflect initial vessel size, since Structure 403, with the largest intact sherds, also had in its assemblage the largest vessels overall, as measured by rim diameter.

The average weight of studied sherds from each house tended to be heavier than the average weight of all sherds from the same house. This can be explained by the characteristics of the sherds in the contexts selected for study, which tended to be better preserved (so larger and heavier) and more diverse in type, thus having elevated potential to yield meaningful results. Also, stoneware sherds such as fragments of Olive Jars and even decorative majolica, either of which, if present in a sample, would have encouraged me to send the bag for study, tend to be heavier than earthenware sherds.

Because excavations occurred at residences with shallow, mixed soils, ceramic sherds were for the most part heavily fragmented. That made form analysis quite difficult. Ceballos Gallareta made form assessments while conducting type-variety analysis for nearly every sherd, including body sherds, often based on qualities of the sherds such as thickness (she finds that bowls tend to be thicker than jars) and forms known to be common for each type. In other cases, she assessed form based on the more concrete characteristics of the rims, necks, or bases, when available. Apart from her form analysis, I selected the largest rim sherds from colonial contexts to draw, analyze for form, and measure for a diameter estimate.

In Chapter 6, I explore the results of the form analysis and rim diameter measurements. My hypothesis was that residences for extended households would have ceramic assemblages with larger rim diameters, especially if we could compare like forms, such as cooking pots (e.g., Crown 2000:230). In addition, by identifying and counting cooking pots, I hoped to be able to provide occupation length estimates that would be helpful in comparing artifact densities across contexts (e.g., Varien and Mills 1997). Overall, the study of vessel types, forms, rim diameters, and surface treatments was designed to provide information regarding chronology and function, which relates to the objective of delineating the activities that took place within each residential area. Vessel form and size can provide archaeologists with information about what people were eating, how food was prepared, and for what size groups.

Analysis of Chipped Stone Tools

In the study of chipped stone, I focused on tools rather than flakes. Tools would be very helpful in the identification of activities that took place within each residential area.

Flakes and debitage were simply washed, counted, and weighed—the identification of primary, secondary, tertiary, and retouched flakes has not yet taken place. Still, density of chipped stone debitage can help to identify where more stone tool production or refurbishing took place. Information about the chipped stone debitage from excavated contexts, and also lists of all special finds including chipped stone tools can be found in Appendix H. During the process of washing, counting, and weighing chipped stone debitage, we separated any tools that we came across that excavators had not already separated in the field. From Operation 15, the vast majority of tools consisted of Colonial period projectile points, although some blade fragments and cores also were found. For each tool, we recorded the following characteristics: color, length, width, thickness, weight, tool type, portion, and description. For projectile points, we also measured neck width, neck height, shoulder width, and distance from shoulder to point. Obsidian was recorded separately by tool type, portion, length, width, thickness, number of dorsal ridges, retouching characteristics, color, and description. No obsidian artifacts appeared to date to the Colonial period. Drawings were made and photographs taken of select representative chipped stone tools.

Analysis of Other Artifacts

Other artifact types included metal, glass, stone and ceramic balls, beads, spindle whorls, fishing line or net weights, groundstone tools, and shell, as well as some plaster and stucco. Glass received minimal attention because very few shards dated to the Colonial period—nearly all glass was recent with the exception of one bottle at Operation 12 that had broken into many pieces and could be found distributed across various lots. As with all artifacts, glass shards were counted and weighed. The collection of metal was more varied;

artifacts spanned Postclassic to Colonial period copper alloy axe fragments to cast iron keys and coins (see Appendix H). Characteristics of metal fragments that were recorded included material, shape, length, width, height, and description, and several examples were drawn and photographed. The ball-shaped artifacts mentioned above tended to be around the size of marbles, created from stone or fired clay. We recorded each artifact's material and dimensions and wrote a description, using a similar approach for beads, spindle whorls, and what we called "ridged ovoids," and later confirmed to be fishing line or net weights, occasionally called "date seed sinkers" (Wiewall 2009:373). Groundstone tool analysis involved description of the raw material and form (e.g., *metate*, *mano*, ball), as well as measurements, weights, and photographs. We worked minimally with groundstone in the field laboratory, however, as I wished to prevent starch grain contamination. Based on later detection of sample contamination, I should have limited interaction with groundstone to an even greater extent. Shell, which was relatively uncommon, was divided into the categories of marine or terrestrial, then counted and weighed. Worked shell beads are the sole type of crafted shell.

Animal Bone Study

In order to prepare animal bone for analysis, we dry-brushed the bone to clean it, then counted and weighed each bag of bone. The largest collection of preserved bone was found at Operation 15. This was an exciting collection that promised to teach us about early Colonial period animal use and management. Nayeli G. Jiménez Cano analyzed fauna from Units C11 and G15 from Operation 15 (Structure 206) at Tahcabo during May of 2018 (Appendix I). Jiménez Cano performed anatomical and taxonomical identification using comparative specimens housed at the Laboratorio de Biodiversidad y Colecciones Científicas of the Centro de Estudios de la Biodiversidad y Desarrollo Sustentable at the Universidad Autónoma de Campeche, in Campeche, Mexico. In 2019 she studied additional animal bone from Operation 15 using comparative specimens at the Laboratorio de Zooarqueología of the Facultad de Ciencias Antropológicas at the Universidad Autónoma de Yucatán (Appendix I). She also used textual and digital references for identification (Abel and Butler 2016; FLMNH 2016; Olsen 1982, 1968). Apart from identifying taxa and anatomical elements, Jiménez Cano took measurements following the criteria of Von den Dreisch (1976), recorded taphonomic marks (e.g., indicating whether a bone was burned, gnawed, cut, or worked), and provided age estimates. She used Number of Identified Specimens (NISP) and Minimum Number of Individuals (MNI) as abundance estimators, using the criteria of Clason (1972).

Flotation Samples and Macrobotanical and Heavy Fraction Study

The goal of macrobotanical study was to understand what plants people grew in their gardens and prepared as food in their homes. Flotation took place in Calotmul, Yucatán, using a modified SMAP-style machine developed by Shanti Morell-Hart and based on Rob Cuthrell's flotation machine. This method, as adapted for our project, involved using a round plastic drum with the top cut off and a metal spout inserted into a slot cut into the top edge (Figure 3.6). Heavy fractions settled within the drum into sheets of mosquito netting (1-mm openings) that we secured around the edges of the tank using clips (Figure 3.7). Water seeped upward from a showerhead positioned in the center of the tank about halfway up its height. A water pump provided needed pressure to the system—it sucked water from another full water drum in order to pump it into the showerhead by means of a PVC pipe that entered along the side of the tank before bending upward at the bottom toward the showerhead. The light fraction (organic material) would float to the top of the water, maintained at the level of the spout opening, and pour out of the spout and into a piece of cheesecloth (or veil fabric in this case) held in a colander. Once we had completed flotation of an entire sample, often in 2-3 parts due to the large size of the samples, we left the light and heavy fractions to dry, preferably in our covered porch out of reach of the elements. Unfortunately, we did not recycle the water used during this process, although we created small channels to direct excess water toward plants in the garden, which included coconut and citrus trees. We floated 292 samples using this system.

Figure 3.6. Photograph of the flotation machine, showing giraffe-like PVC pipe into which water would flow from a hose and exit through the showerhead toward the sample. There are two metal spouts on the right, one of which fits over a mosquito net inserted into the tank.

Figure 3.7. Flotation machine with mosquito net inserted. Below spout there will be a colander resting on a bucket, which holds the veil fabric used to collect the light fraction.

Due to the high quantities of clay within *rejolladas* and the lack of organic material, flotation of 30-L samples from *rejolladas* took little time, as clay dropped through the heavy fraction screen to the bottom of the tank, and the few bits of organic material floated off the top without difficulty. Unfortunately, the red color and ease of flotation also foreshadowed the lack of charred macrobotanical remains that survive in these contexts. For the most part, only relatively recent charred wood and seeds survived in the *rejollada* soils. Residential samples had far less clay and thus were slower to float, but yielded greater quantities of charred material, at least in midden samples from Colonial period residential areas, as the plant remains are more recent and appear to be better preserved than those samples from the Classic period residences. In one instance I tried to float a sample from the top 10-cm of excavation at a residential area. This did not work, as the amount of vegetation in the light fraction would not allow the water to drain quickly enough, and the light fraction was too substantial—it would have taken an enormous amount of time to sort the sample, which was full of recently deposited and uncharred roots and seeds. From that point forward, we only floated samples collected from 10-20 cm below the surface or deeper.

Study of charred seeds from light fractions took place in the Paleoethnobotany Laboratory of the University of North Carolina at Chapel Hill. Samples were weighed and sifted through a series of geological sieves prior to analysis with a binocular dissecting microscope with 10-40x magnification. Analysis took place for all fractions larger than 0.7 mm in size from each selected sample. Charred botanical remains including seeds and cupules were counted and identified by comparison with the published literature (Lentz and Dickau 2005; Martin and Barkley 1961), online photographic databases, and specimens housed in the Paleoethnobotany Laboratory of the University of North Carolina at Chapel Hill. Wood identification was not conducted at this time, but the charred wood was separated and weighed, and is available for future study.

Due to preservation conditions in tropical environments, any unburned or partially burned plant matter encountered in the samples was considered to be intrusive and has been excluded from data tables and analysis. This is because uncharred plant material tends to break down much more quickly. It is worth considering, therefore, that the plant material found in the samples is often that which is most likely to burn—in the case of kitchen refuse, that which is most likely to fall into the hearth, or which is burned as fuel. Another consideration in terms of preservation in relatively shallow tropical contexts is that charred plant remains tend to break up into small pieces. Thus, seeds that are smaller tend to remain more intact than large seeds, introducing another bias in data recovery—plants with smaller seeds may be more readily identified. Just like pollen and starch grains, to be discussed below, the plant remains available for study in flotation light fractions are subject to preservation biases.

For heavy fractions, we only sorted materials greater than 2 mm in size, while discarding the fraction smaller than 2 mm. We then divided those materials greater than 2 mm in size into those greater and less than ¼” in size by sieving them. The rationale for this division was that some samples had been screened prior to sampling, while others had not, so we needed to standardize the samples. In addition, it was important for us to know which materials were less than ¼” in size, since it is our standard screen size that we used in the field. By observing separately those artifacts present in the matrix less than ¼” in size, we could learn about what we might frequently miss during excavation, and study trends in microartifacts to help discern activity areas that were later swept clean (e.g., Mixter 2016). However, because the samples for the most part were collected from arbitrary 10-cm levels in contexts that rarely contained preserved stratigraphy or floor remnants, results from heavy fraction separation were unlikely to provide clear evidence for working spaces based on the refuse embedded in swept floors. Instead, they were more useful for identifying broadly those small artifacts that otherwise were missed using the ¼” screens. It was also possible to observe areas in which there were greater densities of chipped stone microdebitage, where tool manufacture more likely took place. Finally, heavy fraction separation allowed us to assess charred plant remains that had failed to float, which generally consisted of wood.

During the first lab season in 2017, we separated heavy fractions according to material classes, such as ceramic, lithic, bone, daub, dirt clumps, terrestrial shell, marine shell, modern seeds, hackberry (*Celtis* sp.) seeds, carbonized plant material, glass, metal, *sascab* (soft limestone matrix that could have been used to form living surfaces), stucco, and floor fragments (when an obvious flat surface could be detected). On occasion, we also found beads and even a small fragment of a jade pendant. After the first season, it became clear from analysis that not all of these data categories would provide useful information about activity areas, since the samples did not target floor surfaces where microartifacts might have adhered (because we found few intact surfaces). During the second lab season, in 2018, we took a more efficient approach in which we only separated those items from samples that clearly related to human activity, including carbonized plant remains and artifacts, saving a lot of time by not separating *sascab* or terrestrial shell in particular. However, heavy fraction sorting was a relatively slow and laborious process using either method.

AMS Dates

Seventeen fragments of charred wood were sent to the University of Arizona AMS laboratory for dating and received the laboratory numbers AA110649-AA110665. Each of these pieces of charred wood had been collected during excavation and placed in tinfoil within a plastic bag until selection for shipment. Seven of the samples were found in *rejolladas*, while ten came from residential areas, six of which were thought to date to the Colonial period. One of these six, however, contained too little carbonized wood for dating. The results of AMS dating can be found integrated into Tables 5.2, 5.3, and 6.4. Within *rejolladas*, all of the charred wood sent for dating [collected from contexts that appeared to pertain to older layers at various depths] were found to be quite recent and had likely intruded into the contexts (5 out of the 7 samples). However, two of the pieces of wood excavated from *rejolladas*—those found associated with stone features—were ancient. Similarly, the charred wood submitted for dating from residential contexts thought to be ancient (four out of four) were all found to be more recent, and intrusive into those contexts. It was generally more difficult to tell whether the wood submitted for dating from colonial contexts was intrusive, since the 95% confidence interval for many of the dates ranged from the mid-seventeenth century to the mid-twentieth century due to the calibration curve. Only one date from the colonial residential areas (wood associated with the best-preserved midden), could be said to date securely to the early Colonial period and was not intrusive.

Soil Carbon Isotopes

Rejolladas are known to be places advantageous for orchards, but it is less clear the extent to which they might provide desirable conditions for crops such as maize. After consulting with Elizabeth Webb, of the Laboratory for Stable Isotope Science at the University of Western Ontario, I decided to collect soil samples from *rejolladas* that she would analyze for soil carbon isotopes (Table 3.5). Soil carbon isotopes have been used in the Maya area, and particularly in the central lowlands, to detect the intensification of maize cultivation, an increase in grasses and cleared land, or the presence of maize within middens (e.g., Beach et al. 2011, 2018; Dunning et al. 2015; Johnson et al. 2007; Webb et al. 2004, 2007; Wright et al. 2009). Soil carbon isotopes provide the opportunity to detect whether farmers pursued intensive maize agriculture within *rejolladas* in the past. We were aware, however, that initial studies in the northern Maya lowlands had shown that soil erosion and mixing might dull the signal of intensified maize agriculture or import it from adjacent areas (Larsen 2012). In addition, other C_4 plants apart from maize including C_4 grasses can be found in the area, which might confound the signal (Beach et al. 2017:210; Tankersley et al.

2019:327). Still, the deep soils of *rejolladas* at Tahcabo seemed to provide good contexts to apply this analysis.

Table 3.5. Samples sent to the Laboratory for Stable Isotope Science at the University of Western Ontario after 2016 *rejollada* excavations.

Sample	Operation	Capa/Inc	Lot	Depth below Surface (cm)
TAH 1	1	2A	163002	~5-15
TAH 2	1	2B	163003	20-25
TAH 3	1	2C	163004	~30-40
TAH 4	1	2D	163005	57-62
TAH 5	1	3A	163008	~80-90
TAH 6	1	3B	163008	100-107
TAH 7	1	3C	163009	122-131
TAH 8	1	3D	163010	140-145
TAH 9	1	3E	163011	158-165
TAH 10	1	3F	163012	184-190
TAH 11	1	3G	163012	201-206
TAH 12	2	2A	163015	~5-15
TAH 13	2	2B	163015	~22-32
TAH 14	2	2C	163017	~45-55
TAH 15	2	2D	163018	~70-80
TAH 16	2	2E	163019	~90-95
TAH 17	2	2F	163020	~105-115
TAH 18	2	3G	163021	~125-135
TAH 19	2	2H	163022	~145-155
TAH 20	2	2I	163023	~165-175
TAH 21	2	2J	163024	~185-200
TAH 22	3	1A	163025	~2-10
TAH 23	3	2A	163026	~15-25
TAH 24	3	2B	163027	~35-45
TAH 25	3	3A	163028	63-70
TAH 26	3	3B	163029	82-90
TAH 27	3	4A	163030	104-109
TAH 28	3	4B	163031	174-180

Soil carbon isotope studies examine changes in the ratios of stable carbon isotopes ($^{13}C/^{12}C$) in soil organic matter (derived from decayed vegetation) to determine whether long-term, intensive maize cultivation took place at any point in the past. Plants that use a C_3

photosynthetic pathway (the majority of plants) leave a more negative value than grasses and some sedges, including maize, that use the C_4 pathway. While all plant tissues are depleted of ^{13}C compared to the atmosphere, C_3 plants have an average of -27‰ (parts per mil) $\delta^{13}C$, while C_4 plants have an average of -12‰ $\delta^{13}C$ (Webb et al. 2004). A combination of factors including soil microbial diagenesis can cause increases in stable carbon isotope ratios of 1-3‰ in soils deeper than 20 cm (Boutton et al. 1998:7). Because of this, scholars infer a shift between C_3 and C_4 vegetation based on at least a 3‰ change in $\delta^{13}C$ throughout the profile—an approach that has recently been challenged as too conservative (Tankersley et al. 2019), but helps to avoid overestimating evidence for intensive maize cultivation.

The process for soil carbon isotope analysis involved the following steps: (1) roots were picked out, and soils were lightly crushed and sieved to 300 μm; (2) carbonates were removed from samples using an acid treatment; (3) samples were freeze dried; and (4) samples and standards were weighed. Stable carbon isotope measurements were made with a Fisons 1108 Elemental Analyzer coupled to a Delta V isotope ratio mass spectrometer in continuous flow mode (Webb et al. 2007).

Starch Grains

I selected 16 groundstone tools from excavations for starch grain study and exported them under an INAH permit to McMaster University in Hamilton, Ontario, for analysis. Prior to shipment, assistants wearing nitrile, powder-free gloves weighed, photographed, and measured each tool using calipers. This catalogue accompanied the tools during the export process. Shanti Morell-Hart recommended that the tools be transported to McMaster University for sampling because it can be too difficult to avoid contamination in field laboratories. This was sage advice; however, by creating a catalogue of groundstone tools, which was helpful during the export process, we created opportunities for contamination in the field laboratory. Once at McMaster University, I processed four tools at a time using the following sampling method, derived from the piggyback (starch grain and phytolith) method outlined by Deborah Pearsall (Chandler-Ezell and Pearsall 2003; Pearsall 2016).

First, I cleaned laboratory surfaces and tools using Liquinox laboratory cleanser. I used large Kim wipes to cover any work surfaces as an additional precaution against contamination. Second, I used a new, clean toothbrush to brush dirt off of the tool into a 1-L beaker. I went over the entire tool surface three times to remove as much soil as possible at this stage. This differed from the procedure implemented by Stephanie Simms (2013:185), which involved the isolation of a particular 5-x-6-cm area of each tool's surface that appeared to have been used specifically for grinding (probably a better method). I then added some deionized water to the beaker and washed this sample into a plastic centrifuge tube, labeled as the dry wash ("DW"). Next, I repeated the process, but with a new sealed toothbrush and using a squirt bottle to apply deionized water to the tool as I brushed dirt into a clean 1-L beaker. This became the wet wash ("WW") sample for each tool. Finally, I placed each tool into a beaker filled with deionized water, or if the tool was too large into a heavy duty, sealed plastic Ziploc-style bag filled with deionized water, and placed those beakers and bags into a water bath in the sonicator. I sonicated the tools for a period of five minutes, and the water from around each tool became its sonicated "SO" sample. Then, I transferred each tool into a clean beaker, reapplied deionized water, and sonicated for a second round of five minutes. This became the sonicated second-round "SOx2" sample. My hope was to dislodge as much starch as possible from the groundstone tools using the large, bath sonicator, rather than the handheld sonicating devices that other scholars had previously used and which had yielded mixed results (e.g., Morell-Hart et al. 2019:6; Simms 2013).

Originally, I tried to mount these samples directly onto slides for analysis. This only worked to some extent with the second-round sonicated samples, presumably because the samples were smaller, with less dirt, and the starch grains had detached from the matrix to a greater extent after so much sonication. However, in order to achieve results from the other, rather dirty samples, I floated them in a CsCl solution with a specific gravity of 1.7 g/mL. However, after examining slides it became clear that this procedure yielded few starch grains. Months later, at the Archaeobotany Laboratory at Northwestern University, I returned to the samples and implemented the original, recommended methodology developed by Pearsall, applying first a 0.1% EDTA solution, rinsing, then a 5.75% Hydrogen peroxide solution and rinsing before refloating the original samples with the same CsCl solution. This yielded much higher quantities of starch grains.

Unfortunately, my findings showed that the tools had been contaminated with recent potato (*Solanum tuberosum*) starch at some point prior to laboratory analysis. This contamination likely took place in the field lab, as we weighed and photographed artifacts for their export documentation. An effort was made to differentiate between ancient starch and starch from potato and other potential contaminants. Two chili pepper (*Capsicum* sp.) starch grains were found on grinding tools from Colonial period residences—one from a wet wash (WW; *mano* from late colonial Structure 403), and one from a sonicated sample (SO; pestle/*mano* from middle colonial Structure 317). However, it could not be ruled out that these starch grains were contamination as well. No other identifiable starch grains could be determined not to have contaminated the samples, and the quantities of ancient starch from sonicated samples appeared to be relatively low. For these reasons, the results of the starch grain study are omitted from the data analysis chapters of the dissertation.

Groundstone tools may not always be a ready source for preserved starch grains. While Stephanie Simms (2013) found starch grains in samples washed from groundstone tools found at a Late Classic period context (*Escalera al Cielo*) at Kiuic in the Puuc region of southwestern Yucatán, those residences were particularly well-preserved, with many vessels and tools found *in situ* on preserved plaster floors and in nearby areas outside of each house, where they had been protected by a layer of structure collapse. Perhaps the remarkable preservation of the context helps to explain the extent to which she was successful at isolating starch from the tools. Her strategy to sample only portions of the grinding surfaces of tools may also have helped to concentrate starch related to tool use in the samples she studied.

Pollen

Ten soil samples from 2016 *rejollada* excavations were sent to John G. Jones for pollen study (Table 3.6; Appendix J). The samples were selected from the 20-cm arbitrary levels in Rejolladas A, E, and G that contained artifacts potentially helpful in associating them with specific periods of time. Four samples were selected from Operation 1 because it was placed within the *rejollada* located most centrally in town, contained an interesting feature and artifacts distributed throughout, and there was some semblance of stratigraphic integrity. Meanwhile, only two samples were selected from Operation 2, which contained many gopher holes and had recent artifacts such as plastic incorporated into arbitrary levels located far beneath the surface. Excavations did not continue as deep in Operation 3, where bedrock was reached at approximately 130 cm beneath the surface. It was an interesting context to compare to Operation 1, however, due to its distance from the contemporary town center, and four samples were sent from the unit for pollen analysis. In 2017 I also sent the two beehive plugs encountered in excavation units at Tahcabo (Operations 12 and 13) to John G. Jones for pollen analysis, but the artifact washes yielded no pollen from bee-pollinated plants (only wind-dispersed pollen was present), suggesting a lack of pollen preservation on these artifacts located near the surface.

Table 3.6. Samples sent to John G. Jones for pollen analysis.

Sample No.	Lot No.	Operation	Unit	Capa/Inc	Depth below Surface (cm)
1	163002	1	1	2A	3-15
3	163004	1	1	2C	30-45
4	163005	1	1	2D	57-62
8	163010	1	1	3D	140-145
13	163016	2	1	2B	15-35
14	163017	2	1	2C	35-55
22	163025	3	1	1A	0-15
23	163026	3	1	2A	15-30
24	163027	3	1	2B	30-50
25	163028	3	1	3A	55-75

Differential preservation and other issues with pollen interpretation. Pollen has a number of important limitations when used to determine agricultural practices. First, the highest proportions of pollen will derive from wind-pollinated species. This pollen can travel long distances, which is why pollen studies are often used for paleoclimate reconstructions--pollen can often represent the broader landscape, although plant species produce pollen in different quantities, spread them to varying distances, and may be differentially preserved (Delcourt and Delcourt 1980). Some pollen grains have characteristics that make them more easily distinguished from other grains and identifiable to a species level. Pollen can generally be identified to the level of family or genus.

As mentioned, wind-pollinated plants, known as anemophilous, produce the most pollen (~10,000-70,000 grains per anther; Bryant and Holloway 1983). As a result, three pollen types (Asteraceae, Cheno-Am, and Poaceae) typically account for 50 percent or more of the pollen in samples. Insect- and animal-pollinated plants, called zoophilous, generally produce far less pollen (~1,000 grains or fewer per anther). Pollinators deplete the supply of pollen in zoophilous flowers, so that few pollen grains remain to become incorporated into the archaeological record (Appendix J:447). Thus, common zoophilous perennials (e.g., Apocynaceae, Fabaceae, and Rubiaceae) tend to be poorly represented in the pollen record (Jones 1991). Nonetheless, some zoophilous plants produce more pollen than is typical and stand a better chance of being represented in pollen samples.

The three main degradation factors of pollen samples are mechanical, biological, and chemical. Mechanical degradation can result from pollen transportation and sedimentation, and soil disturbance by farmers and animals, as well as changes in temperature and moisture (Bryant and Holloway 1983). Biological degradation entails microbial decomposition of pollen, causing extensive pollen destruction. Selective preservation occurs when fungi prefer the pollen of certain taxa over others (Bryant and Holloway 1983). Corrosion of pollen walls also occurs through chemical processes such as oxidation, and therefore pollen preserves better in acidic rather than in alkaline environments (and Yucatán's soils over karstic bedrock tend to be alkaline). The amount of sporopollenin in a pollen grain's walls impacts its ability to withstand oxidation (Appendix J:449).

Pollen Analysis Methods. The Palynology Laboratories at the Institute for Integrative Research in Materials, Environments, and Society (IIRMES) at California State University in Long Beach, California processed the soil samples, using the Archaeological Consulting

Services' (ACS) favored protocol (Appendix J:449). John G. Jones conducted pollen analyses at the ACS laboratory. Pollen extracts were mounted on slides in glycerol, using a cellulose-specific stain (Appendix J:450). Jones used a Nikon E200 compound microscope to view the slides at 400x magnification until either: 1) reaching 200 grain, or 2) counting 75 tracer spores. Once one of these goals had been reached, Jones scanned the remainder of the slide at 200x magnification to identify pollen of any remaining economically significant taxa. Pollen grain identification was conducted with the help of the ACS pollen reference collection and standard pollen references (e.g., Kapp et al. 2000). Additional information can be found in Appendix J.

Conclusion

This chapter provided an overview of the field and laboratory methods used as I attempted to answer the research questions that this dissertation poses. In the following chapters, I present the outcomes of the different activities pursued, such as site survey and mapping (Chapter 4), excavation of *rejolladas* (Chapter 5), and excavation of colonial residences (Chapter 6). The soil carbon isotope and pollen studies helped to identify the use of a *rejollada* for possible intensive maize and cotton cultivation, while also demonstrating the use of *rejolladas* as places to maintain biodiverse gardens through time. Charred seeds, which failed to preserve for long periods of time within *rejolladas*, could be found in floated samples from midden contexts located around the edges of Colonial period platforms, providing some insight into how food provisions may have changed through time, especially when considered alongside the faunal remains. While the preservation of plant remains and shallow colonial deposits is poor in the northern Maya lowlands, by piecing together evidence from the analysis of a number of artifact classes, samples, and context types, and also by learning about landscape interactions from current Tahcabo residents, glimpses into daily life in the houses and gardens of a farming community become available.

CHAPTER 4:

SETTLEMENT HISTORY AND LANDSCAPE INTERACTIONS

This chapter addresses trends in the settlement history and landscapes of the northern Maya lowlands based on archaeological research, including survey at the research site of Tahcabo. In particular, I provide background information that helps to explain some of the dynamics of the Colonial period, but which also provides a fuller perspective with which to understand evidence for the early use of *rejolladas* and the construction of residential platforms later re-used during the Colonial period. Scholars including Maxine Oland (2009; 2012) and collaborators (Hart et al. 2012) have pointed out the importance of contextualizing colonial processes within longer histories, shaped by the agency of indigenous peoples. This approach can help to accurately detect changes wrought by colonial processes and to decenter the Colonial period as the primary inflection point in peninsular history.

For each period discussed in the first half of this chapter, beginning with the Early Preclassic period, I seek to explain briefly any archaeological evidence available about the political institutions, trade networks, climatic conditions, and demographic trends that characterized the time and that could have impacted livelihood strategies and settlement patterns in the northern Maya lowlands. In terms of the sustainable livelihoods framework, this information falls primarily into the category of contexts, conditions, and trends that play a role in livelihood decision making. Archaeological information available about crafting, subsistence behavior, and food production (e.g., botanical and faunal studies, analysis of water and soil management features) is also included. For each period from which I found ceramic evidence, I also include trends in the settlement history of Tahcabo based on survey, surface collection, and mapping, allowing for the comparison of local and regional circumstances. Unfortunately, due to the limited ceramic material studied from Tahcabo up to this point, it is not currently possible to name ceramic complexes for the site or map them precisely onto the broader chronology of the northern Maya lowlands (Table 4.1). Instead, the ceramic evidence was analyzed in relation to complexes and examples from nearby sites, and chronology estimated (e.g., Bey et al. 1998; Robles Castellanos 1990).

Table 4.1. Chronology of the northern Maya lowlands leading up to the Colonial period (based on Andrews and Robles Castellanos 2018; Brown and Bey 2018; Appendix F).

Period	**Approximate Dates**
Early Preclassic	2,000 – 1,000 BC
Middle Preclassic	1,000 – 400/300 BC
Late to Terminal Preclassic	400/300 BC – AD 250/300
Early Classic	AD 250/300 – 550/600
Late to Terminal Classic	AD 550/600 – 1100
Postclassic	AD 1100 – 1540

The rough chronology that ceramicist Teresa Ceballos Gallareta devised for Tahcabo's ceramics can be found in Table 4.2 (see Appendix F for additional information). This is provisional due to the limited excavations conducted to this point, and the quite small average sherd size. In the table, both the Middle and Late Preclassic period ceramics have been assigned dates coinciding with the Late Preclassic period for the larger region. This interpretation represents a conservative perspective on ceramic groups that have often been assigned to the Middle Preclassic period (e.g., Dzudzuquil), even when found in nearly all cases along with Late Preclassic period groups. Xocnaceh in the Puuc hills is another site at which Middle and Late Preclassic period sherd groups could consistently be found mixed together (Glover and Stanton 2010:63; Hernández Hernández 2005). It is quite possible that ceramics that began to be produced during the Middle Preclassic period survived longer at some sites than has been previously estimated. Based on their co-mingling in both surface collections and excavated contexts, this may be the case at Tahcabo as well.

Table 4.2. Chronology of Tahcabo's earthenware ceramic groups (i.e. designation level above type-variety) as estimated by Teresa Ceballos Gallareta.

Period	Approx. Dates	Ceramic Groups Represented
Middle-Late Preclassic	400/300 BC – AD 250/300	Pital, Tancah, Joventud, Chunhinta, Dzudzuquil, Unto, Tipikal, Sierra, Dzilam, Carolina, Habana, Tamanche, Flor
Early Classic	AD 250/300 – 550/600	Tancah, Saban, Sierra, Dzilam, Carolina, Habana, Huachinango, Xanaba, Polvero, Zotz, Cetelac, Shangurro, Tituc, Timucuy, Aguila, Balanza, Arena, Batres, Maxcanú
Late-Terminal Classic	AD 550/600 – 1100	Arena, Cetelac, Batres, Maxcanú, Chablekal, Chum, Petkanche, Encanto, Achote, Vista Alegre, Teabo, Balancan, Muna, Ticul, Dzitya, Dzitas, Sisal, Dzibiac, Silho, Tohil
Postclassic	AD 1100 – 1540	Navula, Mama, Sulche, Kukula, Polbox
Colonial and Historic	AD 1540 – 1950	Yuncu, Sacpokana, Oxcum

The second half of the chapter introduces the geology of the northern Maya lowlands, addressing in particular those factors relevant to agriculture, such as the availability of water and the diversity of soils. Previous archaeological studies of soil composition and soil carbon isotopes are also presented. Next, I discuss the agricultural system, including the role of gardens, the phases of outfield agriculture, and the use of forested areas. This discussion provides a generalized view of farming practices in Yucatán based on ethnographic evidence, while trying to indicate the diversity inherent to the system and how farmers put it into practice in distinct locales. In this section of the chapter, I seek to provide an overview of farming in the region and an introduction to the relational ontology of farmers without essentializing agricultural practices or suggesting that they are universally consistent across space and time, thus robbing them of historical contingency.

The chapter concludes with a section on the sinkholes of the northern Maya lowlands, including archaeological and historical evidence for their varied use through time. In the following chapter, I explore ethnographic and archaeological evidence for the gardening practices that Tahcabo residents implement within *rejolladas* and the extent to which certain horticultural strategies may have persisted or changed. This chapter, in contrast, provides the context with which to understand how conditions of life during the Colonial period at Tahcabo fit into a longer site narrative and how the site maps onto regional patterns of population movement, resource use, agricultural production, and economic organization. In order to better visualize regional interactions and relationships, Figure 4.1 includes many of the sites mentioned in this chapter.

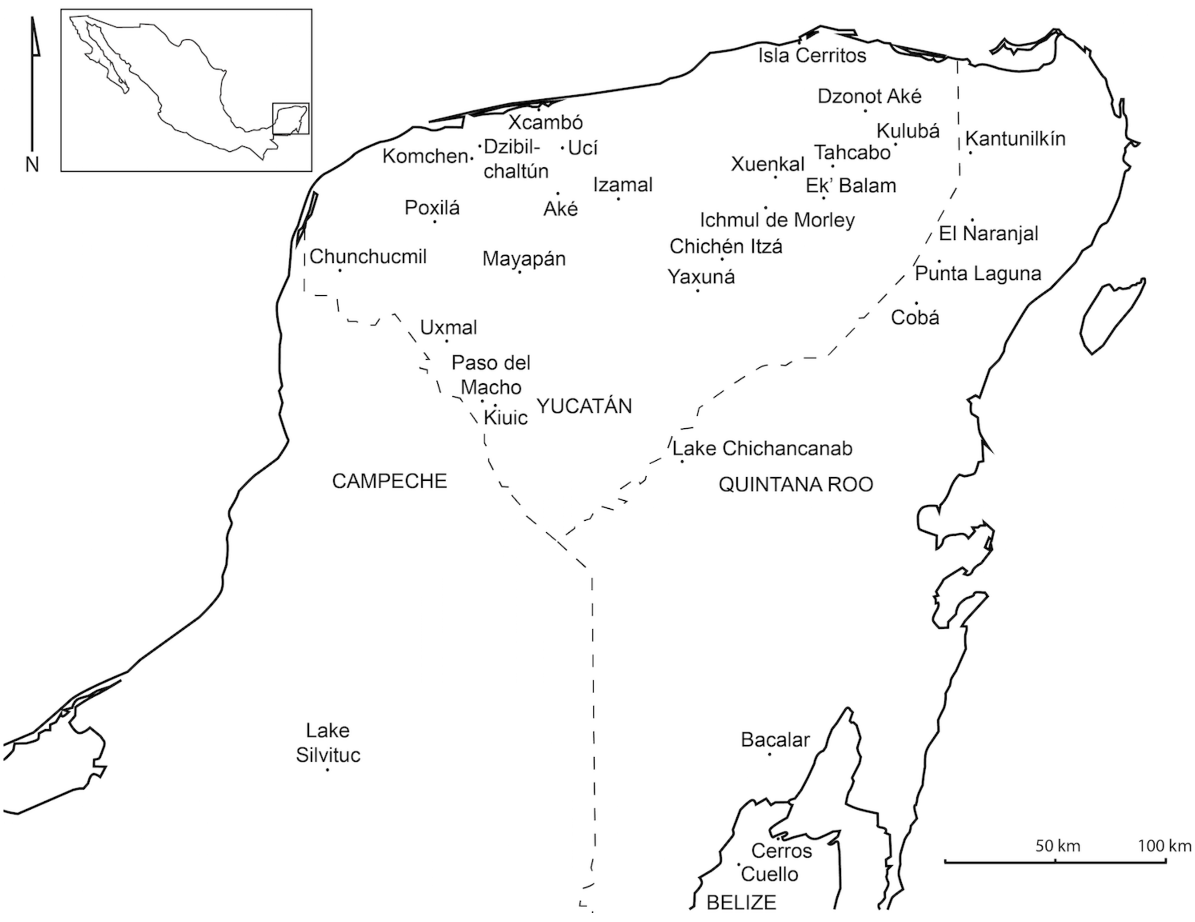


Figure 4.1. Map of sites mentioned in the settlement history section of this chapter.

Settlement History

Early Preclassic (ca. 2000-1000 BC)

Recent summaries of the archaeology of the northern Maya lowlands highlight the paucity of evidence for human activity during the Early Preclassic period—the time of the earliest permanent settlements across the wider Maya area (Andrews and Robles Castellanos 2018). The lack of information about populations living in the northern Yucatán peninsula during the late Archaic and Early Preclassic periods, followed by seemingly abrupt evidence for the presence of permanent settlements with relatively well-developed ceramics around 1000 BC, has led scholars to suggest that migrants from the south may have arrived to the area around that time and assimilated the earlier inhabitants of the Yucatán peninsula (Andrews and Robles Castellanos 2018:30). On the other hand, recent publications have documented maize pollen present in the northern lowlands beginning as early as 2000 BC (Carrillo-Bastos et al. 2013; Leyden 2002:96; Leyden et al. 1998; Islebe et al. 2018). Evidence for the transition from foraging to agriculture has been sparse in the northern Maya lowlands.

The lack of evidence for Early Preclassic period populations in Yucatán may relate to the relatively shallow soils of the northern Yucatecan plain, which rarely preserve intact contexts dating to such early times. Deeper soils can be found within dry sinkholes called *rejolladas*, where older deposits may preserve, as I found at Tahcabo (see Chapter 5). *Rejolladas* in particular, addressed later in this chapter, may yield evidence relevant to the transition to agriculture due to their utility for horticulture and their relative lushness during drought, which could have attracted late Archaic and Early Preclassic period populations. The moisture of *rejollada* soils could be particularly relevant at this time, since Leyden

(2002:96) argues that a prolonged dry period began during the Early Preclassic period (at approximately 1800 BC) and persisted through the Early Classic period (until AD 600).

Middle Preclassic (ca. 1000-300 BC)

The earliest sites with evidence for permanent settlement appear across the northern Maya lowlands with well-developed pottery during the early Middle Preclassic period (ca. 1000-900 BC; Andrews and Robles Castellanos 2018:21; Andrews V et al. 2018; Ceballos Gallareta and Robles Castellanos 2012). Pottery from across the northern lowlands during this period falls into five ceramic groups: Achiote, Chunhinta, Dzudzuquil, Joventud, and Kin, which are understood to have first appeared in northwestern Yucatán before spreading eastward (Glover 2012:274-5). Evidence for long-distance exchange dating to this time period includes jade caches found at the sites Poxilá and Paso del Macho in western Yucatán (Robles Castellanos and Ceballos Gallareta 2018:243). Long-distance trade appears to have been much more important during the early Middle Preclassic period than during earlier times (Lohse 2010:342).

Populations expanded by the mid to late Middle Preclassic period, a time when regional survey in northwestern Yucatán indicates that sites existed in a three-tiered hierarchy (Anderson et al. 2018:211). Secondary sites in northwestern Yucatán exhibited diversity in form, with some encompassing unusual features such as ballcourts. The early spread of ceremonial architecture can also be noted in the appearance of select E-Group complexes, more commonly found in the southern Maya lowlands, in Yucatán around the year 800 BC (Collins 2018; Glover and Stanton 2010:68; Reese-Taylor 2017), suggesting the importance of ritual in the founding of early communities. The late Middle Preclassic period was a dynamic time characterized by population increases, growth in site size and monumental architecture, the establishment of a hierarchical social order, and intensified long-distance trade (Brown and Bey 2018:398).

Middle Preclassic subsistence data have been retrieved from sites in Belize with an intensity that is unrivaled in the northern Yucatán peninsula. Consistent emphasis on subsistence data in the southern lowlands and especially in Belize, but not in the northern lowlands, can in part be explained by the poor preservation of northern contexts, which are often shallower and more fragmentary, with higher soil alkalinity. The differences in data availability can also be attributed to distinct excavation strategies and lines of questioning pursued in different countries. Plant remains recovered in Belize that date to the Middle Preclassic period indicate that populations at this time ate foods consisting of maize, squash, beans, chili pepper, *ramón*, coyol palm (*Acrocomia aculeata*), hogplum, nance (*Byrsonima crassifolia*), and *mamey* (Miksicek et al. 1991; Powis et al. 1999:370). Faunal collections from archaeological sites in Belize dating to the Middle Preclassic period contain diverse assemblages of fish, shellfish, birds, reptiles, and small to medium mammals, as well as dog, deer, turtle, armadillo, pearly mussel, and peccary, demonstrating the diversity of early diets in the region (Masson 2004; Powis 2004; Powis et al. 1999; Shaw 1999; Wing and Scudder 1991).

Late Preclassic (ca. 300 BC – AD 250)

By the Late Preclassic period, the large site of Komchen in northwestern Yucatán had consolidated its power in the region. Secondary sites had become more uniform than during the preceding period, and ballcourt sites declined (Anderson et al. 2018:211). Megalithic style architecture was characteristic of this period and the subsequent Early Classic period, based on associated pottery, architecture, and AMS dates of charred wood preserved in architectural mortar (Mathews and Maldonado Cárdenas 2006). The architecture consists of massive blocks of stone, often over one meter in length, arranged with curved edges around a rubble core (Taube 1995). The megalithic style overlaps with other general characteristics of architecture during the Late Preclassic to Early Classic periods, which include platform-pyramid complexes and triadic groupings, but is not found everywhere (Glover 2012:279). Major civic ceremonial constructions built in the megalithic style can be found at sites across the peninsula, including Xcambó, Aké, Izamal, and Yaxuná in western and central Yucatán, Ek' Balam and Dzonot Aké in eastern Yucatán, and Cobá and El Naranjal in Quintana Roo (Figure 5.1; Bey 2006:27; Mathews and Maldonado Cárdenas 2006:Table 5.1).

Mathews (1998) has argued that the megalithic style represents an interaction sphere that developed as elites of the northern Maya lowlands forged alliances and trade partnerships. Hutson argues that more modest residential buildings (less than one meter tall) at small sites were also constructed in the megalithic style, particularly on the western side of the peninsula, where Izamal was an epicenter for the style (Hutson 2014:118, 128). In the eastern half of the peninsula, however, he believes that the megalithic style, with an epicenter at El Naranjal, could be found only at more elite complexes at larger sites, and he suggests that this may provide evidence that the megalithic style moved from west to east across the northern Maya lowlands (Hutson 2014:127). He believes that the megalithic architectural style, which only partially overlapped with contemporaneous ceramic spheres, can help archaeologists understand complex coalitions present across the northern lowlands at the time (Hutson 2014:135). Glover (2012:286-9) has also shown that the megalithic style is relatively rare in the Yalahau region of northern Quintana Roo, even though El Naranjal and a few elite complexes can be found in the style, and he suggests there may have been political differences between sites where the architecture was and was not employed.

While megalithic architecture can be found across northern Yucatán with few regional differences, ceramics provide evidence for distinct traditions that began to develop during the Late Preclassic period and can be characterized as five ceramic spheres by the onset of the Early Classic period (Bey 2006:35; Ceballos Gallareta and Jiménez Álvarez 2006; Glover and Stanton 2010:Figure 4). Due to overlapping ceramic types, archaeologists cannot always distinguish between Late Preclassic and Early Classic period contexts. However, in the Yalahau region of northern Quintana Roo, Jeffrey Glover (2012) argues that the highest regional population levels coincided with the Terminal Preclassic period (75 BC to AD 100-400) based on the presence of ceramics with bichrome slips and incised designs, but a lack of Early Classic period polychromes (Glover 2012:279; Glover and Stanton 2010:64). Ceramicist Teresa Ceballos Gallareta (personal communication, 2018; Table 4.2) believes that among the incised bichrome sherds present at Tahcabo, Dzilam Verde Bichrome-Incised could be found as early as the Late Preclassic period, while Huachinango Bichrome-Incised could be seen as diagnostic of the Early Classic period along with polychromes such as the regionally common Tituc Orange Polychrome. At Ek Balam, however, all bichrome-incised wares were thought to have developed simultaneously (Bey et al. 1998:111). Saban, Cetelac, and Balanza ceramic groups are also associated with the Early Classic period in particular, and can help to distinguish between Late Preclassic and Early Classic deposits (Bey et al. 1998:113; Ochoa Rodríguez 2004:30; Robles Castellanos 1990).

In northern Belize, evidence from Cerros shows that during the Late Preclassic period consumption of tree fruits increased dramatically, at a time when an elite class also appears to have emerged at the site (Crane 1996). Animal bone found in the same context showed an increase in the consumption of turtle, dog, deer, and peccary during the Late Preclassic period at Cerros. Plant species used for food during the Late Preclassic period at Cuello and Cerros in northern Belize (based on Crane 1996; Cliff and Crane 1989; Miksicek et al. 1991) included maize, chili peppers, tubers, squash, wild legumes, nance, avocado, hogplum, coyol palm, *mamey*, allspice (*Pimenta dioica*), guava, *ziricote* (*Cordia dodecandra*), and persimmon (*Diospyros* sp.). Little work has been conducted on plant remains from Preclassic sites in the northern Maya lowlands.

As to climate, Leyden (2002:96) argues based on data from the Cenote San José Chulchaca in northwestern Yucatán, near Chunchucmil, that the northern Maya lowlands experienced a dry period that lasted throughout the Late Preclassic and Early Classic periods. At Punta Laguna, in contrast, the climate prior to AD 250 was found to be fairly wet (Curtis et al. 1996:44), while at Lake Silvituc in Campeche, the climate prior to year AD 1 was said to be wet, followed by a dry period particularly from AD 150-300 (Vela-Peláez et al. 2018). Despite the different accounts of Late Preclassic period climate, there seems to be some consensus that the subsequent Early Classic period was relatively dry in comparison.

Early Classic (ca. AD 250-600)

At some sites, such as Dzibilchaltún and Komchen, demographic declines follow the Preclassic period (e.g., Andrews and Andrews 1980). However, at other sites across the northern plains, continuity and new growth can be found during the Early Classic period, as demonstrated in the elaboration and wider distribution of monumental architecture (Glover and Stanton 2010). During the Late Preclassic period at Yaxuná, Yucatán, large monumental constructions were for the most part focused on public performance. This changed during the Early Classic period, when most of the architecture was mortuary and emphasized restricted access, which Glover and Stanton (2010:69) argue relates to the emergence of divine kinship and new dedication "to the cult of kingly ancestors." They note that a population decline at Yaxuná accompanied this transition.

Early Classic period ceramic diversity suggests growing social complexity, also reflected in the presence of larger monumental structures. Regional surveys have found differing patterns of Early Classic period population distribution. For example, at Ek' Balam, Early Classic period sherds were mostly found in the site center and rarely encountered in rural areas, while in the Chikinchel region in far northeastern Yucatán state along the coast, Early Classic period sherds could be found distributed across the landscape, at 90% of surveyed sites (Bey 2006:34; Houck 2004:224; Kepecs 1998:124).

Long distance trade grew during the Early Classic period, when the trading center of Chunchucmil reached its largest size (Hutson et al. 2006), Xcambó became a trading port (Ortega-Muñoz et al. 2018; Sierra Sosa 1999), and large-scale salt production began (Kepecs 1998). Evidence for interregional interaction can be found at many sites dating to this time, and include influence from Teotihuacan at sites in the Puuc hills (Chac II and Oxkintok; Hutson 2014:130; Smyth and Ortegón Zapata 2006; Smyth and Rogart 2004; Stanton 2005) and trade with Guatemala based on the immense quantity of obsidian found distributed evenly across Chunchucmil (Hutson 2014:131, 135). Urban centers, including sites as contrasting as Chunchucmil and Izamal, grew to be extraordinarily large during the Early

Classic period. At Chunchucmil, there was no focal pyramid, no intersite causeways could be found, and residents appear to have been densely packed in the urban core and dependent on the market economy (Hutson 2014:122). At Izamal, on the other hand, some of the largest pyramids ever built in the region were constructed during the Early Classic period, and other features included intrasite and intersite causeways, and areas for gardens and agriculture within the sprawling city, which engulfed nearby sites (Hutson 2014:120). However, Fisher (2014) has shown that on average even Chunchucmil had much more substantial garden space within house lots than did the later sites of Cobá or Mayapán.

In terms of agricultural trends, evidence from the northern lowlands shows that extended families positioned themselves near landscape features such as *cenotes* and *rejolladas* (Houck 2006; Koby 2012; Munro-Stasiuk et al. 2014). At Early Classic period Chunchucmil, *rejolladas* always occurred within house lot walls, suggesting they were used for family-level production (Dahlin et al. 2005). As mentioned above, the Early Classic period coincides with a drier climate than the preceding Preclassic period (Aragón-Moreno et al. 2012; Curtis et al. 1996; Hodell et al. 2001, 2007), or continues a dry trend (Leyden 2002:96), which may help to explain the concentration of residences and agricultural activity at these features. During the Early Classic period, stable carbon and nitrogen isotopes from human remains indicate that residents of the central Yucatecan site of Yaxuná relied on maize for about 60-70% of their diets, as found at sites in Belize, and that they supplemented maize with C_3 plants and wild animals such as deer (Mansell et al. 2006:177). At Chunchucmil, on the other hand, diets depended less heavily on maize and instead depended to a greater extent on C_3 plants (Mansell et al. 2006:180).

At Tahcabo, populations were widely distributed across the landscape during the Middle Preclassic through Early Classic periods (ca. 450 BC – AD 500) based on survey and surface collection (Figure 4.2). Figure 4.2 incorporates sherds from across this long expanse of time due to overlaps and continuity in the use of many of the ceramic types. Sherds from these periods have been found in nearly every location where surface collection has taken place. All of the colonial residences studied at Tahcabo (see Chapter 6) could be found to rest atop platforms dating to this timespan. The large platforms that characterize this time period predominate among the structures documented around *rejollada* rims and across the site in general. Their distribution suggests what de Montmollin (1989:299) called "a spatially 'efficient' distribution of the population with reference to agricultural fields," which may have facilitated intensive production. The relatively even distribution of house platforms during the Middle Preclassic through Early Classic periods correlates well with the idea that the control of land and labor was maintained mostly at the level of the extended family household at this time. Based on surface collections and excavations, the Early Classic period was a time of population maximum at Tahcabo.

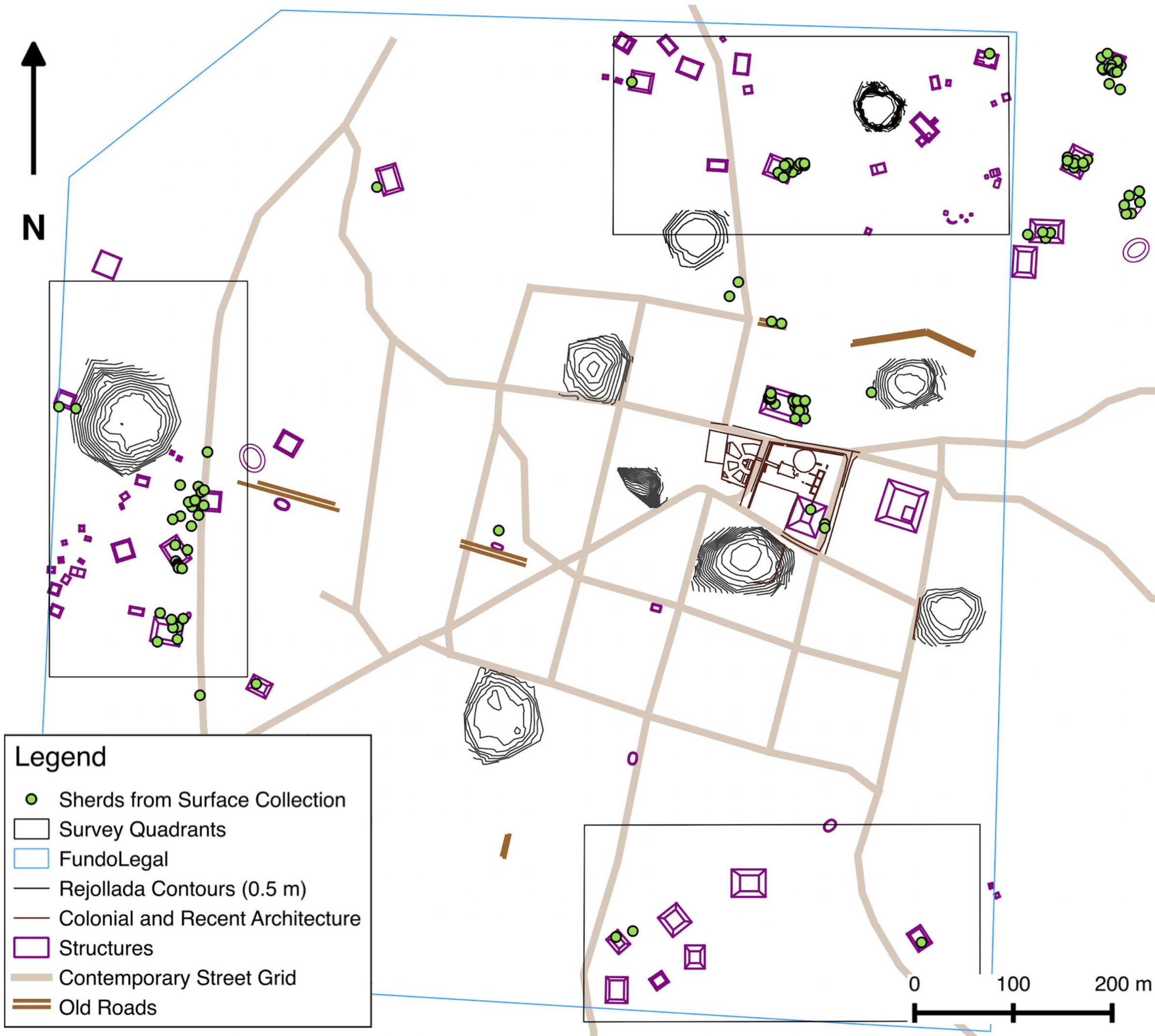


Figure 4.2. Distribution of Middle Preclassic to Early Classic period sherds at Tahcabo.

Late to Terminal Classic (ca. AD 600-1100)

Less is known about the Late Classic political sphere in the northern lowlands than in the south, in part due to a relative paucity of hieroglyphic texts in the north. Emblem glyphs from the sites of Uxmal and Ek' Balam use the *k'ul ahau* title, suggesting the presence of divine lords at these centers, and other hieroglyphic texts found in the northern lowlands indicate the presence of a hierarchy in titles (Shaw and Johnstone 2006:143). During the Late Classic period, a *sacbe*, or causeway connecting Cobá to Yaxuná was built, an event that has been interpreted as part of a strategy by Cobá to expand its state (Shaw and Johnstone 2006:153). The largest Late Classic period cities in the northern lowlands were functionally and economically diverse (e.g., Hutson et al. 2016). Elaborate social differentiation emerged, populations clustered to a greater extent into town centers, and competition between regional centers grew (Bey 2006:35; Bey et al. 1998:101; Houck 2004; Kepecs 1999; Shaw and Johnstone 2006:153). Exceptions to this trend certainly exist, however—for example, the Yalahau region of northern Quintana Roo was mostly depopulated during the Late to Terminal Classic period (Glover 2012:279), and populations at Ucí and Chunchucmil in western Yucatán declined after the Early Classic period as well (Hutson et al. 2016:129). Evidence for conflict among sites during this time included settlement fortification and the apparent sacking of Yaxuná by Chichén Itzá (Ambrosino 2003). Chichén Itzá continued to flourish at a time when many sites in the southern lowlands had been depopulated, and when populations had fallen in the northern lowlands as well. It did so while intensifying trade and adopting an authority structure distinct from previous cities ruled by divine kings.

Chichén Itzá famously expanded coastal trade routes and controlled at least the Yucatecan segments of the routes (Kepecs et al. 1994). Key commodities that Chichén Itzá imported included green obsidian from locations in central Mexico (Braswell 2010:137), jade ornaments and basalt grinding stones from the Guatemalan highlands, and Tohil Plumbate pottery from Chiapas; in return, Chichén Itzá exported salt (Ardren and Lowry 2011:437). Green obsidian and Chichén Itzá-affiliated Sotuta and imported ceramic wares can be found at sites across the northern lowlands during the Terminal Classic period, when the power of Chichén Itzá peaked across the region. Mesoamerican elites across the vast areas connected by coastal trade routes increasingly sought imported goods during the Late to Terminal Classic period.

Smith and colleagues (2006) argue that the mode of rulership in the northern lowlands during the Late to Terminal Classic period was most likely hegemonic rather than territorial. They base their argument on evidence from the site of Ichmul de Morley, located roughly halfway between Chichén Itzá and Ek' Balam. They argue that if rulership at these larger sites was territorial, then Ichmul de Morley would have closely allied itself to one site or the other, and that this allegiance would be seen in the material culture of the site. On the other hand, they argue that if rulership was hegemonic, a community midway between the two larger sites would experience greater autonomy, which would be reflected in material culture that incorporated characteristics of both sites as well as independent invention. Smith and colleagues demonstrate that residents of Ichmul de Morley made use of Sotuta ware ceramics produced at Chichén Itzá, as well as Tohil Plumbate and Silho Fine Orange vessels that the larger site actively received through trade. To an even greater extent, they used Cehpech ceramics, associated with Ek' Balam, Cobá, and sites other than Chichén Itzá. Cehpech and Sotuta wares existed in many contexts together, suggesting their use contemporaneously. A portion of obsidian at Ichmul de Morley could be sourced to central Mexico, characteristic of the Chichén Itzá trade (Braswell and Glascock 2002), while a greater portion of the obsidian could be sourced to locations in Guatemala, characteristic of the Ek' Balam trade. On the other hand, Ichmul de Morley's architecture was distinct from that of both larger sites, and did not include any defensive architecture such as walls. All of these characteristics lead Smith and colleagues to suggest that Ichmul de Morley was not a Chichén Itzá-controlled outpost in this border zone, even though outposts critical to trade did exist (e.g., Xuenkal and Isla Cerritos; Andrews et al. 1989; Ardren and Lowry 2011). The argument for hegemonic rulership based on relationships rather than territories is reminiscent of a similar argument that Sergio Quezada (2014) makes for Postclassic to early Colonial period Yucatán.

Recent studies in the northern lowlands have begun to address the daily lives and economies of non-elites during the Late to Terminal Classic periods (e.g., Dahlin et al. 2005; Hutson 2010; Hutson et al. 2016:131-135; Manahan et al. 2012; Manzanilla and Barba 1990; Simms et al. 2012). In Yucatán, as elsewhere in Mesoamerica, multi-crafting was a common feature of household organization, especially during the Late Classic period (Ardren et al. 2016; De Lucia 2013; Feinman and Nicholas 2007; Hirth 2009). Multi-crafting consists of the pursuit of multiple craft activities by the same household for production beyond household needs. It constitutes a diversified approach to household economy that can be combined with subsistence agriculture, although additional craft activities may become integrated into livelihood portfolios at the expense of some agricultural activities. It is now well accepted that even rural Late Classic period Maya households engaged in market exchange to access items for daily use, and thus had incentive to produce surpluses (e.g., Andrieu 2013; Dahlin 2009; Masson and Freidel 2012). Multi-crafting predominated in this area as the model for both intensive and household-level craft production throughout the Classic and Postclassic periods (Masson et al. 2016). Specialized production, defined as single-commodity or full-time production for exchange, was rare in Mesoamerica (Hirth 2009:24).

While very few studies of charred botanical material have been conducted in the northern lowlands, some microbotanical studies have been successfully applied. Most notable among these are Stephanie Simm's (2013) dissertation at the Terminal Classic site of Escalera al Cielo (EAC) at Kiuic, in the Puuc region of Yucatán. Results of phytolith and starch grain study of tools from residential contexts showed that in addition to maize, beans, and squash, the relatively elite residents of EAC ate chili peppers, palm, arrowroot (*Maranta arundinaceae*), and manioc or *yuca*. Grinding tools such as *manos* and *metates* were not only used to grind maize, but also to grind chilis, extract starch from root crops, and obtain oil from seeds (Simms 2013:301). Simms also found fired clay balls with a number of microbotanical remains adhered, which seem to have been used in place of rocks for roasting food in pit ovens (Simms et al. 2013).

Late to Terminal Classic ceramics are abundant in surface collections at Tahcabo, but their locations are clustered to a greater extent than during earlier times (Figure 4.3). They could be found predominantly to the west of town, as well as in central Tahcabo, with fewer Late to Terminal Classic sherds and structures found to the south and north of the contemporary street grid. Residences could be built of mostly perishable materials on top of previously constructed platforms or as new constructions that consisted of low platforms interspersed with taller features that may have served as shrines. A more nucleated settlement pattern correlates with the control of land tenure at a level of organization above the household, as would be expected at this time (de Montmollin 1989:299). Impulses to nucleate could have included defensive needs, settlement policies, and access to resources, including the *sascab* and building stone available within and around Rejollada G on the west side of Tahcabo, where evidence exists for ancient and recent quarrying activity. Tahcabo was likely drawn into Ek' Balam's sphere of influence during the Late Classic period, when the site reached its farthest extent in terms of footprint and influence (Houck 2004:229).

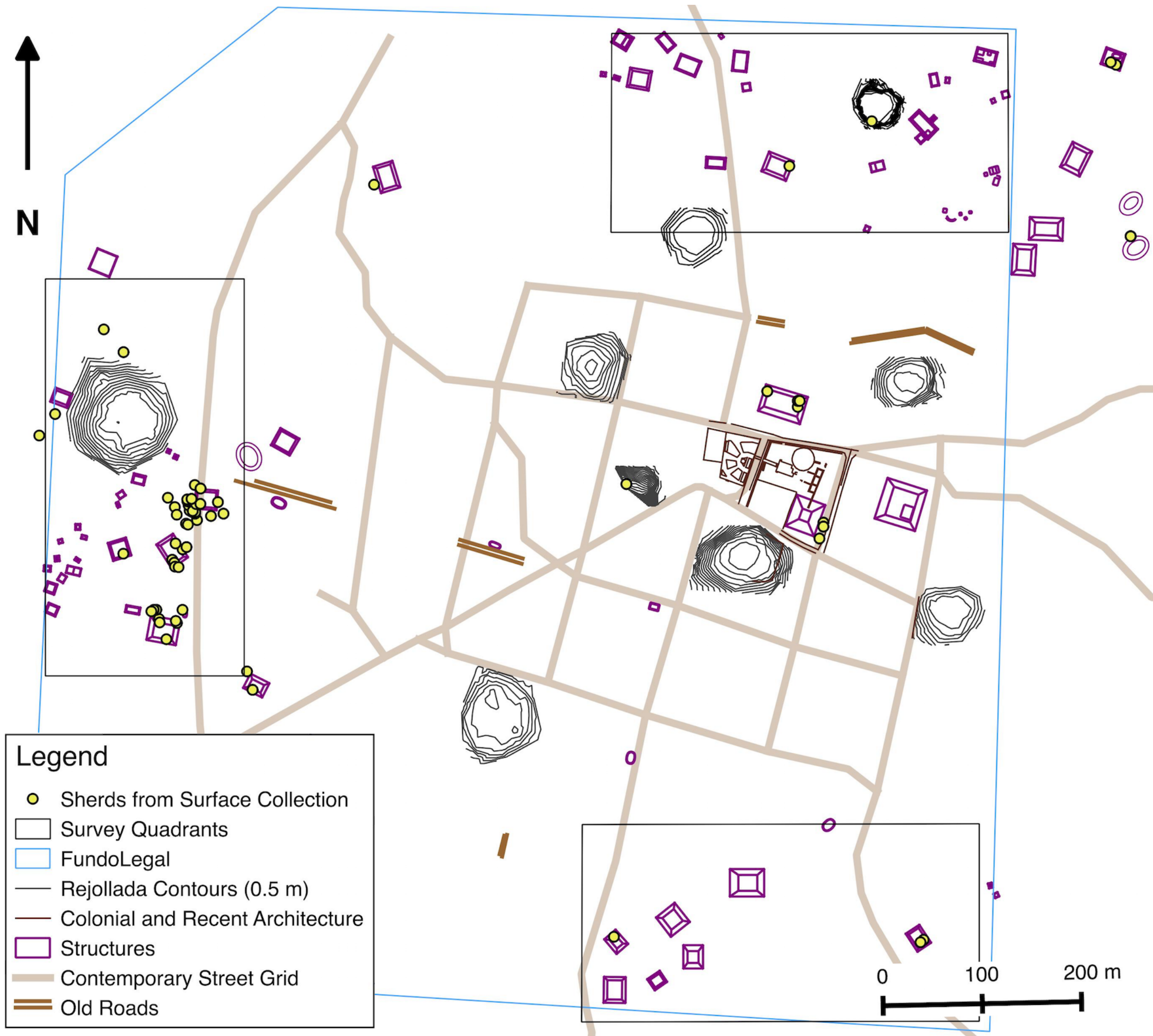


Figure 4.3. Distribution of Late to Terminal Classic period sherds from surface collections at Tahcabo.

By this time, some households would have accessed more highly sought-after agricultural assets, including especially *cenotes* and *rejolladas*. At the large sites of Kulubá and Xuenkal, located near Tahcabo, the largest architectural groups from the Late to Terminal Classic period were located near the largest *rejolladas* at each site, while smaller groups could be found near smaller *rejolladas* (Barrera Rubio 2015; Munro-Stasiuk et al. 2014). Households that settled an area earlier and had the longest claim to land often grew to be the wealthiest, as they held the parcels most highly valued for cultivation ("principle of first occupancy," McAnany 2013:96-97). Control over land would have become increasingly important throughout this period, as studies of regional climate indicate that conditions were relatively wet from about AD 600-770/800, but that the region then suffered from droughts before the end of the Terminal Classic period (Carrillo-Bastos et al. 2010; Curtis et al. 1996:45; Hodell et al. 2005; Hodell et al. 2007; Hoggarth et al. 2016; Kennett et al. 2012:789; Medina-Elizalde et al. 2010:259; Metcalfe 1995; Wollwage et al. 2012), or at least by the Late Postclassic period (Leyden 2002:96). Scholars point out that the collapse of multiple polities during the Terminal Classic period seems to correlate with a regional drying trend, though Hutson and colleagues (2016:136) point out that the rise and fall of cities in the northern lowlands do not necessarily match up well with the patterns of drought. For example, Chichén Itzá achieved its peak influence during the estimated timeframe of the Terminal Classic period drought.

Postclassic (ca. AD 1100-1540)

The transition from the Classic to Postclassic periods was characterized by decreased emphasis on monumental architecture, new seats of power, and changes to governance that included the implementation of a council system (Chase and Chase 2006; Kurnick 2019:52; Masson and Peraza Lope 2014; Ringle et al. 2004). In some rural communities in the northern lowlands, populations continued to reside in the same places, and even on the same platforms and around long-lived plazas, throughout the Terminal Classic to Postclassic period transition (Hutson et al. 2016:137-141). Outside of the major Postclassic center of Mayapán, to be discussed below, the most commonly recognized Postclassic architecture consists of miniature shrines, most often erected on top of earlier structures (Ardren 2015:51-81; Hutson et al. 2016; Kurnick 2019; Lorenzen 2003). While it is clear that Postclassic populations regularly repurposed Classic period architecture, it appears that re-use served diverse purposes for Postclassic populations at different sites—in some places, elites distanced themselves from the past, while in others they found continuity with it (Kurnick 2019:58). The shrines commonly appear to be located near *cenotes*, with speleothems sometimes located within or near the shrines in addition to the commonly found Chen Mul Modeled censers (Kurnick 2019; Lorenzen 2003). The shrines may form part of mound/*cenote* complexes that represent the hills and caves of Maya creation narratives (Brady and Ashmore 1999; Kurnick 2019:62; Martos López 2008:106).

The most famous and powerful Postclassic site in Yucatán and in the Maya area more broadly was Mayapán, a city that governed its surrounding region from about AD 1200 to before 1448. Mayapán is also the site in the northern lowlands where Postclassic period daily life and livelihoods have received the most in-depth study, so it will be the primary focus of this section. At Mayapán, the government consisted of council-based leadership, as the system of divine kingship elaborated especially during the Late Classic period had failed. Monumental architecture was not as large as it had been during the Late to Terminal Classic period, and consisted mostly of colonnaded halls and temples embellished with stucco decorations and especially murals, which preserve poorly, rather than engraved hieroglyphic texts (Masson and Peraza Lope 2014:25).

One often-emphasized characteristic of life at Mayapán and during the Postclassic period in general is the evidence for high levels of commercial activity, seen by some as amplified when compared to earlier times (Masson and Peraza Lope 2014:11). Recent studies have shown that this emphasis on trade and markets did not represent a break from the past but instead an intensification of market institutions established previously. In fact, some scholars argue that commercial development was more fully realized during the tenth century than during the Postclassic period, the latter of which was characterized by a distribution pattern suggestive of administered market exchange or redistribution rather than competitive market exchange (Braswell 2010:137). However, others argue that commercial activity was more uneven during the Late to Terminal Classic period compared to the Postclassic period (Masson and Peraza Lope 2014:27). During the Postclassic period at Mayapán, evidence exists for household dependence on market exchange for the tools needed in everyday life (Kepecs 1999:520; Masson and Peraza Lope 2014:33). Professional vendors and merchants managed trade, using currencies such as shell, greenstone, cloth, and cacao (Masson and Peraza Lope 2014:7, 26).

A great deal of evidence exists for the social complexity of life in Postclassic Mayapán. Across the site, agriculture and horticulture, ritual activity, commerce, residence, and craft manufacture occurred in designated areas. Elite residences included dedicated areas for entertainment, food preparation and storage, animal rearing, and ceremonial activity (Masson and Peraza Lope 2014:9). The wealthiest households at the site specialized in craft production, while the poorest households tended to live at the outskirts of town, suggesting that they lacked connections to established families and likely depended on subsistence farming (Masson and Peraza Lope 2014:33). Among leading families at Mayapán could be found political and religious bureaucrats, tax collectors, and rulers of affiliated polities who lived at least part-time in the city (Tozzer 1941:27). Each neighborhood had its *cenote* and ceremonial group (Brown, C.T. 2005; Masson and Peraza Lope 2014:36). Researchers have noted that *cenotes* must have been common-use resources at Mayapán, since they were not enclosed within individual house lots and tended to be located at path junctures (Hare et al. 2014; Smith 1962).

Economic activities at Mayapán, as alluded to earlier, included agriculture and horticulture, animal husbandry, and food preparation, as well as the manufacture of pottery, lime plaster, effigy censers, figurines, copper bells, shell beads, thread and cloth, and stone tools including knives, spear points, and axes (Masson et al. 2016). Household residents routinely produced both chert and obsidian projectile points, based on the presence of preforms at four dwellings, and the relatively low level of skill needed to produce them (they tend not to be fully bifacially flaked). Household-manufactured points would have added to those produced in workshops for hunting and warfare (Masson and Peraza Lope 2014:389). Apart from the bow and arrow, hunting technology included pit capture and snares, used to provision animals for both ritual and subsistence (Carr 1996; Masson and Peraza Lope 2008).

An extremely large wall with a 9.1 km circumference protected many, though not all Mayapán residents, providing one line of evidence for the high levels of violence prevalent during the Postclassic period in Yucatán (Kennett et al. 2016; Russell 2013; Serafin et al. 2014). We know little about rural life in Postclassic Yucatán—even survey of the region around Mayapán has been sparse, though work continues. Part of the problem, similar to the difficulty in finding Colonial period settlements, is that Postclassic sites often sit underneath or have been replaced by later settlement. Masson and Peraza Lope (2014:28) mention that at this point, the closest approximation to a study of rural Postclassic life in Yucatán might be the books by Rice and Rice (2009, 2018) on the Kowoj, an ethnic group that lived in the Petén region of Guatemala after leaving Mayapán. Early results of the study of rural houses around Mayapán suggest that life for non-elite populations living in rural areas may not have differed starkly from non-elite daily life at the edge of the city (Masson 2020). For example, rural populations accessed regional trade goods for the activities of daily life and some participated in small-scale crafting. However, rural households of all sizes and statuses near Mayapán seem to have had very little access to animal meat (Masson 2020).

According to historical documents, the majority of people living in western Yucatán during the late Postclassic period resided in the towns of Kinchil, Tetíz, Hunucmá, Ucú, Caucel, and Oxcúm (Andrews and Robles Castellanos 2009:117). Smaller sites included Sisal, Chuburná Puerto, and rural settlements scattered across the countryside. Climate during the early Postclassic period appears to have been relatively wet, with some evidence for drying possible during the mid to late Postclassic period, beginning around AD 1250 (Curtis et al. 1996; Hodell et al. 1995; Hodell et al. 2001; Leyden 2002:96), and especially acute around the year AD 1391 (Curtis et al. 1996:43; Medina-Elizalde et al. 2010:257).

Despite the presence of the regional capital of Mayapán in northern Yucatán during the Postclassic period (AD 1100-1500), population levels declined in much of northeastern Yucatán based on ceramic data from archaeological survey at Ek' Balam, the research site of Tahcabo, and the Chikinchel region (Bey et al. 1997; Kepecs 1998:133). In the Yalahau region, however, populations began to grow again during the Postclassic period, resettling house mounds left during the Early Classic period (Glover 2012:281). A similar settlement history occurred at the site of Punta Laguna near Cobá (Kurnick 2019:56-7).

At Tahcabo, little evidence for Postclassic period residence has been found intact, though a few sherds have been found in surface collections (Figure 4.4). These sherds concentrate centrally in town, so evidence for Postclassic period residence may have been disturbed by Colonial period populations. Nonetheless, it is clear that there were people living in the area at the end of the Postclassic period, as they are mentioned in early colonial documents, and Late Postclassic period residents composed some of the early inhabitants of the *congregación* consolidated by the Spaniards (de la Garza et al. 1983 II:186).

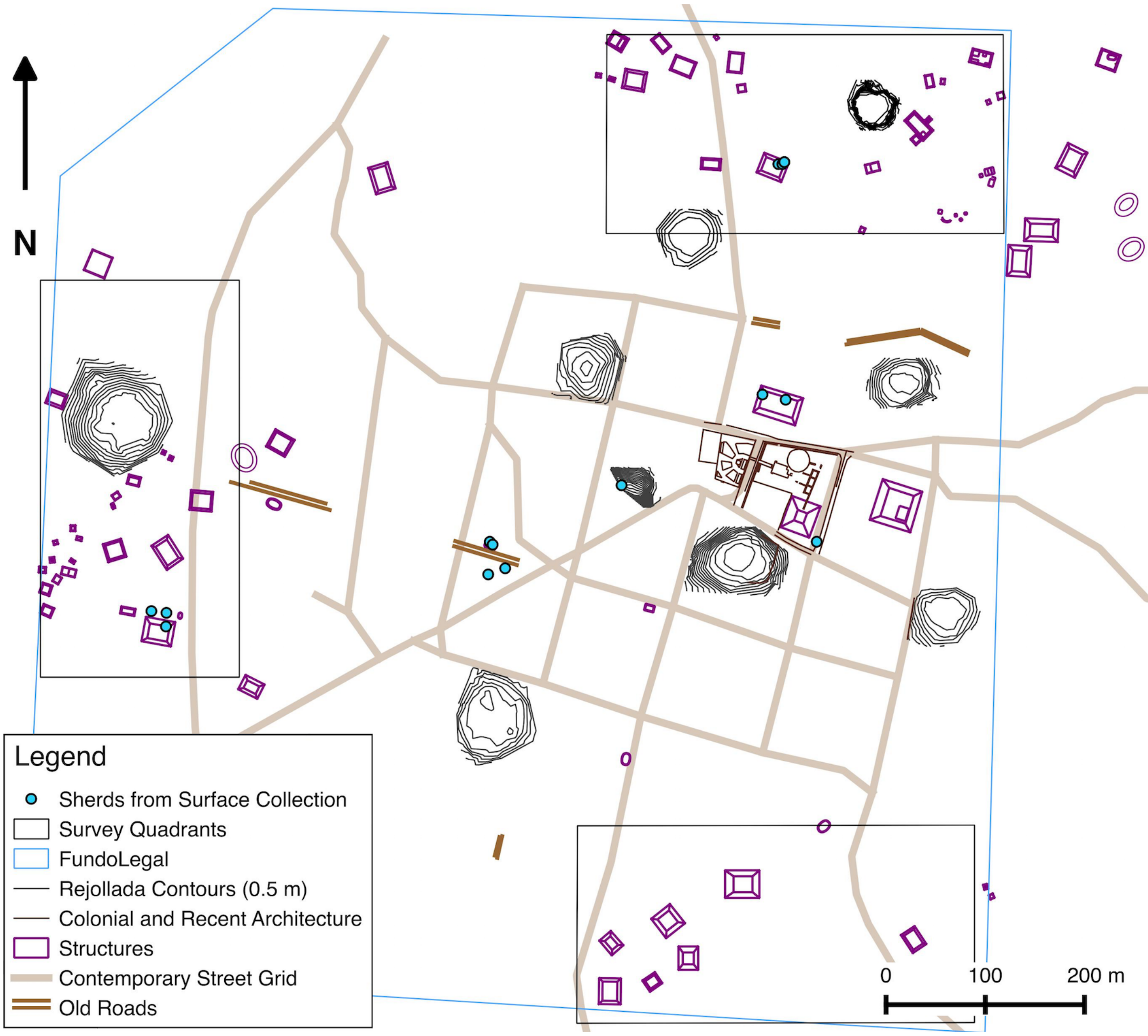


Figure 4.4. Distribution of Postclassic period sherds from surface collections at Tahcabo.

Colonial (ca. AD 1547-1821)

Colonial period occupation shows up clearly based on surface-collected sherds from Tahcabo (Figure 4.5). Chapter 2 provided historical and archaeological information about the

Colonial period in the northern Maya lowlands and at Tahcabo in particular. Based on the population records introduced in that chapter, indicating that populations grew to be as large as three times the size of the current Tahcabo population, it is not surprising that colonial finds were dense and well-distributed across the site. The most common Colonial period ceramics found at Tahcabo are the indigenous earthenware types Yuncu Unslipped and Sacpokana Red (Smith 1971). Unfortunately, the study of Colonial period earthenware in Yucatán lags behind the study of majolica, Olive Jars, and porcelain. Yuncu Unslipped and Sacpokana Red are the only major earthenware types defined for the Colonial period in Yucatán, with dates ranging from 1550-1800, though scholars have begun to distinguish earlier and later traits within these types and advances continue (e.g., Burgos Villanueva et al. 2010; Cruz Alvarado 2010; Hanson 2008; Graham 1987; Kepecs 1998; Oland 2009). Because of this limitation, my dating of residential areas at Tahcabo, presented in Chapter 6, required comparative assessments of AMS dates, limited majolica, and other artifact types.

Figure 4.5. Distribution of Colonial period sherds from surface collections at Tahcabo.

Landscape Interactions

Geology and Hydrology

The northern portion of the Yucatán Peninsula, or the "Northern Pitted Karst Plain" (see Figure 4.6), where Tahcabo can be found, is a flat, limestone plain that never reaches more than 40 m above sea level (Lesser and Weidie 1988:237; Munro-Stasiuk et al. 2014:156). A shallow sea once covered the area, depositing sand and carbonates during the Cretaceous and Tertiary periods that eventually constituted the limestone plain of the peninsula (Pope et al. 1993). Fossilized marine animals deposited during that time are commonly found in stone across the peninsula. Yucatán emerged from the sea 23 million years ago (Pope et al. 1996). It is a karst landscape of highly porous limestone covered with a thin layer of caliche, which is a hardened calcium carbonate deposit, or a thick layer of *sascab*, a Yucatec Mayan-language term for what has been described as "a chalky and friable weathering product of the limestones in this humid, tropical environment" (Lesser and Weidie 1988:237). Layers of hard caliche and bedrock overlay *sascab,* which retains water, providing an important resource for tree roots, which sometimes also access the water table directly (Beach 1998:765; Fedick 2014:74).

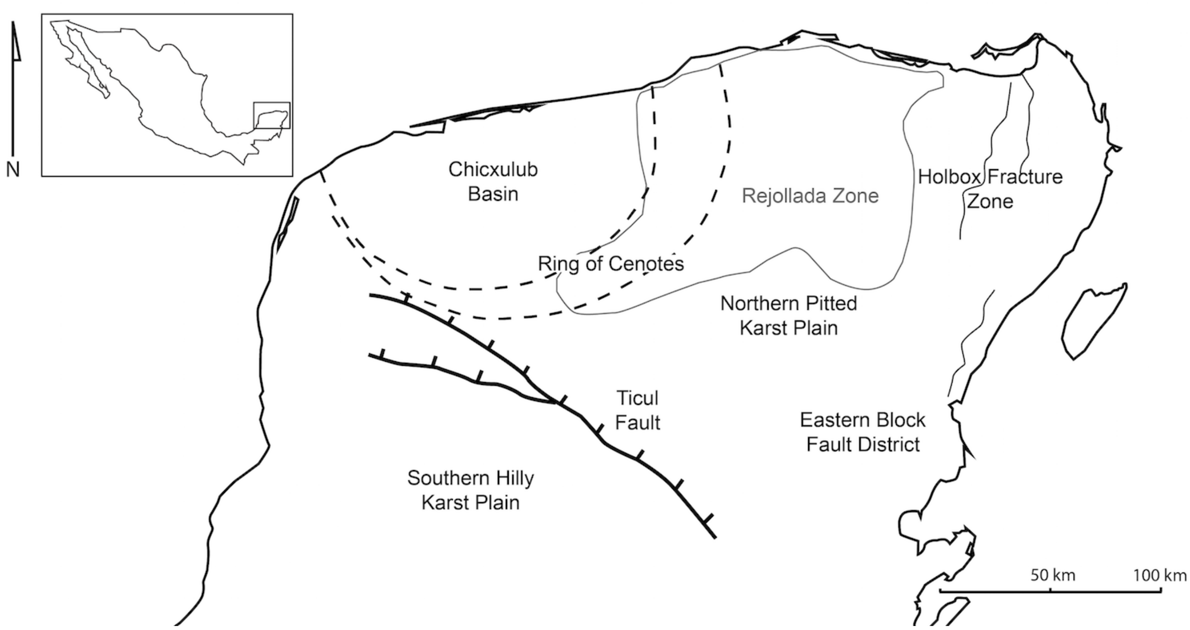


Figure 4.6. Geological map of the northern Yucatán peninsula of Mexico (after Munro-Stasiuk et al. 2014 and Fedick 2014).

Rainfall in Yucatán ranges from 800-1,700 mm per year, with the wet season, from May to October, encompassing approximately 90% of the annual rainfall (Lesser and Weidie 1988:237). The average annual temperature is 25 degrees Celsius, with highs in April through July and lows in December and January. About 85% of rainfall is lost through evapotranspiration, while the remaining 15% filters through the porous limestone bedrock (Lesser and Weidie 1988:237). Ongoing mechanical and chemical weathering occur near the surface when clays wash into cavities below the surface (Lesser and Weidie 1988:238). Because the water easily permeates bedrock, it travels underground to the coast, forming additional fractures, channels, and caverns, rather than flowing at the surface in rivers or streams (Stringfield and LeGrand 1976). Since other sources of water generally do not exist, sinkholes have been crucial to survival in the northern Yucatán peninsula. In northeastern Yucatán, near the research site of Tahcabo, the water table sits about 10-20 m below the ground surface, and the freshwater aquifer is 30-70 m thick (Lesser and Weidie 1988:239).

One major geological event shaping the region consisted of an asteroid impact that occurred around 65.5 million years ago, causing the Chicxulub crater, approximately 180 km in diameter (see "Chicxulub Basin," Figure 5.6; Hildebrand et al. 1991; Pope et al. 1996). Evidence for the crater includes magnetic, gravimetric, and hydrogeologic anomalies, corroborated with geological studies of melt rock, mineral grains, and ejecta from the site of impact and nearby areas (Pope et al. 1993). While the location of the crater itself was filled with Tertiary sediment 300-1000 m in depth and contains few sinkholes, the impact created a large number of fractures in the bedrock of Yucatán around and beyond that area, allowing additional sinkholes to form (Pope et al. 1996). In particular, a ring around the crater bears the name the Ring of Cenotes due to the high concentrations of sinkholes present where unfractured bedrock inside the crater meets the fractured bedrock surrounding it, especially along the drooping rim of the buried crater (see Figure 5.6; Pope et al. 1993). To the east of the Ring of Cenotes, pervasive fracturing also took place, leading to the formation of thousands of solution sinkholes of varying depths from the surface across the northern lowlands—these features return again later in this chapter. Fedick (2014) has called this area, stretching from the Ring of Cenotes eastward to Quintana Roo, and from near Chichén Itza in the south to the northern coast, the "Rejollada Zone" (Figure 4.6).

The Ticul fault line separates the northern from the central lowlands (Lesser and Weidie 1988:237). The fault begins south of Mérida in the Puuc region of Yucatán (Puuc referring to the Yucatec Mayan word for hill), or the "Southern Hilly Karst Plain" and heads southeast from there (Figure 4.6; Lesser and Weidie 1988:237). In the Puuc, elevations are higher, reaching 300 m above sea level, and water can be even more difficult to find, as the region shares the characteristic of lacking surface water such as rivers, but sits much higher above the water table—which exists at times as deep as 100 m below the surface (Lesser and Weidie 1988:238). To the southeast of the northern karst plain can be found the "Eastern Block Fault District" (Lesser and Weidie 1988:239). In this area, about 80 km wide and running from the northern tip of what is now the state of Quintana Roo (see "Holbox Fracture Zone") to Belize, faults run north to northeast, forming horsts and grabens, or high and low areas between the faults. Freshwater lakes and swamps formed in the inland depressions resulting from the faults at locations such as Cobá, Punta Laguna, and Bacalar in today's state of Quintana Roo, Mexico (see Figure 4.1).

Soil Study

Yucatán's soils began to form in the Late Miocene to Pliocene (Pope et al. 1996). Soil heterogeneity is high in the northern portion of the Yucatán peninsula (Bautista and Zinck 2010:5). The shallow pockets of black soil that dot the landscape in Yucatán amidst bedrock outcrops, called *bo'ox lu'um* in Maya, have been designated organic Mollisols (dominant soil order; Munro-Stasiuk et al. 2014:161), and more specifically Mollic Leptosols (Bautista and Zinck 2010:Table 2), Rendzic and Lithic Leptosols (Estrada-Medina et al. 2013:Table 9), Calciustolls and Haplustolls (which are great groups, the classification level below soil orders and suborders, but above subgroups; Sweetwood et al. 2009), Lithosols (Weisbach et al. 2002:254), and Histosols (Gómez-Pompa et al. 1990:251). Mollisols are known to be agriculturally productive soils under rain-fed conditions (Fedick 1996). Red clays, called *terras rosas* in Spanish and *k'ankab* in Maya, can be found on the plains and in deeper deposits, usually 0.5 to 1.5 m below the ground surface, and consist of what have been called calcareous red Alfisols (Lesser and Weidie 1988:238; Munro-Stasiuk et al. 2014:161); Haplic Vertisols (Bautista and Zinck 2010:Table 2); Rhodic Nitisols or Vertic Eutropepts (Beach 1998: 766); Argiustolls, Haplustolls, and Calciustolls (Sweetwood et al. 2009); and Rendzinas (Weisbach et al. 2002:254). They form as limestone weathers, leaving them enriched with iron oxides that creates their characteristic red color (Isphording 1984). The red soils in Yucatán tend to have a more neutral pH, retain more water, and have increased nutrient availability and mobility when compared to the black soils (Beach et al. 2017: 218; Munro-Stasiuk et al. 2014:161). The black soils, on the other hand, contain twice as much organic matter as the red soils, and three times the available phosphorous (Weisbach et al. 2002).

Bautista and Zinck (2010) conducted an ethnoecological study of soils, carrying out soil surveys, interviews, and workshops with knowledgeable farmers across Yucatán, with a focus on the area around Mani. They recorded the indigenous soil classification system used locally, which they called the Maya Soil Classification (MSC) and compared it with the World Reference Base for Soil Resources (WRB). They show that the Maya system depends on classification according to "relief position, rock types, size and quantity of stones, color of topsoil and subsoil, depth, water dynamics, and plant-supporting processes," and there are many more than two types of soil recognized (Bautista and Zinck 2010:1). They found that farmers plant differently depending on the soils and only pursue intensive production of maize, beans, and squash in certain soils (Bautista and Zinck 2010:10). Their classification system functions well, and even results in more accurate classification of leptosols than the WRB. The indigenous system and the WRB are complementary and provide more valuable information about the soils of Yucatán when used together.

Drawing on similar methods, including interviews with farmers, Estrada-Medina and colleagues (2013) provide additional information that certain soils suit some plants better than others. Farmers prefer to plant chili peppers and sometimes sweet potatoes (*Ipomoea batatas*) on rock outcrops, for example, while they prefer to grow vegetables such as *makal* (*Xanthosoma yucatanense*), jicama (*Pachyrhizus erosus*), and manioc or *yuca* in red, *k'ankab* soils on flat plains free of rock, though weeds grow more quickly there as well (Estrada-Medina et al. 2013:3). Maize, beans, and squash can grow even in fairly rocky, shallow soils. Estrada-Medina and colleagues (2013:Table 5) also report on a Maya classification system for rock types—besides *sascab* there is also easily breakable rock called *xuxtunich*, hard rock called *toktunich*, very durable rock called *sakalbox* and bedrock, called *haysaltunich*.

In his studies at Ucí, Yucatán, Zachary Larsen (2012) tested soils for carbon isotope changes with depth, inspired by successful results using this technique at sites in the central Maya lowlands and further south (e.g. Webb et al. 2004). He found evidence that residents grew both C_4 and C_3 plants in *rejolladas* through time, with no sustained change evident. Of course, we would expect there to be some in-washing of eroded soils into *rejolladas*, which would potentially mix soil carbon isotope signatures, as would bioturbation. Soil mixing also seems to have occurred at Chunchucmil, where intensive maize agriculture could not be detected based on soil carbon isotopes (Beach et al. 2017; Sweetwood et al. 2009). At least one sample along the *sacbe* at Ucí, however, showed a vegetation shift throughout the profile from more C_3 plants to more C_4 plants and back again (Larsen 2012:23), suggesting the possibility of intensive maize agriculture along the *sacbe* at some point in the site's history.

Beach (1998) pointed out the limitations of soil resources located in and around the site of Chunchucmil. Not only are soils shallow, but they contain low concentrations of phosphorous, potassium, and zinc (Beach 1998:Table V), which ancient populations would have had to address through the application of fertilizers if they were to intensify agricultural production. Soil management may have been possible within raised beds, for which there is some archaeological evidence (Beach 1998:784). Soils on and near archaeological ruins do contain higher than average available phosphorus, potassium, black carbon, magnesium, and organic carbon, useful to farmers today (Beach 1998:775; Sweetwood et al. 2009). This may result from ancient soil modifications, such as the use of organic fertilizers.

In the Yalahau region, at El Naranjal, scholars found in contrast that the physical and chemical qualities of the soils were advantageous for fixed-plot cultivation, even in areas that had recently undergone intensive garden cultivation (Flores-Delgadillo et al. 2011). Instead, the main limitation for agriculture was the shallow average depth of the soil. Yalahau researchers put forward the idea that the past and present Maya enacted a kind of "precision agriculture," in which farmers used soil-filled cavities as planting containers, and also implemented other adaptive strategies (Fedick et al. 2008).

Beach (1998:767) argued that *milpa*, or shifting agriculture based on the triumvirate of maize, beans, and squash (to be discussed further in the next subsection), as well as other techniques in use today, produce yields too low for the food needs of those who lived at Chunchucmil when populations peaked. He and other scholars (Dahlin et al. 2009; Larsen 2012; Sweetwood et al. 2009) promote the idea that large populations could not sustain themselves in the northern lowlands using the subsistence techniques in place today, yet few concrete strategies for agricultural intensification have been identified in the northern lowlands, even while systems of wetland and *aguada* management, terraces, ridged fields, and forest gardens have been identified in the central and southern lowlands (e.g., Beach et al. 2011; Berry and McAnany 2007; Ferrand et al. 2012; Ford and Nigh 2015; Healy et al. 1983; Lemonnier and Vonnière 2013; Puleston 1978; Sheets et al. 2012; Turner and Harrison 1983).

There are a few exceptions to this lack of evidence for agricultural intensification, specialization, or agrarian change more broadly in the northern Maya lowlands. The first consists of investigations into the use of the Yalahau wetlands of northern Quintana Roo, including the possible application of periphyton harvested from wetlands to agricultural fields in order to improve productivity (Fedick et al. 2000; Morrison 2006; Morrison and Cózatl-Manzano 2003). A second line of evidence includes studies about how people interacted with the favorable environments created by *rejolladas* and *cenotes* across the northern portion of the peninsula, and how they may have been used intensively (more in the subsection on *rejolladas* below). This work intersects with studies of the remarkable productivity of the orchards and gardens of the northern lowlands (e.g., De Clerk and Negreros-Castillo 2000; Gómez-Pompa 1987). Work on gardens in turn relates to the third area of study, which entails mapping the stone walls denoting house lot boundaries to compare patterns of house lot use across space and through time (Alexander 2004; Batún Alpuche 2009; Fisher 2014; Hare et al. 2014; Hutson et al. 2007). These studies begin to illustrate the dynamic nature of farmers' strategies in the northern Maya lowlands.

Agricultural Management and Food Production

This section provides a general overview of the strategies used for agricultural production in the northern Maya lowlands, while striving to point out ways that the system can shift based on changing household priorities and circumstances. It also includes background information about house lot layout and food processing activities that occur in residential areas once plants and animals are harvested. A majority of the information provided in this subsection derives from ethnographic study of agricultural and household practices. We should remain suspicious that information gleaned today reflects past practices, especially given that livelihood strategies shifted over time and would have varied across space. However, ethnographic information constitutes the richest dataset available for study, and we can cautiously use contemporary observations to shed light on past agricultural strategies.

Ethnoarchaeological research in the broader Mesoamerican region indicates that agriculture involves the use of three spatially continuous components: gardens, infields, and outfields (Alexander 1998:42; Killion 1990:197). The terminology of infields versus outfields (generally those fields worked more and less intensively, respectively) derives from concepts developed to describe agriculture in Europe (McCourt 1955), and so should not be applied to Mesoamerican contexts uncritically. Killion (1990), working in Tuxtlas, Veracruz, found that communities surrounded by fertile land tended to focus their efforts on infields, which they could access easily. This livelihood strategy tended to result in larger house lot areas, since agricultural harvests were produced near the home and could be transported to the residential area for processing (see also Alexander 1999 on factors impacting house lot size and configuration). Communities that had poor lands for cultivation tended to travel farther, to more fertile outfields, for intensive cultivation. Their house lots were smaller, since more crop processing and related activities occurred directly in the fields.

In addition, Killion (1990) found that the house lots of farmers generally contained residential structures located centrally, surrounded by refuse-free activity areas, and then an intermediate area (interspersed with gardens) into which refuse could be deposited (see also Arnold 1990; Deal 1985; Hayden and Cannon 1983; Johnston and Gonlin 1998). In Yucatán, however, refuse tends to accumulate immediately behind residential structures at archaeological sites, and often preserves best in locations just off the edges of the platforms on which structures sit (e.g., Hutson and Stanton 2007). A single house lot can contain one or several residential structures, each housing a nuclear family (e.g., Hanks 1990:106). Within the house lot, food preparation occurs in the kitchen building, which is often separate from the residential structure(s), as well as outside in the patio. For example, foods such as meat, vegetables, tamales, and stews can be baked in a *píib*, which can be carved into the ground of a patio or a nearby area (Salazar et al. 2012). The *píib* is famously a cooking technique implemented by men as well as women (Redfield and Villa Rojas 1934:71), and while men often participate in food preparation associated with ritual activities and feasting, women tend to conduct most food preparation on a daily basis. Evidence from archaeological sites in Yucatán shows that hearths existed and grinding took place both inside and outside the kitchen, regardless of household status (Fernández Souza 2010, 2015:19; Manzanilla and Barba 1990; Simms 2013). While similarities exist between house lots today and those of the deep past detected archaeologically, Cabrera Pacheco (2017) reminds us of the many historical events and forces, including colonial *reducción*, that have impacted the activities conducted in house lots (*solares*) through time. In fact, the term *solar* itself is a word with no apparent Maya equivalent (Restall 1997:104-5).

Home gardens play a crucial role in food production in Yucatán today. In twentieth-century Mexico, households faced with high population densities and resulting food insecurity primarily grew maize in their gardens, obtaining up to one-third of their total food requirements from these plots (Sanders and Killion 1992). On the other hand, home gardens are often biodiverse, containing 50 or more plant species in multiple vertical layers that contribute important vitamins and minerals to the diet (De Clerck and Negreros-Castillo 2000; Faust 1998:114; González-Cruz et al. 2015:839). Gardens are also important resources for many other uses, and probably would have been to an even greater extent in the past, especially during times when households had little access to outside resources due to poverty, lack of market access, and other factors (Poot-Pool et al. 2012, 2015). Krishnamurthy and Krishnamurthy (2016:35) list the remarkable number of uses for plant and animal species grown in home gardens of Quintana Roo, Mexico, including:

> "(1) food or groceries; (2) medicinal drugs (for human[s] and domestic animals); (3) fodder; (4) aromatic (flavourings, perfumes, etc.); (5) sweeteners; (6) soft or alcoholic beverages; (7) spices; (8) stimulants; (9) ceremonial (amulets, magic, rituals); (10) drugs (hallucinogens, narcotics, tranquilizers); (11) resins; (12) honey; (13) oil (edible and industrial); (14) fences; (15) windbreaks; (16) tools for agriculture, hunting and fishing; (17) fibers (textiles, cordage and basketry); (18) construction (furniture or houses); (19) for handicrafts; (20) musical instruments; (21) waxes; (22) dyes; (23) biological control (insecticides, fungicides, herbicides); (24) cosmetic; (25) domestic use (cooking, wrapping, drying adhesives, etc.); (26) bioenergy

> (coal, fuel wood, oil); (27) soil erosion control; (28) rubber and latex; (29) ornamental or aesthetic; (30) tannins; (31) toxic (poisonous to [hu]man[s] and domestic animals; (32) honey bee stinging for medical purpose; and (33) green manure."

Gardens display significant diversity in size and species composition, often reflecting differences in proximity to urban areas and market engagement (Corzo Márquez and Schwartz 2008; Neulinger et al. 2013; Rico-Gray et al. 1991; Sheets et al. 2015:347). Alayón-Gamboa and Gurri-García (2008) found that households that practice subsistence agriculture maintain gardens with greater species diversity than the gardens of households pursuing agriculture as a business. The energy efficiency and recycling practiced also make their gardens more sustainable than those maintained by commercial farmers.

Gardening, as part of an infield strategy, can be considered an intensive and innovative form of agricultural production, as it involves additional skills, labor, and inputs near the home to create more output per unit of land, without allowing the land to fallow (e.g., Brookfield 2001; Killion 1990:192; Morrison 1994). Inputs could include the effort it takes to create a raised bed or water plants using a bucket, as well as the addition of soil from elsewhere or modification of the existing soil using fertilizer (Redfield and Villa Rojas 1934:38). Outputs of gardens can be kept for family use or sold, although they are mainly used within the household (Krishnamurthy and Krishnamurthy 2016:35). Women often manage garden production, while men assist with maintenance, harvest materials for construction, and bring products to market (e.g., Caballero 1992; Faust 1998:114; Krishnamurthy and Krishnamurthy 2016:34). Gardens also play important roles in social cohesion and social reproduction. For example, garden produce can be gifted to friends and family members in the community, while intergenerational knowledge can be transmitted through regular maintenance activities that take place within gardens (Krishnamurthy and Krishnamurthy 2016:35).

The system of shifting field agriculture, called *milpa* locally, involves felling trees and controlled burning. Farmers measure their fields from August to December, after which they cut and pile the brush (Faust 1998:117). Once the brush has dried, usually after a three-month interval, farmers burn it. This burn releases nutrients, ash, and biochar into the soil, and replenishes nitrogen, especially when conducted at low temperatures to conserve organic matter (Nigh and Diemont 2013:e49-50). In Xocen, Yucatán, a ceremony was traditionally conducted to request and plan a good burn (Terán and Rasmussen 2009). Subsequently, farmers subdivide and plant their fields once the rain begins to fall daily, usually in May. Weeding and field maintenance take place throughout the summer. During October, farmers bend the maize plants, leaving the cobs to dry on the plant. Harvest can begin soon after and continues until March (Faust 1998:118; Hanks 1990; Redfield and Villa Rojas 1934).

After two to four years of field harvests, a plot of land is left to fallow, generally for 10-25 years (Nigh and Diemont 2013:e45; Terán and Rasmussen 2009; Weisbach et al. 2002:254). After five years, farmers may plant trees to encourage forest growth. Firewood can be harvested at this stage. Once the forest is well-established, after 10-25 years, bee colonies kept in the secondary forest aid in pollination (Diemont et al. 2011:1699). Products harvested from the secondary forest include thatching for roofs, timber, wild fruits, and medicine. After 30 years the forest may be considered to be primary forest once again, although in some places specific terminology exists for forests approximately 30-50 years old, and for those more than 50 years old (Diemont et al. 2011:1700; González-Cruz et al. 2015:840). Forest management in the Maya area, including the practice of shifting agriculture that involves controlled burns, has increasingly come to be understood by scholars as a sustainable system (e.g., Diemont et al. 2011; Ford and Nigh 2015).

Crop production in outfields focuses on maize, beans, and squash, but also includes chili peppers, tomatoes (*Solanum lycopersicum*), *chaya* (*Cnidoscolus chayamansa*), fruit trees, and root vegetables such as sweet potatoes, *makal*, manioc or *yuca*, and jicama (Anderson et al. 2004:15; Terán and Rasmussen 2009:Table 2). Ethnobotanical and ethnohistorical studies indicate that biodiverse *milpa* fields tend to incorporate the cultivation of 15-18 species, usually simultaneously, and additional economic plant species tend to emerge as disturbance-loving weeds. This polyculture promotes efficiency and higher overall biomass, just as it does in gardens near the home (del Amo Rodríguez and Ramos Prado 1993; Terán et al. 1998:23; Terán and Rasmussen 2009:68). One difference between garden and field cultivation is that gardens around the home can often be irrigated using a bucket or hose, while the *milpa* depends on natural rainfall (Terán et al. 1998:24).

Farmers engaging in *milpa* agriculture wield complex and sophisticated techniques that require knowledge of soil types, planting calendars, interplanting strategies, climate dynamics, pest control, and astronomical information, as well as appropriate ritual activities (Anderson et al. 2004:11-12; Barrera-Bassols and Toledo 2005; Faust and Bilsborrow 2000; Gómez-Pompa 1987). Each plant requires specific treatment in terms of its soil humidity requirements, cultivation schedule, disease risks, and more (Terán et al. 1998:25). Ethnographic and ethnohistoric accounts record many ceremonies related to agriculture—others can be seen in the Madrid Codex (Hernández and Bricker 2004; Terán and Rasmussen 2009:62). For example, ceremonial offerings of *sakha'*, a type of maize gruel, take place at the beginning of the agricultural season (Faust 1998:119). Those who have studied Maya ethnoecology tend to agree that Maya agriculture depends heavily on ceremony as agricultural strategy, since farmers exist within a relational ontology, in which deities play active roles in the success or failure of farming ecosystems (Terán et al. 1998:35). Nigh and Diemont (2013:e51) argue that the extensive *milpa* production practiced widely across Mesoamerica today, which tends to foster relatively low biodiversity, differs markedly from types of intensive, or "high performance" *milpa* practiced historically and by some groups today (see also Nations and Nigh 1980:14-15; Wilk 1997:115). Primary differences between these farming practices entail the labor, skills, and knowledge dedicated to their success.

Forests are important to the agricultural and food systems of rural communities across the Maya area, especially during droughts and times of crop failure. Fedick (2017, 2020; see also Dine et al. 2019) compiled a list of drought-resistant plants in use across the wider region, while Terán and Rasmussen (2009:Table 4) also provided a list of seventeen plants identified in historical records for their use in Yucatán during times of food scarcity, including wild and domesticated trees, shrubs, and root crops. Particularly when maize is scarce, plants that can be mixed with nixtamalized maize to augment dough for tortillas, *atole*, and other beverages include tubers such as *makal,* manioc or *yuca*, and papaya (*Carica papaya*) root, and tended forest trees such as *ramón*, coyol palm, and *bonete* (*Jacaratia mexicana*; Terán and Rasmussen 2009:66). In the northern Maya lowlands, populations make use of hundreds of plants found in the forest for food, medicine, and construction, including 215 food-producing trees (Fedick 2014:78).

Rejolladas and Other Sinkholes

As described above, sinkholes, also called dolines, are caused by erosion and bedrock collapse (Lesser and Weidie 1988:238). In Yucatán, they are assigned names based on depth in relation to the water table (Houck 2006). *Cenotes*, a term that derives from the Yucatec Maya name, *dzonot* (Hall 1936:5), provide access to water and their bases often reach deep beneath the water table. *Cenotes* may or may not exchange some amount of water with the surrounding aquifer—when they do, it keeps the water circulating and somewhat fresh (Houck 2006:63; Martos López 2008:101). They exist in cylindrical and covered forms, and caves of various configurations can also be considered *cenotes* as long as they provide access to water (Martos López 2008:101). A wide variety of small to medium fish live in *cenotes* (Hubbs 1936), and have historically been used for food and tribute payments.

A dzadz (pl. *dzadzoob*), a classification that not every community uses, but that Houck (2006:64) found in use around Ek' Balam, is a sinkhole that touches the water table but does not significantly expose it. A *dzadz* thus usually consists of a freshwater swamp at its base (often referred to as an *aguada*; see Hall 1936:5), or a pool of water along one side, accompanied by fertile soil covering its remaining basal area (which Houck refers to as a "multi-use *dzadz*"). Because *dzadzob* provide soil with the highest moisture levels, they may have been the only appropriate locations for cacao cultivation in the northern lowlands, which otherwise tend to be too dry for the cacao tree (Gómez-Pompa et al. 1990; Houck 2006:65). In fact, a *dzadz* in the communal lands, or *ejido*, of Tahcabo retains the name *xkakwil*, referring to its apparent use in the past for cacao cultivation.

Rejolladas (*ko'opoob* in Yucatec Mayan) do not reach the level of the water table, thereby providing access to deep soils, in part due to ongoing erosion into their basins through time. They tend to form bowl-shaped depressions in the landscape, as they are round and have relatively flat central bases (Figure 4.7). Because they rest close to the water table they can be appropriate and convenient places to dig wells, which can be used to irrigate cultigens. The basins maintain moderate temperatures, neutral pH, and contain soils with more stable moisture content than surrounding areas (Fedick et al. 2008; Munro-Stasiuk et al. 2014; more on this in Chapter 5). Houck (2006:62) indicates that the typical *rejollada* of Yucatán measures less than 100 m in diameter, though they can range in size from tens of meters to hundreds of meters across, and their depths range from 2-3 m to greater than 20 m (e.g., Gómez-Pompa et al. 1990:251-2). Due to their ecological characteristics, *rejolladas* are highly valued places for both polycultural gardening and specialized production.

Figure 4.7. Representation of a cross-sectional view of a *rejollada* with diverse vegetation. (Drawing by M.K. Smaby)

Archaeological evidence for this, as mentioned in the previous section on settlement history, includes the observation that sinkholes and ancient settlements tend to be found located near each other. Houck (2006:73) noted that each of the sites he found in the Ek' Balam rural settlement survey could be found associated with at least one water source. González de la Mata (2006:310) recorded five terraces along the wall of a *rejollada* near Chichén Itzá, while Kepecs and Boucher (1996) reported a series of walled-in *rejolladas* associated with oven features, perhaps for cacao roasting, at the site of Emal. These two examples, consisting of terraced and walled *rejolladas*, are some of the best evidence we have to date for the intensive use of *rejolladas* in the past (but also see Chapter 5). When considered along with the clustering of architecture near *rejolladas* and the *rejolladas* incorporated into house lots at Early Classic period Chunchucmil, such evidence demonstrates that *rejolladas* played an important role in the agricultural strategies enacted in the northern Maya lowlands.

Archaeological evidence is growing for the ritual significance of *rejolladas*. The elaborately decorated Late to Terminal Classic period façade of Group A at Kulubá faced the largest *rejollada* at the site, and its iconography included stacked *Cháak*, or rain god masks as well as the maw of the earth monster. Barrera Rubio (2015) argues that this orientation and architectural decoration help to solidify the association of *rejolladas* as portals to the underworld and places to connect with the deities, just as *cenotes* and caves have often been understood (Martos López 2008:106). González de la Mata (2006:314), working in *rejolladas* within a few kilometers of Chichén Itzá, including the one with terraces mentioned above, found not only ceramic sherds and obsidian fragments traded long distances within them, but also traces of drums and censers that could have been used for ritual activity. While evidence for the relationship between *rejolladas* and ritual has remained relatively sparse, many caves and *cenotes*, including the emblematic sacred *cenote* of Chichén Itzá, contain archaeological evidence for ritual activity, and ethnographic examples also exist (Houston 2010; Russell 2016; Tozzer 1957; Proskouriakoff 1974).

There seems to have been symbolic equivalence in the northern Maya lowlands among various types of sinkholes, including *cenotes*, caves, and *rejolladas*, as openings in the earth and access points to the underworld. At the Temple of the Owls, an early Postclassic period structure at Chichén Itzá, an abundance of cacao imagery was found. A painted capstone shows the god K'awil emerging up and out of a sinkhole, perhaps a *cenote* or *rejollada*, from the mouth of a serpent, located within the sinkhole (Schmidt et al. 2018:Figura 2, 34). K'awil is surrounded by cacao fruits and feathers and holds an offering of jade ear spools. The image shows K'awil emerging from the underworld, represented by a sinkhole. On the pillars of the Temple of the Owls, cacao trees emerge from caves (Schmidt et al. 2018:28). Because of the shared symbolism of different kinds of sinkholes, it is helpful to consider how caves, the most well-studied sinkhole type, have come to be understood in the Maya world, in order to better understand the significance of *rejolladas* in the northern lowlands. Caves are often discussed in the literature as places where rain, wind, lightning, thunder, and clouds were produced, and the home of ancestors as well as gods such as Cháak (Bassie-Sweet 1996:10; Brown, C. T. 2005:396; Vogt 1969:82; Vogt and Stuart 2005:177). They can be seen as access points or passageways to the underworld, and thus places where elaborate rituals took place (Bassie-Sweet 1996:52; Prufer 2005). It is also understood that human creation took place in a cave, which can be seen as a womb and place of fertility (Bassie-Sweet 1996:11; Vogt and Stuart 2005:180). *Rejolladas* and *cenotes* also seem to evoke at least some of these associations.

Conclusions

This chapter provided background information necessary to understand the history of *rejollada* use at Tahcabo and the context of Colonial period livelihood decisions. Population levels were high at Tahcabo especially during the Early Classic period, as they would be again more than a millennium later during the Colonial period. However, population configuration during these two time periods was totally distinct. Early Classic period populations dispersed across the landscape, practicing intensive agriculture near homesteads distributed somewhat evenly across space. During the Colonial period, as we learned in Chapter 2, a grid system was installed at Tahcabo, and due to *reducción* and similar policies, populations tended to reside along the roads within the nucleated town. This nucleation differed from that seen during the Late to Terminal Classic period at Tahcabo, when populations clustered near advantageous landscape features where gardens and orchards could flourish. While *rejolladas* can also be found in high quantities within the center of town, Spanish officials likely discouraged their use as fields or forested areas. Unfortunately, little information about Postclassic life could be gleaned through survey and excavation at Tahcabo, even though we know that populations lived in the area at the time of the Spanish invasion, so a direct account of changes in the daily lives of town residents between the Postclassic and Colonial periods cannot be provided as part of this study. Studies of daily life from other Postclassic Maya contexts will have to stand in as relevant comparative examples.

This chapter also presented a generalized picture of life in rural Maya communities, from the homes and patios in which people live, to the gardens and fields that surround the home. At the same time, I sought to allow space within the description of the local agricultural system to show how practices might shift given various circumstances, and to consider how farmer agency and historical processes might interfere with some of the generalizations that scholars have made about agriculture in Yucatán and superimposed onto the past. I wish to challenge the idea that agriculture in the northern Maya lowlands has remained constant through time—an argument that I believe results from a lack of evidence to the contrary, rather than from detailed study. On the other hand, I do argue that agriculture in the northern lowlands has existed along with ritual practice and a rich body of knowledge about the entities involved in landscape production, demonstrating a relational ontology characteristic of the region. In the next chapter, I present the results of excavation within the *rejolladas* of Tahcabo, showing the extent to which horticultural practices and livelihood strategies may have changed through time, but also how the landscape and its constitutive beings and characteristics consistently influenced human behavior in certain ways.

CHAPTER 5:

REJOLLADA STRATEGIES AND INFLUENTIAL LANDSCAPES

This chapter addresses *rejolladas* as places to consider the implementation of livelihood strategies as well as the influence of non-humans and landscapes on human activity and decision making. *Rejolladas*, with their deep soils, can provide glimpses into long-term landscape interactions. In Tahcabo, current town residents consider *rejolladas* to be spaces with special properties, and yet because the *rejolladas* in central Tahcabo are relatively shallow, they can function similarly to the gardens maintained within residential patios. Interviews with community members explored how *rejollada* owners decide on the strategies to employ within them. Evidence from excavation within five *rejolladas* provides information about how such strategies may have changed through time. Both lines of evidence demonstrate how the various constituents of landscape exert agency in their relationships with humans and vice versa.

As described in Chapter 1, while farmers have agency when it comes to what and how they plant, they consider the impact of their decisions on their relationships with and responsibilities to landscape actants—a terms that encompasses humans and non-humans with the capacity to act (Fowler 2013:30; Harrison-Buck and Hendon 2018:4; Latour 1999). Such landscape actants in a farmer's relational ontology could include animals, plants, soils, astronomical cycles, deceased ancestors, spirits, and more. One way to consider how such actants interact in the context of a *rejollada* is to think of them as consisting of an assemblage, as conceptualized by Deleuze, or "a charged, ordered entity arising from complex histories of interaction" (Fowler 2013:22; see also Deleuze and Guattari 1987; DeLanda 2006). The constituents or actants of the *rejollada*, seen as an assemblage, may also contribute to other assemblages, but their specific arrangement and relations in the micro-landscape create "emergent properties" (Bennett 2010:24). Bennett (2010:21) describes the agency of assemblages by noting that "an actant never really acts alone," but "depends on the collaboration, cooperation, or interactive interference of many bodies and forces." Because of this, agency in assemblages must be understood as distributed, a point that helps to explain the role of farmers as they interact with *rejolladas* and other landscape features. The *rejollada* as assemblage influences human behavior, just as farmers appease spirits, petition gods, and work in sync with the rhythmic needs of plants and animals (Ingold 1993; Tsing 2015:32). As such, *rejolladas* are influential landscapes.

In this chapter, I use the data garnered from interviews and *rejollada* excavations to consider farmers' livelihood strategies and the extent to which rural populations can be seen as negotiating among factors that include large-scale political and economic shifts, weather events, demographic change, levels of human and social capital, agroecological considerations, and other factors laid out as part of the sustainable livelihoods approach outlined in Chapter 1. This chapter also presents evidence for an enduring relational ontology that characterizes lifeways in Tahcabo. Overall, I see this chapter as one of the most hopeful in the dissertation, as it provides an argument that supports not only the power of farmers in shaping the rural landscape, but also the extent to which farmers wield this power through relationships that they build and maintain, manifest in part through ceremonial activities and detailed attention paid to the needs of plants and animals, among other non-human actants.

The beauty of the landscape and the autonomy of rural life, tempered though they are by some outcomes of slow violence, discussed in Chapter 7, become evident in this chapter.

First, I present the main plants cultivated within Tahcabo's *rejolladas* and how they relate to community members' strategies for *rejollada* use. After introducing the interviews and plant surveys, I present information from the interviews according to components of the livelihoods framework introduced in Chapter 1. The first half of the chapter addresses the knowledge that people maintain today about what grows best in *rejolladas*, as well as the impacts of various factors on *rejollada* use, including labor availability, family needs, land tenure, seed access, food aid programs, and climate and weather events. Having explored the ways in which interviewees addressed several components of the livelihoods framework, I also add information about Tahcabo residents' relational ontology by presenting some ways in which they respond to various non-human landscape actants in their use of *rejolladas*.

The second half of the chapter compares the use of *rejolladas* today to evidence for their use in the past. Evidence from excavation shows that certain *rejolladas* seem to be consistently identified as places good for one type of activity versus another, therefore shaping human behavior across the landscape. The use of *rejolladas* for horticulture has a deep history, which corresponds to their use as places for ritual activity. On the other hand, differences exist in the ways that *rejolladas* were used during two periods of high population density at Tahcabo: the Late Preclassic to Early Classic period and the Colonial period. The chapter concludes with a discussion of the implications of the *rejollada* study at Tahcabo for rural Colonial period livelihoods amid slow violence.

Strategies for *Rejollada* Use

Introduction to the Interviews

Tahcabo residents shared with me and my research collaborator José Miguel Kanxoc Kumul about the plants, both native and introduced (either during the Colonial period or more recently), that grow particularly well within *rejolladas* due to their specific properties, and showed them to us as they took us on tours of their gardens. They explained the activities involved in maintaining plants within and otherwise using the spaces available within *rejolladas*, which shaped my expectations for what plants might preserve in *rejollada* sediments in addition to what strategies farmers might employ given different circumstances. Interviewees described how they make decisions about what to grow in their *rejolladas*, identifying a wide range of factors that contribute to *rejollada* cultivation strategies. They also provided insights into how *rejolladas* could serve as places to keep and hunt animals and prepare food.

Due to the initiative and insights of Kanxoc Kumul, we also began to get a better sense of how people understand *rejolladas* in relationship to spirits and other influential beings. Caves, *cenotes*, and *rejolladas* all have spirit owners that must be appeased in order to interact with them successfully—a fact that Kanxoc Kumul brought to my attention and raised in follow-up interviews (Kanxoc Kumul and Dedrick 2016). Shared characteristics of these bedrock features (caves, *cenotes*, and *rejolladas*) include their depth into the earth, their utility for cultivation, and their potency and potential danger as places of supernatural beings. Kanxoc Kumul also asked about specific ceremonies and planting schedules that *rejollada* owners maintained or at least knew about—by knowing what questions to ask, he could access information that had previously eluded me, deepening the interviews considerably.

The Plant Surveys

The emphasis of the plant survey with botanists from CICY was to capture as much biodiversity present in the *rejolladas* as possible, with a focus on wild plants, while plant surveys conducted in tandem with interviews were designed to record the plants that town residents purposefully cultivated within *rejolladas*. Afterwards, I compiled the data from both sets of surveys, and found that, in all, collections and observations in Rejollada A yielded 77 plant species, Rejollada E contained 57 species, Rejollada D contained 54 species, and Rejollada B yielded 42 species. We did not conduct plant surveys in Rejolladas C and F, but based solely on garden tours associated with interviews (incomplete evidence), Rejollada C contained 29 species, and Rejollada F contained 10 species. In total, we documented 147 plant species in the six *rejolladas* located closest to the town center (Appendix B).

Of the plants documented in the central *rejolladas*, 32 species were present in three or more of the six *rejolladas*, 20 of which were used for family food production (Table 5.1). Of the 32 species, eight of them, or 25%, were plants introduced to the area during the Colonial period or more recently. Seven of these introduced plants are primarily used for food, one of which also has medicinal uses, while the eighth plant (*Limonaria* sp.) is used for religious purposes. Both papaya and *chaya* have wild varieties that are not commonly used as food—however, I did not systematically record whether the papaya and *chaya* plants that I saw in *rejolladas* were wild or domesticated, so I cannot differentiate between those varieties here. Plants found to be growing within just two *rejolladas* at the time of the plant surveys and interviews all consisted of cultigens used for food production, including six additional fruit tree species, pineapple (*Ananas comosus*), habanero (*Capsicum chinense*; possibly introduced during the Colonial period; Pickersgill 2016:419), *piñuela* (*Morinda royoc*), sugarcane (introduced), and three different root vegetables (see Appendix B).

Table 5.1. Plant species growing in three or more of the six *rejolladas* studied, along with information about the number of *rejolladas* in which they were found, whether or not they are species introduced during the Colonial period or more recently, and their uses.

Scientific name	Common name	No. *rejos*	Intro-duced	Uses
Acalypha diversifolia		3	N	Weedy species
Annona reticulata	*anona*	6	N	Fruit edible
Bixa orellana	*achiote*	3	N	Condiment
Brickellia diffusa		3	N	Weedy species
Brosimum alicastrum	*ramón*	5	N	Timber, fodder, fruit edible
Byrsonima crassifolia	nance	4	N	Fruit edible
Carica papaya	papaya	5	N	Fruit edible, fodder, medicine
Cedrela odorata	Spanish cedar	5	N	Timber, medicine
Ceiba pentandra	*ceiba*	4	N	Religious use, fiber
Citrus aurantifolia	lime	3	Y	Fruit edible
Citrus aurantium	sour orange	4	Y	Fruit edible, medicine
Citrus reticulata	mandarin	5	Y	Fruit edible
Citrus sinensis	sweet orange	3	Y	Fruit edible
Cnidoscolus aconitifolius	*chaya*	4	N	Leaves edible
Cocos nucifera	coconut	3	Y	Fruit edible
Cucurbita sp.	squash	3	N	Fruit edible
Ehretia tinifolia	*roble*	4	N	Medicine, fuel, timber, fodder
Enterolobium cyclocarpum	*guanacaste*	3	N	Seed edible, timber, fodder
Hylocereus sp.	*pitahaya*	3	N	Fruit edible
Leucaena leucocephala	*tumbapelo*	4	N	Medicinal, fodder
Mangifera indica	mango	3	Y	Fruit edible
Manihot esculenta	*Yuca*, manioc	4	N	Root edible
Melicoccus oliviformis	*guaya*	5	N	Fruit edible
Murraya paniculata	*limonaria*	5	Y	Religious use
Musa paradisiaca	banana, plantain	4	Y	Fruit edible, tamale wrappings
Persea americana	avocado	3	N	Fruit edible
Piper auritum	*hoja santa*	4	N	Leaf edible, tamale wrappings
Sabal yapa	*guano*	3	N	Construction, craft
Serjania goniocarpa		3	N	Melliferous
Solanum lycopersicum	tomato	3	N	Fruit edible
Spondias purpurea	hogplum	5	N	Fruit edible
Tecoma stans	*sauco amarillo*	3	N	Weedy species

The plant surveys demonstrated that families use their *rejolladas* for food and fruit production in particular, although they also grow trees and other plants for timber and construction, animal feed, and medicinal and religious uses—one *rejollada* in particular contained a number of medicinal plants, seemingly due to the landowner's interest in these plants. When one household grows a plant in their *rejollada* plot, that plant comes to serve the extended family, and eventually can become a resource for the entire community through food sharing and the sale of extra products.

Among the plants grown for family food consumption, root vegetables would have featured more prominently among plants grown in *rejolladas* had we focused on the plants growing along the flat, bottom portions of the *rejolladas*. These areas have the deepest soils most advantageous for the growth of plant storage organs such as tubers—a point returned to below. Since trees can thrive around the edges of *rejolladas* and on their rocky slopes as well as within them, due to the reach of their root systems, they tend to be more numerous and well-distributed across space. Nonetheless, root crops are productive and contribute significantly to subsistence in Tahcabo. Some of the interview participants indicated that they prefer to cultivate root crops in outfields rather than in the central *rejolladas*. More than one interviewee indicated that tortillas could be prepared from a mix of *masa* made from maize and *yuca* or starch from other plants.

While the shallow *rejolladas* in central Tahcabo have some specific properties that interviewees identified, their use does not differ much from the use of other areas located around the houses in town. While any plant can grow fairly well in a *rejollada*, and many plants grow better, *rejolladas* may less frequently be used for the cultivation of medicinal plants; ornamental plants; and the intensively maintained and predominantly introduced plants known as *huertos*, which include lettuce (*Lactuca sativa*), cabbage (*Brassica oleracea*), radish (*Raphanus sativus*), cilantro (*Coriandrum sativum*), *epazote* (*Dysphania ambrosioides*), other herbs, and tomatoes. These tend to be found in gardens near the house where they can be easily tended and incorporated into daily use (Anderson 2002), rather than within *rejolladas*. One person began cultivating these plants in her *rejollada* plot shortly after our interview due to a government program focused on *huertos*, while another person mentioned that she had used her *rejollada* to grow these species in the past, but that it was too much work, and that she decided to focus instead on cultivating them in containers near her house, where they were easier to water and protect. Another had kept *huertos* in his *rejollada* plot in the past, and had built a structure to protect them from animals. In the next subsections, I continue to explore information about strategies for *rejollada* use from interviews, organized according to the major categories of the livelihoods framework.

Contexts: Rejollada Characteristics, Climate, and Government Programs

Tahcabo residents, and particularly those who own or manage land within *rejolladas*, know about the advantageous characteristics of *rejolladas* that have also been documented scientifically (Munro-Stasiuk et al. 2014). First of all, interviewees indicated that the most nutrient-rich and deepest soils in and around Tahcabo are located within *rejolladas*. Landowners who had excavated pits in their *rejolladas* noted soil depths of two, four, and five meters before reaching bedrock. Soils are said to be very fertile within *rejolladas*, and interviewees commented that seeds can simply fall into *rejollada* soils and begin to grow on their own. They told us that the air is cooler within the *rejolladas* and that the soils retain moisture for longer periods of time than the surrounding areas. Some of the knowledge that landowners maintained about *rejolladas* was passed down from elders, while other information could be attributed to landowners' own experiences and experimentation.

In addition, Tahcabo residents can explain why the *rejolladas* have favorable characteristics and note differences among them. They have observed that water falls into the *rejolladas* from the surrounding areas and washes soil into them as well, explaining the humidity and accumulation of soils. Composted fallen leaves can contribute to soil accumulation. The depth of *rejolladas* protects plants within them from wind, while at the surface above, the wind can uproot plants. While they noted diversity in *rejollada* forms, soils, and rock content, interviewees could not always explain how such landscape features formed and generally wanted to know more about the geological processes that led to their formation. Some *rejolladas* contain soils that are very rocky, while others have more soil in which to grow plants. Interviewees indicated that the amount of rock within a *rejollada* impacts humidity, since rocks retain moisture. More generally, they indicated that each *rejollada* has a different combination of features that makes it unique.

Even though *rejolladas* maintain greater moisture than surrounding areas, cultigens within them still need to be watered during droughts and the dry season. This can be difficult and inconvenient when irrigation requires bucket transportation of water into *rejolladas*. The *rejolladas* within the town land of Tahcabo are relatively shallow, allowing for more easy access in and out, while deeper *rejolladas* can be found in the *ejido.* In the *ejido* lands outside of town, some of the *rejolladas* provide access to the water table, either due to their depth (because they reach the water table), or more commonly due to the presence of a well dug within the *rejollada*, facilitating irrigation. In addition to the *rejolladas* in the *ejido*, one shallow *rejollada* in central Tahcabo (Rejollada F) contains an ancient well that people have used to irrigate nearby crops for hundreds of years.

Rejolladas can provide sun or shade conditions for plants. If trees within the *rejollada* grow large and create a lot of shade, then certain plants, such as squash, watermelon (*Citrullus lanatus*), and maize will not do well. For this reason, at least one person indicated that cantaloupe (*Cucumis melo* var. *cantalupo*) and watermelon do not grow well in *rejolladas*, while others attested that they do grow well in the sunny portions of *rejolladas*. On the other hand, in Yucatán most plants can use at least a little shade, especially in the dry season, which is another reason why so many species grow better in *rejolladas*. A couple of interviewees mentioned that the shade from the larger trees also prohibits weed growth. Because of the different advantages of sunny and shaded areas, a *rejollada* might be divided into halves, one side of which serves for the cultivation of fruit trees and the other side of which hosts plants that prefer sun. This strategy can be found implemented within town as well as in the *ejido*, though it is more commonly employed in the *ejido*.

Large weather events can cause changes in what people grow in their *rejolladas*. In particular, hurricanes can wipe out all of the cultigens in a *rejollada* in a single day, leaving only the option to start anew with other plants. This was the story I heard about coffee cultivation—in the past, one family grew their own supply of coffee, which they then roasted, ground, and drank throughout the year. However, the trees died in a hurricane and were never replaced afterward. Water from hurricanes tends to rush into *rejolladas*, which protects the houses of Tahcabo from flooding but can also drown plants. For example, interviewees reported that during Hurricane Gilbert the water reached high levels within some of the *rejolladas*, while particular *rejolladas* tend to flood more than others. Families may also choose to plant large trees in *rejolladas* since they will be in a space away from the house—a tall tree near a residence could be a hazard during a hurricane. Climate change may also impact the choices that people make about what to grow in *rejolladas* and the labor they designate for farming more broadly. Interviewees told me that in the past people knew what days it would rain and when there would be sun, but that the weather has been unpredictable in recent years.

Tahcabo residents tend to make the most of government programs actively made available to them. Recently, a government program distributed various types of seeds to women in Tahcabo for them to cultivate in their garden plots, which they had also designed with the help and encouragement of the program facilitators. In this program, each year there was a different initiative related to women's economic activities. If the women participated and did well, taking good care of their gardens, they became eligible for benefits offered in future years. Many women in Tahcabo were participating in the program when I conducted interviews about *rejollada* use. Unfortunately, the program has since faded away, as program facilitators stopped showing up to the community to move initiatives forward. This example seemed to follow a trend, based on instances that interviewees mentioned to us, in which government programs instigate widespread efforts by men and women in the community, but then for one reason or another fail to achieve promised economic outcomes based on a lack of follow-through on the part of government officials and to some extent community members as well.

Resource Access: Rejolladas, Natural Capital, and Human Capital

Who owns and therefore accesses *rejolladas* in Tahcabo? They are inherited by men and women, and are sometimes divided among siblings. One person said they inherited land in a *rejollada* from their grandparents, who had left it to their mother and then to them. One woman had inherited a portion of a *rejollada* from her grandfather. Land within *rejolladas,* or any other land in town, if not claimed by anyone or out of use, could be granted to town residents by the town commissioner (*comisario municipal*). One interviewee told us that they had noticed an owner of a *rejollada* left the land unworked. For about five years, the person cultivated plants within the *rejollada*, after which the original owner granted them the official ownership papers. At least a couple of people mentioned that they had claimed or had been granted land that was abandoned or unworked. However, at this time all land within *rejolladas* (apart from Rejollada G) is owned. Sometimes people will sell portions of their *rejolladas*, especially if they need money for an urgent reason, such as a medical expense. One person indicated they had sold the level area at the bottom of a *rejollada*, assuming it would be used by the purchaser as an area to build a house.

The possibilities for land ownership, which include inheritance, purchase, and grants made by the town commissioner, demonstrate how land can become concentrated into the holdings of certain families—including those that have resided in the area for a long time, and those that can afford to purchase land within *rejolladas* when opportunities arise. To some extent, those who arrive earlier to a community have more opportunities to claim and work the most desirable land. On the other hand, as people fail to work land based on the pursuit of other activities, opportunities arise for others who might more actively care for it. As landholdings change hands, new custodians of *rejollada* holdings need to determine how to make the most of their resources through communication with others in the community, experimentation, ceremonies and offerings for relevant beings, consideration of family needs, and the use of seeds they manage to acquire as well as the knowledge of how to plant them.

One important factor that people use to decide what to plant in a *rejollada* is information about what grows best within them. Many interviewees spoke about the advantages of cultivating bananas in *rejolladas*. As mentioned previously, *rejolladas* help to protect plants from wind, maintaining intact leaves that can be used for wrapping tamales. Interview participants also mentioned that root vegetables (in this case plants with tuberous roots and corms), such as sweet potato, *kupti makal* (*Xanthosoma yucatanense*), and manioc or *yuca* grow faster, bigger, and rounder within *rejolladas*. Sugarcane and peanuts (*Arachis hypogaea*) also produce better within *rejolladas*. Other key plants that grow well in *rejolladas* include fruit trees and timber. For example, the *mamey* tree prefers deep soils, and for that reason grows better in *rejolladas*. Citrus trees and mango grow faster in *rejolladas* due to the soft and nutrient-rich soil. Other trees that people mentioned specifically that they were growing in *rejolladas* included nance and avocado. Wood for construction grows well within *rejolladas* because the trees grow straight and tall. Some people also plant bamboo in the *rejolladas* for construction due to how well it grows in them. Of course, there are differences among *rejolladas*, and one interview participant indicated that "the soil prompts (*pide*) which cultigens one should plant" (my translation).

Rejolladas are also places to rear animals including cattle, pigs, turkeys, and chickens. A couple of *rejollada* owners indicated that they had kept animals, even cattle, within enclosures in their *rejolladas* located within town. Cattle certainly roam about in the *rejolladas* of the *ejido* today, while chickens amble through the *rejolladas* in town. Historically, people also trapped animals encountered in their *rejolladas*, especially the large rodents called *tepezcuintles* or pacas (*Cuniculus paca*), and also opossums (*Didelphis marsupialis*) and wild boars called *jabalíes* or peccaries (Tayassuidae). To foreshadow the next chapter, we found paca and peccary bone in early colonial contexts at Structure 206, located next to a *rejollada* where people still trap animals today. One *rejollada* owner mentioned that if you plant the fruits animals want, the animals will be attracted and then you can trap them. In particular, this interviewee mentioned that animals tend to love *poolboox* (*Annona purpurea*), *guaya* (*Melicoccus oliviformis*), and *zapote*.

Interview participants mentioned that their *rejolladas* were not as productive as they had been in the past, and many attributed this to declining human capital, as people leave the community for wage labor or to get married and spend less time on *rejollada* maintenance. When there are few people to work the *rejolladas*, shortcuts may be implemented, such as the large-scale burning of a *rejollada* on a seasonal basis to keep the weed growth down and encourage new growth. One interview participant mentioned that their grandparents had dedicated themselves to working the *rejollada*, and that the biodiversity was higher then, but that it also took a lot more work to maintain. Both men and women take primary roles in *rejollada* maintenance, and some families work together to weed (*chopea*) the *rejollada*, which is the primary work to be done, while others would more often work on *rejolladas* alone or in pairs. Additional information about the types of maintenance that plants in *rejolladas* require can be found in the subsection on "Responding to the Landscape," below.

Livelihood Strategies: Family Needs, Animal Needs

Family needs play a large role in what people decide to grow in their *rejolladas*. The primary use of *rejolladas* within town is for garden and orchard cultivation to produce fruits and vegetables for daily use and reduce the expenses associated with purchasing food. In this case, family members need to decide what qualities of food production are most important to them. For example, one interviewee indicated that jicama produces more fruit than maize does, but that maize is a more important part of the cuisine and more commonly eaten than jicama. Others prefer to take advantage of *rejollada* soils to cultivate trees that produce fruit every year, or select cultigens that require the special soil characteristics available in *rejolladas*. Some people would prefer to plant cultigens that they could harvest within a year of planting, such as *makal*, sweet potato, and jicama, whereas banana and other plants, including *yuca*, must grow for a year or more before the first harvest. Some *rejollada* owners plant whatever seeds, cuttings, rhizomes, or other vegetative material that they happen to have on hand or can acquire easily.

Many *rejollada* owners also prioritize growing feed for their animals, especially during the dry season. Especially within town, *ramón* is a very popular tree to grow within *rejolladas* to meet this need, as it does not lose its leaves during drought. Fruits and vegetables left over after family use can also serve as animal feed, such as *chayote* (*Sechium edule*), squash, *yuca*, sweet potato, and watermelon rind. Some interviewees indicated that, in contrast to earlier times, they now prefer to cultivate grasses within their *rejolladas* located outside of town, which they use as cattle feed. While at least one *rejollada* in central Tahcabo (Rejollada E) also contains imported grass used as animal feed, this option is more popular outside of town. Other crops cultivated in *rejolladas* outside of town, and especially within those cleared of trees to create full sun conditions, include watermelon, cantaloupe, cucumber (*Cucumis sativus*), maize, squash, black-eyed peas (*xpelón; Vigna unguiculata*), beans, and bottle gourd (*chuuj; Lagenaria siceraria*). These plants serve to feed family members and in some cases their animals.

Even though the interviewees indicated that the majority of the plants they cultivate in *rejolladas* are for family consumption, many people prefer to cultivate plants whose products they know they can sell locally or in the nearby city of Tizimín, if needed. A few of the plants that they mentioned are easy to sell included banana, citrus, *anona* (*Annona reticulata*), tamarind (*Tamarindus indica*), *chayote*, *chaya*, papaya, squash, watermelon, cucumber, *mamey*, mango, sweet potato, and *yuca*. One person mentioned that it did not make sense for him to grow peanuts and *yuca* in the *rejollada*, because people will not buy them. Peanuts, for example, are cheaper to buy from the store. He lamented that young people do not even seem to like *anona* or *guaya* fruits anymore. In this way, changing palates, especially among young people, impact the demand for goods in regional markets. Food preferences can be influenced by outside corporations, and can relate to the ways in which foods symbolize class and ethnic distinctions (e.g., Ardren 2018; Bogin et al. 2014; Bourdieu 1984; Leatherman and Goodman 2005).

Often, couples and family members discuss and negotiate with each other about how to use a family's *rejollada* plot. One person mentioned that he wanted to clear his *rejollada*, burning the existing vegetation to open up space to cultivate watermelon for sale. His wife opposed the idea, arguing that the *rejollada* was better for the family and more beautiful containing the diverse resources they cultivate within it, including a range of tubers, trees, and shrubs for use as food, construction, and medicine. Clearly, a wide number of factors come into play when different family members negotiate *rejollada* use.

Responding to the Landscape

While the primary plant maintenance conducted in *rejolladas* includes weeding and protecting the plants from animals, agriculture in Yucatán requires a great deal of knowledge about each plant in biodiverse infield and outfield systems. For example, some plants should be trimmed so that they grow better and produce more fruit. Plants for which this can be a good practice, according to interviewees, include: *ramón*, hogplum, *achiote* (*Bixa orellana*), *guaya*, and *caimito* (*Chrysophyllum cainito*). Plants such as *hoja santa* (*Piper auritum*) and banana have nicer leaves when old ones are clipped. One farmer mentioned that trimming the trees opens up more space for the sun to shine through them, allowing the plants underneath to grow better. These trimmings can then be taken to use as kindling or firewood. *Huertos*, including cilantro, radish, and *epazote*, will grow better after they are planted if the soil is first agitated. Peanuts also grow better within soft, recently disturbed soil.

Interview participants had differing perspectives on the extent to which chemical fertilizers and herbicides might impede or improve cultivation within *rejolladas*. Some interviewees mentioned that chemical fertilizers and herbicides can accumulate in *rejollada* soils as they wash in from surrounding areas. One person mentioned that he recommended maintaining an herbicide-free buffer around *rejolladas* to avoid damage to cultivated plants located within them. A couple interviewees indicated that natural fertilizers should be used in and around the *rejolladas*, and that such products are easy to come by within *rejolladas*, because the leaves that fall from the trees easily become compost in the humid microclimate created by the features. One person indicated that cut weeds and leaf litter should be mounded up around the base of cultivated plants so that when they watered the plants, the litter would maintain moisture and eventually function as compost. Another mentioned that fallen debris, if left in place, protects the ground from the sun, helping to conserve damp soils. Not all of the interviewees agreed that the leaves that fall in the *rejollada* should be allowed to remain in place, or even that natural fertilizers would be preferable to chemical ones. Most people prefer to rake up the leaf litter and weeds to one side of the garden area and burn them, and a good number of people apply chemical fertilizer to plants in gardens and fields alike, including in *rejolladas*, especially when tending certain crops including cantaloupe, watermelon, squash, beans, and maize.

In addition, Tahcabo residents recognize that each cultigen has an auspicious time for planting. For example, oranges should be planted when the moon is small and new, while bananas can be planted during a waxing gibbous. An interviewee indicated that oranges planted during a new moon will bear fruits quickly, and will not grow too much when production begins. While these characteristics of the plants are not specific to their growth in *rejolladas*, the knowledge about when plants should be grown becomes impressive when considering the density and diversity of vegetation in a *rejollada*, as these ideas about when to plant connect *rejollada* soils with astronomical events in a complex choreography that could also be called a polyphonic assemblage (Tsing 2015:32). These notions about planting and moon cycles have a deep history, as evidenced by the planting almanacs from the Madrid Codex, written in the region at the end of the Late Postclassic period, which record the stations of Venus, eclipse seasons, positions in the 260-day ritual calendar, and sequences of relevant ceremonies (Hernández and Bricker 2004).

The *Ch'a' Cháak* rain ceremony in Tahcabo is traditionally practiced in a specific *rejollada* located near the town center, which people tend to refer to in relationship to the ceremony (*u xko'opil ch'a' cháak*, the *Ch'a' Cháak rejollada*; Rejollada B). There are many other examples of oral testimony related to the *rejolladas* of Tahcabo. *Rejolladas* have spirit owners and many different beings live within them. In particular, the *saakaj* ceremony should take place in a *rejollada* to honor the *aluxes*, *balames*, and the *yuum k'aax* associated with the *rejolladas* (Kanxoc Kumul and Dedrick 2016). These are beings that protect the fruits and plants in the *rejollada* and help them to grow well. In particular, the *alux* is created by a human to protect a specific space, such as a *rejollada* or a cultivated field. The *balames* and *yuum k'aax* are divinities that do not take physical forms, but are present symbolically or as what could be considered a kind of wind. All of these beings can be good and bad, so it is important to appease them with offerings of first harvests and other foodstuffs, such as small tortillas. If not, they could harm nearby animals, or even humans.

Because there is so much soil in *rejolladas* and so little soil elsewhere, many people create earth ovens within their *rejolladas*. This involves digging a pit and mounding up wood to burn. Rocks are placed on top, so that the hot rocks fall into the pit as the wood burns. Once the rocks have been heated, the food to be cooked is placed within the pit, then covered with leaves or another layer to protect the food, and finally covered in dirt. After several hours the food is ready to eat. During the month of August of 2018, we witnessed the use of an enormous trench in Rejollada B (the *Ch'a' Cháak rejollada*) as an earth oven to prepare approximately 30 vats of the stew called *relleno negro*, which then fed community members of and visitors to Tahcabo as they joined together to celebrate the holy day of Saint Bartholomew, the town's patron saint.

This first main section of Chapter 5 has shown that *rejolladas* can be used as gardens when located in town and as if they were part of the outfield system when located in the *ejido*, with a few key differences. *Rejollada* owners take many factors into consideration as they decide how to make use of the spaces. They consider the needs and preferences of their families and animals, using their knowledge, inherited or discovered, about what plants grow best; sell most easily; attract the most animals; contribute to the best cuisine, construction materials, or medicines; and produce amply or quickly. They may not put as much effort into the *rejollada* or decide to grow certain low-maintenance crops if they know that human capital will be directed elsewhere. On the other hand, they may be encouraged to redirect resources to production in *rejolladas* if government programs incentivize them to do so, or if they have decided to take on a specific project that they believe will be profitable. Decisions about how to use *rejolladas* may be negotiated among household members when opinions differ. Farmers consider other humans and non-humans as well as weather events and climate changes when deciding when, how, and whether to plant, conduct ceremonies, or build enclosures in any given *rejollada*. This section illustrates that the sustainable livelihoods framework serves as a useful heuristic to understand the development of rural livelihood strategies in Yucatán and how they may have changed throughout the Colonial period. It also points to the need to include a relational ontology to explain farmer decision making more precisely, as gardening and agriculture in Yucatán cannot be understood as distinct from ritual activity and the diverse relationships that form the landscape.

***Rejolladas* as Influential Landscapes**

Introduction to Rejollada Excavations

The interviews about *rejollada* use provide insights that allow for more successful interpretations of evidence from *rejollada* excavation. However, this is not because current residents are like past residents or that they face similar challenges, but simply that the range of factors they consider when making decisions may be similarly broad. Strategies for *rejollada* use in central Tahcabo relate to the specific characteristics of each *rejollada* in addition to family and animal needs; the availability of labor, seeds, fertilizers, and pesticides; market prices or trade networks; climate; and the knowledge of planting protocols and maintenance necessary for each plant in a biodiverse garden. Ritual activity also ensures continued success in *rejollada* use. This section considers the specific characteristics of certain *rejolladas* while also providing a wider perspective of the long-term role that *rejolladas* have played in the livelihoods and food systems of rural populations living in what is now the town land of Tahcabo.

Unfortunately, it was not possible to learn through excavation within *rejolladas* exactly what people had grown in them through time. The soils that had incrementally washed into *rejolladas* were all too mixed together to provide the necessary chronologically-intact stratigraphy. In addition, water flowing into the *rejolladas* and through their soils to the bedrock through time had broken apart all but the most recent charred botanical material, except in locations where stone features protected charred remains.

Nonetheless, excavation in the *rejolladas* demonstrated their long-term use for both agriculture and ritual activity based on archaeological features as well as analyzed pollen and soil carbon isotopes from soil samples. The oldest feature was an arc-shaped rock alignment found 155 cm below the ground surface in a *rejollada* located just northeast of the church (Rejollada D). A piece of carbonized wood found associated with the rock alignment dated to the Early Preclassic period, approximately 3,500 years ago (calibrated calendar years 1686-1534 BC with 95% probability; Arizona AMS Laboratory AA110654).

The evidence from *rejollada* excavation demonstrates parallels in the use of specific *rejolladas* through time. For example, within the *Ch'a' Cháak rejollada* (Rejollada B) introduced above, where a great deal of ritual activity and feast preparation takes place today, we found protected beneath a layer of rock an Early Classic period burial in a seated position. In a different *rejollada* where diverse cultigens grow today, but half of which is used to grow introduced grass for animal feed, we found evidence for intensive cultivation in the past as well. Evidence included a single cotton pollen grain from a soil sample within the *rejollada* trench, as well as a signature of intensive maize cultivation among the soil carbon isotope samples. Both of these crops (maize and cotton) would have required full-sun conditions, just as the grass does today, and based on ceramics it seems that both lines of evidence correspond to the Early Classic period, when population levels were relatively high in and around Tahcabo. In other *rejolladas*, there is evidence for their steady use as locations for biodiverse cultivation. Even as populations of humans, animals, and plants changed, the characteristics of certain *rejolladas* seem to shape human and non-human relationships and activities enacted within them.

This section provides an overview of *rejollada* excavation results, comparing the layers, which we referred to as *capas* in Spanish, present across *rejolladas*, and exploring the extent to which *rejollada* soils and their accompanying artifacts were mixed or intact. Next, I present the dated features identified within *rejolladas*. Soil carbon isotope and pollen results then precede a concluding section that outlines how I interpret the information gathered through interviews related to and excavation within *rejolladas*, especially in light of the larger research questions focused on Colonial period livelihood strategies.

Characteristics of Rejollada Stratigraphy

Excavations took place within five *rejolladas* located in the town land boundaries of Tahcabo (Figure 5.1). As mentioned above, the *rejollada* excavations demonstrated that soils in these features and their associated artifacts become remarkably mixed up through water, soil, and animal activity, including soil erosion into the *rejolladas* through time, making it difficult to detect diachronic changes in *rejollada* use. On the other hand, soils within *rejolladas* maintained some differences relative to stratigraphy, including decreased organic material with depth, and depths beneath which ceramic sherds generally could not be found. While the results of pollen study generally could not be assumed to provide information about how cultivation in *rejolladas* changed through time, they could provide a general picture of the overall inventory of plants that people grew in and around *rejolladas* to compare with inventories made through plant surveys in the *rejolladas* today. In this subsection I further explore the extent to which *rejollada* soils were mixed and yet still maintained some trends in relation to stratigraphic depth.

Some similarities in *rejollada* stratigraphy could be seen across all five *rejollada* units (Table 5.2; Appendix E). These relate to the amount of organic material retained in the soils with depth. *Rejollada* soils tended to have three stratigraphic layers: closest to the surface there was am organic-rich layer (silt or loam), followed by a second layer that ranged from very dark brown to dusky red (silty clay or clay loam), and a third that was compact, dark red to dark reddish brown (clay, sometimes mixed with silt or loam). Within the one excavation unit that reached bedrock, there was a fourth layer over bedrock consisting of degraded limestone or possibly *caliche* (a natural deposit of calcium carbonate), mixed with red silt (pH 7.7-8.2; very alkaline due to the high limestone content). The unit in Operation 3 was placed much more to the side of the *rejollada* when compared to other *rejollada* units. This may help to explain why excavators reached bedrock before achieving 2 m in depth.

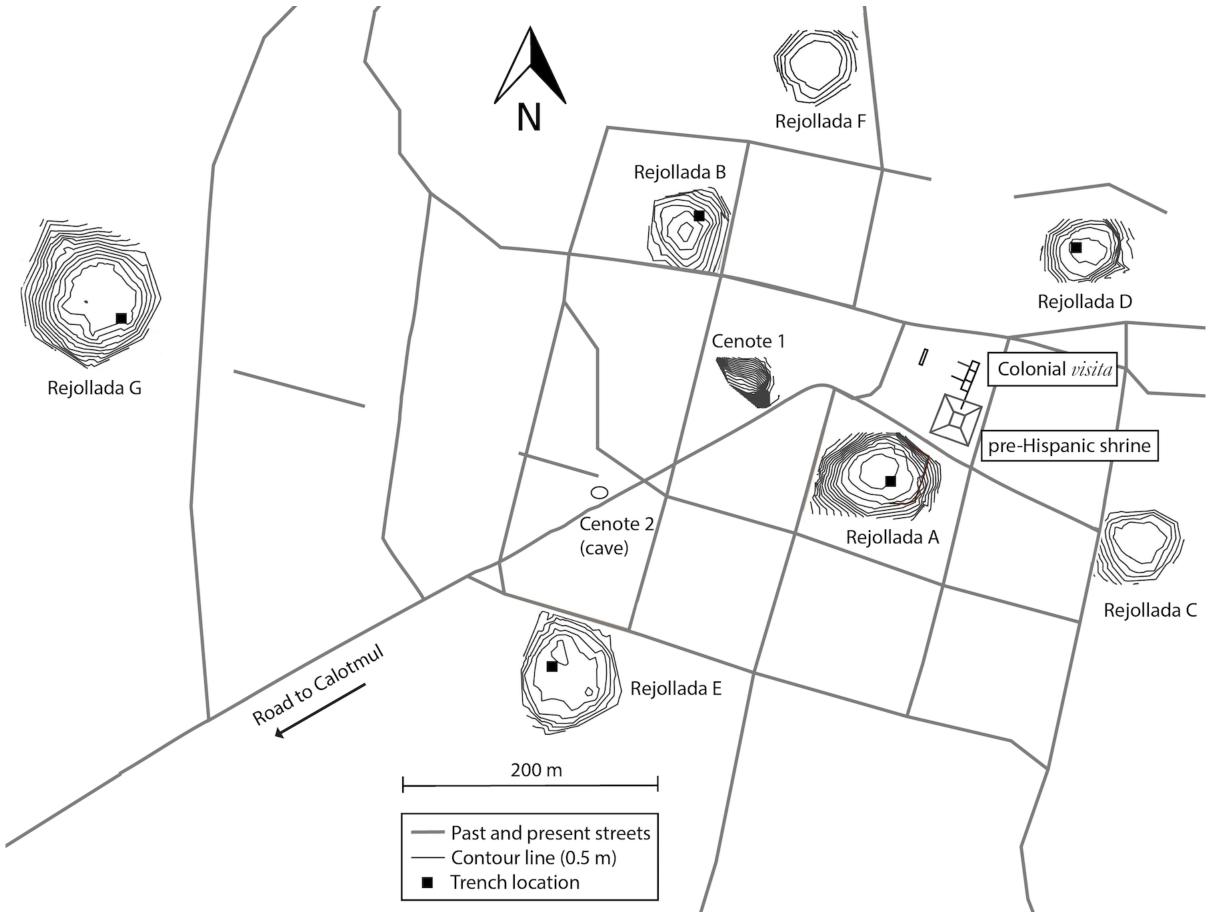


Figure 5.1. Locations of *rejollada* excavation units (trench size exaggerated for ease of view).

On the other hand, apart from these stratigraphic changes, there were also many patches of differently colored soil found mixed in with each layer. Evidence for disturbance could be seen throughout all of the *rejollada* units. It often consisted of (dark reddish brown and very dark brown) patches of looser and softer soil re-deposited from higher levels to lower levels, or even on occasion the reverse. There were also empty tunnels left by gophers and roots, and some burned roots that extended into and across the units. Additional evidence for animal and other mixing consisted of the artifacts and AMS dates.

Table 5.2. Summary table of data from *rejollada* excavations.

		Rejollada A (**Op 1**)	Rejollada E (**Op 2**)	Rejollada G (**Op 3**)	Rejollada D (**Op 4**)	Rejollada B (**Op 5**)
Capa 1	Depth	0-25 cmbs[a]	0-15 cmbs	0-18 cmbs	0-15 cmbs	0-35 cmbs
	Color	Very dark brown (7.5YR 2.5/2)	Dark reddish brown (5YR 3/4)	Very dusky red (2.5YR 2.5/2)	Black (10YR 2/1)	Black (10YR 2/1)
	Texture	Silt	Sandy silt	Silt	Sandy clay loam	Loam
	Incl[b]	Limestone 0-10 cm, charred wood, FCR, clay nodules	Limestone 0-10 cm, charred wood, clay nodules	Limestone 0-18 cm, charred wood	Limestone 0-10 cm, charred wood	Limestone 0-17 cm (10%), charred wood, maize
	Artif	Glass, plastic, metal, ceramic sherds	Glass, metal, animal bone, ceramic sherds	Ceramic sherds	Metal, daub	Glass, plastic, metal, animal bone, lithics, daub, ceramic sherds, ceramic sphere, sascab
	Chrono Ceram[c]	***Early*** Dzudzuquil, Kuche	***Early*** Chunhinta, Dzudzuquil, Saban	***Early*** Dzudzuquil ***Colonial*** Sacpokana, Yuncu	None	***Early*** Carolina, Cetelac, Chunhinta, Dzilam Verde, Dzudzuquil, Joventud, Tancah, Tituc ***Colonial*** Sacpokana, Yuncu ***Recent*** Porcelain
Capa 2	Depth	25-80 cmbs	15-90 cmbs	18-60 cmbs	15-95 cmbs	35-75 cmbs
	Color	Dark reddish brown (5YR 3/4)	Dark reddish brown (2.5YR 3/4)	Dusky red (2.5YR 3/3)	Very dark brown (10YR 2/2)	Very dark brown (10YR 2/2)
	Texture	Silty clay	Silty clay	Silty clay	Clay loam	Clay loam
	Incl	Limestone 0-25 cm, charred wood, FCR clay nodules, ash	Limestone 0-20 cm, charred wood, FCR clay nodules	Limestone 0-19 cm, charred wood clay nodules, ash	Limestone 0-10 cm, charred wood clay nodules	Limestone 0-23 cm (25%), charred wood
	Artif	Ceramic sherds	Glass, animal bone, ceramic sherds, lithic	Ceramic sherds	Animal bone (Capa 2C), daub, ceramic sherds	Plastic, glass, metal, animal bone, lithics, daub, ceramic sherds, sascab, shell
	Chrono Ceram	***Early*** Dzudzuquil, Habana Club, Dzilam Verde	***Early*** Chancenote, Dzudzuquil, Joventud, Saban ***Colonial*** Yuncu (~30 cmbs)	***Early*** Carolina, Dzilam Verde, Joventud, Saban	***Early*** Carolina, Cetelac, Dzilam Verde, Dzudzuquil, Habana Club, Joventud, Majan, Tancah	***Early*** Carolina, Cetelac, Chancenote, Chunhinta, Dzilam, Dzudzuquil, Habana Club, Huachinango, Joventud, Majan, Saban, Shangurro, etc. ***Colonial*** Yuncu

	Chrono AMS[d]	AD 1666 to the present (45-65 cmbs)	AD 1666 to the present (45-65 cmbs)	AD 1666 to the present (35-55 cmbs)	AD 1996 to 2000 (80-95 cmbs)	None available
Capa 3	Depth	80-210 cmbs	90-200 cmbs	60-100 cmbs	95-190 cmbs	75-110 cmbs
	Color	Dark red (10R 3/6)	Dark red (2.5YR 3/6)	Yellowish red (5YR 4/6)	Dark reddish brown (5YR 3/4)	Dark reddish brown (5YR 3/3)
	Texture	Clay	Silty clay	Silt	Clay	Clay loam
	Incl	Limestone 0-15 cm, charred wood, FCR clay nodules	Limestone 0-12 cm, charred wood clay nodules, ash	Limestone 0-22 cm (50%), charred wood snail shells	Limestone 0-20 cm,	Limestone 0-100 cm, charred wood, FCR
	Artif	Ceramic sherds	Glass	Ceramic sherds	Animal bone, lithics, ceramic sherds	Ceramic sherds, shell, possible textile, hematite, sascab; perhaps all related to Feature 2
	Chrono Ceram	***Early*** Dzudzuquil, Habana Club, Joventud, Saban	None	***Early*** Dzilam Verde	***Early*** Chancenote, Chunhinta, Dzilam, Dzudzuquil, Habana Club, Joventud ***Late Classic*** Muna Slate (Capa 3B; 115-135 cmbs)	None available—by the time Feature 2 was excavated (in the rainy season), it was difficult to be certain which ceramic sherds unequivocally pertained to this capa.
	Chrono AMS	AD 1961 to 1980 (Capa 3D; 130-150 cmbs)	None available	None available	None available	None available
Capa 4	Depth			100-185 cmbs		
	Color			Red (2.5YR 5/6)		
	Texture			Silt, degrading limestone		
	Incl			Limestone 0-25 cm (>75%) bedrock (SE), snail shells		
	Artif			Ceramic sherd		
	Chrono			***Early*** Chancenote		

[a] "cmbs" refers to cm below the surface. These depths are estimates because the transitions between layers were not at consistent depths across each 2-x-2-m unit.
[b] "Incl" refers to inclusions while "Artif" refers to the artifacts found in each *capa*, or layer.
[c] ***Early*** refers to pottery dating from the Middle Preclassic to the Early Classic periods. The names that follow are ceramic types. See Appendix G for full list.
[d] AMS date ranges include the calendar age range within 95% probability (2σ).

While the layers found in the different *rejollada* units were roughly comparable, there were some differences in the thicknesses and characteristics of the *capas* that could have implications for their use. For example, the first layer within Rejollada E's unit was redder than that of other *rejollada* units, a characteristic that was also visible prior to excavation. Another consideration is the depth of the first and second layers in the different *rejollada* units. Rejollada D had the greatest soil depth to the point of transition between the second and third layers, at 95 cm. This means that the *rejollada* contained the thickest soil rich with nutrients and organic content available for plants. This characteristic may in part be explained by the size of this smaller *rejollada*, into which soil nutrients and organic material collect more quickly. Though smaller, this *rejollada* supports dense plant growth.

Some inclusions found within *rejollada* soils provide evidence for persistent burning activity through time. The limestone inclusions in *rejolladas* were often gray, chalky, and powdery, perhaps due to burning and the decomposition of stone in humid soils. Fire-cracked rock was also present. Other inclusions that I believe resulted from consistent burning throughout time included hard clay nodules of different colors, that may have formed from the clumping of natural clay in the soils after a burn due to their high clay content. Ash patches and charred wood were also present. Given that over the past several years I have seen many instances of small and large-scale burns in *rejolladas* in central Tahcabo, it is unsurprising that evidence for burning would be present in the *rejollada* sediments.

What might be unexpected is the low quantity of charred wood and plant material present in the *rejolladas*. With that much burning through time, it seemed that more plant material should have survived. Flotation of 30-L samples from each 20-cm arbitrary level in each 2-x-2-m unit resulted in very few charred seeds. Out of the seven pieces of charred wood from *rejollada* contexts sent to the University of Arizona for AMS dating, five came back with dates ranging from the Colonial period to more recent times. Three of these came back with calendar age ranges dating from AD 1666 to the present with a 95% confidence interval due to the nature of the curve used to relate calendar years to radiocarbon years, while two dated to periods even more recent, or "post-bomb" (AD 1961-1980; AD 1996-2000). Therefore, most of the charred wood dated to fairly recent times. All of the five dates mentioned come from charred wood found in the second and third layers in the *rejollada* units, so from contexts a good distance below the surface. The two pieces of charred wood sent for AMS dating that came back with ancient dates were found associated with stony features. It is likely that the limestone in these features helped to protect the charred wood fragments from different disturbance factors that would have otherwise destroyed them.

The period of time from the mid-1700s through the early-1800s was a time of growth for the community of Tahcabo, as can be seen in historical records documenting the population of both Tahcabo specifically, and Yucatán more broadly, as discussed in Chapter 2. Therefore, that time was also one in which we would expect to see more evidence for burning within *rejolladas* and in other areas, in part because low populations prior to that time had allowed for forest re-growth. Another reason to explain the preponderance of wood charcoal from that time period and up to the present day is that it is more likely to survive than more ancient wood. Primary factors impacting the preservation of charred plant material in *rejollada* soils likely include annual wet and dry periods, repetitive burning, intense flows of water associated with hurricanes and major weather events, capillary action that draws water upward from the water table below (Munro-Stasiuk et al. 2014:167), and bioturbation.

As seen in Table 5.2, ceramic sherds do not show up in *rejolladas* in strict chronological order according to stratigraphy. Just in the first layers of Rejolladas G and B, consisting of the first 0-15 and 0-35 cm below the surface respectively, ceramic sherds types dating from the Middle Preclassic to Early Classic were found mixed together with sherds from the Colonial period and more recent times. However, in Capas 2 and 3 it was more common than not to find only early ceramic sherds rather than a mix. Overall, Middle Preclassic to Early Classic period sherd types were most commonly found in *rejolladas*. This trend may relate to one or more of the following factors, among other possibilities: (1) population densities were particularly high at Tahcabo during the Middle Preclassic through Early Classic periods; (2) Middle Preclassic through Early Classic period residents produced and used higher quantities of ceramics than did residents of Tahcabo during other periods; or (3) the residents deposited higher quantities of sherds in the soils of *rejolladas* and surrounding gardens (perhaps as mulch) compared to residents of other periods. Apart from sherds dating to the Middle Preclassic through Early Classic periods, there were Colonial period sherds in the second layers of Rejolladas E and B, and there was a Late to Terminal Classic sherd in the third layer of the Rejollada D excavation unit (Table 5.2).

Other artifacts found out of their expected places and thus providing evidence for mixing include plastic, metal, and glass artifacts present in the second and third layers of Rejolladas A, B, and E. For example, plastic and metal artifacts were found in levels that also contained Middle Preclassic to Early Classic period sherds within Rejollada A, while glass appeared in a layer of Rejollada E at a depth at which there were no longer ceramic sherds present. Some of the animal bone present in *rejollada* excavations was gopher bone, which emphasized their presence in these features and their role in mixing the soils through time.

Along with all of this evidence for mixing, some hints of stratigraphic integrity existed. First and foremost, there were the features, described below, that had remained relatively intact for thousands of years—likely the larger limestone cobbles and boulders forming those features tended not to move around so much in the soil and protected underlying sediments from intense water flows. John Jones found in his study of pollen from *rejollada* soil samples, described later in this chapter, that the deepest sample he studied, from 140-145 cm below the surface in Rejollada A, contained practically no pollen due to lack of preservation. Pollen that had been deposited contemporaneously with this soil would have been too old to survive, and so the fact that there was almost no pollen at that level suggests a lack of contamination from above. The lack of ceramic sherds in the third layer of Rejollada E's excavation unit likely related to the deposition of this soil prior to ceramic use at Tahcabo, and thus indicates a certain amount of stratigraphic integrity. Across units, Colonial period sherds were not found in the third layers, which also suggests that the stratigraphy was not entirely mixed up to the point that any artifact could be found at any level. Finally, the general trend in which soil organic content decreased with depth, causing layers to be observed, indicates a certain amount of stratigraphic integrity.

Description of Features

Rejollada D, Feature 1. This feature provides early evidence for the integration of *rejolladas* into the culture and lifeways of people living in northeastern Yucatán. In this 2-x-2-m unit that we excavated into a *rejollada* located just northeast of Tahcabo's town square, we found an alignment of rocks and pebbles (5-30 cm in size) located between 155 and 165 cm below the surface, which formed an arc across the unit, probably indicating the presence of an early field boundary or a feature used to manage soil humidity (Figure 5.2; Table 5.3). Below this level, approximately 165-190 cm below the surface, the quantity of limestone inclusions tripled. As mentioned earlier, we found charred wood associated with this alignment, which dated to a calibrated calendar age of 1686-1534 BC with 95% probability (AA110654). Artifacts included a piece of chipped stone debitage and two ceramic sherds that must have worked their way down into the context from above, if the date is correct. Based on the AMS date and the depth of this feature below the surface, *rejolladas* attracted the attention of populations in the region early on. Because this feature dates to the Early Preclassic period, before known evidence exists for agriculture or permanent settlement, the feature could relate to early horticulture that preceded settled agriculture.

Table 5.3. Summary table of dated *rejollada* features.

	Rejollada D, Feature 1	Rejollada B, Feature 2	Rejollada B, Feature 1
Depth	155-165 cmbs	65-95 cmbs	50-75 cmbs
Description	Aligned arc of pebbles and cobbles curving from the southwest to the northeast corner; gravel layer underneath from 165 cmbs to end of excavation	Primary burial; east-facing, seated; poor to moderate preservation; middle aged individual; found with ceramic sherds, red hematite ochre, possible textile, charred wood, chipped stone debitage, and limestone inclusions up to 18 cm in size	Many limestone boulders 12-48 cm in size cross the unit, roughly aligned from north to south
Type	Rock alignment	Burial	Rock alignment
Dimensions	2-x-2 m expanse 10-cm in depth	60 cm by 65 cm 30-cm in depth	2 m by 45 cm 45-cm in depth
Use	Soil or water control; boundary marker	N/A	Boundary or burial marker; cap for burial pit
Chronology (AMS dates are calibrated calendar age, 2σ, IntCal13)	AMS date: 1686 to 1534 BC	***Colonial*** *(30)* [a] Yuncu ***Early*** *(25)* Cetelac, Chancenote, Chunhinta, Dzilam Verde, Fango, Huachinango, Joventud, Saban AMS date: AD 246 to 381	***Colonial*** *(12)* ***Early*** *(156)* (see details in Table 5.2; Capa 2)

[a] ***Colonial*** refers to ceramic types (listed in plain text) affiliated with the Colonial period. ***Early*** refers to ceramic types affiliated with the Middle Preclassic through Early Classic periods. Numbers in parentheses and italics refer to counts of sherds per temporal category.

Figure 5.2. Rejollada D, Feature 1, dating to the Early Preclassic period (arrow 20-cm long).

Rejollada B, Feature 1. In Rejollada B, the *Ch'a' Cháak rejollada*, the excavation unit looked different from the moment we began, as there were many more artifacts throughout (Table 5.4). At approximately 55 cm below the surface, we came down on an alignment of boulders (12-48 cm in size) running north-south roughly through the middle of the unit, within a layer that was generally rockier than above. The alignment was about 45-cm wide and 45-cm deep (Figure 5.3). By the bottom of this feature, soil was changing to the dark reddish-brown clay seen in the third layers of other *rejollada* units. Artifacts found along either side of the feature included stucco, chipped stone debitage, animal bone, one human tooth, daub, ceramic sherds, plastic, and metal. Long bone fragments were found in the northeast quadrant along the east side of the feature, set in approximately 50 cm from the northern and eastern walls, and it was observed that the fragments could be human bone. At this point use of the pick ceased and excavations proceeded with great caution. After fully exposing the feature and then removing the stones that constituted the wall, we found that this feature served to cover and preserve a burial, named Feature 2.

Figure 5.3. Rejollada B, Feature 1. Darker soil in center of unit is the location of Feature 2.

Table 5.4. Counts of sherds across *rejollada* unit excavation levels.

Depth (cmbs)	Rejollada A, Op 1	Rejollada E, Op 2	Rejollada G, Op 3	Rejollada D, Op 4	Rejollada B, Op 5
0-20	5	14	3	3	66
20-40	6	7	3	5	45
40-60	2	2	9	27	83
60-80	9	0	0	14	100
80-100	2	0	2	10	59[a]
100-120	2	0	1	6	3
120-140	21	0	0	1	N/A
140-160	0	0	0	2	N/A
160-180	3	0	N/A	0	N/A
180-200	0	N/A	N/A	0	N/A
Unit Total	50	23	18	68	356

[a] Includes ceramics found in association with Feature 2.

Rejollada B, Feature 2. Underneath the alignment, we found a seated primary human burial, which was associated with Early Classic period sherds, intrusive Colonial period sherds (not directly associated with the human bone), red hematite ochre, and a fragment of carbonized wood that was AMS dated to AD 246-381 with 95% probability (AA110655). The human burial faced east and the body had been placed in a seated position (Figures 5.4-5.5). Preservation was poor to moderate. Apart from the long bones, bones encountered included cranial fragments, the mandible, teeth, metacarpals, carpals, phalanges, vertebrae, ribs, and pelvis. Initial study of the bones suggests that the person buried was middle-aged or older and possibly female, but the bones require further study for confirmation. The dimensions of the seated burial were approximately 60 cm by 65 cm. Although a clear cut for the burial was not apparent (the soil color changed gradually), the burial was located in very dark brown (10YR 2/2 or 7.5YR 2.5/3) silt loam, surrounded by dark reddish brown (5YR 3/4) clay. With the burial removed, excavation became difficult due to the presence of large boulders, wet soil, and destabilized trench walls due to active gopher activity. Once a flat, earthen surface beneath the burial was detected and cleaned, excavation in this unit ceased.

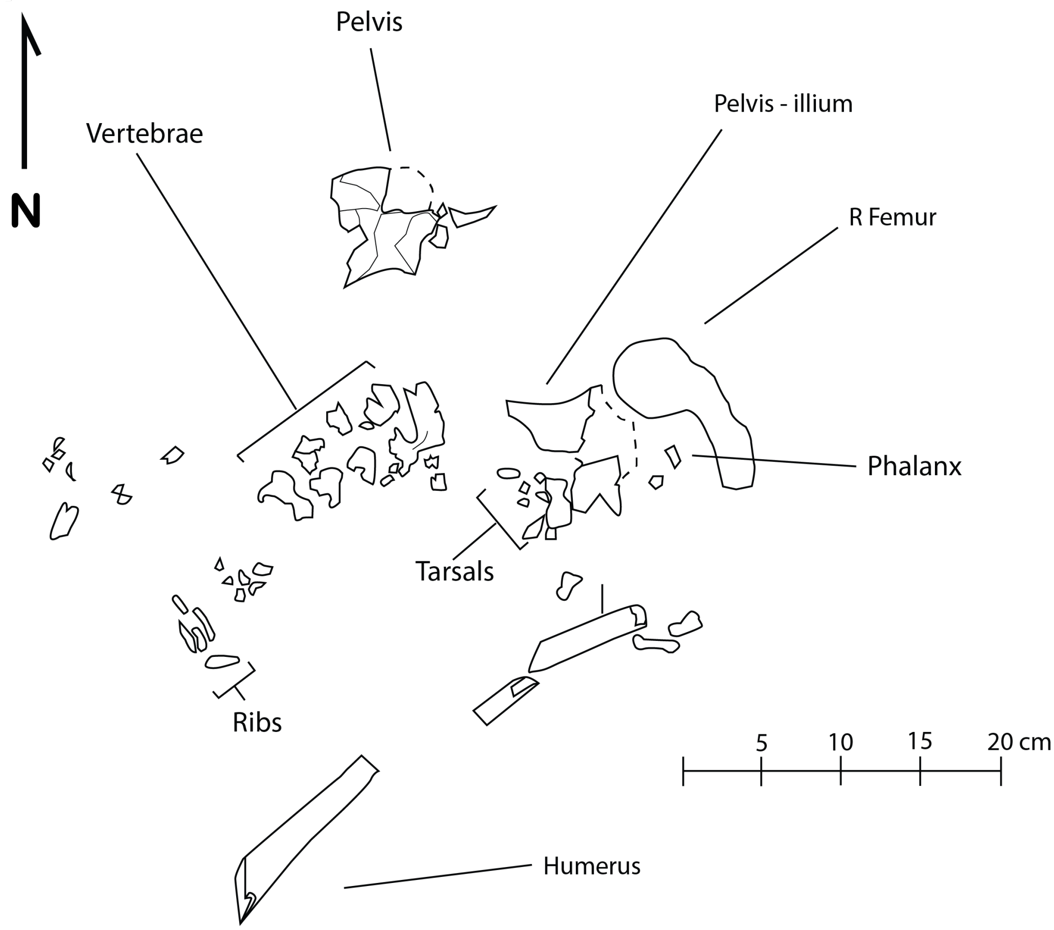


Figure 5.4. Drawing of bottom 13-cm of human burial, designated Rejollada B, Feature 2.

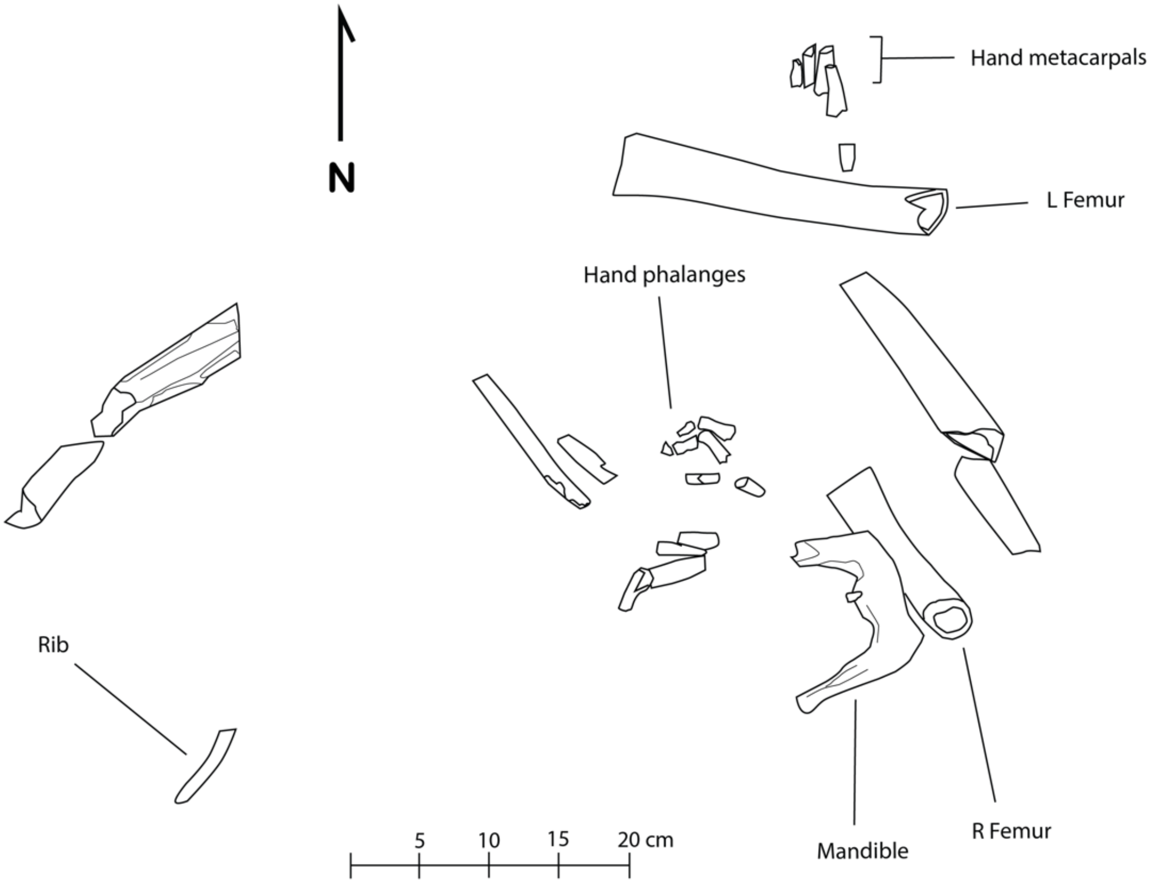


Figure 5.5. Drawing of top 13-cm of human burial, designated Rejollada B, Feature 2.

The location of this burial suggests that people understood the *rejollada* to be a place worthy to inter a beloved family member. Because the burial was so well positioned and carefully interred, it does not match evidence for burials that some archaeologists have suggested might have been sacrifices of witches (Lucero and Gibbs 2007). The people of Yucatán and the wider Maya area often interred their dead under or near their homes. On the other hand, in the current states of Yucatán and Quintana Roo, people often built their houses on top of natural bedrock rises, which complicated the proposition of burying family members within the residential platform. Perhaps for that reason, accounts indicate that during the Colonial period and even until recently, people have buried their dead in domestic gardens and patios (Le Guen 2008:91; Pacheco Cruz 1934:32; Tozzer 1941:130). In the Maya area, there is a symbolic association between bone, seed, and the regeneration of new life (Brown, C. T. 2005:140; Tedlock 1985:114). In the Popol Vuh, for example, the ground bones of the Hero Twins are cast into a river, and on the fifth day, after having germinated, they are regenerated (Carlsen and Prechtel 1991:32; Tedlock 1985:150). Classic period iconography shows human corpses sprouting with vegetation (e.g., Carlsen and Prechtel 1991:32-36; Schele and Mathews 1998:120-123). This symbolic relationship may have contributed to the decision to bury a family member in a *rejollada*, where that person would be left interred in sufficient soil and protected from unintentional disturbance beneath a layer of rock.

Soil Carbon Isotopes

Samples from three *rejolladas* (11 samples from Rejollada A, 10 from Rejollada E; and 7 from Rejollada G; see Table 3.5) were sent to Elizabeth Webb for soil carbon isotope study. As described in Chapter 3, soil carbon isotopes may allow for the detection of intensive maize cultivation within *rejolladas* and their surrounding areas based on the enrichment of ^{13}C in soil organic matter (Webb et al. 2007). The results of this study show a significant ^{13}C-enriched signature in Rejollada E (with a $\delta^{13}C$ value of -16.6‰), while signatures from the other two *rejolladas* result from a mix of C_3 and C_4 vegetation (Figure 5.6).

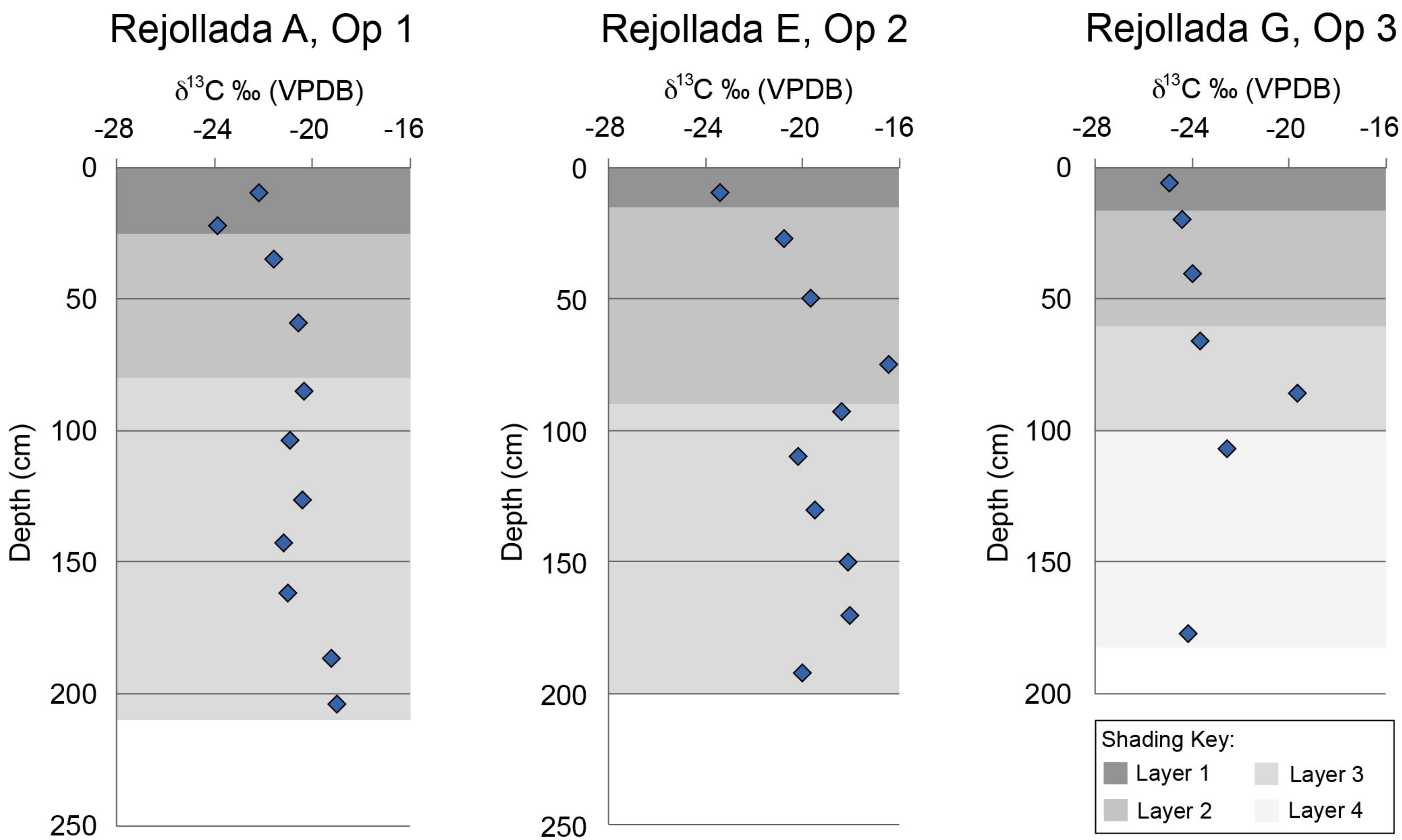


Figure 5.6. Comparison of carbon isotope ratios with depth for soils sampled from three *rejolladas* at Tahcabo. VPDB (Vienna Pee-Dee Belemnite) refers to the standard used in calculating the ratios.

The results of the soil carbon isotope study demonstrate changes in *rejollada* use through time, and differences in the use of each *rejollada*. It appears that Rejollada A, located in the center of town, served predominantly as a space for horticulture and silviculture throughout most of Tahcabo's history. The sample with the strongest signature of maize overall, from Rejollada E, suggests intensive cultivation in that *rejollada* corresponding to the Early Classic period or earlier, since it came from a level (Capa 2D) just beneath the earliest and deepest ceramic sherds found in the unit, though above a shard of glass. The samples from Rejollada G appear to indicate a mixture of input from C_3 and C_4 plants, as expected due to the maize pollen found in the unit (see next subsection). The Rejollada G sample with the most ^{13}C-enriched signature, like the most ^{13}C-enriched Rejollada E sample, came from a level in which were found the earliest and deepest ceramic sherds. It is possible that the most intensive maize production that occurred within the *rejolladas* of central Tahcabo took place during the Early Classic period or earlier. However, this particular Rejollada G sample, from 82-90 cm below the surface, was collected from the east wall rather than from the west wall of the unit near the northwest corner, the location from which all other samples were collected. In other words, it was taken from a location approximately 2 m to the east of rather than from within the sampling column, an inconsistency that should be noted but likely had little impact on the quality of the data, as locations 2 m apart likely would have had comparable vegetation through time.

Pollen

Care must be taken in interpreting the results of pollen study from ten soil samples collected from units within Rejolladas A, E, and G. Apart from the issues of differential pollen preservation mentioned in Chapter 3, there are special considerations when studying pollen found within *rejollada* sediments. Pollen can be transported by water, and in many cases water washes into *rejolladas* on its way to the aquifer. Thus, there could be a great deal of pollen from different time periods and locations relocated into the *rejollada*, and a great deal of mixing of soils occurring within the *rejollada* due to water influxes, especially during extreme weather events such as hurricanes. While pollen found in *rejollada* soil samples may not provide a diachronic view of economic plants used by local residents through time, they can at least lend to a composite view of the types of plants grown in the area, which can be compared to those documented today.

A list of all pollen taxa identified in the ten soil samples from Tahcabo *rejolladas* can be found in Table 5.5 (Appendix J:Table 2). In order to begin to explore differences in the plants documented in the pollen study versus those identified in the contemporary plant survey, I list which of the three *rejolladas* included pollen evidence for each taxon in column 3 of Table 5.5, and I list which of the six *rejolladas* included plants of each taxon based on survey in column 4 of Table 5.5. This comparison can help us to begin to understand both change through time and, to some small extent, the biases of pollen data. For example, see the underrepresentation of spurge, mallow, and legume family plants in the pollen evidence, among other insect- and animal-pollinated plants. Following the presentation of pollen counts for each sample, I provide some information about the characteristics of pollen from the different taxa types before presenting the results of the study specific to each *rejollada*.

Table 5.5. Pollen taxa identified in the Tahcabo sediment samples.

Taxon (Family or genus)	**Common Name**	**Rejollada in which Pollen Detected**	**Rejollada in which Plant Survey Detected**
*Agave**	agave, henequen	A	E
Alismaceae	pickerelweed family	G	
*Alternanthera**	strawflower	A, E, G	E
Asteraceae low-spine*	ragweed type, aster family	A, E, G	A, B, D, E
Asteraceae high-spine*	sunflower type, aster family	A, E, G	A, B, D, E
Borreria	false buttonweed	A, E, G	
Cheno-Am*	goosefoot, pigweed	A, E, G	A, B, D, E
Cyperaceae	sedge family	A, E, G	
Euphorbiaceae*	spurge family	G	A, B, C, D, E
Fabaceae*	legume family	A, G	A, B, C, D, E, F
Gossypium	cotton	E	
Malvaceae*	mallow family	E	A, B, C, D, E, F
Poaceae*	grass family	A, E, G	A, D, E
Polygonaceae*	knotweed family	A, E, G	A, B
Typha	cattail	G	
*Zea mays**	maize	A, G	E
Acacia	acacia	A	
Alchornea	*tapia*	A, G	
Alnus	alder	A	
Anacardiaceae*	cashew family	E, G	A, C, E
Apocynaceae*	dogbane family	E, G	A, D
*Bursera**	gumbolimbo	A	A, D
*Cecropia**	trumpet tree	E	A
*Cedrela**	Spanish cedar	A	A, B, C, D, E
Celtis	hackberry	A, E, G	
*Coccoloba**	*bob*, sea grape	A, E, G	A
Combretaceae*	white mangrove family	A, E, G	A
Haematoxylum	logwood	G	
Hippocratea	provision vine	A	
Hiraea	hiraea	A, E, G	
Loranthaceae	mistletoe family	G	
Moraceae*	*ramón*, breadnut	A, E, G	A, C, D, E, F
Myrtaceae small*	cf. *Eugenia*, stopper vine	A, E	A, B, D
Pinus	pine	A, E, G	
Pithecellobium-type	blackbead, monkeyear	A	
Quercus	oak	E	
Salix	willow	A, G	
Sapotaceae*	sapote family	E	A, C, E
*Spondias**	hogplum, *ciruela*	A, E	A, B, C, E, F
Rhizophoraceae	red mangrove family	A, E, G	
Zanthoxylum	prickly ash	A, G	

* also documented in *rejollada* plant surveys

Nine out of the 10 sediment samples yielded 200-grain pollen counts, though pollen preservation ranged from poor to very good (Table 6.6; Appendix J:Table 3). For example, hardy Cheno-Ams (referring to either chenopod- or amaranth-family pollen) were over-represented in the sample, but occasionally fragile pollen grains were also found (e.g., Alismaceae and *Pithecellobium*), suggesting a good level of preservation in some samples. The one sample for which pollen concentrations were too low for acceptable study (Rejollada A, Capa 3D; calculated to be 193 grains per mL of sediment) was a soil sample excavated from approximately 140 cm below the surface. Pollen did not preserve at this depth. In the other nine samples, forty-one total pollen taxa were identified, including 16 non-arboreal and 25 arboreal taxa.

Table 5.6. Pollen counts from Tahcabo sediment samples organized by *rejollada*, with the depth of each sample (in cm below the surface) indicated in the header.

	Rejo A (Op 1)			**Rejo E** (Op 2)		**Rejo G** (Op 3)			
Plant Taxon	57-62	30-45	3-15	35-55	15-35	55-75	30-50	15-30	0-15
Domesticates									
agave (*Agave*) * ‡			1						
cotton (*Gossypium*) * ‡				1					
maize (*Zea mays*) *			1			1		2	3
Weedy Species									
false buttonweed (*Borreria*) ‡			1		1				1
goosefoot, pigweed (cheno-am) ◊	26	50	42	60	44	23	13	14	26
grass family (Poaceae) ◊	26	28	11	38	18	17	22	13	25
joyweed (*Alternanthera*) ‡	4	6	36	2			2		2
knotweed family (Polygonaceae) ◊	5	9	2	2	1	2	2	3	4
legume family (Fabaceae)	7		1			3			4
mallow family (Malvaceae) ‡				2	3				
ragweed type (Asteraceae) ◊	48	48	44	54	56	68	87	87	59
sunflower type (Asteraceae) ◊	13	13	8	10	28	36	27	34	10
spurge family (Euphorbiaceae)							1		
Wetland Herb									
cattail (*Typha*) ◊							1	2	
pickerelweed family (Alismaceae) * ‡								1	
Swamp Forest									
bob, sea grape (*Coccoloba*) *	11	7	7	1	8	4	6	9	10

Plant Taxon	Rejo A (Op 1) 57-62	30-45	3-15	Rejo E (Op 2) 35-55	15-35	Rejo G (Op 3) 55-75	30-50	15-30	0-15
bullet tree family (Combretaceae) ◊		2		5		3	6	1	5
gumbolimbo (*Bursera*)			1						
leather fern (*Acrostichum*)									1
logwood (*Haematoxylum*) * ‡									1
red mangrove family (Rhizophoraceae) ‡	2	3	3	1					1
sedge family (Cyperaceae) ◊	2	2	7	3	3	5	2	4	3
watermoss (*Salvinia*)	1						4	2	
willow (*Salix*) ◊	4		1			1	2		
Well-Drained Forest									
acacia (*Acacia*) ‡	12		4						
blackbead (*Pithecellobium* type) ‡	1		3						
cashew family (Anacardiaceae) * ‡					1			1	
dogbane family (Apocynaceae) ‡				1			1		
hackberry (*Celtis*)		2			1	1			2
hogplum (*Spondias*) * ‡	1	1	3		2				
Spanish cedar (*Cedrela*) * ‡	5								
prickly ash (*Zanthoxylum*) ‡		2	1				1		1
ramón family (Moraceae) * ◊	8		2	2	8	13	7	13	15
sapote family (Sapotaceae) * ‡				2					
stopper vine (Myrtaceae, small) *	1				1				
trumpet tree (*Cecropia*)					2				
Long-Distance Tree Pollen									
alder (*Alnus*)		1							
pine (*Pinus*) ◊	2		1	1	2	4	2		4
oak (*Quercus*) ◊				2	1				
Miscellaneous Arboreal									
hiraea (*Hiraea*)	2	3	1	3			1		2
mistletoe family (Loranthaceae)							1		
provision vine (*Hippocratea*)	1								
tapia (*Alchornea*)	1					3		2	
Indeterminate	18	24	21	10	20	16	16	14	22
Total Pollen Count	**200**	**201**	**202**	**200**	**200**	**200**	**200**	**200**	**200**
Lycopodium Tracers	532	651	173	657	520	532	209	204	138
Concentration Value	2030	1667	6305	1644	2077	2030	5167	5294	7826

* known economic value
◊ probable pollen rain

Pollen Characteristics. Pollen grains from three domesticates were found within the samples: maize, cotton, and agave. Maize pollen is easily distinguishable from other grass pollen grains and tends to be larger than other grass pollen. Cotton pollen is easily distinguishable but tends to be scarce because few grains are produced and the plant is insect-pollinated. Agave pollen is also insect-pollinated, and so also tends to be scarce.

Weedy species included members of the aster, chenopod, amaranth, and grass families. Plants in these families tend to be wind-pollinated, producing abundant pollen. For example, the aster family composes the largest family of flowering plants and produces durable pollen. The plants that make up the family consist of herbs, ornamental flowers, and shrubs that are often encountered in open fields. Strawflower, or the *Alternanthera* genus within the amaranth family, on the other hand, is actually insect-pollinated and was found in the samples, suggesting that the *rejolladas,* and especially Rejollada A, provided environments in which the plant thrived (Table 5.6; Appendix J:455). Grass family pollen is common in most samples from disturbed environments. All grasses are wind-pollinated and produce great quantities of distinctive pollen.

The two types of definitively wetland taxa represented by pollen in the samples were the pickerelweed family and cattail, both found in Rejollada G. The pickerelweed family plants prefer permanent wetlands and marshes. Pickerelweed family pollen grains found in the *rejollada* samples likely represent arrowhead (*Sagittaria* sp.), a common marsh weed with edible tubers (Appendix J:444). Cattails prefer phosphate-rich wetlands (Appendix J:445). Many parts of the plant are edible, including the pollen, which is calorie-rich (Gibbons 1962). Wind-pollinated, cattail produces abundant, distinctive pollen, but the grains are moderately fragile.

Arboreal pollen from the samples include taxa of the swamp forest, taxa preferring well-drained soils, and taxa with pollen that travels long distances. Swamp forest taxa "prefer to have their roots at or near the water table," though some can also occur in well-drained forest settings (Appendix J:445). These include gumbolimbo, *bob* or sea grape, bullet tree, logwood, willow, red mangrove, waterwood, and water-loving ferns including leather fern and watermoss. Trees that prefer well-drained soils include cashew family, dogbane family, trumpet tree, Spanish cedar, hackberry, *ramón*, *guayaba*, allspice, sapote family, hogplum, and prickly ash. Most well-drained forest species are insect-pollinated and thus they are generally underrepresented in pollen samples. The taxa mentioned here that are wind-pollinated include trumpet tree, *ramón*, and stopper vine (Appendix J:446). Arboreal taxa with pollen that can travel hundreds of miles include pine, oak, and alder. While these taxa can be found in low numbers in eastern Yucatán, they tend to prefer highlands such as the Puuc hills in western Yucatán, as well as highlands further afield in Guatemala and Belize. Distant highland stands could be the source for the pollen found in the *rejollada* samples (Appendix J:444).

Rejollada A. Pollen from crops in the Rejollada A samples included a single maize pollen grain and a single agave pollen grain, "almost certainly representing historically cultivated henequen" (Appendix J:455). Neither of these crops were recorded in Rejollada A during the plant surveys. Potential economic tree pollen found in Rejollada A samples included Spanish cedar (timber, medicine), *bob* or sea grape (food, construction), hogplum (food), and myrtle family (Myrtaceae; possibly *guayaba* or allspice; food). All of these (Spanish cedar, *bob*, hogplum, and *guayaba*) were found in the Rejollada A plant surveys.

Acacia was well-represented in the Rejollada A pollen samples, and the significant presence (6% occurrence; Appendix J:455) of this ordinarily rare pollen suggests that an acacia tree was located near the sampling location. However, we did not record acacia in our plant surveys, so the pollen must represent past vegetation. The presence in Rejollada A of a watermoss (*Salvinia* sp.) spore, transported only in water, suggests that water was located in or near the *rejollada* during sediment deposition (Appendix J:455), or that it was transported in water that ran through the *rejollada* at some point after deposition. Overall, pollen evidence from Rejollada A suggests similarities in economic tree species growing in the area through time, along with evidence for the cultivation of maize, agave, and additional economic trees not grown in the *rejollada* today.

Rejollada E. The samples from this unit were dominated by pollen rain, reflecting a fairly open or disturbed environment. Economic taxa in the deeper of two samples included a single cotton (*Gossypium* sp.) pollen grain. During the plant surveys, we did not document any cotton growing in Tahcabo, and it rarely is grown in the region today, despite its historical economic significance. Cotton pollen is large, heavy, and pollinated by insects, and is thus rare, but might be deposited in a field area (Lavold 1997). Wild and domesticated cotton grains are largely indistinguishable, so it is possible that the grain could represent a wild plant, but this is unlikely due to historical records indicating widespread cotton production in the area as well as the distance from the coast, where wild cotton would be more commonly found (Appendix J:457). The sample with the cotton pollen grain was taken from a level in which the earliest and deepest ceramics in the unit were found, just 20 cm above the carbon isotope sample with a signature of intensive maize production. Both lines of evidence likely date to the Early Classic period or before.

Evidence for economic tree species in the Rejollada E pollen samples included two sapote family (e.g., *chicle*, *caimito*, *zapote*, *mamey*, etc.) pollen grains and two hogplum pollen grains. There is a hogplum tree located next to the location of the excavation unit today, so it is unclear whether this pollen reflects the modern vegetation. No sapote family trees were documented in Rejollada E during the plant surveys. Overall, pollen evidence from Rejollada E, especially when considered along with the soil carbon isotopes, suggests that the *rejollada* was maintained as a fairly open area used for the more intensive cultivation of sun-loving crops and fruit trees during intervals in the past.

Rejollada G. Three out of four samples in the Rejollada G excavation unit contained maize pollen. Other pollen in the samples represented mostly non-economic forest taxa, in addition to the potentially economic trees *bob* (*Coccoloba* sp.) and *ramón* (Moraceae). A single pickerelweed family pollen grain was found, possibly representing arrowhead (*Sagittaria* sp.)—an edible tuber that grows in marshy environments (Appendix J:444). Overall, aquatic taxa such as cattail, watermoss, and willow were common in the samples from Rejollada G, suggesting that the *rejollada* frequently held water. While we did not survey contemporary vegetation in Rejollada G, it was forested at the time of excavation and there was no maize growing, nor was there standing water (though excavation took place during the dry season). Because Rejollada G is further out of town today than the other *rejolladas* excavated, it is not currently used for gardening.

Interpretations and Conclusions

This chapter provides evidence that similar strategies for *rejollada* use were implemented through time, with certain *rejolladas* demonstrating a propensity for ritual use or crop (maize, cotton, and grass) cultivation. Even as populations changed drastically through time, characteristics of certain *rejolladas*, or perhaps more accurately the actants composing *rejollada* assemblages, seemed to shape human behavior within them. For example, the excavation unit in the *Ch'a' Cháak rejollada* (Rejollada B) had denser artifacts throughout, dating to all time periods, including evidence for contemporary ritual and feasting activities as well as an ancient human burial. As another example, very few artifacts were found in the Rejollada E excavation unit from any time period, and yet samples from the *rejollada* provided the best evidence for specialized agricultural production in the past and today, along with pollen indicative of a more open, sunny environment. Rejollada D hosts biodiverse plant cultigens today (Figure 5.7) and thick top layers of soil appropriate for cultivation, along with a rock alignment 155-cm beneath the surface indicating that use of the *rejollada* for horticulture may have begun during the Early Preclassic period.

Figure 5.7. A view into Rejollada D (photograph by Patricia A. McAnany).

Interviews with today's *rejollada* owners provided complementary insights to those pieced together by means of *rejollada* excavation and soil study. Tahcabo residents today maintain knowledge about the needs of different plants and how they fit into broader landscape rhythms. They told us about the factors, including the characteristics and actants at play within diverse *rejolladas*, that they consider when deciding which livelihood strategies to pursue on the lands to which they have access. The livelihood decisions that they make can be seen as relational, in that they depend on relationships with family members, animals (wild and kept), spirits, soils, weather patterns, seeds, moon cycles, markets, and even government programs and representatives. Farmers negotiate among these components of the landscape as they differentially exert influence on humans and each other. More specifically when it comes to the use of *rejolladas*, farmers must consider the varying opportunities and drawbacks provided by sun and shade conditions, irrigation, locations in relation to infield and outfield strategies, and possibilities for flooding. Today, farmers make calculations related to the lack of labor available to spend on plant cultivation due to their own and family members' participation in wage labor pursued locally or in cities near and far.

The chronological resolution of cultivation practices within *rejolladas* was not as high as I had hoped when embarking on this study. While the soils within *rejolladas* seemed to follow similar stratigraphic trends across units, we found Middle Preclassic to Early Classic period ceramic sherds throughout soil profiles (likely in part due to ongoing erosion of soils containing these sherds), while late Colonial period charred wood found its way to varying soil depths (due to heavy burning at this time, as well as preservation issues and soil mixing). On the other hand, certain consistencies in the findings across *rejolladas* indicated that some degree of stratigraphic integrity existed, as evidence for intensified *rejollada* use seemed to occur repeatedly in levels associated with deeper contexts containing Early Classic period or earlier ceramic sherds, and features were found relatively intact and, in some cases, associated with ancient wood seemingly protected by limestone boulders.

The Late Preclassic to Early Classic period in Tahcabo was a time of high population density, and residents of what is now the town land of Tahcabo made intensive use of *rejolladas* to grow maize, cotton, and economic tree species, and even decided to bury a family member within one *rejollada*. Nonetheless, similar evidence does not exist dating to the Colonial period, another time when population densities would have been higher due to *reducción* policies and late colonial population growth. One possible exception to the lack of pollen or soil carbon isotope evidence for intensive *rejollada* use during the Colonial period is the charred wood found dating to the late Colonial period. In addition, three out of five *rejollada* excavation units contained Colonial period sherds. Overall, however, it seems that Colonial period populations did not make use of *rejolladas* to the same extent that Late Preclassic to Early Classic period populations did, even though *rejolladas* could have been extremely useful for the cultivation of cotton and maize, both demanded as tribute.

Likely, aspects of life constituting the slow violence of colonialism can help to explain why *rejolladas* did not play a bigger role in colonial livelihood strategies at Tahcabo. First of all, Tomás López Medel's *ordenanzas* demonstrate that Spaniards did not wish for indigenous communities to grow crops or maintain forested areas in town—this did not match their expectations for what settled community life should entail (Ancona 1889). During the early Colonial period, Spaniards likely discouraged indigenous populations from using *rejolladas*, especially as they worried that town residents might grow the *balche'* trees that contribute to an alcoholic beverage used in non-Catholic ceremonies (Chuchiak 2003). While they would have been encouraged to grow select plants and trees around the home, *rejollada* use may have been discouraged. Another element of slow violence would have been the extreme demands on residents' time as they sought to meet tribute requirements. As the interviews about *rejollada* use demonstrated, to maintain a diverse array of plants or to produce crops intensively within *rejolladas* requires a great deal of labor, which early colonial town residents likely would not have been able to spare. In the next chapter, I present evidence from residential areas related to the livelihood strategies that Tahcabo residents selected throughout the Colonial period.

CHAPTER 6:

COLONIAL PERIOD RESIDENCES AND EVIDENCE FOR CHANGING LIVELIHOOD STRATEGIES AT TAHCABO

Farmers in rural Yucatán negotiated and resisted the impacts of colonialism through their everyday livelihood decisions, which took place, as we saw in previous chapters, within rich landscapes populated with human and non-human actants. This chapter explores evidence of changes in livelihood activities based on the excavation of four residential areas, and begins to consider the strategies that people used to maintain autonomy or achieve other ends not necessarily in line with the objectives of Spanish policy. The next chapter outlines the strategies further, compares them to practices detected at other colonial sites, and considers the long-term implications of such decisions amid the slow violence of colonialism.

This chapter introduces, in chronological order, the Colonial period residential areas excavated at what is now the outskirts of Tahcabo, providing an in-depth look at the artifact densities and special artifact classes found at each house (Tables 6.1-6.2). Next, it explores the lines of evidence that help us to compare the houses side-by-side and deepen our understanding of changes through time. These include AMS dates, occurrences of rarer Colonial period ceramic types, analysis of vessel forms and rim diameters, and charred seeds identified from each residential area.

Table 6.1. Residential excavation summary table.

	Colonial Timeframe			
	Early **Str 206**	Middle **Str 317**	Mixed **Str 407**	Late **Str 403**
Vol. excavated (m^3)	26	18	12	12.5
Mean no. ceramics/m^3	742	229	451	669
Mean wt. (g) ceramics/m^3	2466	866	1274	3265
Total no. grinding tools	1	4	4	28[a]
Grinding tool types	*mano*	*metate*, *mano*, ball, pestle	*mano*	*metate*, *mano*
Total wt. (g) animal bone	2,140	90	418	14
Total no. marine shell	39	21	63	24
Total wt. (g) debitage	3,664	958	1,166	414
Total ct. lithic debitage	555	209	247	83
Projectile points?	Y, n=50	N	Y, n=2	N
Total no. of metal pieces	13	9	362	18
Metal finds	copper alloy axe fragment, copper alloy sheet, L-shaped iron nail, hematite nodule	cast iron nail	cast lead bullet	cast lead bullets, cast iron scissors, cast iron keys, silver coin, L-shaped nail
Special artifact classes	bark beater; spindle whorl; ceramic “ridged ovoid” net weights; censer fragments; shell, bone, stone beads; ceramic spheres (~13 mm diam)	beehive plug and plug fragments; burnishing stone	stone and ceramic spheres (~13 mm diam); stone, ceramic beads	burnishing stone, old glass bottle (broken up and distributed across residential area)
Small finds from heavy fraction	hematite bead, net weight, sphere	cast lead bullet		mano fragment, glass bead
Average depth to bedrock	Varied widely	20 cm	30 cm	20 cm

[a] Many *manos* were found fragmented, so the total number of tools may be closer to 10.

Three of the four residences considered in this chapter were situated on top of platforms originally dating to the Middle Preclassic through Early Classic periods. The size of such platforms and extent to which they were remodeled during their re-use varied through time. The early Colonial period residence was found atop a large platform, with earlier features of the platform, such as room foundations and plaster floors, left for the most part intact. Meanwhile, the middle and late Colonial period residences more thoroughly impacted the smaller platforms that they adopted for their living spaces.

Table 6.2. Summary of counts, weights, and percentages of ceramic sherds from each residence by type, organized chronologically.

Colonial timeframe		Early				Middle				Mixed				Late			
Structure number		**206**				**317**				**407**				**403**			
Chrono	Type	No.	%	Wt.	%	No.	%	Wt.	%	No.	%	Wt.	%	No.	%	Wt.	%
Recent	All					3	0.15	2	0.02	5	0.24	7	0.10	22	0.45	44	0.17
Colonial	Columbia	1	0.01	17	0.05					1	0.05	9	0.13	2	0.04	26	0.10
	Olive Jar					1	0.05	233	2.57					6	0.12	150	0.59
	Oxcum	5	0.06	36	0.11									1	0.02	4	0.02
	Sacpokana	329	3.75	2190	6.58	176	8.88	888	9.80	147	7.07	600	8.77	140	2.86	1127	4.47
	San Luis B					1	0.05	3	0.04	3	0.14	4	0.06				
	San Luis Pol									1	0.05	`	0.01				
	Yuncu	5326	60.78	18698	56.16	1431	72.2	6550	72.26	1269	61.09	3566	52.13	4,336	88.69	22105	87.62
	Yuncu: Texti					52	2.62	180	1.98	80	3.85	405	5.91	172	3.52	647	2.57
COLONIAL TOTALS		**5661**	**64.6**	**20941**	**62.9**	**1661**	**83.8**	**7854**	**86.65**	**1501**	**72.25**	**4584**	**67.01**	**4657**	**95.25**	**24059**	**95.37**
Postclassic	Chen Mul	49	0.56	231	0.69												
	Mama	42	0.48	251	0.75												
	Navula	29	0.33	217	0.65					1	0.05	1	0.03				
	Tecoh	3	0.03	9	0.03												
L-T Class[a]	Balancan									1	0.05	5	0.07				
	Encanto	3	0.03	12	0.04												
	Muna Slate	3	0.03	38	0.12	2	0.1	9	0.10	6	0.29	92	1.35				
	Piste	7	0.08	33	0.10	1	0.05	3	0.03								
	Tekit					1	0.05	2	0.02								
	Yokat					22	1.11	53	0.58								
E-T Class[b]	Arena Red													1	0.02	1	0.00
	Batres Red	14	0.16	56	0.17									3	0.06	6	0.02
	Cetelac	45	0.51	107	0.32	2	0.1	2	0.03	17	0.82	59	0.86	2	0.04	21	0.08
	Maxcanu	6	0.07	45	0.14					2	0.10	7	0.10	3	0.06	16	0.06
E Classic	Fango	3	0.03	15	0.04	1	0.05	3	0.03					1	0.02	8	0.03
	Huachinango	41	0.47	170	0.51	3	0.15	49	0.54	31	1.49	166	2.43	6	0.12	98	0.39
	Polvero					1	0.05	3	0.03								
	Saban	957	10.92	2698	8.10	84	4.24	263	2.90	113	5.44	326	4.77	29	0.59	147	0.58
	Shangurro	12	0.14	40	0.12												
	Timucuy	25	0.29	234	0.70	1	0.05	70	0.77								
	Tituc Orange	16	0.18	92	0.28	4	0.2	26	0.29	12	0.58	27	0.40	2	0.04	4	0.02
	Tixmas	1	0.01	11	0.03												
	Xanaba	17	0.19	116	0.35	1	0.05	5	0.06	2	0.10	12	0.18				

Colonial timeframe		Early				Middle				Mixed				Late			
Structure number		**206**				**317**				**407**				**403**			
Chrono	Type	No.	%	Wt.	%	No.	%	Wt.	%	No.	%	Wt.	%	No.	%	Wt.	%
M Pre-EC[c]	Carolina	28	0.32	136	0.41	6	0.3	12	0.14	5	0.24	16	0.23	2	0.04	21	0.08
	Chancenote	592	6.76	2551	7.66	59	2.98	237	2.61	136	6.54	559	8.17	38	0.78	198	0.79
	Dzilam Ver	214	2.44	1580	4.74	5	0.25	29	0.31	16	0.77	99	1.44	25	0.51	175	0.69
	Habana Club	173	1.97	730	2.19	2	0.1	7	0.07	3	0.14	14	0.20	11	0.22	71	0.28
	Sierra Red	9	0.10	36	0.11	6	0.3	14	0.15	2	0.10	46	0.68	4	0.08	39	0.15
	Tancah									3	0.14	110	1.61				
	UnID Bichr									1	0.05	0.09	0.00				
M-L Pre[d]	Bakxoc	8	0.09	70	0.21					1	0.05	7	0.10				
	Canaima	2	0.02	21	0.06												
	Chunhinta	132	1.51	445	1.34	7	0.35	26	0.29	8	0.38	23	0.34	4	0.08	15	0.06
	Dzocobel	6	0.07	19	0.06	4	0.2	11	0.12								
	Dzudzuquil	241	2.75	998	3.00	20	1.01	73	0.81	31	1.49	86	1.26	26	0.53	97	0.39
	Guitara	2	0.02	7	0.02	1	0.05	1	0.01					3	0.06	12	0.05
	Joventud	115	1.31	423	1.27	32	1.61	109	1.20	24	1.15	112	1.64	19	0.39	73	0.29
	Kuche	5	0.06	41	0.12					3	0.14	5	0.08	1	0.02	9	0.03
	Laguna Ver													1	0.02	21	0.08
	Majan	15	0.17	163	0.49	7	0.35	48	0.53	15	0.72	77	1.13	8	0.16	46	0.18
	Mateo									1	0.05	4	0.05				
	Nacolal	6	0.07	22	0.07	1	0.05	9	0.10	1	0.05	14	0.21				
	Pital	2	0.02	6	0.02												
	Petjal					1	0.05	3	0.03								
	Sierra Light					7	0.35	29	0.32								
	Tamanche	1	0.01	6	0.02												
	Tipikal	5	0.06	31	0.09	1	0.05	8	0.09	1	0.05	2	0.03				
	Totoh					1	0.05	3	0.04								
	Tumben					2	0.1	8	0.09								
	Unto	7	0.08	12	0.04	2	0.1	4	0.04								
No ID		266	3.04	685	2.06	31	1.56	89	0.99	137	6.59	382	5.59	21	0.43	47	0.19

[a] Refers to the Late to Terminal Classic period
[b] Refers to the Early to Terminal Classic period
[c] Refers to the Middle Preclassic through Early Classic periods
[d] Refers to the Middle to Late Preclassic period

Evidence from the four residential areas explored here forms the basis for the arguments I make about Colonial period livelihood strategies. Materials changed drastically across houses over this long span of time—early colonial residents had copper alloy tools, crafted chert projectile points on site, and accessed molded ceramic implements for specialized activities including the spinning of cotton thread used to meet tribute quotas. Late colonial residents made use of iron tools and firearms, Spanish currency, and high quantities of large jars and maize grinding tools. These material changes provide insights into changing strategies and conditions as populations living at the outskirts of town negotiated the political, economic, social, and institutional upheavals that accompanied Spanish colonialism. Tahcabo residents employed and experimented with strategies such as hunting and collecting to maintain livelihood flexibility and mobility, as well as with food sharing and ceramic stockpiling to promote community well-being.

Description of Each Residential Area

In this section, I provide a description of each house excavated that had a significant Colonial period component (see Table 6.2; Figure 6.1). I present the residential areas in chronological order according to my assessment of the evidence encountered at each. Throughout the chapter I explain the lines of evidence—including ceramic types, special finds, and AMS dates—that contribute to the dating of residences. As an introduction to each house, I present platform dimensions, any architecture detected, and the location of the residence in relationship to known features such as roads and *rejolladas*. After the initial description of each house, I present mapped density distributions of ceramics and other artifacts and describe special finds. When I refer to Colonial period contexts in the text, I mean excavated levels in which at least 75% of ceramics by count and weight dated to the Colonial period.

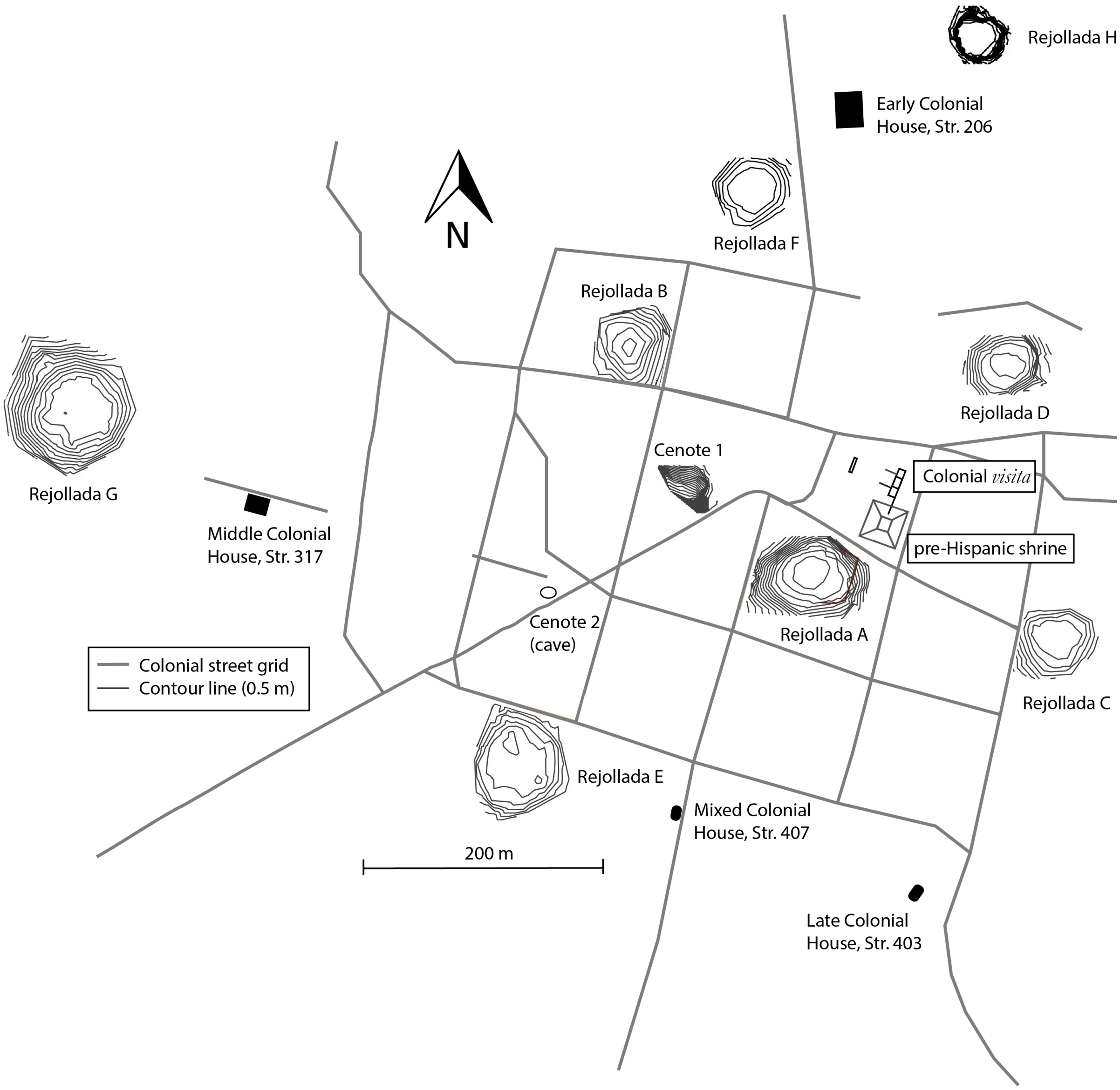


Figure 6.1. Locations of Colonial period residences in relation to other Tahcabo features.

Early Colonial House

Structure Configuration and Location. Structure 206 is a substantial platform built originally during the Middle Preclassic through Early Classic periods. Its lateral extent (22 m by 20 m) and height of about 1 m above the surrounding ground surface exceed the dimensions of the other platforms to be considered here (Figure 6.2). Like many structures in the area, Structure 206 sits atop a natural bedrock rise, which was filled in and expanded using primarily cobbles and stones mixed with dirt. A road runs roughly north-south approximately 25 m west of Structure 206. The road leads to Hacienda Yokpita, used today for cattle ranching, but operated during the late Colonial through National periods as a sugar plantation. Just across the road from Structure 206 can be found Structure 515, about 35 m distant and directly to the west—this is another large platform similar in construction that was likely used during the Middle Preclassic through Early Classic periods.

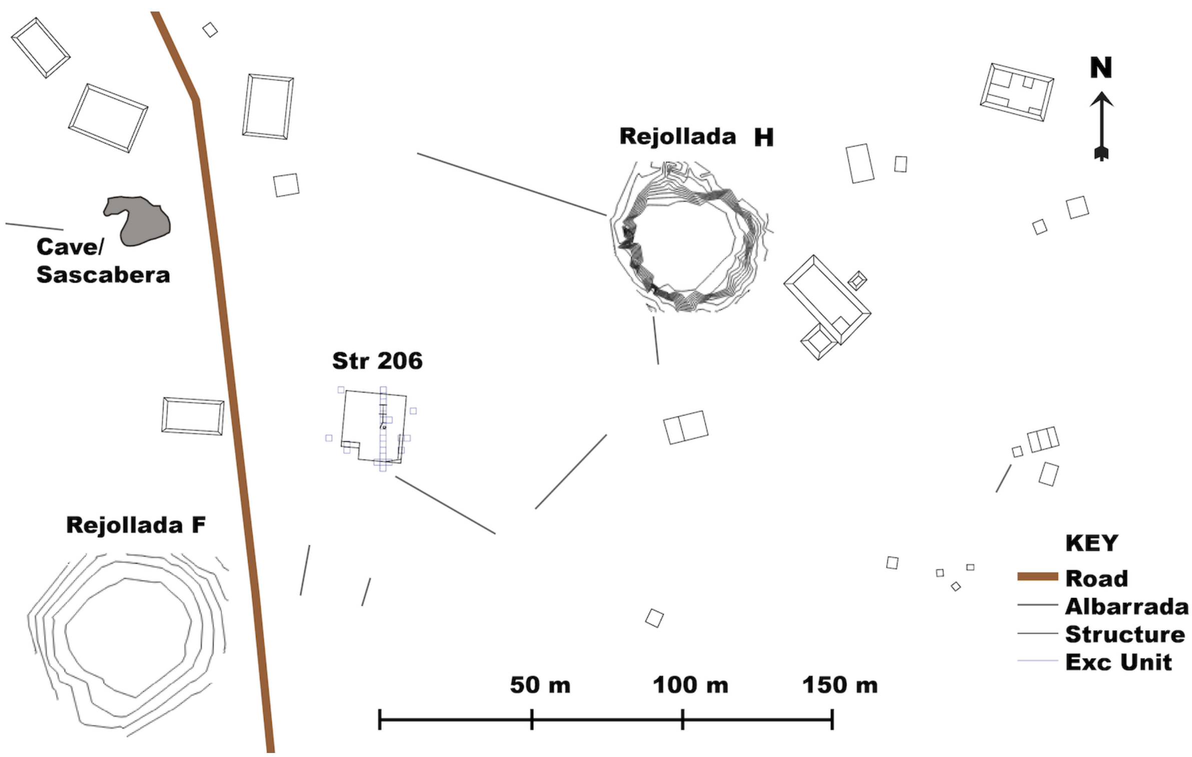


Figure 6.2. Structure 206 in relation to other features in northern Tahcabo.

Approximately 80 m northeast of Structure 206 can be found Rejollada H (Figure 7.2), which is a *rejollada* with steep rock cliffs for walls and an overhang along the south side wall that people use today for hunting paca during moonless nights. Interestingly, the *albarradas* (dry-laid rock walls) we mapped during survey of the area, which may well date to more recent times than the Colonial period, seem to connect Structure 206 and Rejollada H by creating an enclosure that includes both. Sixty meters southwest of Structure 206, and across the road, can be found Rejollada F, which is relatively shallow but contains an ancient well at its base. About 80 m northwest of Structure 206 can be found a cave where harvesting of limestone and *sascab* took place in the past.

More so than at the other structures considered here, architecture dating to the early periods survived, including some room wall foundations, conserved plaster or packed marl floors, and even a circular stone formation around a cached ceramic sherd with repair hole, and a possible pit for a human burial (left unexcavated; Figure 6.3). All of these architectural remains could be found in our axial trench crossing the surface of the platform, while the platform retaining walls remained difficult to discern, as was the case at the other structures as well. Along the south side of the structure, in at least two instances, it was possible to see pits where large boulders that once formed part of the retaining wall had been removed for other uses.

Along the south side of the early platform, on top of bedrock at the base of the platform retaining wall, we found a cache dating to the Postclassic or Colonial periods (Figure 6.4). Midway along the wall in Unit C11, we found a Navula Unslipped censer with tripod feet, while adjacent in Unit C12 we found fragments of a Chen Mul Modeled censer, including an elbow resting on bedrock and other elements including a nose in the fill. In an area just above the Navula censer we found a fragment of a copper alloy axe (see more in the section on special finds, below). These artifacts, commonly dated to the Postclassic period, may have been offerings left at that time, as found at many sites (e.g., Chase and Chase 2006:186), or they may have been heirlooms or pottery types that continued in use and circulation that were deposited by the early Colonial period platform residents (Hanson 2008:1508).

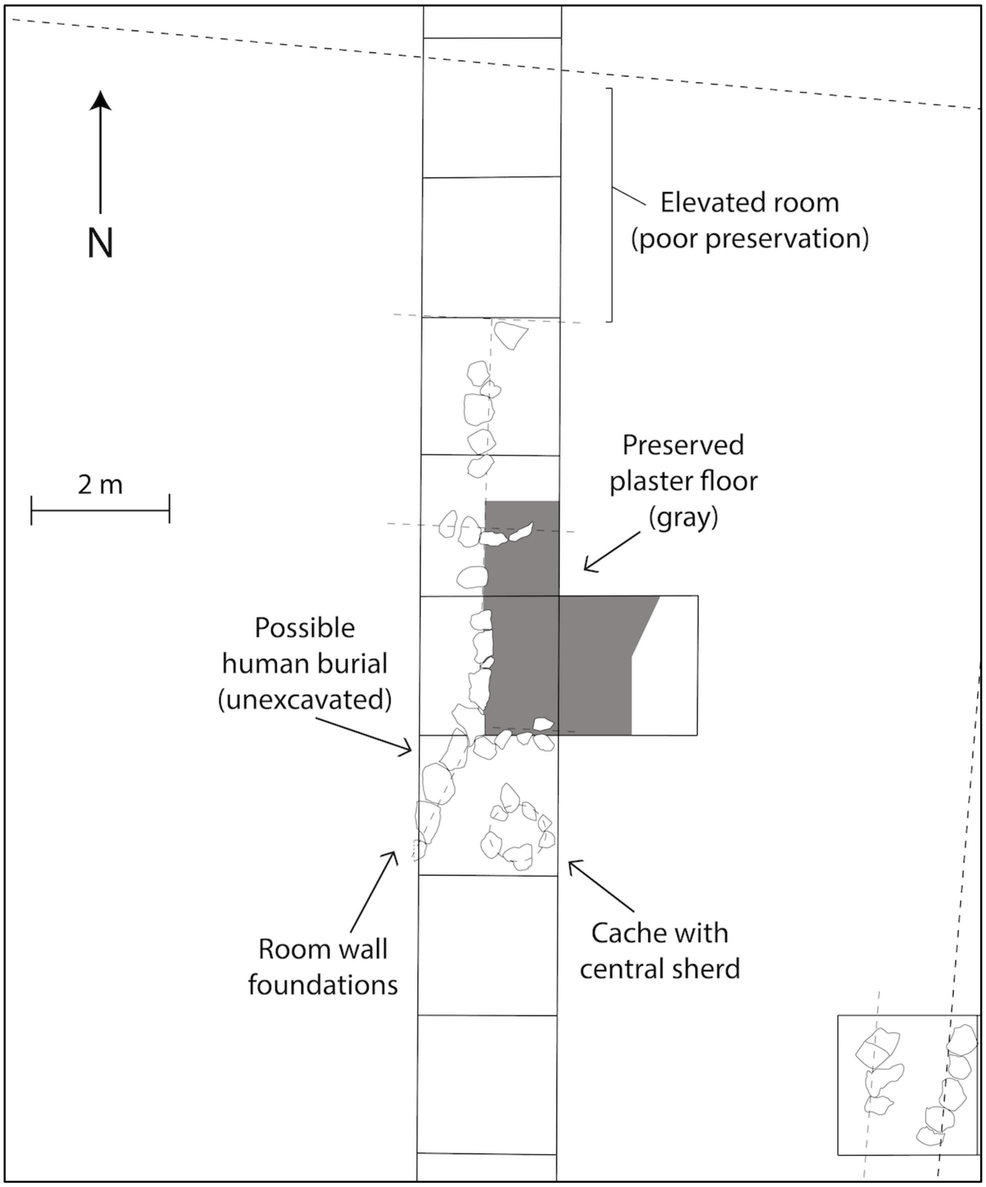


Figure 6.3. Early architecture that survives on top of Structure 206.

We also found small quantities of Postclassic sherds mixed into other contexts with Colonial period sherds around the edge of the platform. I included them in the calculations of Colonial period sherds for the Structure 206 density maps to follow, because likely these types were still in use during the early Colonial period. For example, Hanson (2008:1423) found Mama Red and other Postclassic sherd types in the same contexts as Colonial types such as Yuncu Unslipped and Olive Jar sherds. Postclassic ceramic types found around the base of Structure 206 in small quantities and mixed together with Colonial period ceramics included Mama Red, Navula Unslipped, Chen Mul Modeled, and Tecoh Red on Cream. In most cases, the Postclassic period types were found at least 10 cm below the ground surface, suggesting that they coincided with the earliest component of the early Colonial period residence. They were found in low enough quantities not to suggest a separate, earlier occupation during the Postclassic period (Table 6.2; Appendix G).

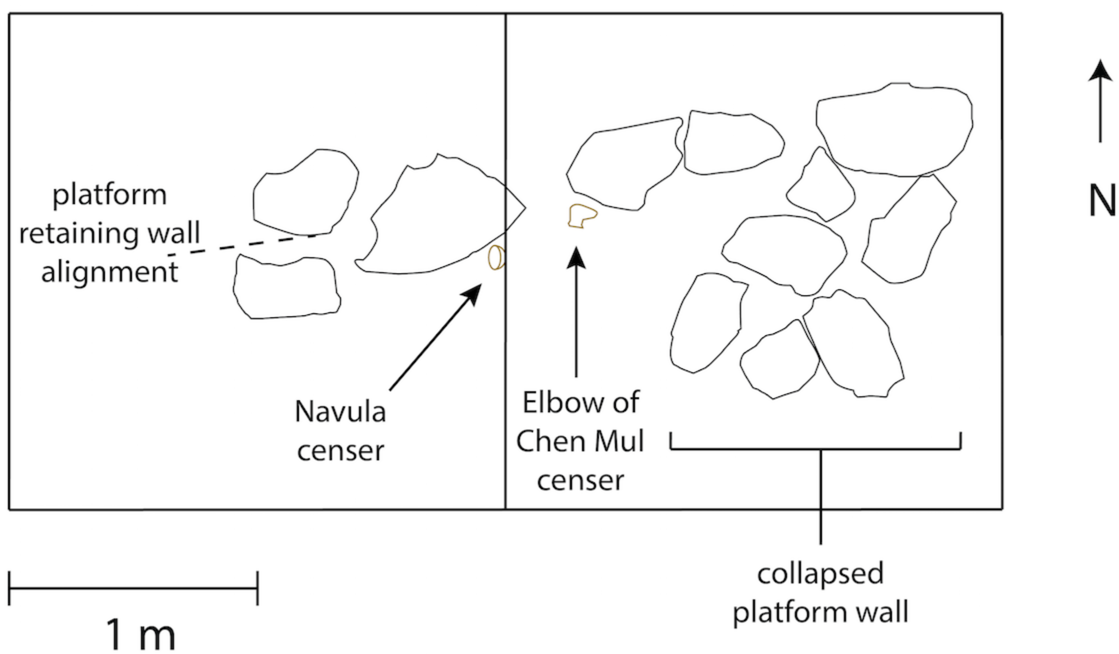


Figure 6.4. Cache at south side of Structure 206

As seen in Table 6.1 (“Average depth to bedrock”), the depth to bedrock varied at Structure 206 more so than at other structures. In Units A11-B11, for example, bedrock could be found well within 10 cm of the surface, to the extent that Unit A11 was basically non-existent and omitted from the map. Bedrock was also very shallow in some units on top of the platform. In Units G15 and E14, however, we did not reach bedrock until about 50 cm below the surface, and it continued deeper. Many units fell somewhere in between, with a depth of about 25-30 cm before bedrock was exposed across the unit. That depth can help to explain why the total volume excavated at Structure 206 was much greater than that of the other structures. The other reason for more excavation was the size of the structure—my excavation strategy included a trench that extended across each residence. This required a great deal more excavation at Structure 206 than at the smaller structures. The greater extent of the early Colonial period residence may suggest that the area housed an extended family household rather than a nuclear family household, the latter of which must have been the case at the small, middle to late Colonial period houses discussed in the following sections.

Ceramic and Faunal Densities. Overall, many more ceramic sherds were retrieved from Structure 206 than the other structures, since the average count of ceramics per cubic meter was also higher (Table 6.1; "Mean no. of ceramics/m^3"). The greatest total animal bone and chipped stone debitage by quantity, weight, and density were also found at Structure 206. On the other hand, only one grinding tool, a *mano*, was found in the excavation units.

Figures 6.5 and 6.6 show ceramic densities across excavation units at Structure 206. The dotted lines in the figures indicate the estimated locations of walls pertaining to the earlier platform, including retaining and interior walls. The squares composed of solid lines indicate the locations of excavation units, named according to letter and number designations assigned according to the structure's grid. For each of the top two levels (0-10 cm and 10-20 cm below the surface) excavated at each residential area, I have prepared a map that shows the number of ceramic sherds found in each area and the percentage of sherds found that dated to the Colonial period. For the 0-10 cm level, resolution is 2 m, while the resolution for the 10-20 cm level is 1 m. Structure 206 had enough animal bone to justify faunal density maps for the 0-10 cm and 10-20 cm levels as well (Figures 6.7 and 6.8). Projectile point density at Structure 206 can be found represented along with special finds in Figure 6.9.

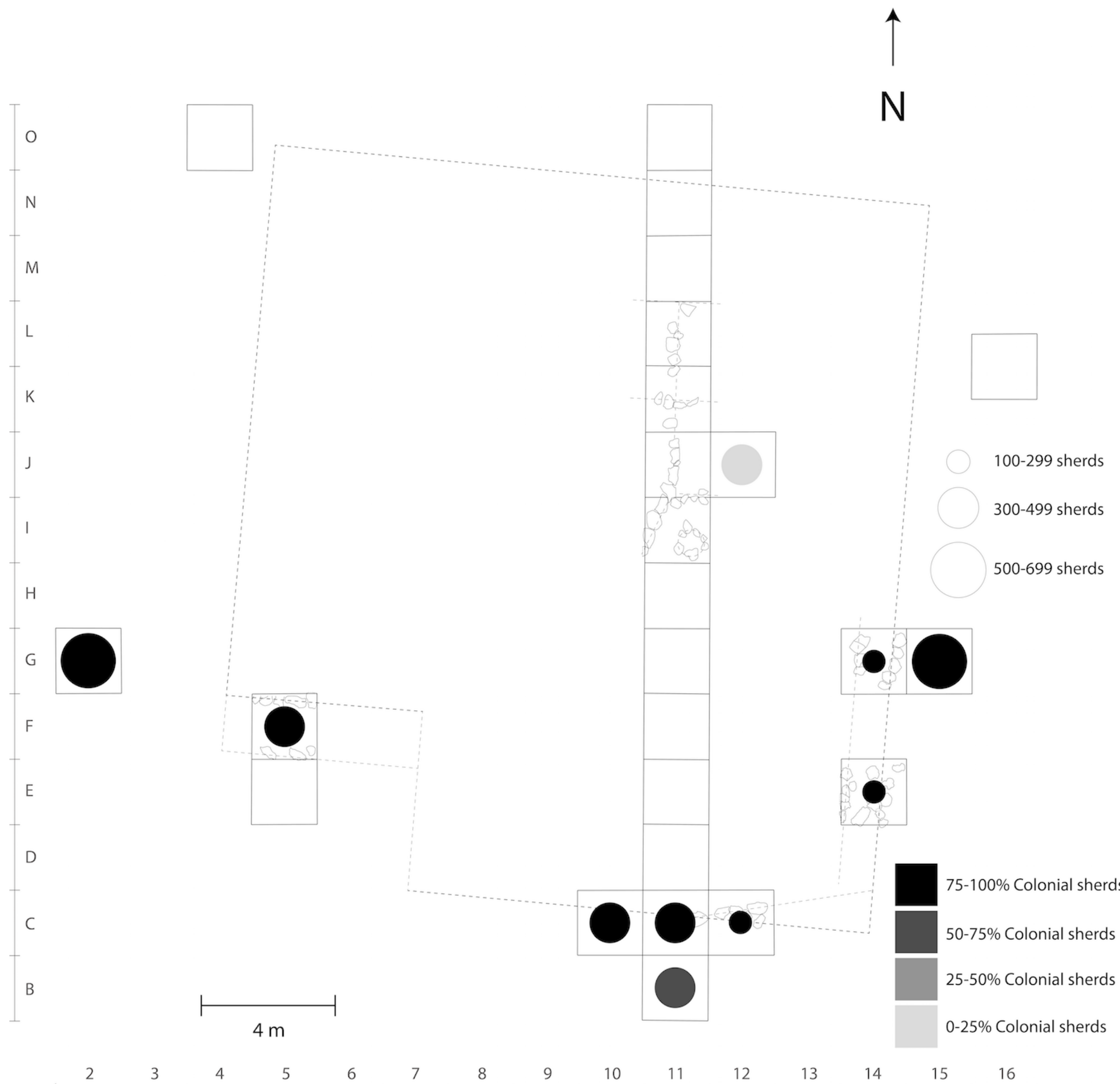


Figure 6.5. Colonial period ceramic densities in the first 10 cm below the surface, Str. 206.

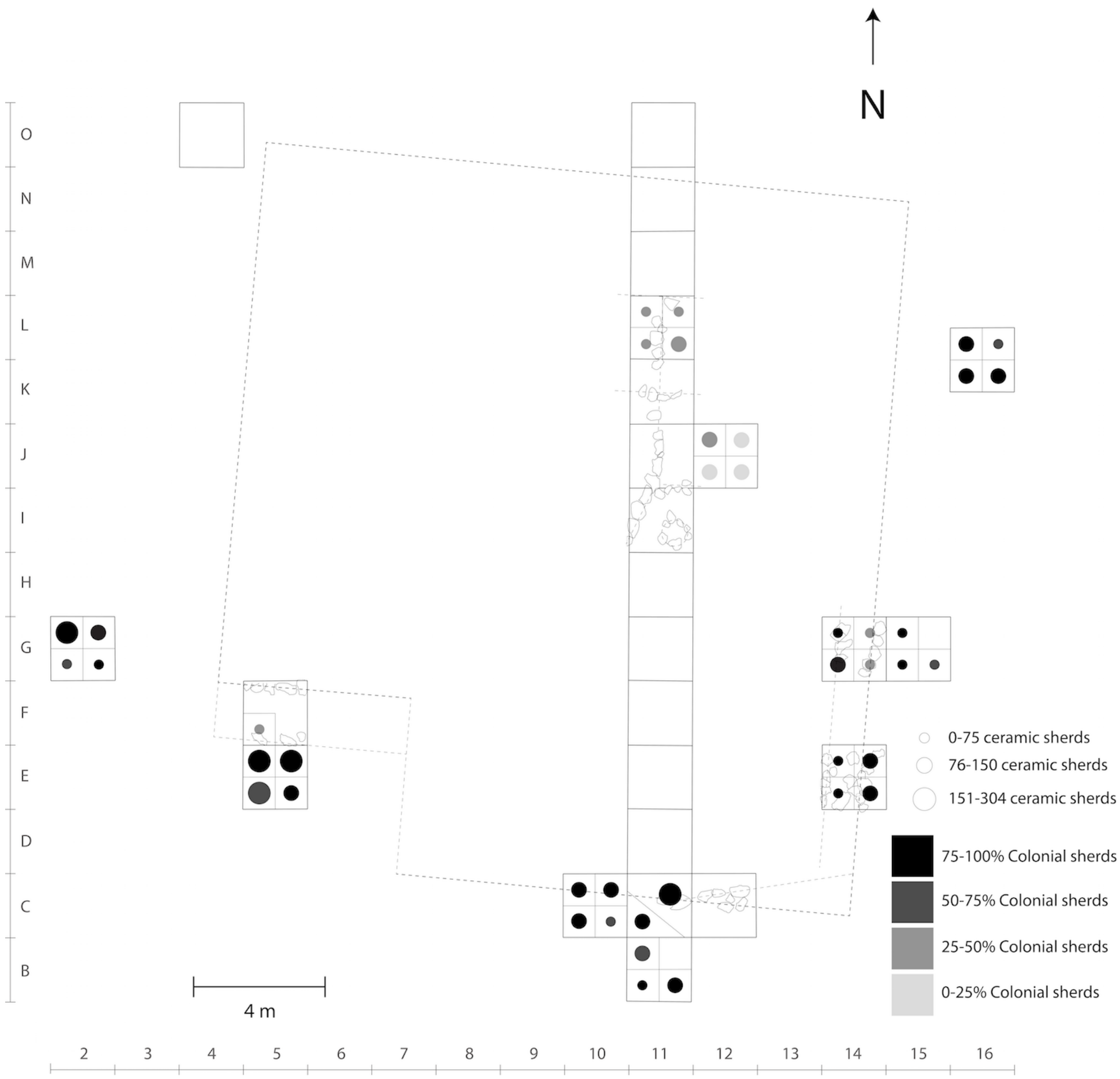


Figure 6.6. Colonial period ceramic densities from 10-20 cm below the surface, Str. 206.

For the early Colonial period Structure 206, it is possible to see from both the ceramic and animal bone density maps (Figures 6.5-6.8) that Colonial period midden material concentrated just off the edge of the earlier platform that Colonial period residents used as a living space. The correlation of animal bone and Colonial period ceramic density provides evidence that the faunal material dates to the Colonial period. On top of the platform, even within 10 cm of the surface, most ceramics date to earlier time periods. This, along with intact earlier architecture, suggests that Colonial period residents did not remodel or prepare the platform to any great extent prior to erecting perishable structures.

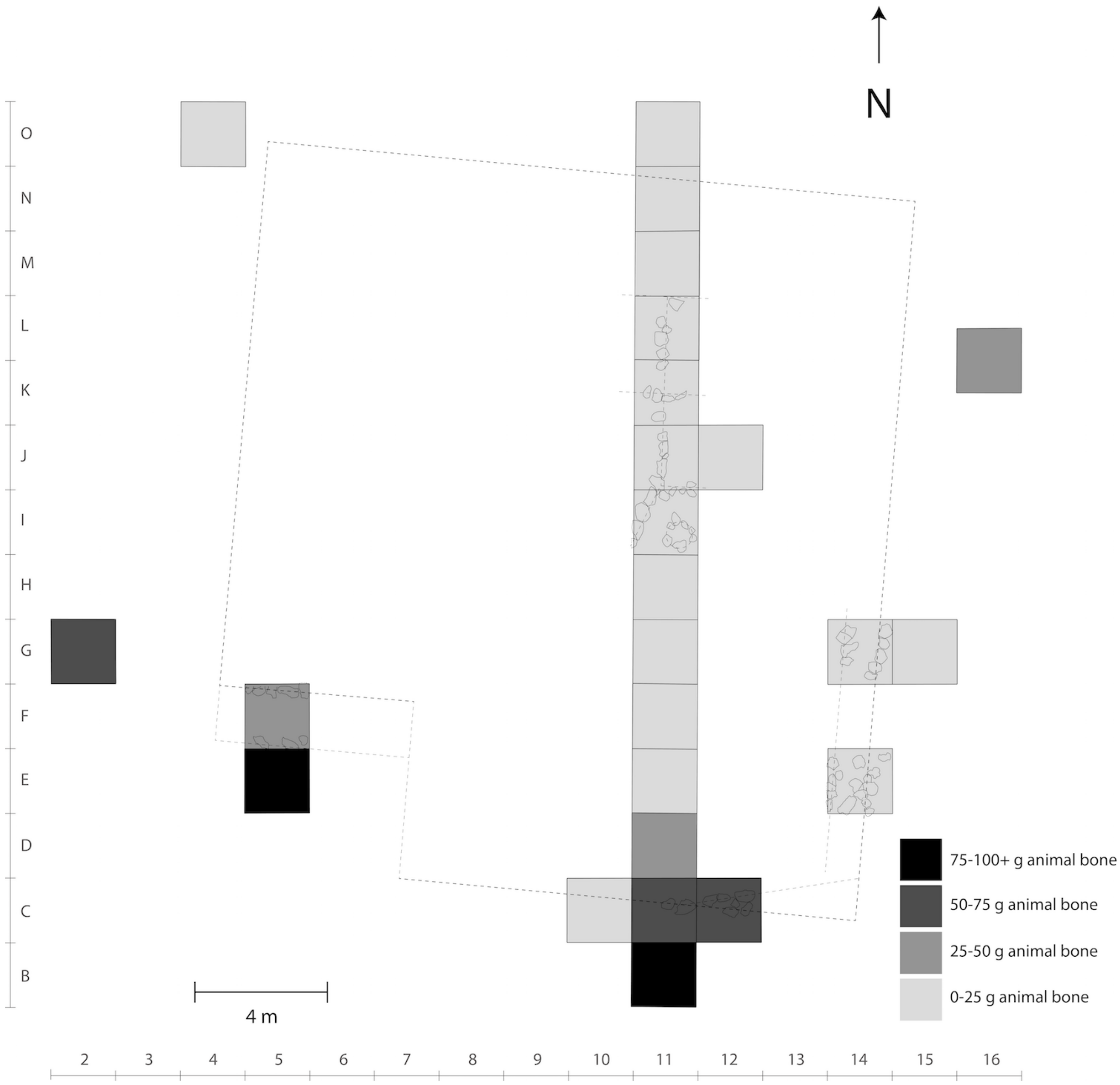


Figure 6.7. Animal bone densities within 10 cm of the surface at Structure 206.

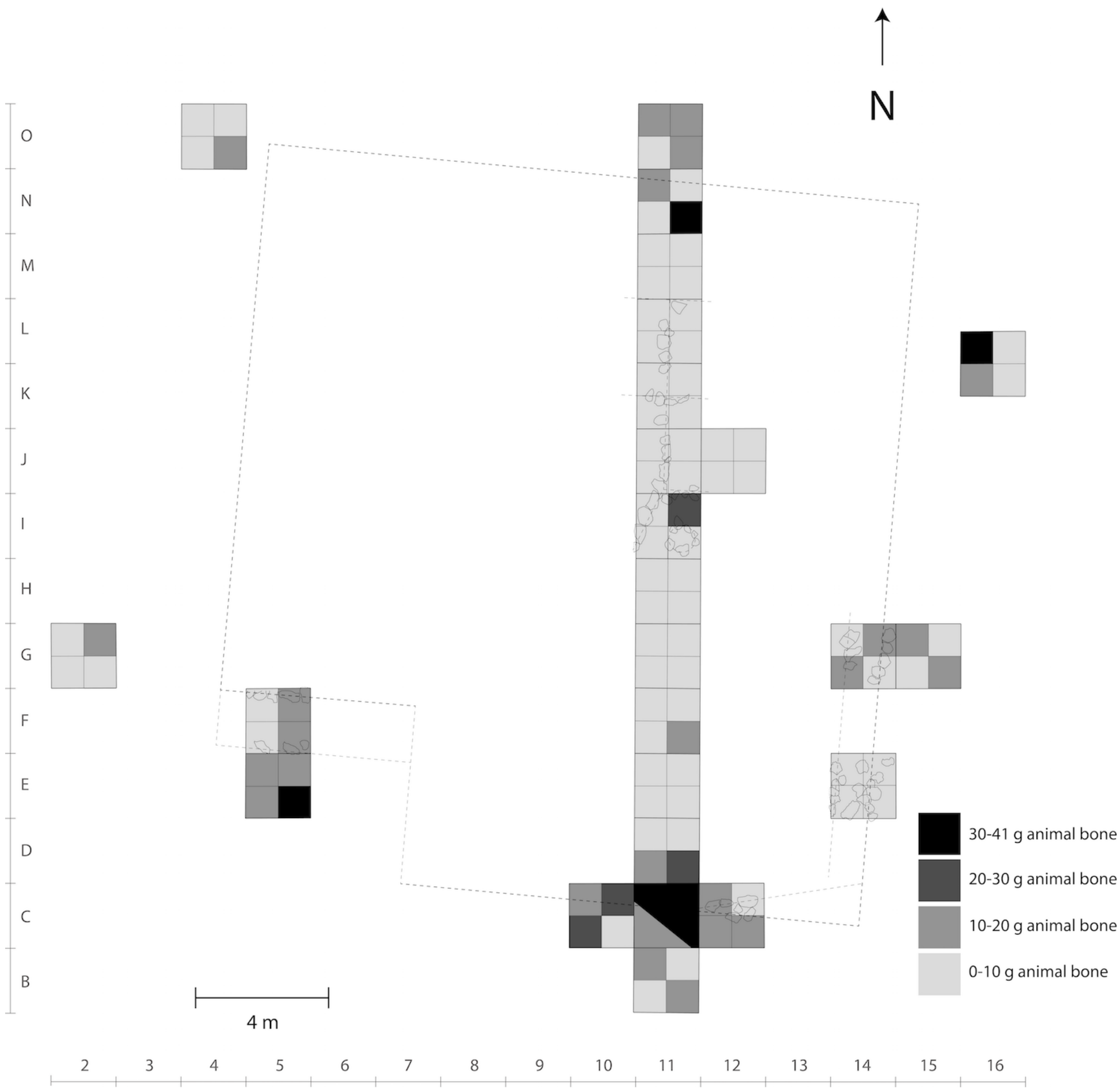


Figure 6.8. Animal bone densities between 10-20 cm in depth at Structure 206.

By the 10-20 cm level at Structure 206, units placed on top of the platform began to intrude into the early fill, which helps to explain the occurrence of mostly early sherds. On the other hand, higher quantities of animal bone and Colonial period sherds can still be seen around the edge of the platform, as in the 0-10 cm level. One exception to the rule of finding high quantities of animal bone at the edges of the platform is Unit E14, which consistently yielded a high proportion of Colonial period pottery in both the 0-10 cm and 10-20 cm levels, but had very little animal bone within these levels.

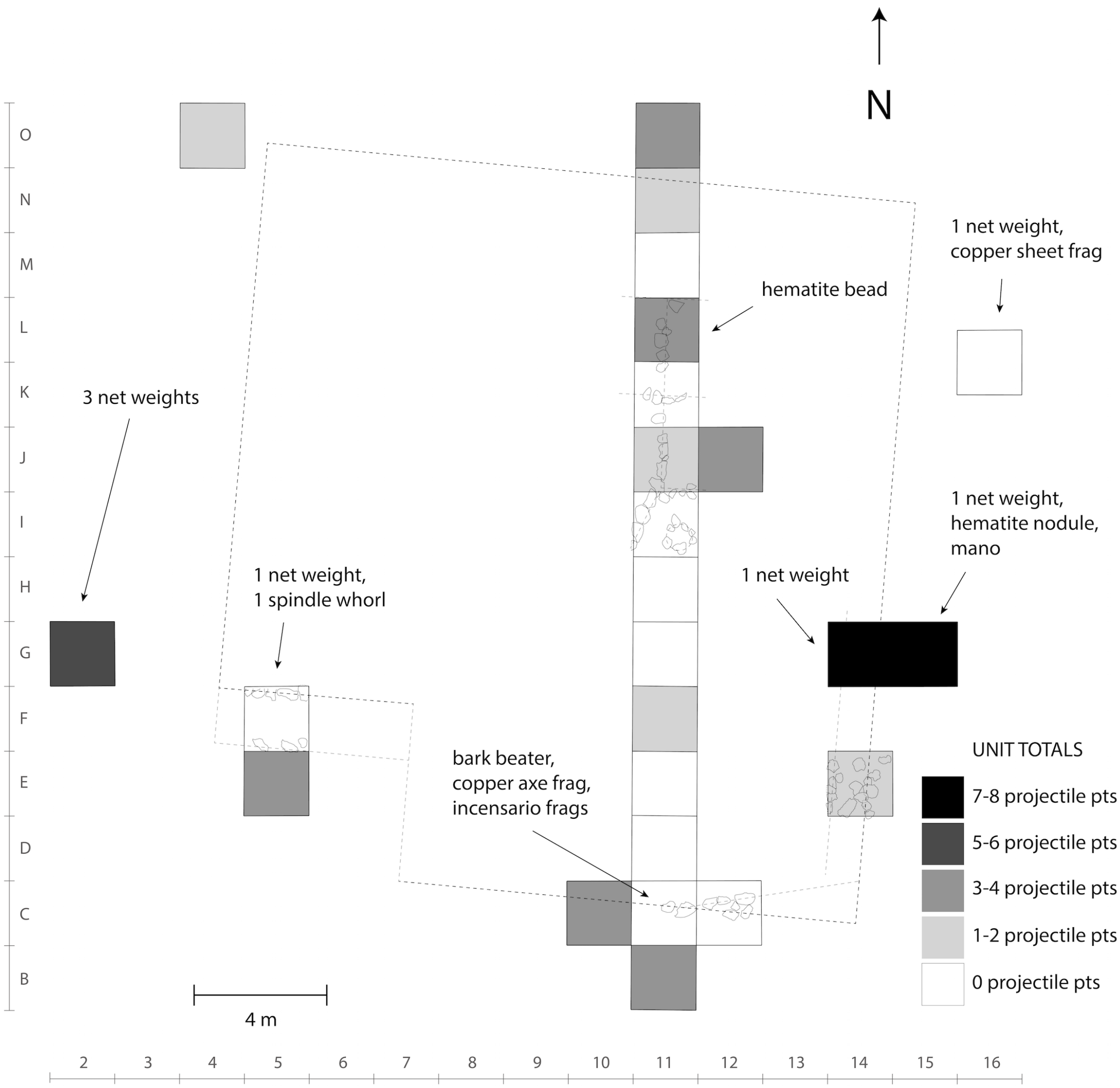


Figure 6.9. Projectile point densities and special finds found at all depths at Structure 206.

Preservation of midden material appeared to be greater off the eastern side of the platform, where few sherds were found in the 10-20 cm level, but higher densities of sherds could be found beneath that level. Unit G15 was deeper than many of the other units and seemed to contain the best sample of early Colonial period midden. The large number of sherds found in the first level of Unit G15 (Figure 6.5) may include many that washed in from higher elevations through time, since the densities of ceramics in the next level are lower prior to increasing again. Likely this was a lower elevation area during the Colonial period, which helps to explain why it was a good place to deposit midden material, and why a greater amount of sediment washed into the area from the top of the platform after occupation ceased, helping to preserve the artifacts below. In other words, some of the differences in the densities of Colonial period sherds and animal bone in the first 20 cm below the surface can be explained by surface and bedrock topography.

In the first level of Units G14 and G15, animal bone density was low, but projectile points were present (Figure 6.10). In the second level (10-20 cm), the lower percentages of Colonial period sherds in the eastern half of Unit G14 showed that the excavations there began to penetrate into the earlier platform fill, although animal bone densities increased slightly (Figure 6.11). The Colonial period sherd density increased in the southwest quadrant, which likely corresponded to additional Colonial period deposits on top of the platform. The greater numbers of projectile points in the second level of Unit G14 correlated with higher densities of animal bone. In the second level of Unit G15, however, Colonial period finds were fairly sparse. Perhaps parts of the earlier platform and general silt eroded into this lower elevation unit, as hypothesized above. I analyzed light fractions from the second through fourth levels (10-40 cm) of Unit G15 for charred seeds.

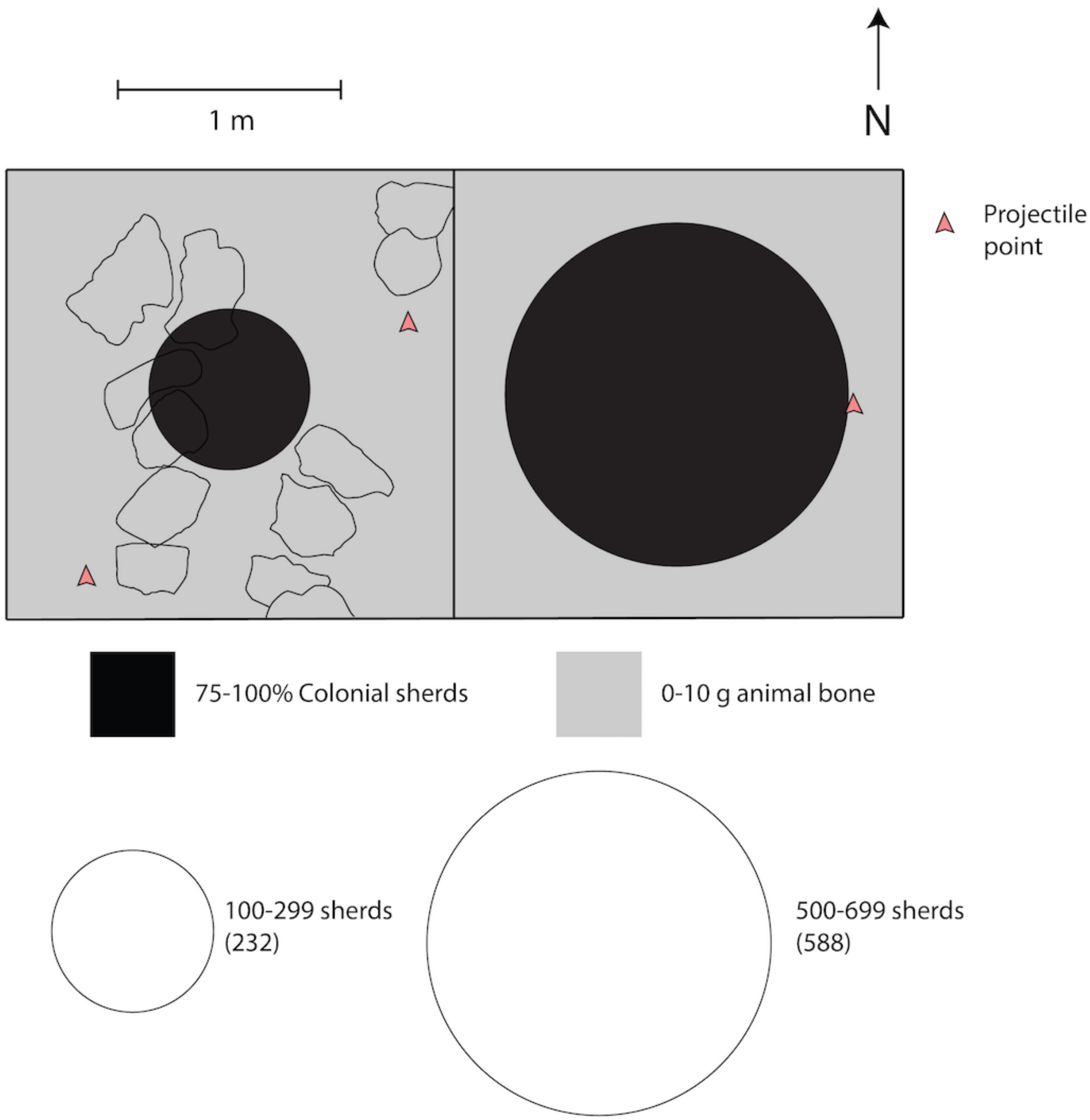


Figure 6.10. Special finds and colonial ceramic and animal bone densities, 0-10 cm below the surface in Units G14 and G15.

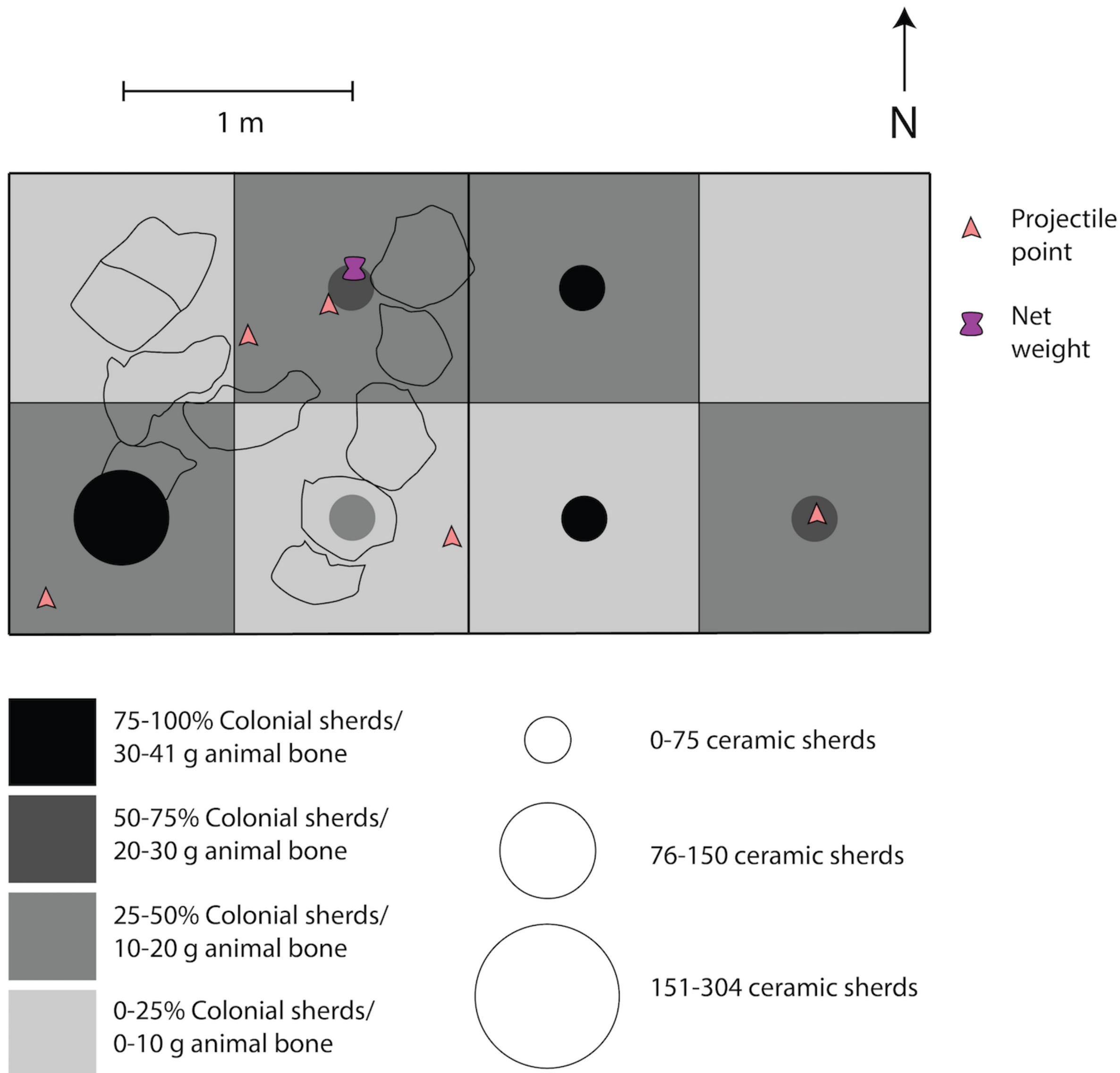


Figure 6.11. Special finds and colonial ceramic and animal bone densities, 10-20 cm below the surface in Units G14 and G15.

Figure 6.12 shows the ceramics and faunal remains found within the third and fourth excavation levels of Unit G15 (at 20-30 cm and 30-40 cm below the surface). Within the 20-30 cm level, ceramic densities and percentages of Colonial period ceramics increased markedly, suggesting the presence of *in situ* midden material dating to that time. Animal bone densities also increased, and a projectile point and hematite nodule (originally identified as iron slag) were found. The 30-40 cm level in this unit showed a similar pattern: ceramic densities were high, although now the Colonial period sherds were mixed with earlier sherds because this side of the platform was also a midden during the earlier use of the platform. Animal bone density remained fairly high in the eastern half of the unit. Special finds included projectile points as well as a fishing line or net weight—and a *mano*. *In situ* Colonial period midden material continued to be found in this final level excavated.

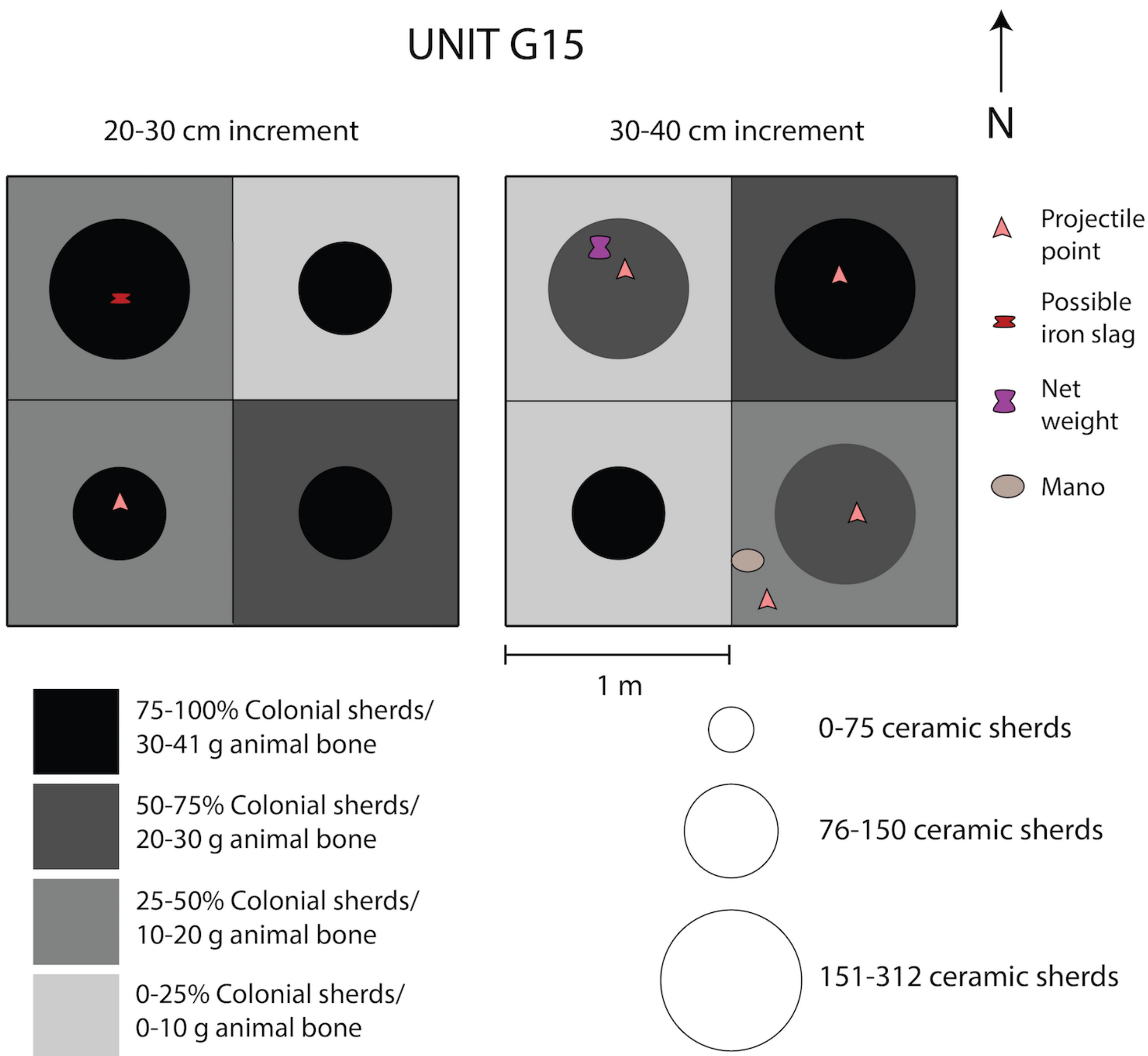


Figure 6.12. Special finds and colonial ceramic and animal bone densities 20-30 cm and 30-40 cm beneath the surface in Unit G15.

Faunal analysis. During a first season of analysis, Nayeli G. Jiménez Cano studied the animal bone from two of the richest and best-preserved units at Structure 206—Units G15 and C11 (Table 6.3; for full report see Appendix I). Within the collections from these two units, she identified a wide range of mammals, birds, and reptiles (Table 6.3). However, she found no clear evidence for the presence of domesticated animals introduced by Spaniards, such as the chicken, pig, and equines found at other early Colonial period sites, and in particular at nearby Ek' Balam (deFrance and Hanson 2008). She found turkey and some bone that was indeterminate between turkey and chicken, but nothing that was definitively chicken. During a second season of analysis, Jiménez Cano completed the study of animal bone from Structure 206, and the combined results of analysis can be found in the next chapter in Table 7.1, though MNI (minimum number of individuals) assessments are not available for the overall dataset. Overall, the findings from the larger dataset continued the trends of the animal bone seen in Table 6.3, with the exception that she also found two equine (*Equus* sp.) teeth, one of which was a horse tooth, providing the only evidence for Spanish domesticates. She also found a cougar (cf. *Puma concolor*) tooth, as well as bones from freshwater and coastal fish, due to her study of a sample of bone separated from a heavy fraction from flotation.

Based on Table 6.3, animals for which the MNI was two or more included white-tailed deer, collared peccary, coyote or large dog, lowland paca, nine-banded armadillo, eastern cottontail, hispid pocket gopher, turkey, and mud turtle. As paca continues to be hunted in Rejollada H near Structure 206, the presence of the animal in the assemblage is not a surprise and may suggest that house residents could access the *rejollada* for the purpose of hunting. The presence of dog among the faunal remains is not surprising either, considering the important role dogs play in Yucatec hunting practices. The white-tailed deer represented in the assemblage were primarily adults, which suggests low-pressure hunting was in place (Carr 1996), though more of the peccary were subadults, especially in Unit C11.

Table 6.3. Studied animal bone from Units C11 and G15, early colonial Structure 206.

Common Name	Taxon	NISP	MNI
Mammals			
white-tailed deer	*Odocoileus virginianus*	34	4
Yucatan brown brocket deer	*Mazama pandora*	1	1
brocket deer	*Mazama* sp.	1	1
deer	Cervidae indet.	15	0
white-lipped peccary	*Tayassu pecari*	1	1
collared peccary	*Pecari tajacu*	4	2
peccary	Tayassuidae indet.	5	0
dog/coyote	*Canis* sp.	5	2
canids	Canidae indet.	1	1
lowland paca	*Cuniculus paca*	14	2
paca	Agutidae indet.	4	0
nine-banded armadillo	*Dasypus novemcinctus*	122	3
eastern cottontail	*Sylvilagus floridanus*	2	2
hispid pocket gopher	*Orthogeomys hispidus*	3	2
small rodents	Cricetidae indet.	1	1
big mammal	Mammal (big)	6	1
medium mammal	Mammal (medium)	31	1
small mammal	Mammal (small)	114	0
mammals	Mammal indet.	359	0
Birds			
turkeys, chickens	Galliforme indet.	2	2
turkey	*Meleagris* sp.	1	1
big birds	Ave (big)	12	0
medium birds	Ave (medium)	3	0
small birds	Ave (small)	3	0
birds	Aves indet.	39	0
Fish and Reptiles			
cichlids	Cichlidae indet.	1	1
sea breams	Sparidae indet.	1	1
bony fishes	Teleostei indet.	2	1
snakes	Serpentes	3	1
furrowed wood turtle	*Rhinoclemmys areolata*	2	1
box turtle	*Terrapene carolina*	3	1
mud turtle	*Kinosternon* sp.	15	5
turtles	Testudines indet.	10	4
Sample Total		**821**	**43**

Special finds. Notable Colonial period artifacts found at Structure 206 included projectile points and point fragments, a copper alloy sheet fragment and axe fragment, fishing line or net weights, beads (including a tiny hematite bead found in a heavy fraction from flotation), a bark beater, and a spindle whorl fragment. Projectile points entailed the most ubiquitous special find identified at Structure 206, and would have been used for hunting and defense (Figure 6.9; Figure 6.13). In addition to the 50 projectile points, which included projectile point blanks and failures, we located an elongated projectile point, four chipped stone tools that could not be identified by type, seven possible blades or projectile point preforms, and two prismatic blades. All tools were made from chert or chalcedony; no obsidian at any residence was found in a context determined to be definitively colonial. Some of the tools were re-worked or re-touched, and the density of chipped stone debitage at the structure was high overall, supporting the idea that house residents were engaged in production and maintenance of their stone tools. In heavy fractions from flotation, the samples with the highest quantities and weights (5 g or more) of chipped stone debitage less than ¼" in size occurred in units C10, C11, C12, E14, F5, G14, and L11. Of these, all of the units except for L11 (which contained animal bone and the hematite bead) were those in which Colonial period ceramic densities were high.

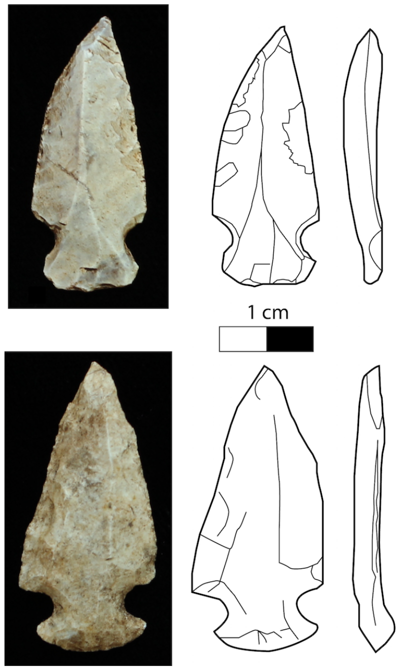


Figure 6.13. Two projectile points of the 50 found at early colonial Structure 206.

Another special find at Structure 206 was a molded ceramic spindle whorl used for spinning thread, found in Unit F5, a unit within which the vast majority of artifacts dated to the Colonial period. Incised designs included striped triangles and possibly a snake on the opposite side (Figure 6.14A). One type of artifact was unique to Structure 206. There were seven ceramic fishing line or net weights similar to other net weights documented from the region, but rounder and lightweight (Figure 6.9; Figure 6.15). They range in size from 15-19 mm in diameter and height, with weights from 2.6-5.3 g. Despite their light weights, these artifacts likely served as weights for fishing lines based on finds at contemporary sites in Yucatán and Belize (e.g., Morandi 2010:151; “date seed sinkers,” Wiewall 2009:373).

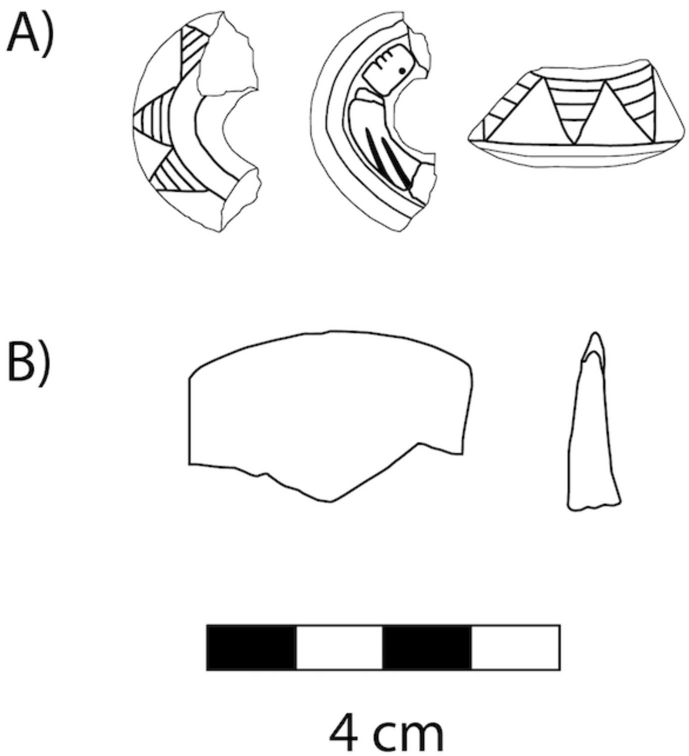


Figure 6.14. Special finds from Structure 206: A) spindle whorl fragment; B) copper alloy axe fragment.

Figure 6.15. Examples of ceramic fishing line or net weights found at early colonial Structure 206.

Other special finds from Structure 206 included a somewhat informal bark beater in Unit C11, within the 0-10 cm level. The lines carved into one side of this small (6 x 6 x 6 cm) object were not quite parallel, which was what made it seem like a less than formal tool. Still, it may indicate participation in paper production at the house. The bark beater was found in a level located near the copper alloy axe fragment (Figure 6.9; Figure 6.14B) and Postclassic censers mentioned earlier in the chapter. A small piece of copper sheet metal was found in Unit L16 as well (Figure 6.9).

Apart from copper, other metal at Structure 206 included hematite. Unit G15 included little flakes of material throughout that appeared to be degraded iron, as they were metallic and reddish in color. Finally, in the 20-30 cm level, we found a larger and hard piece of what originally seemed like it might be iron slag, but which I later identified as a hematite nodule (12.5 x 12 x 8.5 mm in size), as mentioned above (Figure 6.12). Based on the hematite bead found elsewhere on the platform, this could have been used for bead production. The L-shaped iron nail listed in Table 6.1 was located in the top 10 cm of Unit G2 near the road, and was introduced to the area at a later time.

Middle Colonial House

Structure Configuration and Location. Structure 317 was a low platform, 16 m long by 10 m wide (Figure 6.16), built originally during the Middle Preclassic through Early Classic periods and re-occupied during the Colonial period. The platform is considerably smaller in extent as well as in height above the surrounding ground surface than Structure 206. Structure 317 is located to the west of the current street grid, where an extended section of the grid can be seen based on *albarrada*-lined historical roads that are not paved nor used today. The road would have run east-west directly north of Structure 317 during its Colonial period occupation (Figure 6.16). Minor paths would have run along other sides of the residential area, but at greater distances from the house. Rejollada G, the largest *rejollada* in the town lands of Tahcabo, can be found 115 m northwest of the structure.

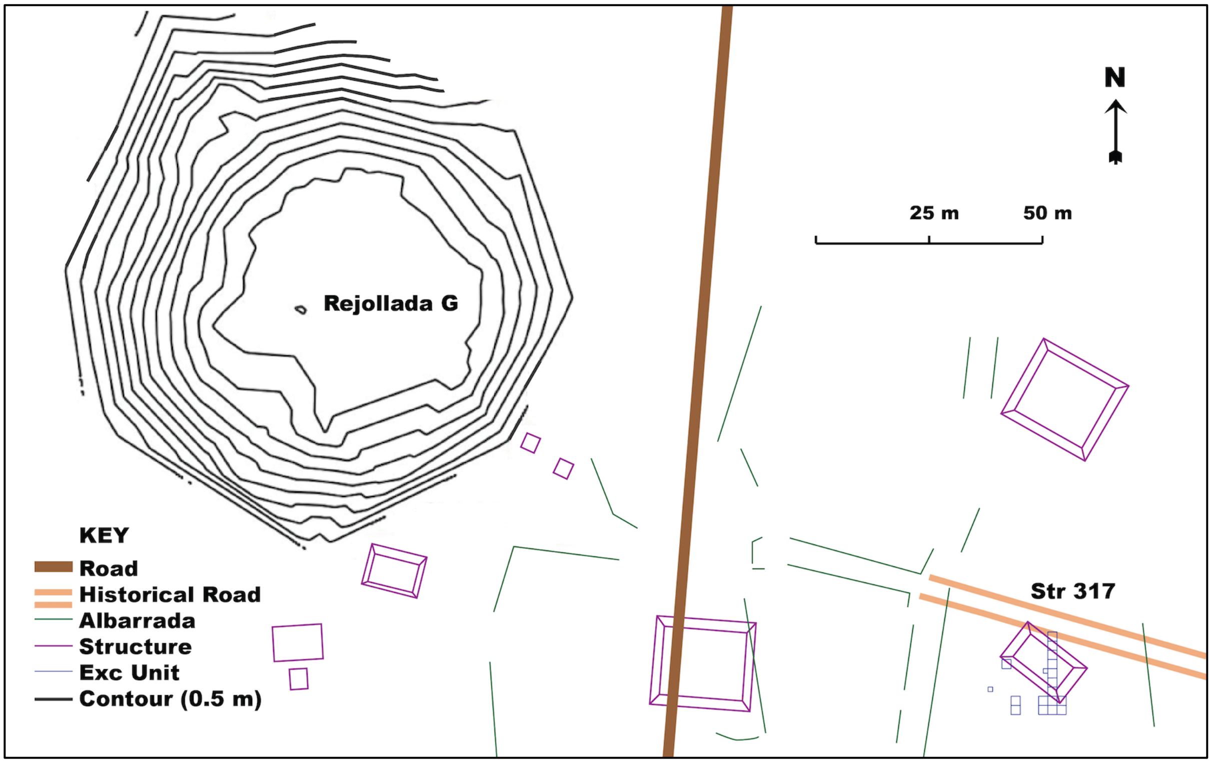


Figure 6.16. Structure 317 in relation to other features in western Tahcabo.

As at Structure 206, no architectural features could be found on top of or at the edge of the platform that dated specifically to the Colonial period—only midden material could be discerned, primarily along the southern and southeastern platform edge. This was likely the area behind the house, as it was located along the opposite side of the house from the road to the north (Figure 6.16). There was, however, a possible alignment of stones located southwest of the structure that may have pertained to a Colonial period ancillary structure associated with Structure 317. This was hard to discern, in part because the perishable colonial structures may not have aligned perfectly with the earlier platform—perhaps the colonial house extended farther into the area with the rock alignment. In association with this alignment we found several broken artifacts that may have been beehive log plugs—the fragments matched a disc found in Unit B8 (see special finds section below). The rock alignment may have served as foundation stones for an ancillary structure related to beekeeping. This alignment is very close to the early platform (we might expect an apiary to be farther from the main residence), so another explanation is that it marks a work area near the residence where beehive plug fragments were deposited after use.

We could not make out clear platform retaining walls, perhaps because of (1) the Colonial period re-occupation and re-working of the earlier platform, (2) the shallow and undulating bedrock supporting the platform, and (3) re-use of the area to the present day. Colonial inhabitants may well have disassembled any stone walls apparent at the surface in order to construct the *albarradas* lining the roads. The remarkable quantity of *albarradas* west of town and the quality of their stones suggest re-use of earlier materials. Because of such disturbance, we were able to define the rough extent of the platform based on patterns of midden deposition, but could not pinpoint specific platform edges. Unlike Structure 206, no platform surfaces or footing walls from any period could be discerned, although there were areas of possible plaster or at least flattened bedrock located directly south of the platform below the midden deposits. These remnants of surfaces likely date to the Middle Preclassic through Early Classic periods. As seen in Table 6.1, we excavated most units in Operation 9 to at least 20 cm in depth, and usually to bedrock.

Ceramic Densities. The average densities of ceramics per cubic meter by count and weight were relatively low compared to the other Colonial period residences excavated

(Table 6.1), although the percentage of Colonial period ceramics found was generally high (Figures 6.17 and 6.18). At the middle and late Colonial period Structures 317 and 403, high proportions of Colonial period ceramic sherds were found across the structures in the 0-10 cm level. Because of this, the top 0-10 cm maps show units in which 70-100% (rather than 0-100%) of sherds found dated to the Colonial period (by count). Although the proportions of Colonial period sherds generally are higher for Structure 317 than Structure 206, it is still the case that the units located just off the edge of the platform tend to have higher proportions of Colonial period sherds than the units on top of the platform. The units with the lowest percentages of Colonial period sherds occurred near the edges of the earlier platform, where some of the fill eroded to mix with later sherds.

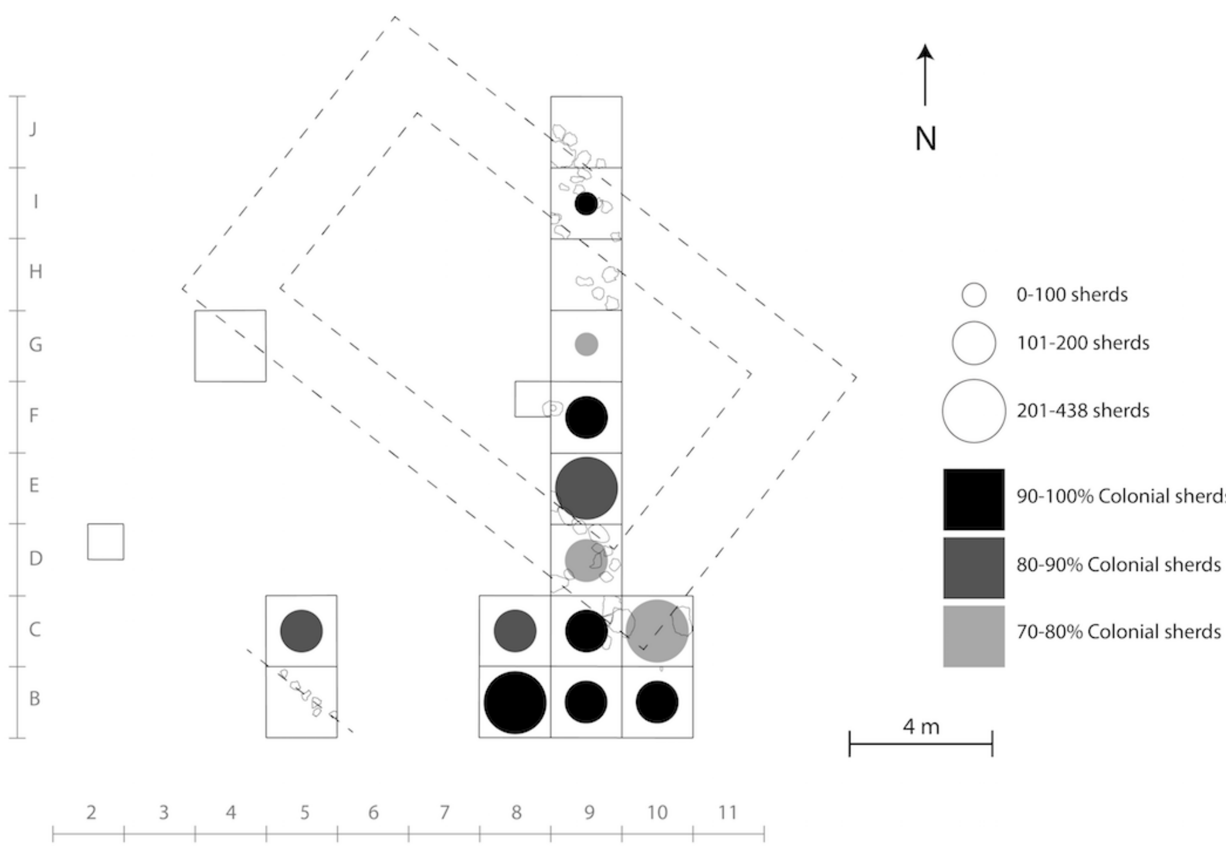


Figure 6.17. Colonial period ceramic densities within 10 cm of the surface at Str. 317.

The 10-20 cm map of ceramics at Structure 317 (Figure 6.18) shows much greater variability in the chronological span of sherds. In this level, there are quadrants in which only 0-25% of the sherds date to the Colonial period. By this point, we reached the fill of the earlier (Middle Preclassic to Early Classic period) structure, which explains the high proportions of earlier sherds. In particular, we began to reach fill in some areas on top of the structure and especially near its edges, where the elevation of the ground surface declined, and past which many of the later sherds had fallen. Beyond this now exposed early fill could still be found high concentrations of Colonial period ceramics south of the platform. Figure 6.18 demonstrates that the highest densities of Colonial period sherds could be found in Unit B8, which was the unit selected for light fraction study. Few animal bones were found at Structure 317 in any unit, so animal bone density maps are omitted.

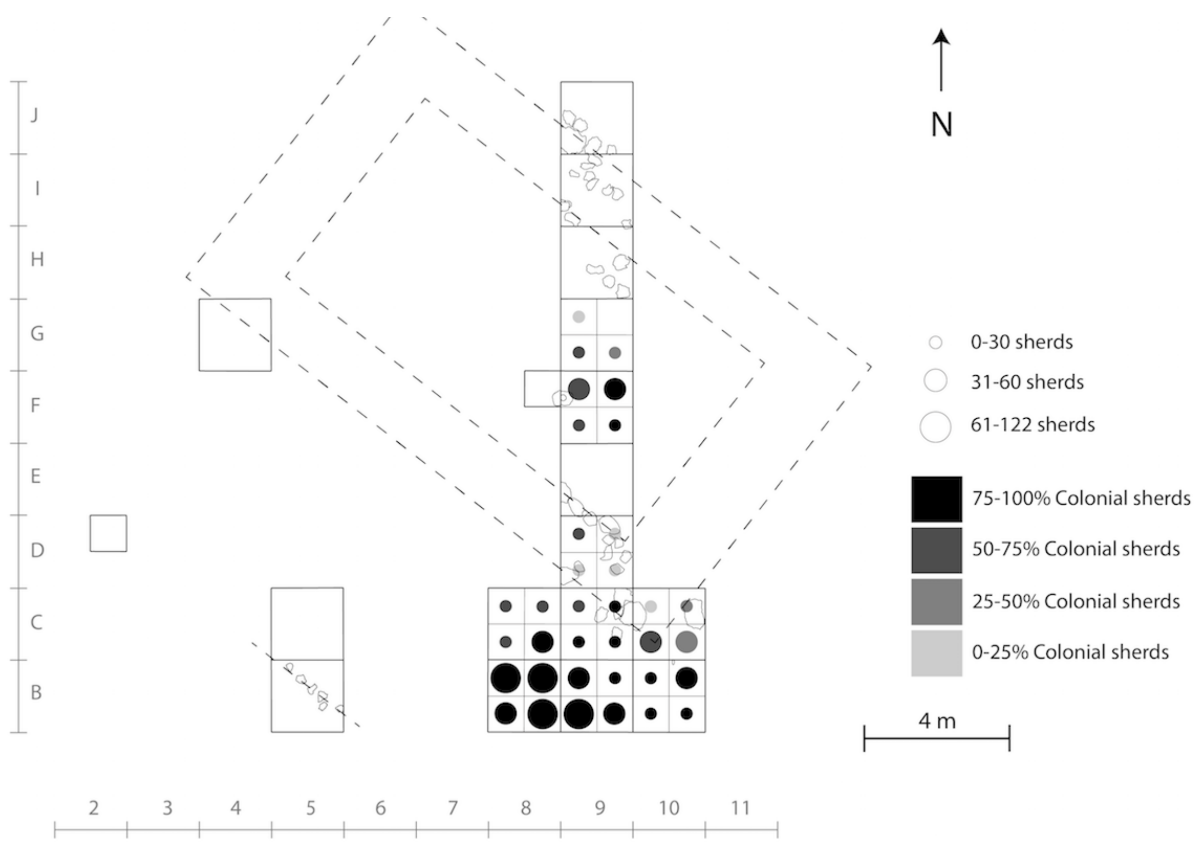


Figure 6.18. Colonial period ceramic densities 10-20 cm below the surface at Str. 317.

Special finds. Special finds at Structure 317 dating to the Colonial period included artifacts that appeared to be beehive log plugs (discussed below), as well as a river cobble likely used as a burnishing stone for ceramic manufacture, a cast lead bullet, and grinding tools, including a *mano*, a pestle, a *metate*, and a sphere (5 cm in diameter; Figures 6.19 and 6.20).

Figure 6.19. Groundstone tools from middle colonial Structure 317.

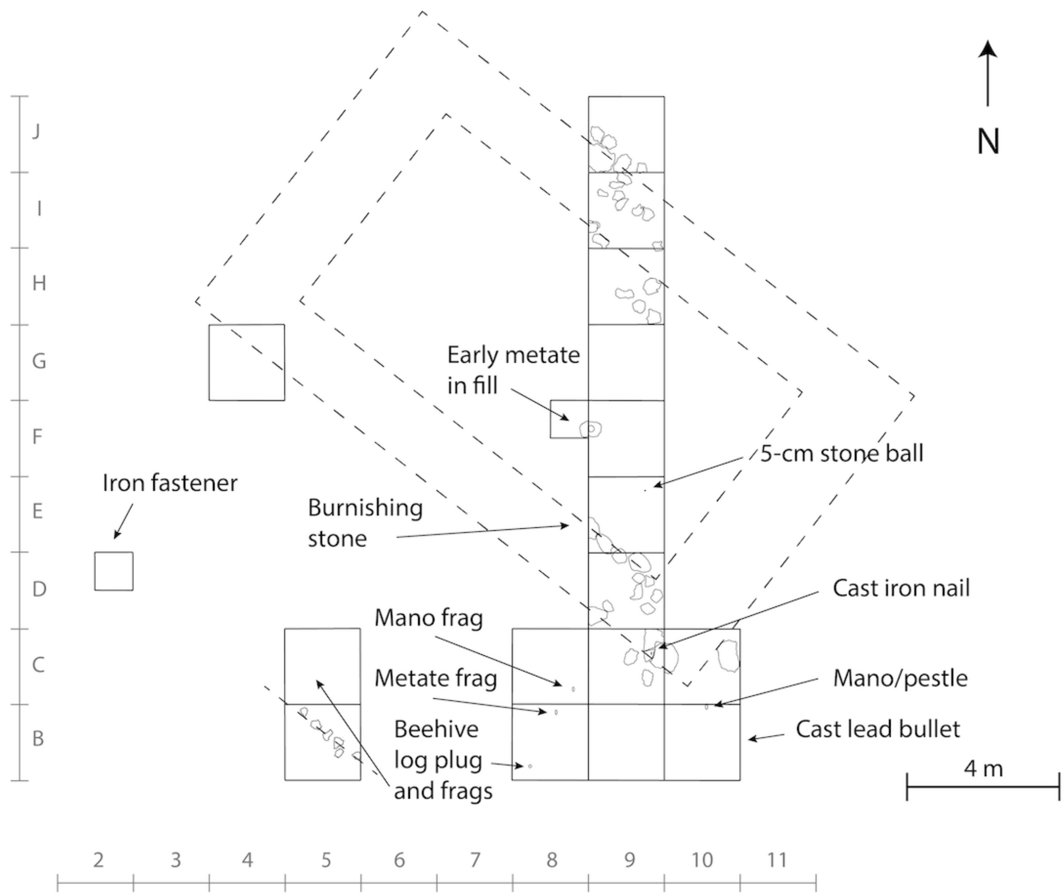


Figure 6.20. Location of special finds at middle colonial Structure 317.

Of the beehive plug fragments, there was one nearly complete example (Figure 6.21) and many broken up fragments found in excavation units on the south side of the grid. These plugs were unusual in that they all were a combination of stucco and ceramic sherds—thus giving the appearance that they might be the bases for stuccoed vessels. However, only one thickly stuccoed vessel rim was found at Structure 403, and the stucco adhered to the interior rather than the exterior of the vessel. The size of the disc-like artifacts matches the diameter appropriate for a beehive plug, and all of the fragments from Structure 317 form parts of discs rather than any other portion of a ceramic vessel. I suggest that the ceramic sherd on the inside would have facilitated extraction of beeswax that might have remained adhered to the plug upon its removal from the log. Beeswax for candle production was exceedingly important during the Colonial period, especially when compared with earlier times, when beekeepers focused on honey collection.

Figure 6.21. Stucco and ceramic beehive plug from a Colonial period context at Str. 317.

Late Colonial House

Structure Configuration and Location. Structure 403 was a very low platform, 8 m wide by 13 m long (Figure 6.22), built originally during the Middle Preclassic through Early Classic periods (as were others discussed to this point) and re-occupied during the Colonial period. Even smaller in extent and height than Structure 317, the platform is located to the southeast of the current street grid, and west of a road that leads southeast out of the town to the ranch called *Yokdzonot*. While there are roads to the north and to the east, they are located some distance from the house. There are no *rejolladas* located adjacent to this house—Rejollada E is the closest at approximately 400 m distance.

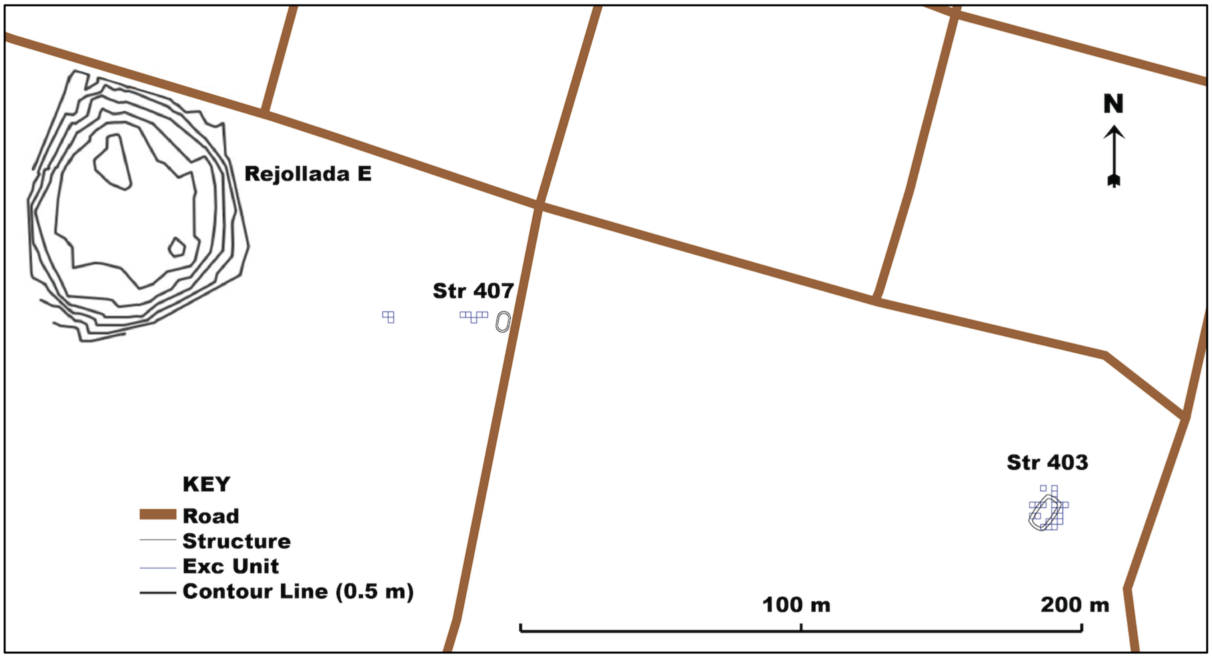


Figure 6.22. Structures 407 and 403 in relation to nearby features in southern Tahcabo.

No architectural features could be found dating specifically to the Colonial period—only midden material from this time could be discerned, primarily along the eastern edge of the platform. In addition, a lot of daub was found near the surface, providing a clue to the characteristics of the Colonial period architecture. Remnants of a retaining wall from the earlier platform survived in a couple of locations along the edge of the platform, although it was difficult to define with certainty. We found a small portion of a plaster floor at the base of the platform on the south side, associated with Middle Preclassic through Early Classic sherds. The platform's eastern side tapered off and became mixed with predominantly Colonial period midden debris, while on the north side earlier fill tapered out slowly as the platform met a bedrock outcrop, and Colonial period midden material was sparse.

The platform is located in a yard where horses are kept today, and there is evidence that they may have participated along with other agents in breaking artifacts and mixing contexts. For example, we found one bowl likely dating to the twentieth century that had been broken into many pieces that were found integrated into units across the residence at differing depths. As seen in Table 6.1, bedrock generally tended to be found about 20 cm below the surface at Structure 403.

Artifact Densities. The average number of ceramics per cubic meter was high and the average weight per cubic meter was highest of the four excavation areas described here. In addition, the quantity of grinding tools was particularly high, and though many of the *manos* were broken into pieces, there were still likely as many as 9 represented, with another found during surface collection at the structure (Figure 6.23). A *metate* with feet was also found in several fragments. The density of chipped stone debitage was low. On the other hand, there were many more metal tools found at this residential area, including cast lead bullets, half of a pair of iron scissors, two iron keys, and a silver coin (see special finds section below). Other special finds included a burnishing stone and a tiny glass bead found in a heavy fraction from flotation.

Figure 6.23. Select groundstone tools from late colonial Structure 403. Fragment in top left corner was one of several fragments of a *metate* with tripod feet.

As at Structure 317, little animal bone was found at Structure 403. It is surprising that middle and late colonial Structures 317 and 403 had such low densities of animal bone. Possibly, kept animals were processed and their remains deposited at some distance from the home rather than near or within the home, the latter of which might have been the case at early colonial Structure 206. Another possibility is that any animal bones deposited near the home were fed to or left for household dogs, who could have disseminated the bones widely across the landscape.

At Structure 403, proportions of Colonial period ceramics were very high in the first 10-cm level (Figure 6.24). Only in Unit H7, to the north of the structure, did the percentage of Colonial period ceramics dip below 75%, to 74.55% by count and 71.07% by weight.

From the first 10-cm level it became apparent that Colonial period midden material concentrated along the eastern side of Structure 403.

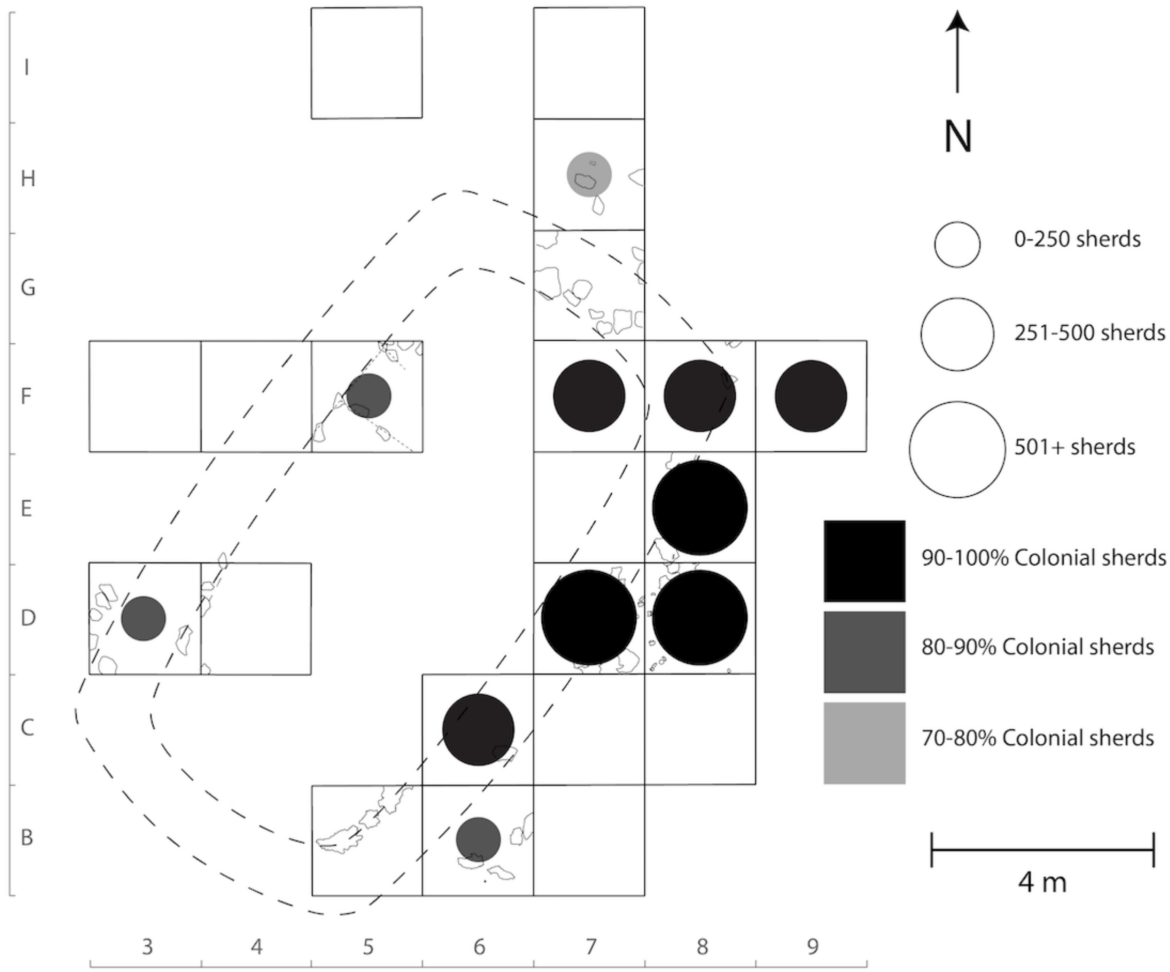


Figure 6.24. Colonial period ceramic densities in the first 10 cm below surface at Str. 403.

The 10-20 cm level ceramic densities at Structure 403 can be found in Figure 6.25. Dense midden debris is again apparent along the eastern side of the platform, and the outer extent of this dense midden was defined. On top of the platform and along its edges could be found higher percentages of early sherds, although the lowest percentage by count of Colonial period sherds was 47.83% in the northeast quadrant of Unit D3, and thus overall the percentages of Colonial period sherds are higher at Structure 403. The highest densities of

Colonial period sherds could be found in the 10-20 cm level in Unit D7, which was the unit selected for the study of charred seeds from light fractions. Of all the houses, the early (Middle Preclassic to Early Classic) platform comprising the base of Structure 403 seems to have been the most remodeled and disturbed. It was also the lowest on the landscape—prior to excavation I was not aware that an earlier platform existed here, because the elevation change was so slight.

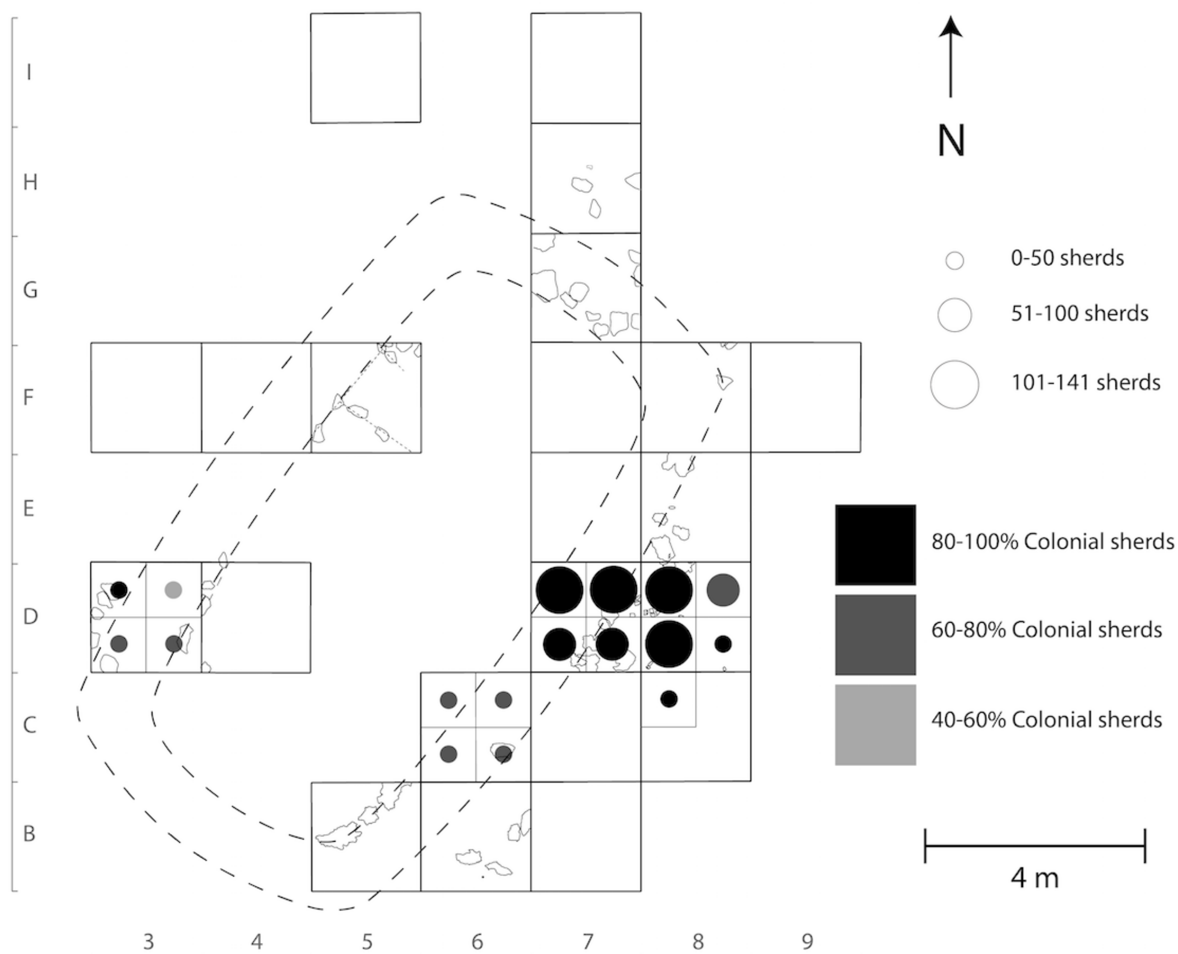


Figure 6.25. Colonial period ceramic densities 10-20 cm below the surface at Str. 403.

Special finds. Special finds at late Colonial period Structure 403 included a burnishing or polishing stone, which may suggest participation in ceramic production (Figure

6.26). Other than relatively high quantities of finished ceramics, no other evidence supports this idea, however, so perhaps the stone was used to polish another material. One cast iron key and a probable key fragment were found at late colonial Structure 403 (Figure 6.27). Keys are designed to protect valuables, perhaps signaling the presence of some wealth that house residents wished to protect. Further evidence for wealth at Structure 403 includes high numbers of jars of diverse sizes to be described below, as well as half a pair of cast iron scissors, and a silver coin (Figure 6.28). The silver coin found in Unit B6 was a 1/2 *real* dating to 1775. This find demonstrates the increasing integration of even small households near the edge of town into the use of Spanish currency, perhaps in part for tribute payments. Market integration may have occurred through involvement in wage labor or the sale of agricultural products or crafts. Other metal at Structure 403 included two cast lead bullets.

Marine shell was present in higher quantities at late colonial Structure 403 and at Structure 407 discussed next, which may suggest that Tahcabo residents had greater access to marine shell during the late Colonial period. By the late Colonial period grinding tools were relatively more plentiful, as we can see from the presence of multiple tools each at Structures 317, 403, and 407, with increasing density through time. In contrast, there was only one *mano* found at early colonial Structure 206, despite the presence of relatively rich midden deposits and a greater excavated volume overall. This may suggest more limited access to or acquisition of grinding tools during the early Colonial period, at least for those living near the outskirts of town.

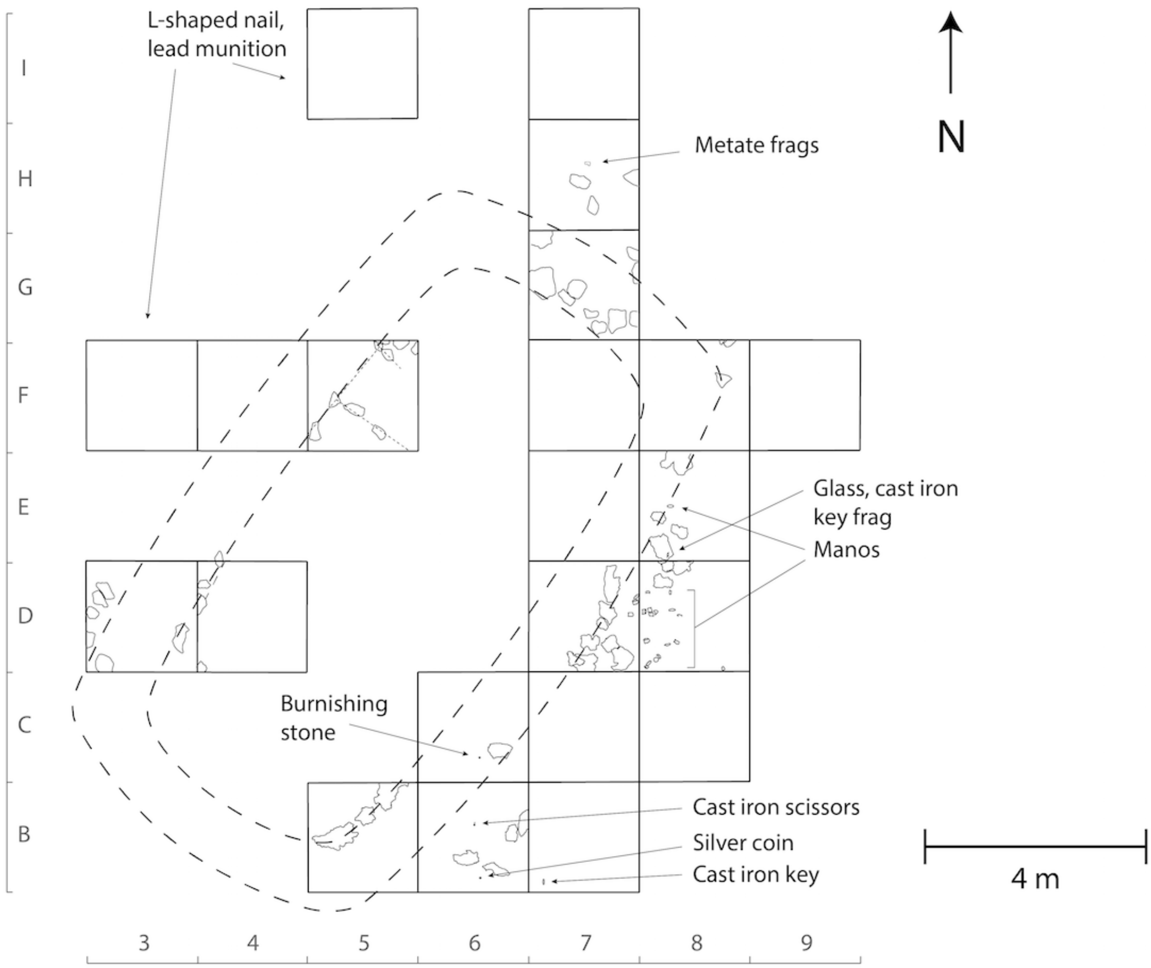


Figure 6.26. Distribution of special finds at late colonial Structure 403.

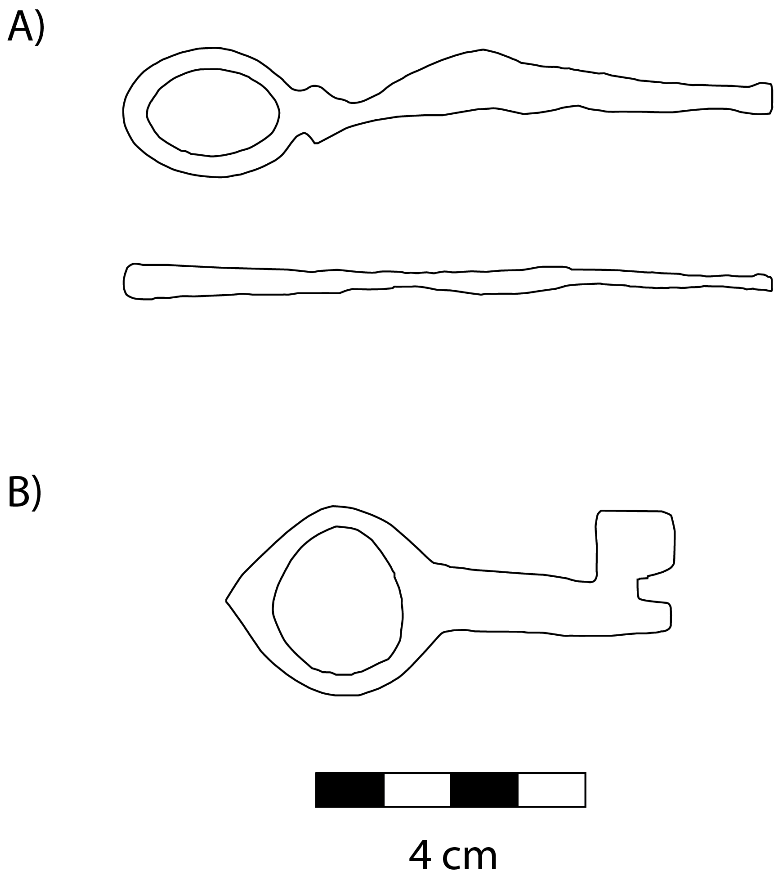


Figure 6.27. Special finds from late colonial Structure 403: A) iron scissors, and B) iron key.

Figure 6.28. Silver Spanish ½ *real* coin from the late colonial Structure 403.

Mixed Colonial House

Structure Configuration and Location. We took a distinctly different approach to excavations in this residential area—which took place behind the currently standing building called Structure 407, which we did not disturb (Figure 6.29). This is an apsidal stone structure, which had at one point been divided into three rooms according to previous residents of the house, with a stone bench attached to the front of the structure. A well is located directly south of the stone structure. The style of the construction suggests it was originally built during the Colonial period, although people resided in Structure 407 until Hurricane Gilbert hit in 1988. Due to the presence of a standing structure, excavations targeted the patio behind the house, where materials associated with household activities might have been deposited.

Figure 6.29. Excavation in progress behind standing Structure 407.

When it became clear that a great deal of what we were finding behind the house dated to recent times leading up to Hurricane Gilbert, I decided to open some units at the far western end of the patio, near the edge of the current property line (Figure 6.22). In this area, I hoped to locate Colonial period deposits free of more recent trash. We were able to locate Colonial period deposits, although in the far patio they were mixed to some extent with Middle Preclassic through Early Classic deposits associated with an elevation rise to the south, which was likely an early platform (Figures 6.30 and 6.31). The bedrock undulated a great deal, and seemed to contribute to the mixing of earlier and later contexts to a greater extent than occurs on flat bedrock. No architecture was found in any of the excavation units dug in this area.

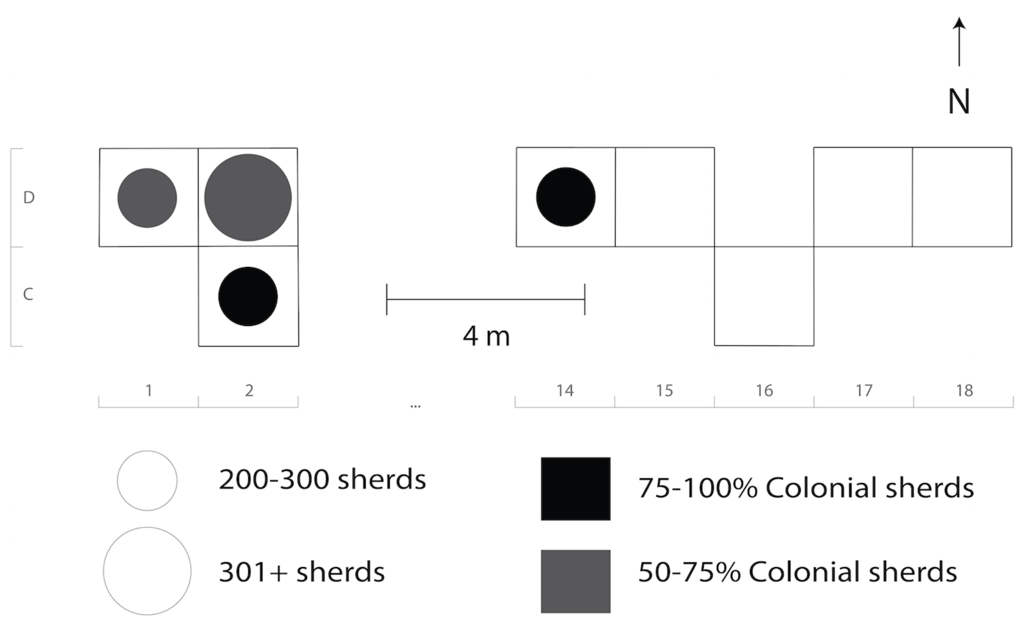


Figure 6.30. Colonial ceramic sherd densities within 10 cm of the surface at mixed colonial Structure 407.

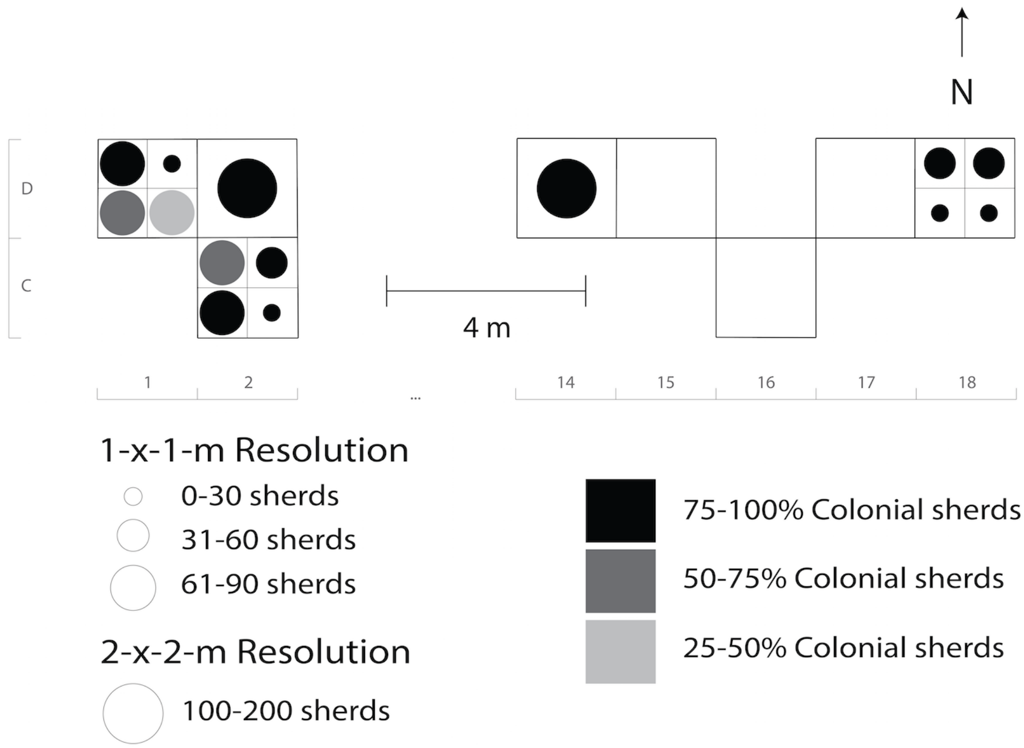


Figure 6.31. Colonial ceramic sherd densities 10-20 cm below the surface at mixed colonial Structure 407.

One road running north-south passes just to the east of Structure 407, and one road running east-west can be found some 50 m to the north. Rejollada E is located approximately 90 m west of Structure 407, and only about 50 m west of Units C2-D2 located on the western side of the patio. The road running south from Structure 407 leads to another *rejollada* as well as land used today for *milpa* agriculture and animal grazing.

Behind Structure 407 we found Colonial period deposits mixed with recent trash, some of which was obvious—burned batteries, scraps of clothing, plastic, and coins dating to the 1980s. The soil looked like it had undergone numerous burn episodes, and had become compact and red much like *rejollada* soils. Soil profiles were complicated—perhaps because we could still see soil changes within pits and holes dug relatively recently. Some pits and tunnels related to gopher activity, while other pits may have been human-created earth ovens for cooking, due to the presence of carbonized wood, even redder soil, and stones. Unlike in the red soils of *rejolladas*, a great deal of burned plant material remained intact in this area, and maize and beans could be discerned during excavation of the units. Unfortunately, it was unclear whether these plant remains dated to recent or older times. Nonetheless, carbon samples and light fractions were collected for possible future study. In general, the ceramics from the area directly behind the house suggest that artifacts dated predominantly to recent times and the late Colonial period.

Artifact densities. The excavation strategy and possibilities for Structure 407 were distinct from the other structures, and thus the results are not as easy to compare. Depth to bedrock was deeper than at Structures 317 and 403, generally reaching 30 cm or more (Table 6.1). Four *manos* total were present in excavation units D1, D2, and D14, and the weight of animal bone was relatively high compared to Structures 317 and 403, although low compared to early colonial Structure 206 (Figure 6.32). The quantities of marine shell and metal fragments were high. Other notable Colonial period artifacts included a cast lead bullet, projectile points, stone and ceramic spheres, and ceramic beads (Figure 6.33).

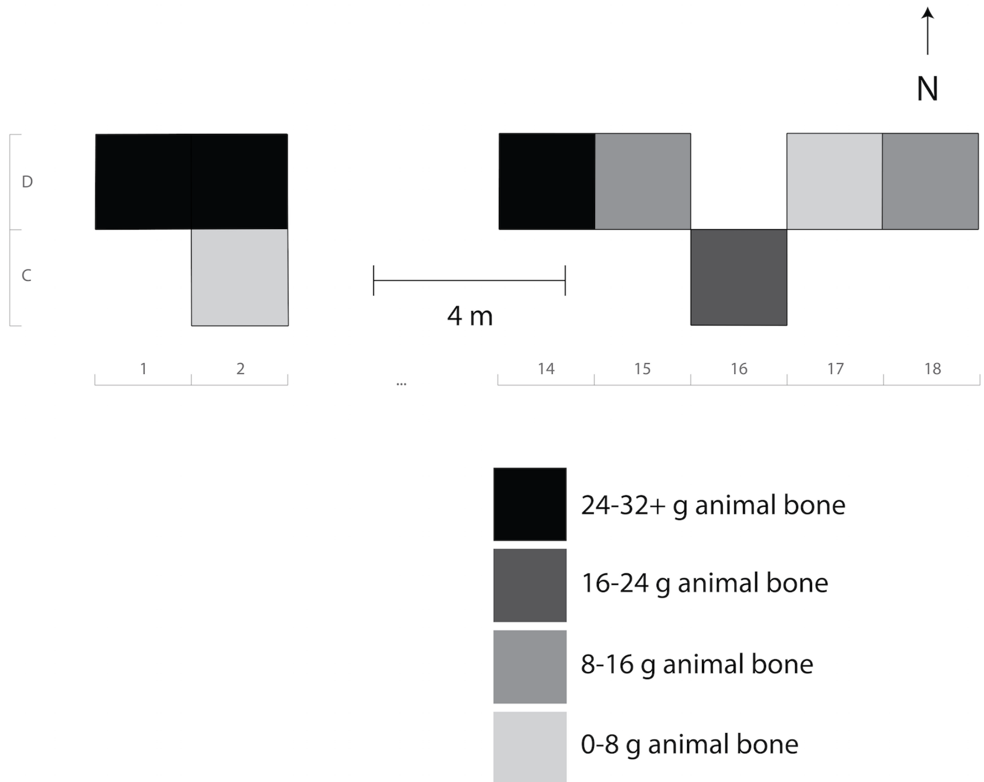


Figure 6.32. Animal bone densities at mixed colonial Structure 407.

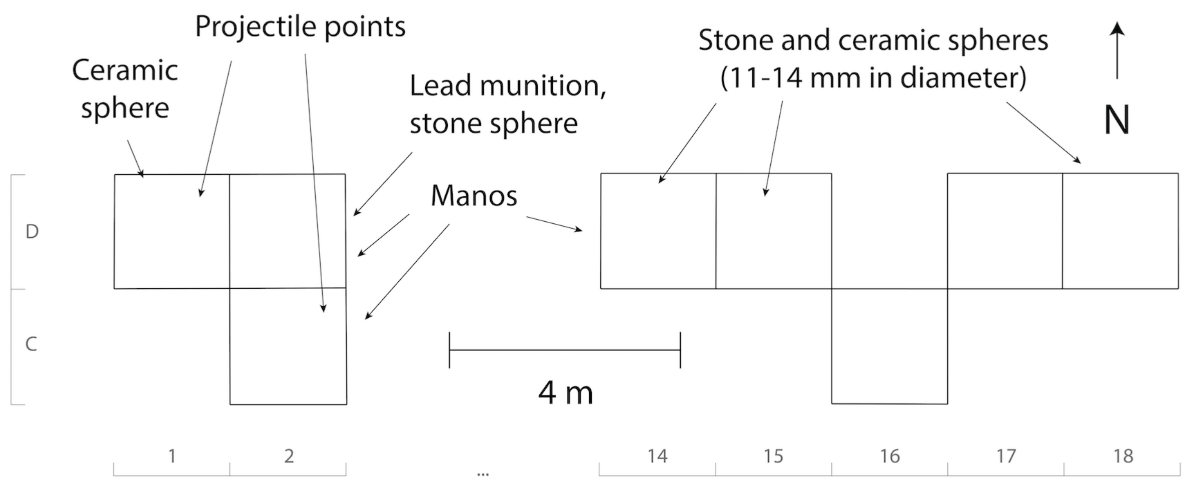


Figure 6.33. Special find distribution at mixed colonial Structure 407.

Special finds. We found one nearly complete Yuncu Unslipped pot in the backyard (Unit D15) starting about 10 cm below the surface (Figure 6.34). Perhaps this pot broke while baking in an earth oven (pit), at which point it was left and simply covered with dirt. This pot is reminiscent of the large jar forms present at Structure 403, which were late colonial as well. In general, the ceramics from units immediately behind the house appeared to date to later in the Colonial period up to recent times.

Figure 6.34. Nearly complete Yuncu Unslipped pot in context at Structure 407.

We found projectile points on the far western side of the patio, along with *manos*, and stone and ceramic spheres (Figure 6.33). As projectile points are often attributed to the Postclassic period, this evidence supports the idea that at least some of the artifacts from the western end of the Structure 407 grid dated to the early Colonial period, since the ceramics associated with the projectile points date to the Colonial rather than the Postclassic period (as at early colonial Structure 206).

Considered altogether, the excavations in this area include deposits from throughout the Colonial period. The function of the stone and ceramic spheres is unknown. They are approximately 11-14 mm in diameter and found in both the eastern and western units of this grid. Hanson (2008) found clay spheres of the same size and argued that they served as blowgun pellets.

AMS Dates

The AMS dates complement chronological information obtained from the ceramic data—they are not dependable on their own because the shallow excavations and low preservation rates make it likely for later charred wood to contaminate earlier contexts. In addition, the calibration curves available for the Colonial period in Yucatán provide wide ranges of possible calendar years for AMS dates, complicating their interpretation. In this section I introduce the AMS dates obtained for each residential area and describe the extent to which the dates seem to correlate with the material evidence encountered at each locale.

From early Colonial period Structure 206, I selected two pieces of carbonized wood for AMS dating (Table 6.4). One piece of charred wood came from Capa 1D of Unit G15—one of the best domestic midden contexts—at approximately 40 cm below the surface. For a residential context at Tahcabo, this is relatively deep, and the sample came from an area that was covered and protected by later in-washing of sediments from the adjacent platform. The calibrated calendar date range (at 95% probability) obtained from that carbonized wood fragment was AD 1484 to 1640, with the highest probability peak (at 37.5% probability) based on the calibration curve encompassing the calendar date range of AD 1554 to 1601. This narrower range matches well with the various lines of evidence found at Structure 206. For example, the Yuncu Unslipped and Sacpokana Red ceramic types were established by the time this charred wood sample was deposited based on ceramic analysis of the excavated level. These types did not emerge until the second half of the sixteenth century (Hanson 2008:1508).

The remaining dates obtained from residences involved the study of charred wood from relatively close to the surface (within 30 cm), increasing the likelihood that later burning activity contaminated earlier contexts. In addition, the calibration curve for Yucatán during the Colonial period and more recently makes it difficult to narrow the range of possible dates for each piece of carbonized wood. The 95% probability interval for each of the remaining residential dates ranged from the late seventeenth to the early twentieth century. While this makes the 95% probability calendar age ranges difficult to interpret and apply to the various residential contexts, the ranges associated with the highest probability peaks according to the calibration curve do appear to provide more helpful information about the likely dates of each piece of charred wood (see Table 6.4, "Highest probability peak").

Table 6.4. AMS dates from Colonial period residential units.

Phase	Str	Unit	Capa	Depth (cm)	Calendar range (95%)	Highest probability peak	% Col ceram[a]
Early	206	G15	1D	40-45	AD 1484 to 1640	AD 1554 to 1601 (37.5%)	86
Early[b]	206	C11	Feat1	10-15	AD 1668 to 1944	AD 1719 to 1780 (30.1%)	77
Mid	317	B8	1C	20-30	AD 1668 to 1949	AD 1725 to 1783 (39.5%)	89
Late	403	D7	1B	12-20	AD 1680 to 1939	AD 1801 to 1893 (47.1%)	98
Mix	407	C2	1C	20-30	AD 1682 to 1936	AD 1805 to 1894 (53.8%)	63

[a] Refers to percent of context ceramics that date to the Colonial period by count.
[b] Believed to be an intrusive piece of carbonized wood; date suspect.

The second date obtained from Structure 206 came from charred wood found in between stones that I originally thought had consisted of a Colonial period rock alignment located to the south of the earlier platform (Unit C11, "Feat1"). Later on, however, I realized that the rock alignment had more likely resulted coincidentally from stone collapse and in-washing from the platform that dated to a time after the early Colonial period residents had left. Animal bone was present amidst the stones, and it does seem like this was an area with

Colonial period deposits, but the context may not have been as intact as I had originally thought. The calibrated calendar date range associated with the highest probability peak is AD 1719-1780. This seems late given the date found in Unit G15 and based on the relative uniformity of artifact classes found across the residential area. Possibly this charred wood was deposited in the context later, when the land was used for agriculture and some stone and soil mixing occurred. Because the sample was only found approximately 10-15 cm below the ground surface, the possibility of later charred wood intruding into the context is high.

At Structure 317, the sample came from a fairly good context 20-30 cm beneath the surface in which 89% of the ceramics by count dated to the Colonial period. Nonetheless, the possibility for charcoal to be intrusive into the context is high given that the platform is located in an area at the outskirts of town where burning takes place frequently and animals are grazed today. The collection of charred seeds from the same unit, taken from the level above that from which the AMS sample came (see charred seed results section below), demonstrate that many of the seeds were from weedy plants that might have become integrated into the soil through time. Nonetheless, the highest probability peak (at 30.1% probability) for the Structure 317 AMS date coincides with a calendar date range that is not unreasonable, though perhaps a bit late for this context based on artifact classes and characteristics: AD 1725-1783.

At late colonial Structure 403 and mixed colonial Structure 407, charred wood sent for AMS dating came back with highest probability peaks that correspond to calibrated calendar date ranges spanning the nineteenth century (Table 6.4). Structure 403 likely dates to the late Colonial period and maybe even to the early Republican period based on the coin from 1775, the metal artifacts, and qualities of the ceramics. Because the charred wood submitted for dating came from just 15-20 cm below the surface, it is possible that later wood intruded into a slightly earlier context. The patio of Structure 407 likely encompasses the remains of a mix of residential deposits dating from the early Colonial period to recent times, so charred wood from this calendar range makes sense.

The AMS dates, though characterized by wide calendar age ranges, especially at 95% probability, do for the most part support the chronology proposed by means of artifact analysis for each structure. Because of the high possibility that later charred wood contaminated earlier contexts, I decided not to include a model for the AMS dates in which the Structure 206 charred wood comes earlier, followed chronologically by the Structure 317 sample and finally the samples from Structures 403 and 407. While such a model could narrow the calibrated date ranges slightly based on Bayesian analysis that the OxCal software conducts, the data inputted into the model would not be of high enough quality to warrant such sophisticated calculations. It is more effective to put the AMS dates in conversation with the artifacts found at each residence, including those discussed further below. Based on this kind of calibration, it seems likely that Colonial period residents of Structure 206 lived there during the early Colonial period, probably within the years 1560-1640. Colonial residents of Structure 317 may have lived there during the middle-to-late Colonial period, in the range of 1670-1780. Finally, residents of Structure 403 would have lived there during the late Colonial period and perhaps into the early Republican period, likely between 1760-1845 (leading up to the onset of the volatile Caste War period). A Spanish coin dating to 1775 provides a *terminus post quem* for at least some portion of Structure 403’s occupation.

Distribution of Rarer Colonial Period Ceramic Types across Residences

Sacpokana Red and Yuncu Unslipped ceramic types predominated at all of the Colonial period residences (Tables 6.5 and 6.6), although their characteristics modulated through time (see vessel form and rim diameter sections below). Rarer ceramic types encountered included Columbia Plain, other majolica, and Olive Jar sherds (Tables 6.5-6.7). At early colonial Structure 206 we found a Columbia Plain (1490-1650) ceramic sherd, as we might expect based on the type's dates of manufacture (all manufacture dates included in this section come from the Digital Ceramic Type Collections of the Florida Museum of Natural History [FLMNH 2019]). Somewhat surprisingly, however, we also found two Columbia Plain sherds each at Structures 407 and 403. Behind Structure 407, one sherd each was found in the eastern and western units of the grid. At late colonial Structure 403, we found the Columbia Plain sherds in a level with an iron key fragment. While the end date for Columbia Plain production tends to be cited as 1650, it continued in circulation until the early 1700s (Marken 1994:163-172) and may have been kept in households as heirlooms long beyond that time.

Table 6.5. Percentage by count of colonial wares for studied contexts.

	Colonial Timeframe			
	Early	Middle	Mixed	Late
	Str 206	Str 317	Str 407	Str 403
Columbia Plain (1490-1650)	0.01		0.10	0.04
Ichtucknee Blue on Blue (1550-1630)	0.01			
San Luis Blue on White (1550-1650)		0.04	0.08	
Olive Jar, Middle Style (1560-1800)		0.07		0.13
San Luis Polychrome (1650-1750)			0.05	
Unknown Majolica			0.05	
Oxcum Brown	0.06			0.02
Sacpokana Red	5.52	10.45	10.03	4.16
Yuncu Unslipped: Yuncu	94.38	85.79	85.11	92.07
Yuncu Unlipped: Textile Impressed		3.66	4.51	3.60
Yuncu Unslipped: Special Modeled	0.01			

Table 6.6. Percentage by weight of colonial wares for studied and weighed contexts.

	Colonial Timeframe			
	Early	Middle	Mixed	Late
	Str 206	Str 317	Str 407	Str 403
Columbia Plain (1490-1650)	0.08		0.19	0.11
San Luis Blue on White (1550-1650)		0.04	0.08	
Olive Jar, Middle Style (1560-1800)		2.96		0.62
San Luis Polychrome (1650-1750)			0.02	
Unknown Majolica			0.03	
Oxcum Brown	0.17			0.02
Sacpokana Red	10.46	11.31	12.85	4.68
Yuncu Unslipped: Yuncu	89.29	83.39	78.23	91.88
Yuncu Unlipped: Textile Impressed		2.29	8.60	2.69

Another relatively rare sherd found at early colonial Structure 206 was what ceramicist Teresa Ceballos Gallareta designated in her analysis as Ichtucknee Blue on Blue, a type that some scholars have re-classified as two different types: Sevilla and Ligurian Blue on Blue (Deagan 1987:70; Goggin 1968:135-141; Hanson 2008:1440; Lister and Lister 1982:62; Marken 1994:216-217). Ligurian Blue on Blue (1550-1600) was produced in Italy, while Sevilla Blue on Blue (1550-1630) was a Spanish imitation of the type (Marken 1994:217). The form they generally take is a broad-rimmed plate (Deagan 1987:70). Because Sevilla and Ligurian Blue on Blue are easily confused, Yucatecan ceramicist Rafael Burgos Villanueva (1995:100) prefers to refer to them as varieties of Ichtucknee Blue on Blue. The only example found at Tahcabo was located at the early colonial structure, in a level with a projectile point and animal bone (Table 6.7). Hanson (2008:1440) found a Ligurian Blue on Blue sherd along with Kraak porcelain, Olive Jar sherds, and iron tools at a relatively wealthy early colonial residence at Ek' Balam. He also found a Sevilla Blue on Blue sherd and a Ligurian Blue on Blue sherd at two other Ek' Balam houses. In his dissertation, Hanson

(2008:1445) points out that Ligurian Blue on Blue in particular was expensive and expresses surprise that he found this type at an early colonial indigenous Maya settlement.

Table 6.7. Counts of rarer colonial sherds across Tahcabo residences.

	Colonial Timeframe			
	Early	Middle	Mixed	Late
	Str 206	Str 317	Str 407	Str 403
Columbia Plain (1490-1650)	1		2	2
Ichtucknee Blue on Blue (1550-1630)	1			
San Luis Blue on White (1550-1650)		1	3	
Olive Jar, Middle Style (1560-1800)		2		7
San Luis Polychrome (1650-1750)			1	
Unknown Majolica			1	
Oxcum Brown	5			1
Yuncu Unlipped: Textile Impressed		108	90	199
Yuncu Unslipped: Special Modeled	1			

San Luis Blue on White (1550-1650) could be found at the middle and mixed Colonial period residences (Structures 317 and 407; Table 6.7), whereas San Luis Polychrome (1650-1750) was found only at Structure 407. The lack of these types at the early colonial residences of Ek' Balam and Tahcabo may suggest that they arrived to the peninsula at a later date than Ichtucknee Blue on Blue. Middle-Style Olive Jar sherds (1560-1800) were only recorded at the middle and late Colonial period Structures 317 and 403, while no Olive Jar sherds were found at the early colonial residence. This is unexpected, as Hanson (2008:1423; 1466) found Olive Jar sherds to be early (often associated with Mama Red and Chen Mul Modeled sherds) and ubiquitous at early colonial Ek' Balam residences, and the same can be said for other indigenous sites across the circum-Caribbean region.

Only at middle and late Colonial period structures were Yuncu Unslipped: Textile Impressed variety sherds found, where they were present in relatively large quantities. These textile-impressed sherds generally consisted of fairly irregular vessels, with wavy rims that made it difficult to obtain rim diameter measurements or determine vessel form. Little has been written of textile-impressed sherds in Yucatán—they appear sporadically in accounts of sherds at nearby sites with some colonial occupation (Alonso Olvera 2013; Bey et al. 1998). However, Hanson did not find this variety at the early colonial residences of Ek' Balam, just as I did not find them at the early colonial house in Tahcabo.

Mention of textile- or fabric-impressed sherds has also been made at the site of Ocelocalco, Chiapas, where during the early Postclassic period through the Colonial period, "fabric-impressed *comales* are the single most common vessel form" (Gasco 1992:70). Gasco suggests that the increased use of such *comales* may have related to the cacao trade. Similarly, fabric-impressed sherds found in the central Mexican highlands, called Texcoco Fabric Impressed, date to the Postclassic period and may have been used in the salt-making industry (Charlton 1969; Talavera Barnard 1979). The fabric in at least the latter case may represent a cover used to separate a mold from the clay used in vessel production. Mold-made vessels would have been easier for non-specialists, such as salt-makers, to produce and use to distribute their product. It is likely that the distribution of textile-impressed sherds of Yucatán maps onto a middle to late Colonial period trade good, which may have been salt, as Tahcabo is relatively close to north coastal salt beds, which could help to explain why we have such a large sample of this type variety. Another possibility is that the textile-impressed vessels were used for honey transport, similar to Bey's (2007) argument that the Postclassic period Blanco Levantado amphoras found in the Tula region were used for the transport of *miel de maguey*.

Oxcum Brown was found at both the early and late Colonial period residences (Tables 6.5-6.7). As far as I know, Oxcum Brown is not yet a well-defined type, and it has been assigned a date range of 1550-1800. Surely variations exist in the type through time, but it is yet to be thoroughly documented. We found so few Oxcum Brown sherds that I cannot make any general observations based on this collection at this time.

Overall, the presence of rare ceramic types at the Colonial period residences excavated at Tahcabo seem more or less to follow expectations based on their chronological positions from the early to late Colonial period. It was unexpected that we found Columbia Plain sherds in a unit at the late Colonial period house, but likely such vessels were traded and kept as heirlooms long beyond their dates of manufacture. While San Luis Blue and White may have been manufactured beginning in the 1550s, it may not have reached Yucatán in large quantities until well after that date. It was unexpected that we did not find Olive Jar sherds at the early colonial house. Finally, the textile-impressed variety of Yuncu Unslipped appears to have been in circulation during the middle to late Colonial period, when it may have been used as a transport vessel for a common regional trade good.

Ceramic Forms and Rim Diameters

In this section I present a broad picture of the varying vessel form occurrences at the different Colonial period residences. Then, I dive into a more detailed analysis of the different forms based on drawings and rim diameter measurements from the best-preserved examples at each of the four houses. Because sherds within the ceramic assemblages were generally very fragmented, few sherds were large enough to allow rim diameter measurements, but those studied did provide intriguing patterns across the houses. They suggest changes in access to and uses of pottery through time.

Form Definitions

In presenting ceramic forms, I translate to English the Spanish nomenclature used in Yucatán generally, and used in particular by ceramicist Teresa Ceballos Gallareta in classifying sherds from Tahcabo. Most of these translate easily to forms commonly used in English form discussions—a *plato* is a plate, defined as a shallow unrestricted form with a height less than one-fifth of its diameter (e.g., Sabloff 1975:25). A *cajete* is a dish, defined as a shallow unrestricted from that is slightly deeper, having a height more than one-fifth but less than one-third its diameter. A *cuenco*, or bowl, can have a restricted or unrestricted opening, with a height from one-third its diameter up to equal its diameter. On the other hand, the *tecomate* form does not translate as easily, so I will use this Spanish term to describe a globular, neckless jar with restricted orifice. An *olla*—a jar—is defined here as any necked vessel—the height of the vessel may or may not be greater than its diameter. Included in this category is the large cooking pot.

Form Analysis

Ceramic specialist Teresa Ceballos Gallareta assigned forms for nearly all studied sherds, including body sherds, based on her knowledge of the forms typically found for every type-variety encountered as well as estimations of thickness tendencies among different forms. In many cases assignments of forms to body sherds are educated guesses. In order to avoid errors and ensure high dataset accuracy, for this analysis I only use the form data generated from rim sherds. I also consider the vessel form and rim diameter data that I gathered from the largest rim sherds as I drew them, which I consider to be high quality data. When comparing the highest quality form data that I generated and the forms that Teresa

Ceballos assigned for all rim sherds, I found that the trends discussed in this section exist broadly in the datasets of Teresa's rim sherds and my drawn sherds (although the second is quite small; see Tables 6.8-6.11).

Table 6.8. Percentage (by count) of colonial rim sherds of each form, by residence.

Phase	**Str**	dish	bowl	jar	plate	*tecomate*
Early	**206**	1.97	29.53	68.11		0.39
Middle	**317**	0.96	24.88	70.81	1.44	1.91
Mixed	**407**	0.74	6.67	91.85	0.74	
Late	**403**		8.26	91.45	0.28	

Table 6.9. Counts of colonial rim sherds representing each form, by residence.

Phase	**Str**	dish	bowl	jar	plate	*tecomate*	**Total**	bowl/dish: jar
Early	**206**	5	75	173		1	**254**	0.46
Middle	**317**	2	52	148	3	4	**209**	0.36
Mixed	**407**	1	9	124	1		**135**	0.08
Late	**403**		29	321	1		**351**	0.09
	Total	**8**	**165**	**766**	**5**	**5**	**949**	

Table 6.10. Percentage (by count) of forms for colonial rim sherds drawn, by residence.

Phase	**Str**	dish	bowl	jar	plate	*tecomate*
Early	**206**		25	50		25
Middle	**317**	15	42	38	4	
Mixed	**407**			100		
Late	**403**		6	94		

Table 6.11. Counts of forms for colonial rim sherds drawn, by residence.

Phase	**Str**	dish	bowl	jar	plate	*tecomate*	**Total**
Early	**206**		4	8		4	**16**
Middle	**317**	4	11	10	1		**26**
Mixed	**407**			9			**9**
Late	**403**		2	32			**34**
	Total	**4**	**17**	**59**	**1**	**4**	**85**

Here I compare Colonial period vessel forms across residences (see Figures 6.35-6.37). The forms of Colonial period ceramic types include high proportions of jars at each residence. When looking at the larger dataset (Table 6.8), percentages of jar forms range from 68-92% of the Colonial period ceramic assemblage from each residence, and the percentage of jars increases through time. Similarly, Table 6.9 shows that ratio of bowls and dishes to jars decreases through time. In the late and mixed Colonial period assemblages from Structures 403 and 407, jars predominate over all other types, while bowls come in second and plates or dishes a far third. At early Colonial period Structure 206, the more diverse collection includes bowls, dishes, and *tecomates* (in that order of occurrence; Table 6.8). The Structure 317 assemblage, with the widest range of forms present despite relatively low counts overall, includes jars, bowls, *tecomates*, plates, and dishes (Tables 6.8-6.9).

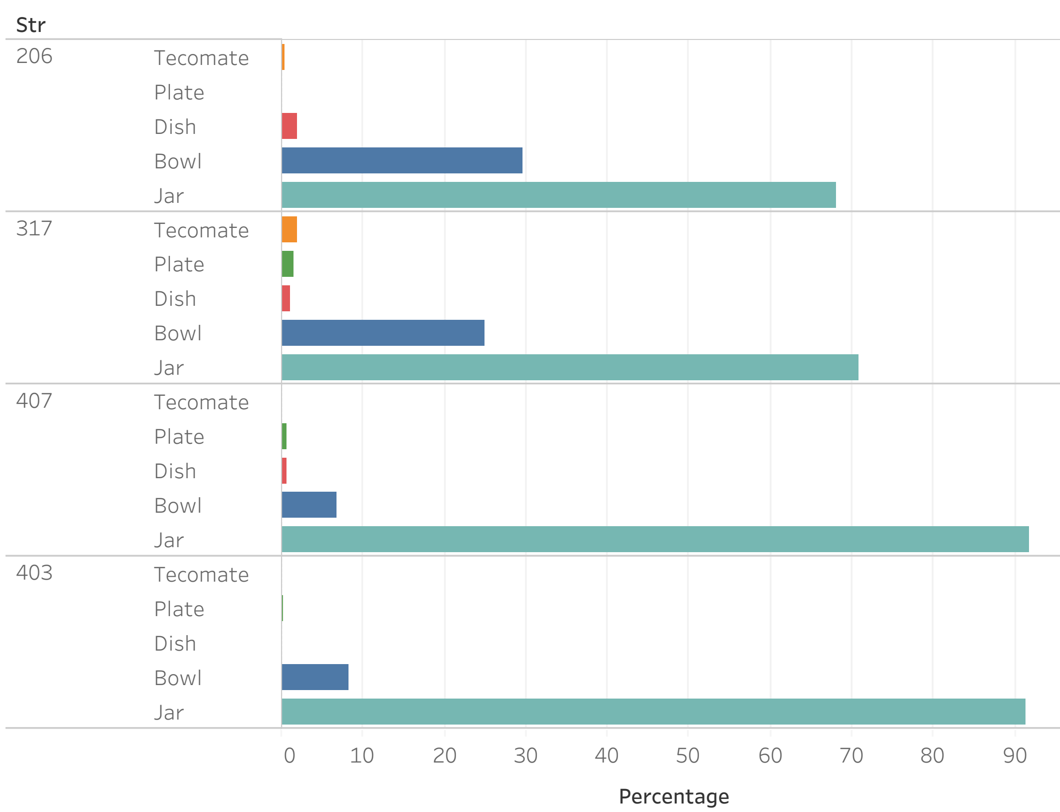


Figure 6.35. Percentages (by count) of colonial rim sherds of each form, by residence.

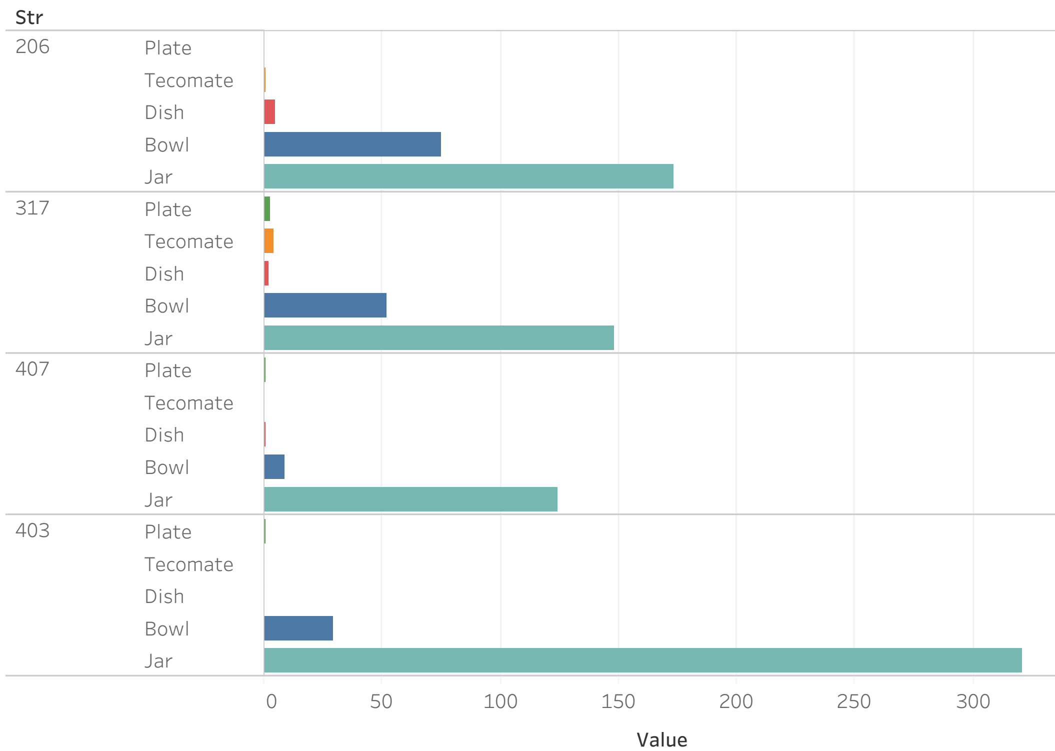


Figure 6.36. Count of colonial rim sherds of each form, by residence.

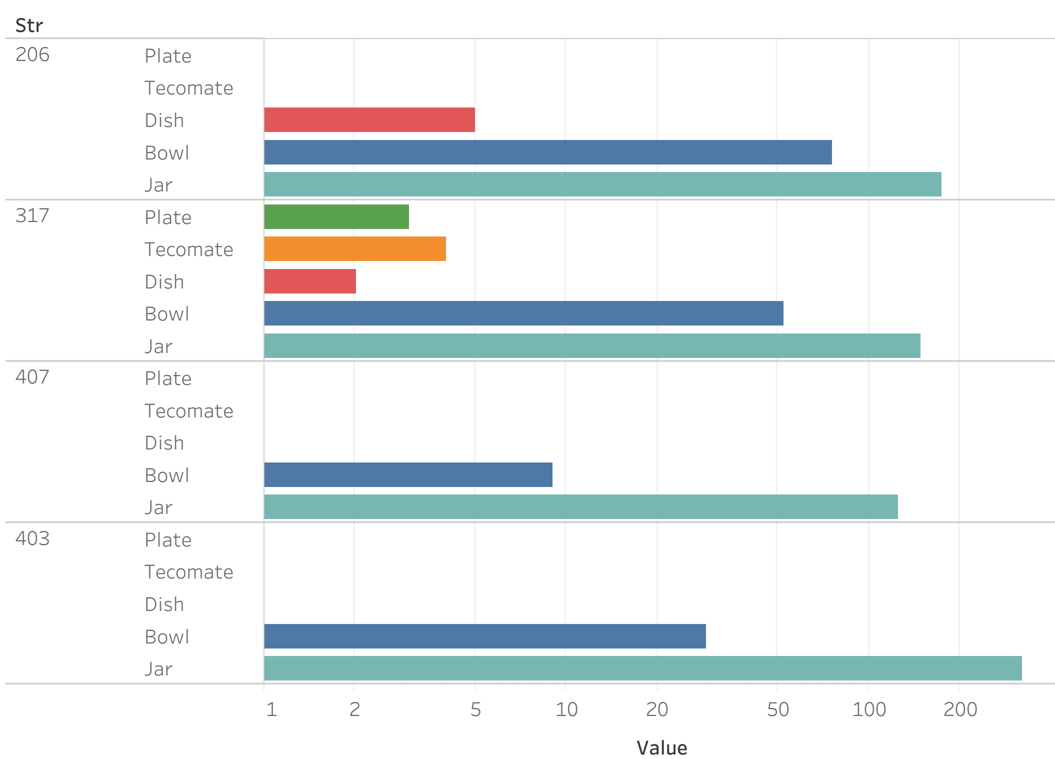


Figure 6.37. Log-scale counts of colonial rim sherds of each form, by residence.

The wider variety of forms at the early to middle Colonial period houses may suggest greater access to resources and ceramic trade networks. The later shift towards jars, with low quantities of individual serving vessels in late Colonial period contexts (see next section), could suggest a shift to using lightweight and more portable gourds more consistently as personal bowls. The shift may also have to do with increased vessel stockpiling related to changes in ceramic availability during the late Colonial period. Another factor contributing to the apparent change is the vast number of sherds that result when a large jar breaks apart. We return to these considerations in the discussion of vessel rim diameters below.

Rim Diameter Study

This section addresses the Colonial period rim sherds that were large enough to accurately draw and measure for rim diameter (see Tables 6.10 and 6.11 above). While it is a small sample (n=85), the largest rim sherds that I selected roughly paralleled the overall form percentages, suggesting that relative diversity was preserved in the sample.

Overall, my expectations for vessel rim diameters were contrary to the findings. My original hypothesis was that vessel rim diameters would be larger at an early Colonial period house than at a middle or late Colonial period house, mirroring the trend in household size from large, extended groupings to small, nuclear house lots. The other possibility, I thought, was that ceramic vessel sizes would stay constant, providing evidence that extended families continued to participate in the joint preparation and sharing of food among the extended family even though they lived in nuclear family residences later in the Colonial period. Instead, the rim diameters of vessels from the early Colonial period house (Structure 206) are considerably smaller on average than the rim diameters of vessels from the late Colonial period house (from Structure 403; Figures 6.38-6.39).

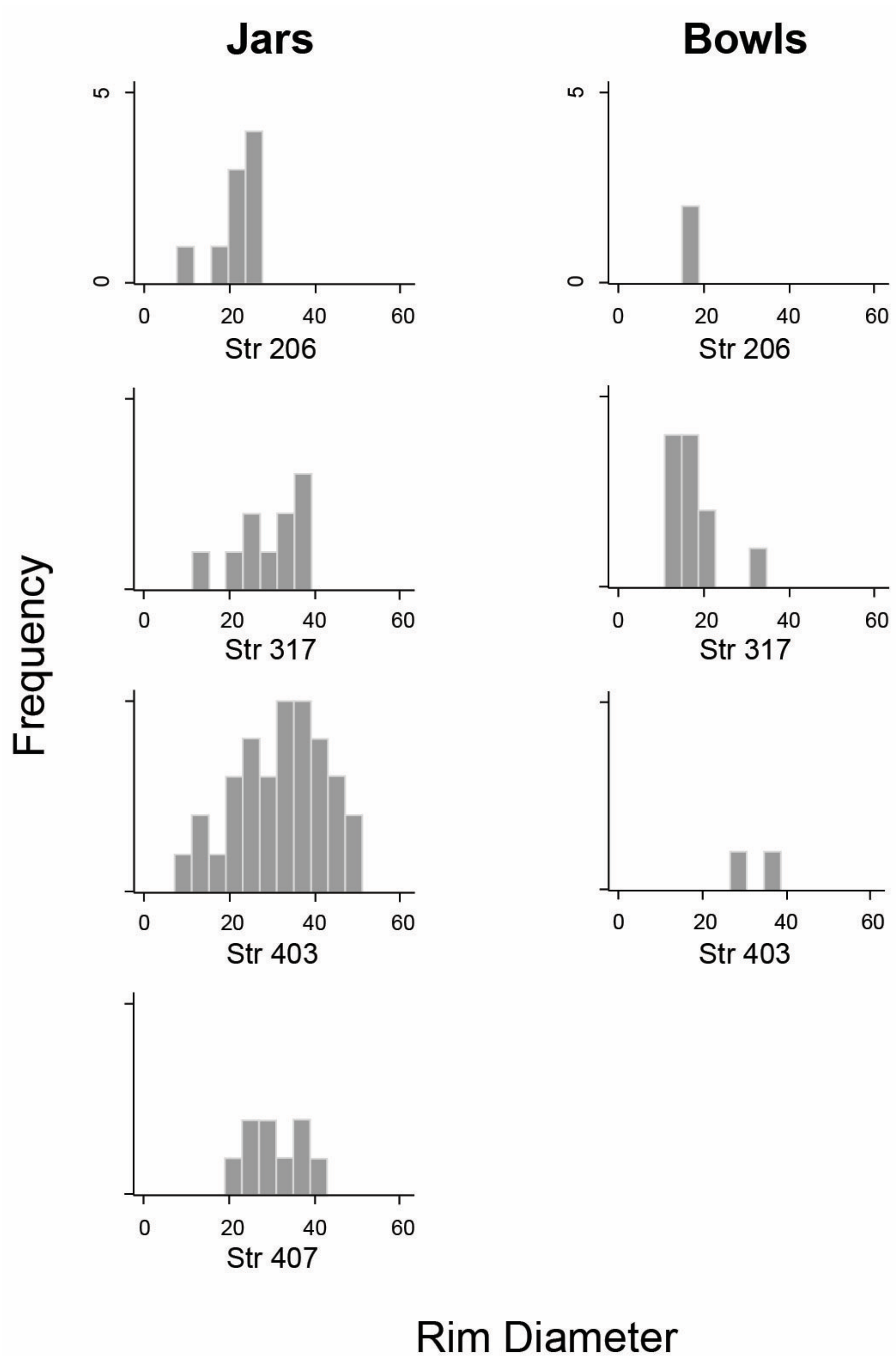


Figure 6.38. Rim diameters of jars and bowls by residence, for vessels drawn.

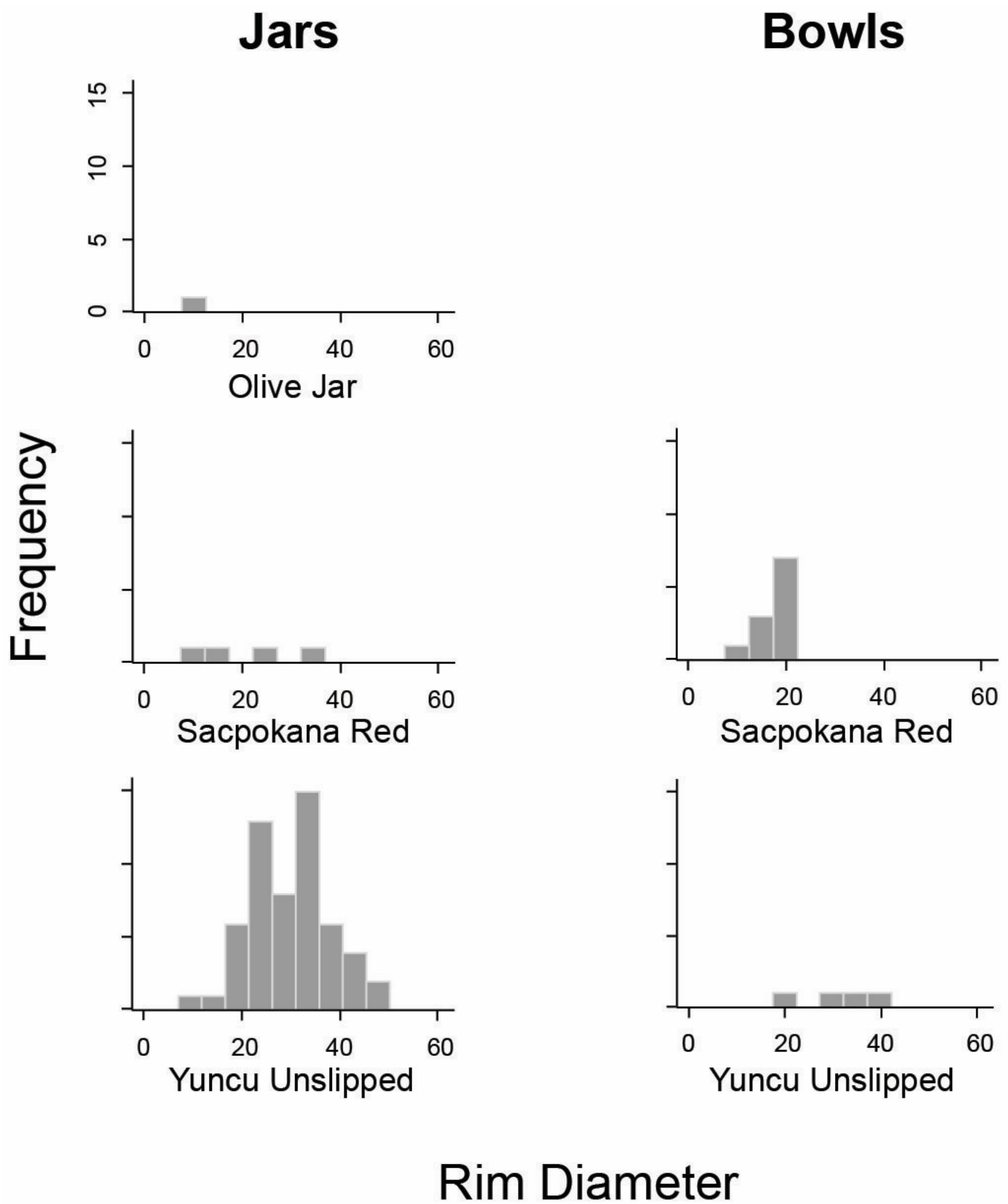


Figure 6.39. Rim diameters of jars and bowls by ceramic type, for vessels drawn.

While the rim diameters of jars at Structure 403 overlap with those at Structure 206, they also include jars with rim diameters almost twice the size of vessel rim diameters at the earlier structure (Figure 6.38). The range of rim diameters for jars at Structure 403 is very wide, as well, as the assemblage includes Olive Jar and Sakpokana Red jar sherds, with small rim diameters (Figure 6.39). Beyond those two examples, nearly all vessels from Structure

403 examined for rim diameter are of the Yuncu Unslipped ceramic type. Rim diameters of jars at Structures 317 and 407 fall in-between those at the early and late Colonial period structures, on average, though the median rim diameter for jars at Structure 317 is the same as that of Structure 403 (median rim diameter = 32 cm).

Some differences in the rim diameters among jars have to do with their functions—for example whether they were used to hold water versus cook stews or store dry goods. Cooking pots would vary in size based on the size of the household for which they provided food on a daily basis or what households were eating (Crown 2000:230). In addition, however, some larger cooking pots would be required for preparing feasts, in order to meet the food needs of large gatherings of people, especially for baptisms, weddings, and other special occasions. Jars also include storage vessels, which could have been quite large, with rim diameters appropriate for what they stored and less dependent on household size. Unfortunately, the exact function of vessels could not be determined from the rim sherds examined. One possible functional class could be detected for the Structure 206 assemblage—long-necked and narrow-rimmed jars not present at the later houses (Figure 6.40). These may have served to hold water or other liquids, which would generally be the expectation for jars with narrow rims.

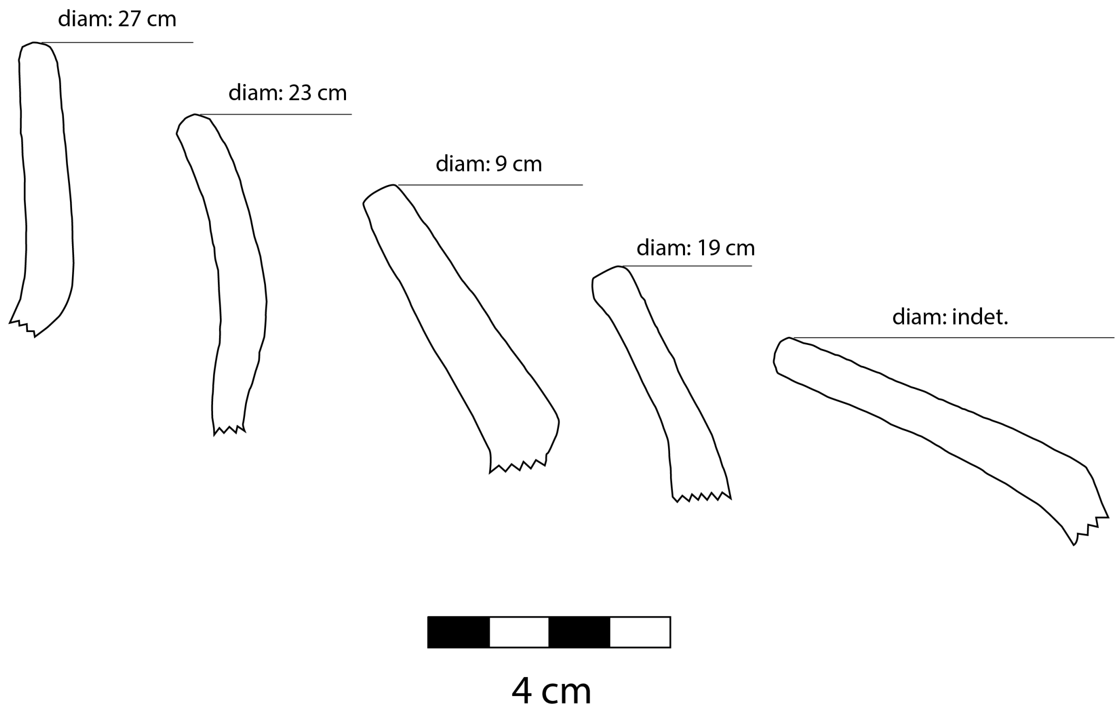


Figure 6.40. Long-necked jar rim sherds from early Colonial period Structure 206.

Factors impacting the dataset include the advanced breakage of sherds from the early Colonial period house as compared to the late Colonial period contexts. This could bias against finding rim sherds of large jars with enough rim present to be measured accurately. One way I sought to minimize the impact of this taphonomic process on the dataset was by selecting rims with larger diameters to draw even though they had lower surviving percentages of the complete rim than I would have preferred (e.g., 3%, even though I generally preferred to draw those sherds with at least 5% surviving rim). Another factor mentioned earlier is that the larger jars found in late Colonial period contexts could be over-represented by count and weight in a ceramic assemblage with other vessel simply because of their size. No minimum vessel calculations were made that might correct for this vessel form overrepresentation due to size.

Only within the early colonial Structure 206 ceramic assemblage did I find *tecomate* rim sherds large enough to draw and measure, and the range of their rim diameters was slightly broader than but similar to the range of rim diameters for jars in the same context. The smallest *tecomate* (rim diameter = 7 cm) from Structure 206 seems transitional between Mama Red and Sacpokana Red types (Socorro Jiménez Álvarez, personal communication 2018; Figure 6.41B). The form of the vessel resembles that of earlier Mama Red (Postclassic) forms (e.g., Brainerd 1948:Figures 22, 103), while the paste and slip characteristics resemble those of Sacpokana Red, a Colonial period type. A rim sherd from a bowl found at Structure 206 also appears transitional between Mama Red and Sacpokana Red (Figure 6.41A), and one body sherd from a jar has the form characteristic of an earlier Yacman Striated jar with a paste of Yuncu Unslipped (Figure 6.41C).

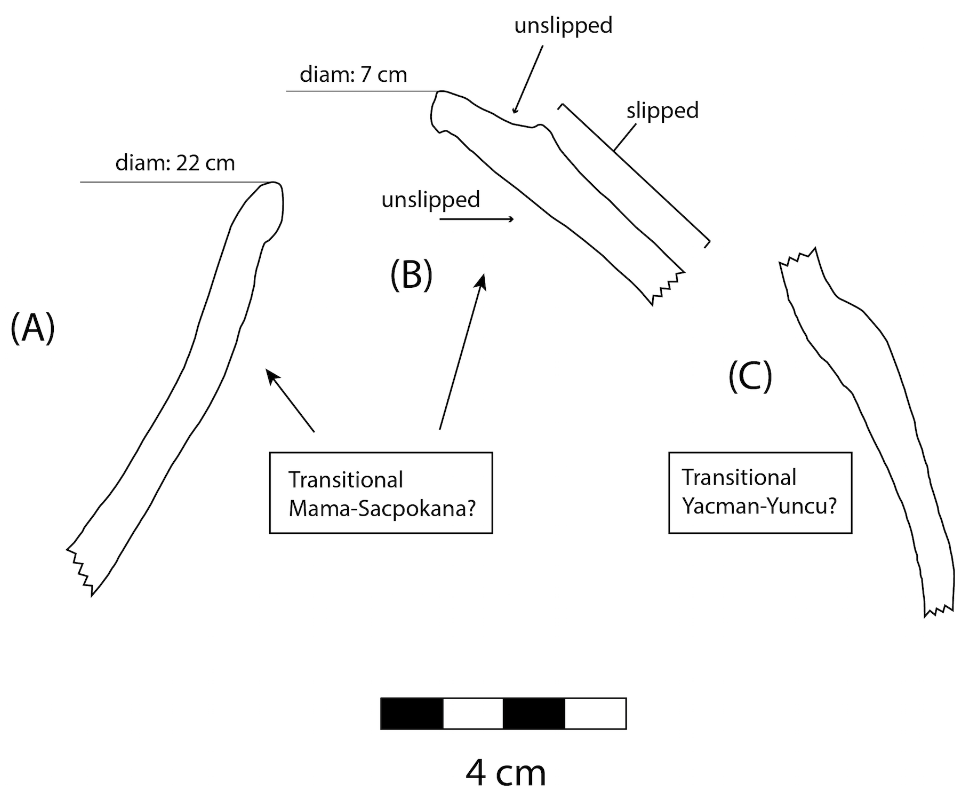


Figure 6.41. Examples of transitional vessels with Postclassic forms and Colonial pastes from early colonial Structure 206.

Some similarities could be seen among vessels at Structures 206 (early colonial) and 317 (middle colonial). Present at both were vessels with flattened and grooved rims that seem to be characteristic of earlier Yuncu Unslipped forms (Hanson 2008:1514; Kepecs 1998:130). Vessels with this rim at Structure 317 included a plate, a dish, and short-necked jars (Figure 6.42). While the rim diameters of jars from Structure 206 are smaller than those from Structure 317, individual serving dishes and bowls are consistent in rim diameter size across the structures. On the other hand, the smallest vessels constituting the sample at Structure 317, whether jars, bowls, or dishes, are Sacpokana Red, while the smallest vessels at Structure 206 are a mix of Yuncu Unslipped and Sacpokana Red, with a slightly higher proportion of Yuncu Unslipped vessels. It is possible that Sacpokana Red serving vessels of all forms became standard during the middle Colonial period, when residents lived at Structure 317, or the presence of such ceramics may indicate that house residents had good access to pottery, since slipped vessels were likely preferred as serving vessels.

Short-necked but wide-rimmed jars with hard, gray pastes are the standard vessel form found at the late Colonial period house (Figure 6.43). As stated at the end of the previous section, small dishes and bowls appear to be absent at Structures 407 and 403—perhaps individual serving vessels consisted instead of cleaned and prepared gourds (i.e., calabash) harvested from gardens and fields. The two bowls identified at Structure 403 were very large, at 27 and 38 cm in diameter, and may have been used for food preparation rather than presentation. The lack of Sacpokana Red ceramics at the two later structures correlates with the lack of individual serving vessels found in those assemblages.

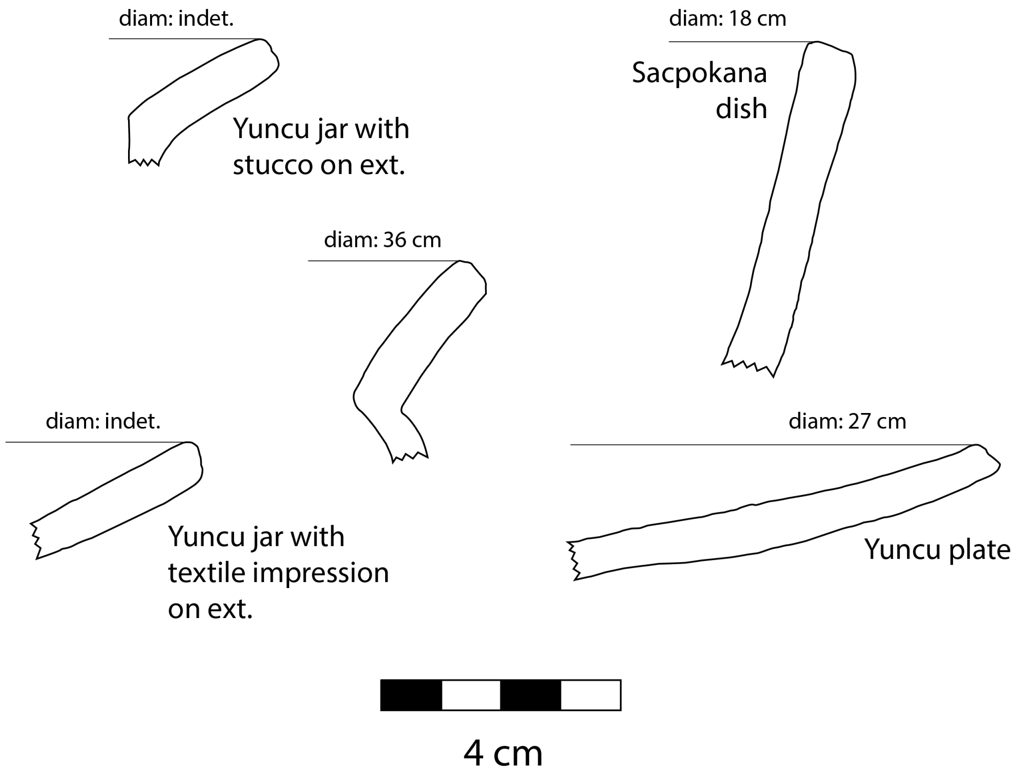


Figure 6.42. Vessels with flattened and grooved rims from middle colonial Structure 317.

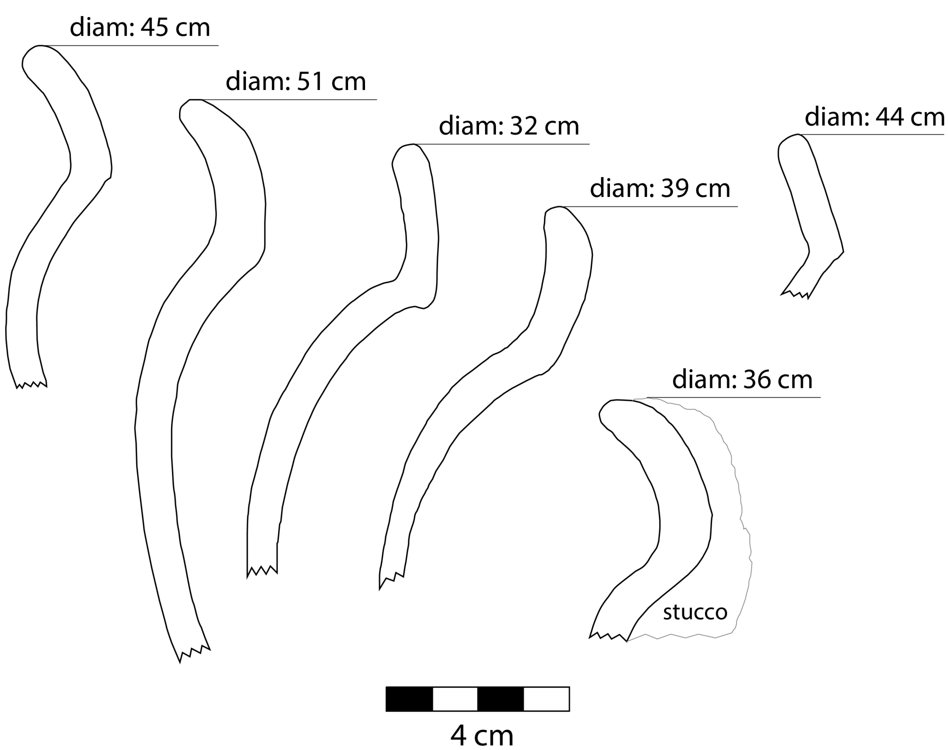


Figure 6.43. Short-necked and wide-rimmed jars from late colonial Structure 403.

Charred Seed Results Compared

Light fraction samples selected for analysis came from levels with high artifact densities and high proportions of Colonial period ceramics, as described above. Because of the nature of the deposits and the environment of Yucatán, few charred seeds were preserved, and the samples selected for study were from those levels with high Colonial period artifact densities, including evidence for kitchen trash deposition in the form of groundstone tools. While the data produced from the samples are not robust, they point to certain possible trends worth considering as part of this discussion of Colonial period livelihoods. Quantities of plant remains were higher at Structure 206 because the identified midden was deeper than the others and consisted of three samples rather than just one. In addition, as the majority of the midden was located farther beneath the surface, the preservation of plant remains was better.

In order to standardize the seed counts across residences, I decided to use the ratio of seed count per wood weight for each sample. The weight of charred wood preserved (greater than 2 mm in size) serves as a proxy for varying levels of preservation. This correlation could be seen in the data: in Structure 206's Unit G15, the largest sample, from the 10-20 cm level, yielded 2.63 g wood, while the smaller samples from the 20-30 cm and 30-40 cm levels yielded 3.19 g and 3.71 g, respectively, representing better preservation with depth. On the other hand, the quantity of wood preserved from the Structure 317 sample was high, which could to a greater extent reflect how much more recent burning happened in which wood became integrated into the 10-20 cm level.

Fairly high quantities of maize cupule and kernel fragments were found in the early Colonial period Structure 206 midden (Table 6.12). Kernel fragments were more than twice as numerous as cupule fragments. There was also a clump of maize cob and cupules mixed up with charred wood, suggesting that a piece of cob fell into the cooking fire. Other *milpa* crops represented by charred seeds in the samples included legume, squash, and chili pepper. Tree fruits consisted of palm endocarps, while a wild berry seed (*Rubus* sp.) was also found. This suggests an emphasis on wild resources collected from forest and field. The weed seeds may have been intrusive to the context, as some examples were found uncarbonized.

The middle Colonial period midden sample from Structure 317 included maize cupule and kernel fragments in addition to a charred bean and what seemed to be charred squash rind. Many weedy species were found in this sample, especially a species of morning glory (*Ipomoea* sp.), which is not unexpected given that the sample was collected from a level starting at just 10 cm below the surface. While the weed seeds were charred, there is no particular reason to expect them to have been *in situ* deposits from the Colonial period, since ongoing burning and soil mixing has occurred in the area through time. However, the context was relatively well-preserved (i.e. the proportion of Colonial period ceramics was high and the AMS date plausible), and all of the weedy species represented have economic uses (as ornamentals, for animal feed, and for honey production) as well, so it is possible that these plants were growing in the house lot, which was swept and the resulting trash burned, thus preserving the charred seeds within a midden deposit.

The late Colonial period midden sample from Structure 403 included only maize kernel fragments and no cupule fragments. This may suggest a lack of maize processing occurring at the house, although findings are preliminary since the counts are so low. VanDerwarker (2006:105-106) has argued that increased ratios of maize cupules to kernels may indicate elevated levels of maize processing, or shelling, and that increased shelling at a residence may indicate greater emphasis on infield cultivation. On the other hand, higher kernel to cupule ratios may suggest the use of outfield cultivation or even the purchase of maize. Another likely possibility in this case is that residents prepared kernels already removed from the cob for tortilla, tamale, or *atole* preparation, as Tahcabo residents do today. Bean was also found, as well as a sapote family fruit seed fragment. The fruit seed fragment may indicate that residents of the house grew this valuable tree or that they received fruits from a neighbor or relative.

Table 6.12. Plant taxa found within the richest Colonial period midden contexts at residences in Tahcabo.

	EARLY COLONIAL		**MIDDLE COLONIAL**		**LATE COLONIAL**	
	Str 206 Midden *10-40 cm*		**Str 317 Midden** *10-20 cm*		**Str 403 Midden** *10-20 cm*	
Plant Taxon	count	#/wt †	count	#/wt	count	#/wt
Domesticates						
Maize cupule fragment	28	2.94	3	1.02		
Maize kernel fragment	72	7.56	1	0.34	7	15.56
Maize cob fragment	1	0.10				
cf. Common bean (cf. *Phaseolus* sp.)			1	0.34	4	8.89
Legumes (Fabaceae spp.)	1	0.10			1	2.22
cf. Squash rind (cf. Cucurbitaceae spp.)	1	0.10	1	0.34		
Squash seed (cf. *Melothria* sp.)	1	0.10				
cf. Chili pepper (cf. *Capsicum* sp.)	2	0.21				
Tree fruits						
Palm endocarp (Arecaceae spp.)	2	0.21				
cf. *Zapote*					1	2.22
Wild berry						
Rubus sp.	1	0.10				
Weedy species						
Asteraceae spp.			1	0.34		
Cecropia sp.	11*	1.15				
cf. *Davilla* sp.	1	0.10				
cf. *Phytolacca* sp.	1*	0.10	1	0.34		
Ipomoea sp.	1	0.10	54	18.34		
Malvastrum sp.	4	0.42	23	7.85	2	4.44
cf. *Solanum* sp.	1	0.10			1	2.22
Tradescantia sp.			4	1.37		
Wissadula sp.			1	0.34		

	EARLY COLONIAL		MIDDLE COLONIAL		LATE COLONIAL	
	Str 206 Midden *10-40 cm*		**Str 317 Midden** *10-20 cm*		**Str 403 Midden** *10-20 cm*	
Plant Taxon	count	#/wt †	count	#/wt	count	#/wt
Unknown Taxa						
Identifiable seeds	9	0.94	1	0.34	2	4.44
Unidentifiable parts	31	3.25	30	10.24	15	33.33

† Refers to the number of seeds or taxa found over wood weight (g); Weights of wood (in g) >2 mm in size for Str 206 Midden, Str 317 Midden, and Str 403 Midden are 9.53, 2.93, and 0.45, respectively.
* uncarbonized examples also found

Interpretations and Conclusion

The various lines of evidence presented in this chapter begin to shed light on how livelihood strategies changed throughout the Colonial period. The size of the early Colonial period residential area, which extended across a large Middle Preclassic through Early Classic period platform based on the midden materials deposited all the way around it, suggests that farmers continued to live in extended family households even as Spanish friars demanded that they break apart into nuclear family house lots. Nonetheless, the varied ceramic vessels they acquired were generally on the small side, suggesting they may not have participated in or at least did not host community-wide food sharing activities.

The lack of large vessels may also relate to a livelihood strategy that maintained flexibility and the possibility for mobility should conditions deteriorate. Animal bone and projectile points distributed across the residential area suggest that house residents put great emphasis on hunting as a food acquisition strategy and did not adopt Spanish-introduced domesticated animals. Likely wild animals were abundant due to the recent demographic collapse across the region. Charred seeds indicate an emphasis on *milpa* crops and foods collected from forest and field, which do not require large investments of time or resources.

In addition, the chert that house residents used to produce projectile points on site and the copper alloy fragments present suggest that house residents continued to have some access to non-Spanish trade networks. The spindle whorl would have been used for spinning cotton thread, likely to help satisfy tribute requirements demanded by Spaniards and enforced locally by indigenous leaders in the community.

By the middle Colonial period, house size had shrunk considerably—likely households consisted of nuclear units by this time. Increased vessel sizes, however, as evidenced by large rim diameters, suggest that food sharing across larger social groups may have taken place, along with household food storage or a greater emphasis on gruel-based foods. The variety of vessel forms at the middle Colonial period house (including the number of slipped individual serving vessels) suggests a relatively high level of access to pottery, and a low level of vessel stockpiling (e.g., ceramic densities were lower than at the other houses). The smooth cobble that could have been used as a burnishing stone suggests possible participation in ceramic production. Grinding tools also increased in quantity and diversity at this time.

Surprisingly, little evidence for animal husbandry could be found at the middle or late Colonial period houses—likely any butchering took place offsite and dogs carried off animal bones left over from meals. It is also possible that meat was too expensive for routine consumption at the household level. One cast lead bullet found in a heavy fraction at the middle Colonial period house suggests that residents hunted—cast lead bullets were also found at the late Colonial period residence and behind Structure 407.

Also found at the middle Colonial period residential area was evidence for beekeeping in the form of beehive plugs. If the discs served as plugs for beehives kept in logs, then they represent an innovation when compared with published reports of such artifacts (made of stone, ceramic, coral, and wood), due to their stucco and ceramic composition (Bianco et al. 2017; Masson 2000; Paris et al. 2018; Zrałka et al. 2018). Possibly, as Colonial period residents sought to extract as much wax as possible from their hives for *repartimiento* payments, the ceramic sherds helped to facilitate beeswax removal.

Three of the four residences considered in this chapter were situated on top of platforms constructed during the Middle Preclassic through Early Classic periods. The size of such platforms and the extent to which they were remodeled during their re-use varied through time. The early Colonial period residence could be found atop a large platform, with earlier features of the platform, such as room foundations and plaster floors, left for the most part intact. Meanwhile, the middle and late Colonial period residences more thoroughly impacted the smaller platforms that they adopted for their living spaces.

Evidence from the late Colonial period suggests that a large amount of maize-kernel grinding took place, and that food was prepared and stored in large pots. Tree fruits added some variety to the diet. The lack of individual serving vessels in the Structure 403 and 407 ceramic assemblages suggests increased use of cleaned gourds for this purpose, which may have correlated with decreased access to pottery. It is unclear whether the polishing stone found at the late Colonial period residential area would have been used in ceramic manufacture or for some other purpose—such as smoothing daub for the walls of the house. A lack of access to pottery could also explain the need to stockpile vessels for large feasting events that may have taken place only occasionally. House sizes remained small.

A Spanish coin indicates that house residents living at the edge of Tahcabo during the late Colonial period experienced market integration, and they may have even paid taxes in currency, as historical documents attest. Other metal finds from Structure 403 included iron scissors and keys. The latter suggests a desire to protect one's valuables—perhaps a logical corollary to the possession of currency.

The immense changes in material culture at houses around the outskirts of Tahcabo provide some insights into the volatility of the period, and the extent to which farmers' livelihood strategies would have shifted through time in response to changes in the wider political economy. The transition from extended family households to nuclear family households that gathered for community feasting events would have changed how town residents enacted their social identities within the community as well.

CHAPTER 7:

COMPARATIVE PERSPECTIVES AND LIVELIHOOD OUTCOMES

This chapter draws together the results of research at Tahcabo presented in previous chapters and compares them to archaeological findings from other sites in the area to reflect on changing Colonial period livelihood strategies and their impacts. It responds to the research questions posed in the dissertation's introduction: 1) How did farmers in Tahcabo select livelihood strategies amid the slow violence of colonialism?; and 2) How did livelihood portfolios shift through time, and what were their long-term consequences? The questions are explored through a chronological examination of the evidence, followed by a discussion of the results of *rejollada* excavation. Threats to food security, resource access, autonomy, and labor valuation become themes to track throughout the Colonial period. Excavation units within *rejolladas*, though for the most part located some distance from excavated residences, provide contextual information, when considered along with interview results, about the challenges and opportunities for farmers as they pursued livelihoods and well-being during the Colonial period.

Early Colonial Household

Livelihood Portfolio

Evidence from the early Colonial period house shows that household members conducted a wide variety of activities. The large size of the platform, with Colonial period sheet midden scattered around all sides, suggests the presence of an extended family household, which may help to explain the diversity of the livelihood portfolio. Activities pursued included gathering of berries and palm nuts from the forest, as well as hunting and fishing. The projectile points found could have served for defense in addition to food procurement when household members left on extended trips to trade, hunt, and fish. The presence of estuarine fish species' bones and fishing lines weights (commonly found at coastal sites) indicates that fishing trips at least occasionally led house residents to travel as far as the north coast of the peninsula. The wild animal bone collected from residential middens was diverse, and included paca, which could have been hunted in a nearby *rejollada* (Rejollada H, located 80 m northeast). Based on the *albarradas*, or rock walls, that remain in the area today, which seem to enclose both the platform and the Rejollada H, it seems like this *rejollada* was accessible to household residents. The white-tailed deer bone present included elements from complete animals, suggesting that at least some hunting occurred nearby, and whole animals could be transported home to feed the household. House residents raised turkeys and dogs for meat, and the dogs could have assisted household hunters as well.

Most of the trade pursued by household members appears to have occurred within regional indigenous networks, possibly including illicit trade across the frontier, located not far to the east (within 60 km of Tahcabo, and about the same distance as the north coast). Items they procured through this network included chert, hematite, copper alloy (including finished axes and sheet metal), beads (from shell, bone, stone, ceramic and hematite), molded ceramic fishing line weights, and earthenware pottery. It is possible that this household would have traded for items needed to meet tribute demands in the community, such as beeswax (Wallace 2019). Wild bees could be found in the woods, and their wax could have been collected on hunting trips. Evidence from the house middens suggests that trade also occurred for items considered European, such as majolica pottery (the Columbia Plain and Ichtucknee Blue-on-Blue sherds found), although it is likely that this trade occurred in town through interactions with other indigenous households or through direct purchase in the town's sanctioned market (Ancona 1889:554). Majolica acquired significance in indigenous communities distinct from its meaning within European society (Oland 2009; Rodríguez-Alegría 2010).

Members of the early colonial household cultivated typical *milpa* crops: maize, beans, squash, and chili pepper. While there were no cotton seeds found in the kitchen midden context from which macrobotanicals were studied (perhaps in part because they would not have been as likely to char due to a lack of proximity to the hearth), household residents would have been exhorted to grow cotton in order to contribute their share to tribute demands. The single *mano* found in the residential midden suggests that house residents ground maize for tamales and gruel, at least on occasion. It is possible that grinding tools were not easy to come by within indigenous trading networks at this time, based on research at Chanlacan, Belize (Oland 2009:135), and the presence of just one grinding tool in an excavation sample much larger in volume than at the other colonial Tahcabo residences (Table 6.1). Limitations to gardening around the house, which could have supplemented the diet of field crops and gathered resources, would have included access to water. Household members likely collected water in long-necked, narrow-rimmed jars (such as those in Figure 6.40). They may have received access to the ancient well in nearby Rejollada F, located 100 m to the southwest, or perhaps they would have needed to travel farther to a well that they were permitted to use. Today there is another well located to the south, within the street grid, which household members may have accessed.

Craft activities included thread spinning, some bone working (based on flattened and sectioned bones; Appendix I [Report 2]:Table 3), possible manufacture of hematite beads, and the production of expedient stone tools, especially projectile points. The bark beater encountered suggests that paper-making took place for production of clothing or another purpose. If cotton cloth was so highly valued as a tribute good, perhaps residents would have clothed themselves using an alternative material.

The deposit of censers along the southern wall of the residential platform suggests that household members took part in ritual activities, which might have been categorized by Spaniards as traditional ceremonies involving idol worship. The censers were Navula and Chen Mul Modeled (Postclassic) types, which may have been heirlooms in the possession of household members or goods acquired through trade. At Zacpetén, Pugh (2009b) also found censers and ritual refuse deposits within and outside of residential structures. He notes that "Zacpetén's occupants killed effigy censers and caches by smashing them and scattering the sherds in special refuse areas such as behind ceremonial buildings" (Pugh 2009a:378). He argues that such caches activated buildings. At Tahcabo, the fragment of a copper alloy axe, as well as a horse tooth and an equine tooth found nearby may have been deposited in the same ritual context, as similar artifacts have been found in residential caches elsewhere (Pugh 2009a).

It seems likely that this household had moved to the area from elsewhere for two reasons. First, forced relocation was common for rural populations at this time, and the house's location at the northern edge of town, some distance from the church and outside of the gridded street plan, suggests a residential location that might have been available beyond the area commonly used inhabited by long-term Tahcabo residents. Second, the residential platform that the household members adopted showed very little evidence of disturbance or renovation prior to habitation. It seems likely that the household moved there quickly, erecting perishable structures as needed (apparently in a hurry), without spending much time preparing the space (which would have been easier had they moved to the location from another spot in town). Early Classic period or earlier footing walls, plaster floors, and ritual deposits remained intact, which was not the case for the platforms beneath residences dating to the middle and late Colonial period. Based on the AMS date from Unit G15 and the ceramic evidence (Yuncu Unslipped and Sacpokana Red ceramic types had been established), people appear to have lived at the platform during the late sixteenth century—perhaps after the 1582 campaign of *reducción*. The next section compares the artifacts and livelihood activities pursued by early Colonial period residents of Structure 206 with evidence from similar houses nearby at Ek' Balam and in Belize and Petén, Guatemala.

Early Colonial Comparisons

Ek' Balam. Hanson's (2008) work at Ek' Balam is the most relevant to compare to excavation results from the early Colonial period house at Tahcabo, because Ek' Balam is located only a short distance from Tahcabo (20 km), the colonial site dates to a similar early Colonial period timeframe, it was a *visita* and *reducción* community (like Tahcabo), and the landscape there also encompasses a number of *rejolladas*. However, as mentioned in Chapter 2, one difference is that Hanson (2008) focused the majority of his efforts on features and residences located near the church (which was not possible at Tahcabo). The surface collection and small test units that he excavated at residences farther from the church have greater relevance as equivalent comparative material for the Tahcabo house. However, a comparison of his work, focused more on the center of colonial Ek' Balam, with my research at the outskirts of Tahcabo can show the extent to which household experiences and strategies varied at *visitas* during the early Colonial period. Long-term residents of communities such as Tahcabo and Ek' Balam, who were able to remain in their towns and retain land rights there after the assignment of Spanish *encomiendas*, would have held privileged positions compared to households forced to move from their homes, gardens, and fields during the *reducción* process. For example, Hanson (2002) argues that the wealthier households located centrally within early Colonial period Ek' Balam controlled production within the *rejolladas* located nearby. The same may have been the case at Tahcabo.

I now compare the faunal data and residential contexts from Ek' Balam with the early Colonial period house at Tahcabo. First, as mentioned in Chapter 2, there was a large pit in central Ek' Balam that Colonial period inhabitants had first used as a *noria* and then used as a garbage pit, within which a great deal of animal bone was found and analyzed. The cultural layer of animal bone (distinguished from a superimposed layer in which they found animals that had fallen into the pit unintentionally) consisted primarily of European-introduced and local domesticates, with some hunted animals. This dataset contrasts markedly with the animal bone sample found at Structure 206 at Tahcabo (see Table 7.1 for comparative specimen counts). While the animal bone found in central Ek' Balam includes equids, pig, and chicken, the only European-introduced animal bone identified from the Tahcabo structure's assemblage consisted of two equine teeth (one of which was from a horse, the other indeterminate). The other major component of the Ek' Balam assemblage was dog (53.9% of identified specimens), which was also present at Tahcabo but constituted a much lower proportion of the sample (2.9% of identified specimens). At Tahcabo there was a greater abundance of hunted animals, including especially peccary, deer, armadillo, paca, fish, and turtles. The fish bones identified at Tahcabo were separated from a single heavy fraction—further analysis of bone separated from heavy fractions would increase the fish totals in Table 7.1. Hunted animals found at Ek' Balam but not at Tahcabo included fox, weasel, porcupine, raccoon, opossum, and macaw. Households in central Ek' Balam and in northern Tahcabo both engaged in hunting, but Ek' Balam residents appear to have focused their energy on raising domesticates and hunting small mammals, while Tahcabo residents frequently fished and hunted for deer, armadillo, paca, and turtles.

Table 7.1. Studied animal bone from early colonial contexts at Tahcabo, Ek' Balam, and Chanlacan (NISP).

Common Name	Taxon	Tahcabo	Ek' Balam[a]	Chanlacan[b]
Mammals				
horses, mules, burros	*Equus* spp.	2	30	-
pig	*Sus scrofa*	-	77	-
collared peccary	*Pecari tajacu*	4	-	-
white-lipped peccary	*Tayassu pecari*	1	-	-
peccary	Tayassuidae	9	2	34
peccary/pig	Tayassuidae/Suidae	-	2	-
brocket deer	*Mazama* sp.	2	3	-
white-tailed deer	*Odocoileus virginianus*	70	25	-
deer	Cervidae	33	-	56
dog/coyote	*Canis* sp.	19	705	13
jungle cat/cougar	cf. *Puma concolor*	1	-	2
unidentified carnivores	Carnivora	5	-	-
gray fox	*Urocyon cinereoargenteus*	-	1	-
weasel	*Mustela frenata*	-	1	-
Mexican porcupine	*Coendu mexicanus*	-	5	-
raccoons	*Proyonidae*	-	1	2
cf. margay	*Felis* cf. *wiedii*	-	6	-
opossum	*Didelphis virginiana*	-	63	1
armadillo	*Dasypus novemcinctus*	286	54	821
coatimundi	*Nasua narica*	-	-	4
rabbit	*Sylvilagus* spp.	2	7	1
pocket gopher	*Orthogeomys* sp.	5	2	-
hispid cotton rat	*Sigmodon hispidus*	-	12	-
rodents	Muridae	8	1	10
lowland paca	*Cuniculus paca*	26	-	-
paca/agouti	Agoutidae	5	-	16

Common Name	Taxon	Tahcabo	Ek' Balam[a]	Chanlacan[b]
Birds				
macaw	*Ara* spp.	-	10	-
macaws, parrots, parakeets	*Psittacidae*	-	2	-
chicken	*Gallus gallus*	-	4	-
turkey	*Meleagris* spp.	2	96	42
turkeys, chickens	Galliforme	2	-	-
unidentified birds	Aves	66	172	436
Fish and Aquatic				
hardhead sea catfish	*Ariopsis felis*	1	-	-
catfish	Ariidae	1	-	697
seatrout	*Cynoscion* sp.	2	-	-
bass	*Serranus* sp.	-	-	73
drum fish	*Umbrina* sp.	-	-	4
barracuda	*Sphyraena* sp.	-	-	3
snapper	Lutjanidae	-	-	3
tarpon	*Megalops* sp.	-	-	1
tiger shark	*Galeocerdo cuvier*	-	-	1
shark	Selachimorpha	-	-	11
sawfish	Pristidae	-	-	2
cichlids	Cichlidae	4	-	-
bony fishes	Teleostei	3	-	143
ladyfish	Elopidae	-	-	5
unidentified fish	Ichthyes	-	-	182
eagle ray	*Aetobatus* sp.	-	-	1
ray	Rajiformes	-	-	18
crab	Brachyura	-	-	7
water bug	Gerridae	-	-	42
cockle	cf. *Dinocardium robustum*	2	-	-
mollusk	Mollusca	1	-	-
Reptiles				
poisonous snakes	Viperidae	-	18	-
snakes	Serpentes	4	9	41
iguana	*Ctenosaura* sp.	9	-	3
white turtle	*Dermatemys mawii*	5	-	-
mud turtle	*Kinosternon* sp.	16	-	5
wood turtle	*Rhinoclemmys* sp.	3	-	-
box turtle	*Terrapene carolina*	3	-	-
pond slider	*Trachemys* sp.	21	-	-
sea turtle	Chelonioidea	-	-	269
turtles	Testudines	21	-	581
crocodile	*Crocodylus moreletii*	-	-	35
unidentified reptiles	Reptilia	1	-	31
Sample Total[c]		**645**	**1,308**	**3,596**
large mammal		8	unavail.	261
medium mammal		31	unavail.	-
small mammal		115	unavail.	-

Common Name	Taxon	Tahcabo	Ek' Balam[a]	Chanlacan[b]
mammals (indeterminate)		1,055	unavail.	316
unidentified		60	unavail.	-

[a]Data from DeFrance and Hanson 2008, Table 2.
[b]Data from Oland 2009, Table 4.23.
[c]Sample totals calculated without the tabulations of unidentified mammal bone, which were not published for Ek' Balam.

As mentioned in Chapter 2, Structure 206 was similarly situated in relation to Tahcabo's church as IT16 was oriented to Ek' Balam's church (at a distance of approximately 240 m). The dimensions of the platform on which IT16 was located (26 m by 28 m) are similar to those of Structure 206 (22 m by 20 m). IT18 (24 m by 28 m), located near IT16 at Ek' Balam, also had similar dimensions. Like at Tahcabo, Colonial period Ek' Balam residents appear to have re-used or renovated earlier platforms for the construction of perishable houses. At each of the three residences, the platform was a combination of bedrock outcrops and stone fill used to create a level, slightly elevated area. While the finds at IT16 and IT18 were similar to those at Structure 206, differences included the lack of Olive Jar sherds at Structure 206, and the low overall sherd densities at IT16 and IT18. The more ephemeral evidence for Colonial period occupation at IT16 and IT18 most likely results from their use over the course of a shorter period of time than Structure 206 at Tahcabo. For example, Yuncu Unslipped and Sacpokana Red sherds were not found at these platforms, suggesting residents had left the area by the late sixteenth century. The densities of ceramics and other artifacts at the centrally-located Ek' Balam houses more closely resembled the densities present at Structure 206. In addition, both at houses in central Ek' Balam and at Structure 206 were found projectile points and preforms, beads, and sherds of the following types: Columbia Plain, Chen Mul Modeled, Yuncu Unslipped, and Sacpokana Red. Ek' Balam seems to have shrunk considerably in size during the Colonial period before it was depopulated altogether around AD 1620—based on the evidence in Hanson's (2008) dissertation, only the residents living in the center of the community (those whom had the most to lose by leaving) remained in the area until that time.

Belize. Whereas Simmons (1995) found projectile points with diverse basal forms at Tipu and especially at Lamanai, the projectile points found at Structure 206 were relatively uniform (generally curved-based, small, and side-notched). If the points were made within a single extended family household, as I believe they were, then the uniformity of projectile point shape makes sense, and lends support to Simmons' argument that basal forms relate to unconscious toolmaking traditions. At Chanlacan, another site at which projectile points dominate among formal tools, differences include that the majority of projectile points have a square basal style and were crafted from Colha biface thinning flakes, while approximately 20% were made of obsidian (Oland 2009:117, 120). Oland (2009:113) argues that increasing numbers of projectile points at the site related to expanded conflict rather than increased rates of hunting. Obsidian was also the preferred material for projectile points in the central Petén lakes region (Meissner 2018).

Compared to the animal bone that Emery (1990, 1999) studied from Tipu and Lamanai, trends at Structure 206 seem more similar to the faunal remains found at Tipu, which were diverse, with a high species richness (including large mammals), and an increased dependence on armadillo and turtle. According to Emery, the diverse assemblage of animal bone found at Colonial period Tipu suggests an environmental rebound due to a distribution of species that prefer "secondary growth, riverine, and canopy forest ecosystems" (Emery 1999:72). Population declines by the late sixteenth century likely led to forest regrowth across the northern and central lowlands (Lentz et al. 2016; Rushton et al.

2012). At Tahcabo, Jiménez Cano (Appendix I:409, 416) found that the deer and peccary bones identified in the faunal sample from Structure 206 were primarily adults, suggesting that house residents hunted from a well-balanced wild animal population indicative of a healthy forest. Mark Cohen and colleagues (1994) found evidence from human skeletal isotopes that populations at Tipu were healthier than at Lamanai, suggesting that access to diverse animal foods served the population well. Likely the same was the case at Tahcabo.

Elite Lamanai residents produced copper tools such as axes during the early Colonial period (Simmons et al. 2009:65). Evidence included pieces of broken copper axes that fit together alongside probable casting reservoirs (Simmons et al. 2009:65). Also found at Lamanai were fragments of copper sheet like those found at Ek' Balam and Tahcabo (Cockrell and Simmons 2017; Simmons et al. 2009:66). It is possible that early Colonial period Tahcabo and Ek' Balam residents would have acquired copper alloy axes through trade networks that eventually linked to communities in Belize. Lamanai is currently the only known location where copper tool production took place in the eastern Maya area during the early Colonial period.

The charred seeds identified from the midden on the east side of Structure 206 overlapped in some respects with those identified from Chanlacan, Belize, described in Chapter 2. Both plant assemblages contained remains of maize, squash, and palm. However, there is no evidence for the use of orchard species at Structure 206, given that palm could have been harvested from forest stands. At Chanlacan, three different orchard species in addition to three species of palm were present. The difference in the representation of orchard species at the two early Colonial period sites makes sense because people had lived at Chanlacan since the fifteenth century—they were not forced to abandon their orchards and relocate, as Structure 206 residents seem to have been. Both Tahcabo and Chanlacan residents paid tribute in cotton and cotton cloth (e.g., Jones 1989:195), though cotton seeds were only found in the Chanlacan plant assemblage.

The animal bone assemblage at Chanlacan was also similar to that found at Structure 206—Chanlacan residents ate a wide variety of fauna, including especially birds, fish and marine species, and small and medium mammals, including armadillo, which was far less commonly exploited at Caye Coco, the associated Postclassic period site (Oland 2009:132-133; Table 7.1). Peccary, deer, armadillo, and turtle were common both at Chanlacan and at Structure 206 from Tahcabo, and they similarly contained small proportions of the native domesticates dog and turkey, though birds overall were heavily exploited at Chanlacan. No bone from Spanish-introduced domesticates was identified at Chanlacan, while a wide variety of fish and sea resources were in use. Modeled fishing weights were also found at Chanlacan, especially in the top excavation levels, while notched sherds used as fishing weights (but not found at Tahcabo) were also present within all levels (Oland 2009:133). At Chanlacan there were also two large carnivore teeth found at one residence, similar to the cougar tooth found at Structure 206, which may have been used symbolically (Oland 2009:162). Because Oland found that the two residences with large animal bone assemblages also contained wide-mouthed bowls (unslipped Progresso Sandy type), she argues that the households hosted feasts and associated rituals, which may have been a marker of social distinction for the fifteenth to seventeenth century community (Oland 2009:162). This is different from Structure 206, where no wide-mouthed bowls or jars were identified.

Pieces of Chen Mul Modeled censers, along with speleothem fragments and quartz crystals, were found in all of the residences of Chanlacan, including around altars, over burials, in residential middens, and outside of front entrances (Oland 2009:147-148). This widespread distribution represented a different pattern of deposition than preceding Postclassic contexts (Oland 2012:187). Very few examples of European-style pottery were found at Chanlacan, consisting of some Olive Jar, Columbia Plain, and blue-on-blue majolica sherds. Other artifacts included four glass beads, a glass ornament, and iron tools and fragments. The small number of artifacts found at just two houses may suggest that residents engaged in gift exchange with Spaniards (Oland 2009:165). The gifts were then used in Maya ritual practice at the site by elite members of the community who also used the objects to maintain their status (Oland 2014).

As obsidian use declined at Chanlacan, copper alloy tool use increased, especially at a high-status residence, where five copper axes and the majority of copper artifacts were found (Oland 2009:121, 125, 157). Other copper artifacts included a fish hook, a bell fragment, two pieces of sheet copper (like those found at Tahcabo and Ek' Balam), and a nose, ear, or lip plug. Oland (2009:Figure 4.9) also found small hematite nodules, which can be used in the production of ceramics and beads. These appear to be the same material as the nodules that Hanson and I had originally identified as iron, suggesting they may have pertained to the indigenous rather than Spanish trade networks of the time. Oland (2009:131; Table 4.21) also found two types of bark beaters at Chanlacan residences, for a total of five from five different structures. Ornaments found at the site were made of marine shell, animal and human bone and teeth, stone, jade, hematite, and ceramic (Oland 2009:131). Some of the marine shell beads resemble the elongated, two-holed beads found at both Ek' Balam (Hanson 2008:Figure 17.23) and Tahcabo (at Structure 407), while the hematite bead found resembled a smaller one from Tahcabo's Structure 206 (Oland 2009:Figure 4.11).

At Chanlacan, Oland found six spindle whorls in total (Oland 2009:129), in contrast to the 77 spindle whorls found at the nearby Postclassic site, Caye Coco (Masson 2002:350). Five of the six whorls from Chanlacan are uniconvex, like the broken whorl from Tahcabo's Structure 206, which also had approximately the same diameter (25 mm versus mostly 24 mm), but greater thickness (12 mm versus 8 mm on average) than the Chanlacan whorls. As mentioned in Chapter 2, some of the best evidence for early Colonial period cotton thread spinning comes Tayasal, Guatemala, where 37 spindle whorls were found (Pugh et al. 2016:60). Grant Jones (1989:195) indicates that colonial populations at sites in Belize such as Tipu traded cacao to the Itzá in exchange for cotton cloth. The number of whorls found at Tayasal versus at Chanlacan seems to support this narrative (Oland 2009:130).

Petén. Animal bone found within three structures at Mission San Bernabé, on the western edge of the Tayasal peninsula, Petén, Guatemala, contained evidence for the use of European-introduced animals (Pugh et al. 2016:Table 4). The mission dates to the eighteenth century, after the late conquest of the area. The relatively high-status residence excavated contained evidence for the greatest proportion of European introduced animals, with a minimum of three cows and two pigs (Pugh et al. 2016:64). At the mission church, a horse and pig were found. At the less elite residence, cow remains were present but consist mostly of teeth (Pugh et al. 2016:65), which is reminiscent of the horse tooth at Structure 206 at Tahcabo. Other animals present at the mission included snails, deer, paca, gopher, dog, skunk, bird, caiman, fish, and a great deal of turtle, the latter of which is similar to faunal assemblages at Tahcabo, Chanlacan, and Cedar Bank, Belize (Morandi 2010:Table 7.1).

Comparisons among sites can assist in the identification of Tahcabo residents' strategies for well-being. Evidence left by residents of Structure 206 appears to resemble some aspects of assemblages at both Chanlacan and Ek' Balam. Comparison with Ek' Balam helps to show how distinct diets may have been among households living centrally and peripherally in the *reducción* communities of Yucatán. Those who maintained privileged access to landscape features such as *rejolladas* had the opportunity to diversify their plant diets, tend introduced animals, and build wealth that was transferable to new economic endeavors. As a result, they were less likely to pursue mobility as a livelihood strategy. Intracommunity differences also would have been apparent in the architectural styles of houses, though both types were constructed on top of earlier platforms leveling bedrock.

Notably, evidence from sites of *reducción* in Belize, and from Chanlacan in particular, demonstrate that a shared material culture existed among inhabitants of sites in Yucatán and Belize. Trade networks connected populations up and down the eastern coast of the peninsula, and Tahcabo residents had opportunities to interact with these networks as they engaged in extended hunting and fishing trips. Comparing evidence from Structure 206 with that of residences at Chanlacan, the lack of remains from orchard species or ceramic sherds from large bowls at Structure 206 becomes even more evident. One difference between Structure 206 and all other early Colonial period residences mentioned in this section is the lack of Olive Jar sherds. It is difficult to know what to make of the absence of Olive Jar sherds at the Tahcabo house, but it is exceptional.

Strategies for Household Well-Being

The diverse livelihood activities that residents of Structure 206 at Tahcabo pursued suggest that the household sought to maintain livelihood flexibility and mobility in case conditions should worsen, they were able to return to their previous location of residence, or a new opportunity arose. Hunting and gathering are activities that do not require long-term investments of time and resources, and draw on skills that, once developed, can be relevant in other locations. Beads also served as a mobile form of wealth. The ceramic vessels at the house were mostly small, which could suggest a lack of integration into the local community, at least to the extent that the household was not hosting feasts. It is possible that there were fewer communal feasts at the time due to López Medel's prohibition of gatherings of more than a dozen indigenous people for any reason other than church-sanctioned activities (Ancona 1889:552). Perhaps some small vessels would have traveled with people as they moved from one place to another, providing an explanation for smaller vessels, though the explanation seems unlikely. The cultivation of *milpa* crops also suggests flexibility because the plants are annuals that grow quickly, with seeds that can be transported to produce future harvests elsewhere.

In an interview about what people grow in *rejolladas*, one Tahcabo resident reflected, "My grandparents told me they couldn't plant the same things that we do. They moved a lot and couldn't plant like this. There were many wars, and for that reason they couldn't plant much" (my translation). This statement attests to the relationship between mobility and food selection in Yucatán, and the importance of knowing how to produce and procure food during unstable times.

As household residents engaged in trade and long-distance hunting and fishing expeditions, they would remain in communication with people in other areas, exchanging news and information. By making use of regional, indigenous trade networks, household members could attain materials to make projectile points and get what they needed to maintain some autonomy from colonial structures. While few European-introduced goods could be found at this residence, experimentation with such products could be seen in the use of at least two majolica dishes, and the presence of equine teeth in the faunal assemblage. While this household would have preserved traditional ecological knowledge related to hunting, gathering, and crafting, they were also innovating in these and other areas.

Nonetheless, house residents paid tribute in maize, beans, chili peppers, turkey, raw cotton, and cotton cloth, all of which they appear to have been producing based on evidence from the plant remains, animal bone, and the spindle whorl fragment. Likely, they met the bare minimum requirements for tribute and maize cultivation as enforced by the town's *gobernador* and monitored by the neighborhood's *principal* (Farriss 1984:127). Similar products could have been used to satisfy demands for church donations, along with beeswax collected from wild hives. They could likely find ways to trade for tribute goods if necessary. House residents also likely participated in the construction and renovation of buildings such as the church and town hall, as well as in road maintenance.

Diversification is a common risk-reduction strategy pursued by extended family households, and this was no exception. House residents drew on an array of strategies to achieve well-being. The amount of animal bone found in the middens of this residence stand in sharp contrast to the quantities at other residences. It would seem that this household maintained a much more protein-rich diet than later households. Presumably the abundant access to animal protein, in addition to the ability to move in case of disease outbreak, would have contributed to the health of household members.

Outcomes of Early Colonial Period Strategies amid Slow Violence

Clearly the activities of Structure 206 residents would have helped them to maintain autonomy and preserve traditional ecological knowledge, especially when it came to tool production and use of animals and plants from the forest. Fedick (2020) has documented the immense diversity of plants that Maya peoples use and has also shown that the vast majority of them are drought-resistant. Knowledge of these resources maintained through hunting and gathering trips would have increased household resilience during dry spells. Mobility and greater dependence on marine resources also would have provided options when crops failed. Meanwhile, residents of Structure 206 may have been able to hunt in the nearby *rejollada*, which would have attracted small mammals like pacas, particularly during the dry season.

However, despite their autonomy, there would have been some costs to prolonged hunting trips and the dependence on flexible strategies that permitted mobility. One likely cause for this strategy was at least a temporary lack of secure land rights. If this household had moved to the area from elsewhere, then any land to which they had rights would have been located far away. In fact, one objective of prolonged hunting, fishing, and trading trips could have included return visits to original places of residence. The cost, however, would have been a lack of investment in wealth-building strategies in and around Tahcabo. Specifically, tending to trees, garden perennials, and domesticated animals allowed for the generation and reproduction of wealth (as seen in documented in wills, for example). Such investments would have precluded easy mobility, but they might have helped an extended household build claims to nearby land through land improvements.

Another kind of investment for which there is little evidence at Structure 206, apart from trade, is in social capital. There is no evidence that house residents hosted feasts or otherwise participated in food pooling to such an extent that they would become integrated into village-wide risk-sharing opportunities. If household members had built relationships with wealthier town residents, they might have received gifts in the form of fruits and produce from their orchards and gardens—a distribution practice common today.

Slow violence can be seen in the lives of those who lived at Structure 206. For example, it seems that the residents of this household were forced to move to the location, which would have had a number of implications for their well-being in terms of resource access and social networks (human and non-human). However, house residents were able to maintain traditional ecological knowledge, live in an extended household configuration, and maintain a diverse livelihood portfolio that would have helped to reduce risk and maintain autonomy. Hunting and gathering and other daily activities would have required ritual activity and ongoing maintenance of relationships with landscape actants. One concrete example of this can be seen in the censer deposit on the south side of the platform—many other daily expressions of landscape relationality would not have left material traces.

During the early Colonial period, at least some Tahcabo households appear to have successfully resisted adhering to Spanish ideals for small-town life. Population movements disrupted the process of *reducción* (Hanks 2010:59-60), and led to the increased preservation and integration of non-Catholic religious practices into daily life. This study shows that the process of transition—from extended to nuclear family households, from mobile to settled, and from diversified to more intensive economic activities, was slow to occur during the Colonial period, extending over decades and even centuries. Transformation took place, but not according to the vision or expectations of Spanish colonial officials.

Middle Colonial Household

Livelihood Portfolio

Evidence for the livelihood portfolio of Structure 317 residents is slightly more limited than the evidence found at Structure 206. The overall ceramic density was lower than at other residential areas, which may have resulted from a more limited occupation timespan. While the density of artifacts was lower overall, their diversity was high. The excavated pottery included a relatively high proportion of slipped (Sacpokana Red) sherds, with the greatest diversity of forms present at any of the Colonial period residences excavated. Individual serving bowls were available, but so were sizeable jars and bowls that would have permitted food preparation for large groups. In addition, the four groundstone tools found in colonial contexts represented four distinct tool types: *mano*, *metate*, pestle, and sphere. The presence of textile-impressed ceramics at this and later residences may suggest access to a trade good (e.g., honey or salt) distributed in expedient mold-made vessels. The diversity of artifacts represents access to local trade outlets and producers. On the other hand, metal artifacts were fairly rare.

Evidence for livelihood activities includes the presence of a smoothed cobble, which could have been used as a burnishing stone for pottery or plaster. The disc and disc fragments could have been used to plug beehive logs, providing evidence that residents of Structure 317 engaged in beekeeping, most likely of the native *Melipona beecheii* bee species. While the 90 g of animal bone found at the residence has not been analyzed, I noted the presence of sheep or goat bone among the finds during excavation, so the small quantity of bone may provide evidence for animal husbandry or occasional consumption of domesticated animals. Certainly, house residents had less access to animal protein than did Structure 206 residents, though apparently more than the residents of late colonial Structure 403. The presence of a cast lead bullet suggests that hunting took place, matching evidence that Restall (1997:104) found in wills indicating that hunters began the transition to firearm use by the mid-seventeenth century.

Residents of Structure 317 appear to have eaten foods grown in the *milpa*, such as maize, beans, and squash. Beyond this, the seeds found in the residential midden appear to have been from weedy species, but the number of weed seeds and species present warrant further consideration. The seeds were found carbonized in a relatively intact, Colonial period midden, according to artifacts and the associated AMS date. Perhaps the weed seeds made their way into the midden after leaves and other debris from the house lot had been swept up and burned, as is common practice for cleaning the patio today. If so, these plants might have been encouraged in house lot gardens. For example, *Ipomoea* sp., a type of morning glory (this specimen was too small to be sweet potato), can serve as an ornamental, a melliferous flower (collected by bees to produce honey), and a medicinal plant (CICY 2010; Lentz and Dickau 2005). *Tradescantia* sp. is planted as an ornamental, has medicinal uses, and its flowers can be used to create a purple dye as well. *Malvastrum* sp. also has medicinal uses and its leaves can be fed to pigs in particular, while *Wissadula* sp. can be used as a fiber. Perhaps these plants were intentionally planted near the house for their decorative properties and as resources for diverse household and animal needs. Batún Alpuche (2009:80-81) pointed out that people managed plants across the landscape for bees, and this could possibly represent an example of that.

While the spatial extent of this middle Colonial period residence appears constricted compared to Structure 206, suggesting that it housed a nuclear family, the vessels had larger rims than those found at the earlier residence. There were a number of impressively wide-rimmed jars and a bowl appropriate for the preparation of meals for an extended family or other large group. In fact, the median rim diameter of vessels at Structure 317 was the same as that of vessels present at the later Structure 403. Thus, residents of Structure 317 may have participated in food sharing, suggesting that household members were integrated to some extent into a wider community social network.

Comparisons to Nearby Sites

At Mopilá near Yaxcabá, a pueblo not unlike Tahcabo, evidence dating from the mid-eighteenth century to the end of the Colonial period (potentially relevant comparative material for results from both Structures 317 and 403) indicates that households maintained few ancillary structures within their house lots (Alexander 1999:Table 6.1, 2004:145). Alexander (1999:90) argues that the lack of ancillary features, and the absence of animal pens in particular, "suggests a greater emphasis on arboriculture or storage than on small livestock raising." She argues that the tithe on small livestock, enforced in pueblos by the late Colonial period in particular, may help to account for the lack of animal pens in Mopilá house lots (Alexander 1999:90). This trend may be supported by the lack of animal bone found at Tahcabo Structures 317 and 403, though another possibility is that house residents reared and sold animals, rarely processing or consuming them locally.

About half of each house lot was dedicated to gardening at Mopilá, where house lots were relatively large, averaging 3,451 m^2, but were not used as intensively as house lots pertaining to nearby *rancho* or *hacienda* communities (Alexander 1999:92). Alexander argues that since Mopilá residents paid tribute and *obvenciones*, both state and church representatives had incentives to protect the inhabitants from land encroachment on the part of *haciendas*, helping to explain the large size of house lots. Based on the *albarradas* still present around Structure 317 (unfortunately none remain encircling Structure 403 today), the area of its house lot was approximately 2,200 m^2—considerably smaller than the average lot at Mopilá. This difference is not entirely surprising given that the neighborhood in which Structure 317 is found likely was designed and built in response to an increasing town population, which may have been accompanied by some land pressure. The evidence for this interpretation is discussed further below.

Glazed ceramics and metal artifacts were relatively common within Mopilá house lots compared to house lots at surrounding *ranchos* and *haciendas* (Alexander 1999:91). However, the quantities of such artifacts varied widely across the site based on intensive surface collection, from eleven to seventy-six metal artifacts recovered per house lot, and from nine to thirty-seven glazed ceramic sherds per house lot. Differential access to the regional economy existed among households at Mopilá. The houses from Tahcabo were on the low end of the range in terms of access to such artifacts (Table 6.1), especially considering that the Tahcabo structures underwent excavation rather than just surface collection. This could be expected in part due to the location of the houses near the outskirts of town, and also due to their shorter occupation spans. The high quantities of metal artifacts and glazed ceramics at Mopilá house lots may result from the study of lots inhabited for extended periods of time, and their relatively good preservation, since Alexander studied at least some house lots located near the center of the community, in use over the course of 266 years if not longer, until the onset of the Caste War (Alexander 1999:Table 6.1).

Strategies for Household Well-Being

As mentioned, Structure 317 appears to have been integrated into a neighborhood created when the population of Tahcabo grew. Running east-west along the north side of the structure, there are two *albarradas* that run parallel to create a road extending the town grid. There are other parallel *albarradas* that run north-south just west of the structure (Figure 6.16). During the survey we found other Colonial period artifacts in areas adjacent to these defined roads, as if there were a number of house lots laid out along the *albarradas*. I suggest that the town population grew, leading town leaders to clear the area and define roads by constructing *albarradas* with stones from the Early Classic period structures in the area, including Structure 317, which was fairly well dismantled prior to its use as a level area for a Colonial period residence. This matches the description that Alexander (2004:119) provides for the process of moving to a community and establishing residence today. The other houses located nearby may or may not have been populated by relatives of those living at Structure 317. Regardless, residents of Structure 317 appear to have made use of their social and economic capital as they accessed goods, including their diverse pottery assemblage.

Structure 317 residents, who had perhaps recently moved to the area from elsewhere, or who had lived in Tahcabo but moved into a new house within the newly formed neighborhood, pursued activities that would help them to satisfy local tax requirements and obtain necessities. It is possible that house residents kept beehives in part to meet *repartimiento* demands for wax, which were infamously high throughout the seventeenth and eighteenth centuries. *Repartimiento* represents the quintessential antimarket—Spanish officials would force contracts onto communities, demanding cheap commodities in exchange for goods and currency distributed upfront (Solís Robleda 2009). Structure 317 residents also likely kept bees for their honey, of course, which they may have been able to sell. Perhaps in service of the bees and other animals they tended, household members could have encouraged select volunteer plants that grew near the home. It is unclear whether house residents would have participated in raw cotton and thread or cloth production, also demanded as part of the community's *repartimiento*, but it seems likely based on reports of high regional quotas at the time (Farriss 1984:78). The lack of spindle whorls present in the midden could indicate that thread spinning occurred elsewhere (perhaps in a central workspace), or that spindle whorls were made of perishable wood. In return for *repartimiento* payments, the household could have received some European goods such as olive oil, wine, or glazed ceramics, which could explain the Olive Jar and San Luis Blue-on-White sherds found at the structure (Alexander 2004:45; Hunt 1974:476-483).

By the mid-eighteenth century if not sooner, wage labor would have been available on *haciendas* or in the *milpas* of wealthier town residents. Perhaps this was a way Structure 317 residents obtained enough cash or credit to acquire the diverse pottery and groundstone tool collections present within the residential midden.

It is difficult to say more about the strategies that Structure 317 residents employed. Based on the location of the house in a newly developed neighborhood and the relatively low ceramic densities, it is possible that house residents moved into the area from elsewhere and moved again before too long, in which case mobility remained a tactic in use by Tahcabo households—a well-documented way to escape exploitation and seek new opportunities. As mentioned in Chapter 2, the 1664 *repartimiento* list for Tahcabo indicates that 30 people fled town that year (García Bernal 2005:245). Mobility continued to be a tactic for well-being, while wage labor was another way to supplement household-level production.

Outcomes of Middle Colonial Strategies amid Slow Violence

As populations in mid-eighteenth-century towns grew, communities would have faced renewed challenges to access land for household cultivation, meet excessive *repartimiento* demands, and avoid debt peonage. Residences housed nuclear families by this time, which would have restricted possibilities for the diversification of livelihood portfolios. If demands and requirements for living in town came to be too much, then households would disperse to the woods or to private estates, or perhaps to a new town where demands were said to be lower. This strategy posed a threat to authorities trying to extract what they could from communities during the middle Colonial period, as suggested by the counts of escapees in *repartimiento* records. Of course, this strategy, enacted in response to the slow violence of colonialism, also posed a threat to the long-term well-being of migrant families.

At the time that people lived at Structure 317, Tahcabo's *cofradías* likely played a large role in daily life. Today in Tahcabo, there is a *gremio de campesinos* (peasants' guild), an association of the community's Catholic population, and there is also a *gremio de niños* (children's guild). Today, larger communities have greater numbers of *gremios*, based on the various trades and occupations pursued by the populace. During the middle Colonial period, the similar town association known as the *cofradía* would have owned ranches operated on behalf of the community (Hanks 2010:78). Residents of Structure 317 may have been involved in community work days and other contributions to the *cofradía*. The *cofradía* cared for the sick, the saints, and the church, and organized feast day celebrations, which included fireworks, bullfights, dances, processions with candles, and food for all, as continues to be the case today. Oral histories preserved by Tahcabo residents indicate that saints were hidden in caves for their protection during times of conflict. The age of the saints in the church today—more than 100 years old based on the inscriptions found on Saint Bartholomew's metal knife and halo, indicate the success of this tactic and the importance of the *cofradía*'s role in the community. One wonders whether this time of population expansion, when hunted animals became scarcer, and *cofradías* owned estates with crops and domesticated animals, would have fostered the development of new and innovative feast foods such as those that include pork as a primary ingredient (e.g., *relleno negro* and *cochinita pibil*), and their accompanying dance (*el baile de cochino*). Perhaps Tahcabo residents had planted bananas in their patios and *rejolladas* by this time, where their leaves could be harvested for the preparation of tamales and *cochinita pibil*. Clearly there is more work to be done to understand the history of culinary practice in Yucatán.

Late Colonial Household

Livelihood Portfolio

The late Colonial period house, Structure 403, was the smallest excavated. The presence of large quantities of daub in the area suggests a wattle-and-daub structure—while many houses in Yucatán have walls made solely of secured poles, this house likely had walls sealed with clay. Residents of Tahcabo have mentioned that this was once a common style for houses in the community, though it no longer is.

The ceramic density at the residence was high, consisting primarily of unslipped jars, with jar openings ranging from restricted (including glazed Olive Jars) to extremely large (Yuncu Unslipped, greater than 50 cm in diameter). I have suggested that the high quantity of jars may indicate that vessel stockpiling occurred. Perhaps house residents also hosted feasts on a regular basis, for which they knew they needed the large cooking pots. The midden on the east side of the platform contained many grinding tools, which suggests that maize was prominent in the diets of house residents, perhaps primarily as a gruel, based on the jar collection, or perhaps as tortillas or tamales to accompany feast foods. Supporting this assertion, maize kernel fragments were found, though maize cupules were not present. This suggests that the maize was processed elsewhere, such as in outfields, or that house residents purchased or otherwise acquired shelled maize (the former possibility seems more likely). Other seeds found included beans and a pit fragment from a sapote family fruit, suggesting household access to fruit trees. In addition, few individual ceramic serving dishes were found—instead, gourds must have served for this purpose, corroborating evidence that house residents accessed orchard species.

Tended orchards would have attracted wild animals to the property, which could then be hunted. However, we found almost no animal bone around the residence, suggesting animal protein may have been difficult to acquire. Primary evidence for animal use includes the marine shell found at the house and two bullets suggestive of hunting practices. If late Colonial period populations were growing as large as census documents suggest, overhunting may have been a problem for town residents seeking to acquire meat in that way.

The mixed Colonial period residence, Structure 407, also provides some insight into late Colonial period livelihoods, though many of the contexts were too mixed up to make chronological determinations. However, in the yard behind the structure, there was a large, nearly complete Yuncu Unslipped pot similar to those found at late Colonial period Structure 403, which seems to have been left in a pit, perhaps a *píib* that had been excavated there. In addition, the proportion of jars to other vessel forms was remarkably similar at Structures

403 and 407 (approximately 91% for both assemblages, and bowl or dish to jar ratios of 0.09 and 0.08, respectively). The four different *manos* found within the limited excavation units at Structure 407 also mirror the trend of increased grinding tool density in midden deposits.

The backyard of Structure 407 contained greater quantities of animal bone and marine shell than found at Structure 403. Considering that Structure 407 was constructed of stone, a preferred building material, with a well located on the property immediately to the south of the structure, and with closer access to the town center, it seems possible that house residents had greater access to wealth and thus to animal resources. Residents of Structure 407 hunted, based on the presence of a cast lead bullet. Due to context mixing, no plant remains from Structure 407 were studied, but it is notable that the excavation units, especially in the western portion of the patio, were close to Rejollada E.

Strategies for Household Well-Being

The number of metal artifacts present at Structure 403, and the coin and keys in particular, demonstrate that house residents accessed currency and worked to secure it, even as they may have shared their wealth through feasting events. They most likely acquired currency through wage labor, due to limited evidence for crafting activities within the house lot. The currency could have served to pay taxes and purchase items such as metal and the large ceramic vessels. As mentioned, the presence of maize kernels but not cupules could suggest that the household grew maize in distant outfields, where processing occurred, and kernels were transported to the residence afterwards, perhaps by mule transport. At this time, populations were expanding at Tahcabo, and access to agricultural land may have been more constricted (see, for example, Alexander 2004:115).

One exception to the lack of evidence for crafting activities is the broken pair of scissors we found, which could possibly relate to sewing or embroidery projects that also would have brought wages into the household. Another piece of supporting evidence was the tiny glass bead found within a heavy fraction from flotation, sampled from a unit adjacent to where the scissors were found, as such beads were used for embroidery (Smith et al. 1994:39). Perhaps a woman living in the house used embroidery and sewing projects to supplement household provisions obtained through wage labor and the production of agricultural goods.

The distance of the house from the center of town, and its location away from *rejolladas*, wells, and other obvious landscape resources, suggest the household's more marginal position in the community (based on natural capital, as outlined in the livelihoods approach). I did not determine the nearest water source for house residents, but it may have been located some distance from the residence. Perhaps some of the large jars served to hold water, even though the forms looked more like cooking pots. However, the ceramic evidence suggests that household members worked hard to either integrate themselves into the community or retain their position within it (securing their social capital). They could have had a garden growing around the house, especially if they had relatively easy access to water, or they could have received fruits and gourds from friends and family in the community.

It would have been difficult to raise animals in a house lot without easy access to water, but it is possible that the household engaged in animal husbandry in a distant plot as well, perhaps in a location where water was easier to access. This could help to explain the lack of animal bone in the residential midden, especially if animals were reared for sale rather than for household consumption. It would seem that residents of Structure 403 infrequently ate animals—perhaps access to meat occurred primarily at special events, when households gathered together to provision a feast, as Farriss (1984:322) indicated (see also Hanks 2010:73). The finds at Structure 403 suggest that even as colonial policy sought to reduce community resources available for festivals and autonomous self-governance, town residents pooled resources to ensure that feasts would continue. This suggests community resilience in the face of violence.

Outcomes of Late Colonial Strategies amid Slow Violence

Through the process of colonialism, residents of Tahcabo came to live in nuclear family households, as colonial policies intended, though these nuclear families often continue to cluster in extended family groupings or neighborhoods (e.g., Cabrera Pacheco 2017:504). Nonetheless, the shrinking of the official economic unit would have reduced livelihood diversification, thus exposing households to additional risk during crop failures resulting from droughts, disease, and pests. An increased dependence on a narrower set of cultigens and lessened access to animal protein would have contributed to a lack of household resilience. Accounts of mid- to late-eighteenth century droughts and their impacts on indigenous communities illustrate the consequences of such changes, especially when rural communities lacked institutional support such as allocations of grain (more effectively instituted at the end of the eighteenth century).

Policy changes effected as part of the Bourbon Reforms would have resulted in more people of mixed descent living in the countryside, running *haciendas*, as well as local administrative units. With the sale of communally-managed agricultural enterprises and lack of access to community taxes, community members would not have had access to previously-available pooled resources and would have had to work with renewed energy at the level of the household to meet the needs of annual celebrations and systems of community support. Perhaps this is partly evident in the stockpiling of vessels and groundstone tools at Structure 403. In the meantime, the population of Tahcabo increased, which would have put pressure on land and wild animal populations. This would have increased food insecurity and pushed people to find wage labor or enter into debt peonage.

The production of pottery and perhaps cloth within the community seems to have continued into the middle Colonial period, but by the end of the Colonial period Tahcabo residents likely depended on traveling merchants and community stores for these goods. The late colonial pottery assemblages suggest a lack of easy access to individual serving dishes. On the other hand, the 1841 census shows that two blacksmiths (José and Isidro Aguayo) were living in the community at that time, and the number of metal tools at Structure 403 suggests blacksmiths may have been at work in the community during the preceding decades as well.

In the 1841 census, as mentioned in Chapter 2, the only people referred to with titles (*don* and *doña*)—perhaps those recognized as being of Spanish descent (with surnames Figueroa, Pérez, Güemes, Calderón, and Pineda—names no longer common in Tahcabo today if present at all)—were listed as merchants and a painter. Meanwhile, the vast majority of the men in the population were listed as farmers (*labradores*). The reforms that led more Spanish creoles to live in the countryside likely would have increased town inhabitants' awareness of ethnic hierarchies on a daily basis, at a time when those identified as indigenous would have had a more difficult time accessing goods previously present within households, such as diverse serving wares. Rani Alexander (2004:116) writes, "During the early nineteenth century, economic stratification in Yaxcabá parish became marked. Class divisions took on a 'castelike' quality because they tended to break along the rigid and ascribed ethnic lines separating Indians from non-Indians." Based on the 1841 census from Tahcabo, the same process seems to have occurred in the Calotmul parish. Alexander (2004:181, note 33) also points out that the segregation of ethnicities can be found in church records, as curates kept separate books for the indigenous population and Spanish creoles. Therefore, the ethnicity ascribed to a person at baptism was maintained in such records (of marriage and death, for example) throughout their life.

The 1841 census also shows that the Hacienda Yokpita (sometimes "Yohpita"), located two km north of Tahcabo, employed a large number of people at the time. Current inhabitants of Tahcabo indicate that the *hacienda* was once dedicated to sugarcane production. Historical documents support this community knowledge—a report from a state fair that took place in 1879 indicates that sugarcane from the Tizimín area is of high quality, and notes: "Mr. Carcelo Villamil exhibited a carton of sugar, prepared in a turbine, product of his rancho *Yokpita*" (my translation; Canton 1880:243). Other notable industries around Tizimín noted in the report from the fair included the production of manioc starch, honey, alcoholic beverages, butter, *palo de tinte* (*Haematoxylum campechianum*) dye, gourds (specifically noted to be of use to the indigenous population), castor oil, soap, and chalk, listed among many more products, agricultural and otherwise.

Throughout the Colonial period, evidence related to ritual activity supports the ongoing existence of a relational ontology. At the early colonial house, evidence for ritual using censers in the pre-Hispanic style consists of the deposit along the south side of the residential platform. Middle to late Colonial period houses contain large cooking pots suggestive of feasting, which could have accompanied rituals such as the *Ch'a' Cháak* rain ceremony, the annual feast day for Saint Bartholomew, or feasts for church-related events such as baptisms and weddings. Results from interviews demonstrate ongoing household participation in ceremonies within and apart from the *rejolladas*. These activities are necessary for household agricultural production and family well-being, and they reflect the preservation of a relational ontology.

***Rejollada* Use**

Results from the *rejollada* excavation units suggest that Late Preclassic to Early Classic period use of *rejolladas* was intensive and specialized. Around this time, Rejollada E was used for the intensive cultivation of maize and cotton. Maize production in Rejollada G was also high. Horticultural activities were ramping up in Rejollada A, and ritual activity in Rejollada B included a human burial. The density of human population at Tahcabo during the Early Classic period was rivaled only during the Colonial period. However, less evidence exists to suggest that the use of *rejolladas* was as intensive during the Colonial period. There are at least two possible explanations for this. First, López Medel's *ordenanzas* indicated that there should be no agricultural fields nor stands of trees located within communities, which were to be kept outside the boundaries of town (Ancona 1889:541, 553). Any groves (*arboledas*) found within town were ordered to be burned, though select fruit trees were allowable around houses. These early *ordenanzas* were to have been read aloud and enforced in communities, and may well have discouraged farmers from investing time and energy into *rejollada* cultivation within town. In particular, to forbid the use of Rejollada E for growing maize or cotton, both of which were demanded as tribute during the Colonial period, would have restricted farmers' production. In this case, Spanish rules likely led to a decline in agricultural productivity in the pueblos, which would have been a negative outcome for all resulting from the imposition of Spanish values and expectations about what town life should entail and what it should exclude.

In addition, the maintenance of biodiverse *rejolladas* or their intensive use to grow crops takes a lot of labor. Today that labor is divided rather evenly between men and women in the community, though it is unclear whether that would have been the case in the past. During the Colonial period, women spun thread and wove cotton cloths to meet tribute demands (e.g., Solís Robleda 2003:162). Meanwhile, men procured beeswax and grew *milpa* crops in fields outside of town. Later during the Colonial period, they engaged in wage labor. With demands as high as reported in historical texts, residents of Tahcabo may have had limited time available to dedicate to cultivation within *rejolladas*. For example, today, as community members move or travel regularly to the coast for work, the lack of labor available within households has made it difficult for *rejollada* owners to maintain the diversity of cultigens that they once did. As one interview participant explained, "Production [in the *rejollada*] is very low because we don't dedicate ourselves to it, and apart from that you make more money if you leave to work on something else. Before, they would do it [tend to the *rejollada*] because there wasn't much work and so people dedicated themselves to that." For these reasons people say production is lower in *rejolladas* today than it had been in the past.

However, we did find evidence for the use of *rejolladas* during the Colonial period, including ceramics sherds and charred wood collected from the *rejolladas* that seemingly dated to the eighteenth century. This could indicate that as populations grew, more forested areas near *rejolladas* were cleared to make space for residences (and wood charcoal washed into the *rejolladas*) or that more burning was taking place within the *rejolladas*, to clear weeds and brush as their cultivation increased. By the eighteenth century, Spanish prohibitions on forested areas and field crops within communities had likely loosened, while Tahcabo inhabitants made use of introduced plants such as banana and citrus, which thrived in *rejolladas*. Nonetheless, *repartimiento* demands, wage labor, and the presence of nuclear family households may have continued to restrict human labor available to invest in *rejollada* maintenance.

Pollen found close to the surface of *rejollada* units suggests that during the Colonial period residents of Tahcabo used *rejolladas* to grow henequen, maize, hogplum, and logwood, the first two of which would have thrived in the sun and the last two of which would have provided shade, suggesting some diversity in *rejollada* use and the plants growing within them. However, one limitation of this study is that, for the most part, the inhabitants of the Colonial period residences studied were not those who controlled or had direct access to *rejolladas*. Residents of Tahcabo living centrally in the community were likely those who could access *rejolladas* and make decisions about their use, while those forcibly moved to the area or recently arrived would have lacked access to such features. This breaks the connection that I would have liked to explore between what people grew in their gardens and what they ate in their homes, and how the food system changed. Additional study of plant remains from residential contexts and *rejolladas* will add to our understanding of how *rejolladas* were used during the Colonial period and their role in community resilience.

Based on interviews, *rejolladas* have also been used as places to keep domesticated animals, conduct rituals, and dig earth ovens for feasts and daily food preparation. In particular, interviewees mentioned that they had heard of all kinds of animals, even cattle, being kept within *rejolladas*. This activity is difficult to track archaeologically, and may have been one way that *rejolladas* were used more actively during the Colonial period. Clearly, the *rejolladas* and *cenotes* of Tahcabo were important features of the landscape that continually attracted people to the location over long expanses of time. As new farmers arrived in Tahcabo, they quickly became attuned to landscapes, transferring knowledge of and building new relationships with plants, animals, and other beings, just as they were getting to know the people who lived there.

Conclusion

This chapter provided a discussion of the findings presented in the previous two chapters and related them directly to the research questions posed in the introduction. In particular, it drew on examples from other colonial sites across the Yucatán peninsula to compare them with the materials that resulted from the excavation of Colonial period residences at Tahcabo. This analysis demonstrated the diversity of rural livelihood strategies employed at the site of Tahcabo and at sites across the northern Maya lowlands. Historical information also helped to contextualize the evidence encountered at Tahcabo, providing accounts of the major *congregación* campaigns and highlighting periods of local population growth, demographic change, and shifting colonial policy.

CHAPTER 8:

CONCLUSION

By tracing Tahcabo's archaeological settlement patterns, comparing the residential areas and activities of non-elite farmers, and studying *rejolladas*, used primarily as gardens, this project has provided insights into farmers' agency amid colonial violence. This final chapter provides an overarching account, based on the evidence provided in this dissertation, of the impacts of colonialism on livelihood sustainability in rural communities and the responses that farmers crafted in order to improve their resilience and autonomy at the levels of the household and community. I conclude with comments about how farmers shape history and a discussion of future research that could extend the work presented here.

The Slow Violence of Colonialism

This dissertation has provided concrete evidence to support the notion that colonial policies enacted slow violence on rural livelihoods. In particular, it has demonstrated the specific challenges that farming households faced as they sought to maintain sustainable livelihoods under colonialism. As livelihood portfolios narrowed through time, they included fewer risk-reducing strategies. This negatively impacted household resilience in the face of droughts, pests, and epidemics that impeded well-being in rural communities throughout the Colonial period (Chuchiak 2006). One contributor to this outcome was friars' actions to break apart extended family households into nuclear family house lots, reducing the diversity of livelihood activities that any one household could pursue. The demands imposed on communities by friars, *encomenderos*, and other officials, specified through quotas assigned to each adult household member, resulted in activity intensification at the expense of livelihood diversification. For example, expectations that women were to produce cotton cloth and care for domestic fowl, while men grew maize and beans and met other obligations, reduced the time invested in biodiverse cultivation within gardens and field plots, respectively. In addition, Spanish expectations for the proper organization of rural community life interrupted resilient practices, such as the maintenance of lush vegetation within settlements, that did not conform to Spanish ideas.

Through time, Tahcabo residents came to depend increasingly on *milpa* agriculture, including especially the cultivation of maize, but also beans, chili pepper, and squash. Today, field agriculture in Yucatán is remarkably diverse in some areas, consisting of sixteen plant species and many varieties, which seems to have been the case in the fifteenth century as well (Anderson et al. 2004:15; Terán and Rasmussen 1995, 2009). However, only a few crops were collected as tribute during the Colonial period, which could have impacted field diversity (see also Wilk 1997:115). Increased dependence on maize and a narrower set of cultigens would have left households more vulnerable to droughts (Fedick 2020). Interferences in cultivation diversity also resulted from forced resettlement, as burned orchards, limited seed access, and a lack of firm claims to nearby land took their toll. Given the importance of mobility as a survival strategy in Yucatán throughout the Colonial period, the extent to which crops could travel is pertinent. Selection of cultigens quickly harvested and easily moved through seed transport impacted the diversity of field agriculture. During the late Colonial period, when populations grew substantially, access to land within and near town would have been more limited, leaving residents more dependent on outfields, which also would have inhibited crop diversity (Nations and Nigh 1980:14-15; Wilk 1997:115). Finally, those who took up wage labor on private estates may have purchased maize and other foods. However, maize prices skyrocketed during times of drought and famine—a problem that impacted everyone living in rural communities prior to grain importation (Campos Goenaga 2011; Espinosa Córtes et al. 1987; Hoggarth et al. 2017; Peniche Moreno 2010).

Resilience and Autonomy

Resilience can occur at various levels, such as within the household, extended family, neighborhood, or community. Tahcabo farmers' specific strategies for achieving autonomy during the Colonial period can be tracked based on the evidence presented in this dissertation. As indigenous populations dwindled during the early Colonial period due to Spanish-introduced diseases, forests grew dense, making it easier for people to flee, engage in illicit trade, and survive by hunting and gathering. People who remained living in the communities of Yucatán maintained relationships across the frontier of Spanish control and preserved autonomy through relative mobility and extended trips away from the community despite demands to settle. Tahcabo residents, and men in particular, pursued hunting, taking advantage of abundant animal access, which would have improved the health of household members and maintained livelihood flexibility. Women may have been more likely to stay in the community with the children, as they faced demands to weave vast quantities of plain cloth and bear more children than they had previously (Clendinnen 1982:434; Quezada 2001b). Older, less mobile members of the household may also have been available to help with childcare and activities crucial to meeting tax and *repartimiento* quotas.

Evidence suggests that community-based social supports could be found in Tahcabo during the middle Colonial period and beyond. As mobility continued to be a strategy employed during times of hardship, and populations fluctuated greatly during the late Colonial period, a tension existed between movement and emplacement, or place-making. Movement into a community was accompanied by a search for ways to connect, contribute, and thrive socially, in terms of both human and landscape interaction. One clearly defined way to participate was to support the work of the town as it prepared for its annual saint's day celebration (Farriss 1984:343). This event involved commensality, drink, dance, and many opportunities for socialization. The most sacred and revered element of the festivities may have been, as it is today, the procession of the saint through the town. This involves walking with the statue of the patron saint through the various neighborhoods of the community, an activity that provides an opportunity for place-making through movement. Unlike tax payments, contributions to the fair were graduated based on status and wealth. That is, elites in the community were expected to play a larger role in supporting the celebrations. As town residents began to access and store currency, they also contributed to food sharing practices, pursuing a strategy for resilience at the supra-household level.

Knowledge of the landscape, acquired through household practice, experimentation, and social networks, contributed to the resilience of farmers' livelihoods. Residents of rural communities knew of celestial events that had to be observed as well as spirits and other beings that populated the landscape and required offerings and nourishment for positive outcomes in pursuits as diverse as hunting, agriculture, and animal husbandry. Hunting was a strategy employed throughout the Colonial period that is still practiced regularly today, associated with a rich and deep tradition of ritual practice and oral histories (e.g., Brown, L.

2005:138; Redfield and Villa Rojas 1934:140; Santos-Fita et al. 2015; Tozzer 1941:155). It can occur on the way to or from the *milpa*; involve long trips into the woods, often made by groups of men and their dogs; or can also take place in nearby *rejolladas*, caves, and other places that animals prefer to frequent (see also Wilk 1997:153).

Rejolladas provided a resource for growing fruit trees, which would secure land rights and produce food for years to come. Saplings were planted according to calendars related to astronomical events and were tended carefully during the first few years of growth. As the trees got bigger, the space would have been less amenable to maize and other sun-loving crops, but the products of the orchard would have made this trade-off worthwhile. Not only do orchards solidify land claims and feed the household, but they also provide the opportunity to nurture social networks. Often, trees produce great bounties of fruit all at once, which can be distributed to friends and family, and additional produce can be sold (based on interviews; see also Wilk 1997:107-108). Those who stayed in Tahcabo long enough to cultivate orchards and gardens and reap their harvests for years would have seen improvements in household resilience and social capital.

Farmers and Historical Trajectories

When Spaniards began to implement *reducción* in Yucatán, they encountered the landscape and local ontology at every step, which re-shaped their objectives and the outcomes of their activities. For example, the grid of Tahcabo accommodates the *rejolladas* present in town—the unevenly plotted roads avoid *rejolladas* rather than passing through them, perhaps following already established routes. The church was built next to the mound for ease of stone recycling and also to usurp the sacred space. Religious conversion occurred, but the passed-on knowledge of Postclassic period religious activities also shaped the Catholicism of Yucatán in ways that cannot be ignored. For example, hybrid religious ceremonies continue to take place in sinkholes rather than in the church.

In addition, indigenous farmers experimented with new plants, animals, and technologies, innovating despite colonial constraints. Excavation within *rejolladas* demonstrates that attentive farmers working to understand and innovate within specific landscape features can determine their most productive uses. Each *rejollada* is not the same, and farmers have their own needs and preoccupations as they interact with the landscape. However, parallels exist in the uses of specific *rejolladas* when comparing occurrences today with those from the Early Classic period. These similarities do not suggest static human-environmental interactions but instead demonstrate the rigor of place-appropriate agricultural knowledge attained through relationships between farmers and the polyphonic assemblages constituting landscapes (Tsing 2015:32).

Farmers' agency can, of course, be seen in rebellions, including the famous Caste War of Yucatán, which has been called the most successful indigenous rebellion in the Western hemisphere (Alexander 2004:6). But livelihood strategies also interrupted colonial objectives. Mobility was among the most obvious forms of colonial evasion. However, one also sees in historical accounts the disdain that Spanish officials showed toward communities' annual festivals—in fact, they used such activities as an excuse to justify the re-absorption of community taxes and estates into the Royal treasury, as a means to stop the "drunken revels and other vices" (Farriss 1984:365). More likely, such community festivities caused other problems for colonial officials, including the cohesion that would motivate and allow indigenous inhabitants to reject, complain about, or threaten consequences for heavy taxes, other burdens, and negligence.

Resistance tied to strategies for resilience and autonomy played an important role in shaping historical trajectories. Even today, farmers' strategies in Mexico can surprise and confound social scientists, policy makers, and planners. For example, households of differing socioeconomic status continue to cultivate maize for diverse reasons, including as a strategy to reduce risk and as an expression of food preference, despite the withdrawal of federal support for such production amid trade liberalization (Lerner et al. 2013). As a complement to other livelihood pursuits, and based on their relationships to markets, social networks, and landscapes, households decide to grow small plots of maize. Collectively, such decisions alter planners' imagined landscapes and shape policy responses going forward.

Future Research

More research is needed to build a fuller account of how rural livelihoods changed throughout the Colonial period. This will require the excavation of more residential areas of varying status, with the application of additional soil and artifact studies to help fill in gaps in our understanding of daily life in rural communities. More detailed information could help to distinguish among the different activities and life projects of household constituents. Food systems research, incorporating direct evidence of the plants that households grew in gardens and fields and prepared as food in the home, as well as the animals they reared and hunted, can help to tease out how the now-acclaimed dishes of Yucatán came to be, and explain better the role that rural communities played in their development.

Rural livelihoods can also continue to be traced past the Colonial period to more recent times. Residents of Tahcabo and other communities across Yucatán preserve oral testimony about the *tiempo de esclavitud* ("time of slavery"), which refers to the time when many people worked at the large *haciendas* of the nineteenth and early twentieth centuries. By continuing this study into more recent times, community collaborators can contribute even more of their expertise to the narrative explaining how farmers' lives changed and what those changes meant to people. The consequences of colonial and later policies can be tracked all the way to the present day, in order to evaluate more completely the contributions of rural dynamics to historical trajectories (e.g., Cabrera Pacheco 2017).

Archaeologically, it was difficult to determine the effectiveness of varying livelihood strategies in part due to a lack of local climate and census data. The most complete and detailed climate reconstruction for this time period comes from the Yok Balum stalagmite climate record, collected from a cave in the very southernmost portion of Belize (Kennett et al. 2012). This particular climate record indicates that droughts became progressively worse throughout the Colonial period. With more local climate data, we could determine whether the trend was the same at Tahcabo. Detailed local climate records could be paired with additional research into the available historical documents to reconstruct a more detailed population record, and better track the resilience of Tahcabo households in light of various droughts and epidemics they faced throughout the Colonial period.

This project has examined how colonial policies acted to restrict the livelihood activities that rural farmers pursued and to increase dietary dependence on *milpa* agriculture. It also demonstrates that Maya farmers innovated as they sought to meet tax requirements, feed their families and communities, and introduce new plants and animals to the places where they lived. We should not assume that agricultural practices seen in use today provide valid comparisons to those pursued prior to or during the Colonial period, nor that droughts would have had similar impacts on rural communities through time. It is important to remember, when narrating colonial processes in Yucatán, that farmers comprised the vast majority of the population, and that while life could be difficult for those who stayed in the northern Maya lowlands during the Colonial period, these stalwart inhabitants played a role in shaping historical outcomes. This study highlights how farmers negotiated and resisted colonialism through their everyday livelihood decisions, maintaining traditional ecological knowledge and applying it perceptively within their rich and storied landscapes.

APPENDIX A: TABLE OF SURFACE-COLLECTED CERAMICS

Location	Type	Chronology	Count
Ak Patio	Ciego Composite	M to L Preclassic	1
Ak Patio	Huachinango Bichrome	M Preclassic to E Classic	1
Ak Patio	Sierra Red	M Preclassic to E Classic	2
Behind Str 102	Huachinango Bichrome	M Preclassic to E Classic	1
Behind Str 102	Hunabchen Red	Early Classic	1
Behind Str 102	Sierra Red	M Preclassic to E Classic	1
Behind Str 102	Whiteware	Recent	2
Behind Str 102	Yuncu Unslipped	Colonial	2
Cenote A	China	Historical	1
Cenote A	Mama Red	Postclassic	1
Cenote A	Muna Slate	L to T Classic	1
Cenote A	Sakpokana Red	Colonial	1
Cenote A	Unknown	Unknown	1
Cenote A	Whiteware	Recent	2
Cenote A	Yuncu Unslipped	Colonial	1
Rejollada B	Sakpokana Red	Colonial	2
Rejollada D	Batres Red	E to L Classic	1
Rejollada D	Chancenote Striated	M Preclassic to E Classic	1
Rejollada D	Fiber-impressed	Unknown	3
Rejollada D	Havana Club Punctated	M Preclassic to E Classic	1
Rejollada D	Olive Jar	Colonial	1
Rejollada D	Sakpokana Red	Colonial	1
Rejollada D	Unknown	Unknown	5
Rejollada D	Whiteware	Recent	2
Rejollada E	Unknown	Recent/Historical	1
Structure 101	Bichrome Incised	M Preclassic to E Classic	1
Structure 101	Corelle ware	Recent	3
Structure 101	Hunabchen Red	Early Classic	1
Structure 101	Joventud Red	M to L Preclassic	1
Structure 101	Juventud Red	M to L Preclassic	1
Structure 101	Mama Red	Postclassic	1
Structure 101	Muna Slate	L to T Classic	3
Structure 101	Teabo Red	L to T Classic	1
Structure 101	Tekit Incised	L to T Classic	1
Structure 101	Ticul Thin Slate	Terminal Classic	1
Structure 101	Unknown	Unknown	1
Structure 101	Unknown	Unknown	20
Structure 101	Unknown purple ware	Historical/Recent	1
Structure 101	Unknown Redware	Historical/Recent	4
Structure 101	Unknown Slateware	L to T Classic	3
Structure 101	Whiteware	Recent	7
Structure 101	Yacman Striated	Colonial	2
Structure 101	Yuncu Unslipped	Colonial	1
Structure 101	Yuncu Unslipped	Colonial	4
Structure 102	Aguila Orange	L Preclassic to E Classic	6
Structure 102	Akil Impressed	L to T Classic	1
Structure 102	Batres Red	E to L Classic	5

Location	Type	Chronology	Count
Structure 102	Chancenote Striated	M Preclassic to E Classic	8
Structure 102	Corelle ware	Recent	1
Structure 102	Dzilam Verde Bichrome	M Preclassic to E Classic	1
Structure 102	Dzitas Slate	L to T Classic	3
Structure 102	Huachinango Bichrome	M Preclassic to E Classic	20
Structure 102	Joventud Red	M to L Preclassic	1
Structure 102	Kin Orange-Red	M to L Preclassic	1
Structure 102	Lakin Impressed	Colonial	1
Structure 102	Mama Red	Postclassic	1
Structure 102	Mexico City White	Colonial	1
Structure 102	Navula Unslipped	Postclassic	2
Structure 102	Olive Jar (Middle)	Colonial	1
Structure 102	Oxcum Brown	Colonial	1
Structure 102	Peto Cream	Terminal Classic	1
Structure 102	Saban Unslipped	M Preclassic to E Classic	1
Structure 102	Sakpokana Red	Colonial	1
Structure 102	San Luis Polychrome	Colonial (1650-1750)	1
Structure 102	Sierra Red	M Preclassic to E Classic	9
Structure 102	Teabo Red	L to T Classic	2
Structure 102	Unknown	Unknown	11
Structure 102	Unknown Bichrome	M Preclassic to E Classic	4
Structure 102	Whiteware	Recent	12
Structure 102	Yokat-Piste Striated	L to T Classic	1
Structure 102	Yuncu Unslipped	Colonial	13
Structure 104	Camote Brown	Historical	2
Structure 104	Chenkeken Incised	Postclassic	1
Structure 104	Chunhinta Black	M to L Preclassic	1
Structure 104	Mama Red	Postclassic	5
Structure 104	Polbox Buff	Postclassic	1
Structure 104	Red Guinda	Colonial	2
Structure 104	Sakpokana Red	Colonial	8
Structure 104	Teabo Red	L to T Classic	1
Structure 104	Unknown	Unknown	7
Structure 104	Unknown Buff Ware	Historical/Recent	4
Structure 104	Whiteware	Recent	14
Structure 104	Yuncu Unslipped	Colonial	1
Structure 104	Yuncu Unslipped	Colonial	2
Structure 201	Chancenote Striated	M Preclassic to E Classic	2
Structure 201	Dzudzuquil Buff	M to L Preclassic	1
Structure 201	Huachinango Bichrome	M Preclassic to E Classic	5
Structure 201	Sierra Red	M Preclassic to E Classic	3
Structure 201	Unknown	Unknown	2
Structure 201	Xanaba Red	L Preclassic to E Classic	1
Structure 201	Yokat-Piste Striated	L to T Classic	1
Structure 202	Olive Jar	Colonial	1
Structure 202	Unknown	Unknown	1
Structure 202	Vista Alegre Striated	Terminal Classic	10
Structure 203	Chancenote Striated	M Preclassic to E Classic	4
Structure 203	Havana Club Punzonada	M Preclassic to E Classic	1
Structure 203	Huachinango Bichrome	M Preclassic to E Classic	3

Location	Type	Chronology	Count
Structure 203	Olive Jar	Colonial	1
Structure 203	Saban Unslipped	M Preclassic to E Classic	1
Structure 203	Unknown	M Preclassic to E Classic	2
Structure 203	Unknown	Unknown	5
Structure 203	Yuncu Unslipped	Colonial	43
Structure 204	Cetelac Fiber	E to L Classic	1
Structure 204	Dzilam Verde	M Preclassic to E Classic	4
Structure 204	Dzudzuquil Buff	M to L Preclassic	1
Structure 204	Huachinango Bichrome	M Preclassic to E Classic	9
Structure 204	Olive Jar	Colonial	1
Structure 204	Unknown	Unknown	25
Structure 205	Aguila Orange	L Preclassic to E Classic	1
Structure 205	Carolina Bichrome	M Preclassic to E Classic	1
Structure 205	Cetelac Fiber	E to L Classic	1
Structure 205	Chancenote Striated	M Preclassic to E Classic	8
Structure 205	Huachinango Bichrome	M Preclassic to E Classic	4
Structure 205	Laguna Verde	L Preclassic to E Classic	1
Structure 205	Saban Unslipped	M Preclassic to E Classic	2
Structure 205	Sierra Red	M Preclassic to E Classic	4
Structure 205	Tituc Orange Polychrome	E to L Classic	3
Structure 205	Unknown	Unknown	13
Structure 205	Vista Alegre Striated	Terminal Classic	1
Structure 205	Xanaba Red	L Preclassic to E Classic	1
Structure 206	Chancenote Striated	M Preclassic to E Classic	8
Structure 206	Chunhinta Black, Var. Uci	M to L Preclassic	2
Structure 206	Dzilam Verde	M Preclassic to E Classic	3
Structure 206	Dzudzuquil Group	M to L Preclassic	4
Structure 206	Havana Club Punctated	M Preclassic to E Classic	5
Structure 206	Huachinango Bichrome	M Preclassic to E Classic	15
Structure 206	Majan Red-on-Cream	M to L Preclassic	4
Structure 206	Mama Red	Postclassic	7
Structure 206	Polvero Black	M to L Preclassic	4
Structure 206	Sierra Red	M Preclassic to E Classic	12
Structure 206	Unknown	Preclassic	4
Structure 206	Unknown	Unknown	128
Structure 206	Yacman Striated	Colonial	3
Structure 206	Yokat-Piste Striated	L to T Classic	1
Structure 206	Yuncu Unslipped	Colonial	19
Structure 207	Batres Red	E to L Classic	2
Structure 207	Muna Slate	L to T Classic	1
Structure 207	Saban Unslipped	M Preclassic to E Classic	1
Structure 207	Tituc Orange Polychrome	E to L Classic	1
Structure 312	Slateware	L to T Classic	1
Structure 312	Unknown	Unknown	11
Structure 317	Fine Orange Unknown	Late Classic	1
Structure 317	Majolica	Colonial	1
Structure 317	Olive Jar (Middle)	Colonial	1
Structure 317	Slateware	L to T Classic	2
Structure 317	Unknown	Historical	5
Structure 317	Unknown	Unknown	18

Location	Type	Chronology	Count
Structure 317	Yuncu Unslipped	Colonial	29
Structure 319	Bichrome	M Preclassic to E Classic	1
Structure 319	Olive Jar	Colonial	2
Structure 319	Unknown	Unknown	1
Structure 319	Yuncu Unslipped	Colonial	4
Structure 320	Cetelac Fiber	E to L Classic	1
Structure 320	Chancenote Striated	M Preclassic to E Classic	1
Structure 320	Huachinango Bichrome	M Preclassic to E Classic	1
Structure 320	Teabo Red	L to T Classic	3
Structure 320	Unknown	Unknown	42
Structure 320	Yokat-Piste Striated	L to T Classic	1
Structure 322	Batres Red	E to L Classic	1
Structure 322	Carolina Bichrome	M Preclassic to E Classic	1
Structure 322	Teabo Red	L to T Classic	1
Structure 322	Unknown	Unknown	7
Structure 323	Akil Impressed	L to T Classic	1
Structure 323	Bichrome	M Preclassic to E Classic	1
Structure 323	Sacalum Black-on-Slate	L to T Classic	1
Structure 323	Slateware	L to T Classic	1
Structure 323	Unknown	Historical	1
Structure 323	Unknown	Unknown	4
Structure 324	Bichrome	M Preclassic to E Classic	1
Structure 324	Carolina Bichrome	M Preclassic to E Classic	1
Structure 324	Huachinango Bichrome	M Preclassic to E Classic	1
Structure 324	Sacalum Black-on-Slate	L to T Classic	1
Structure 324	Unknown	Unknown	7
Structure 326	Aguila Orange	L Preclassic to E Classic	5
Structure 326	Akil Impressed	M Preclassic to E Classic	2
Structure 326	Batres Red	E to L Classic	1
Structure 326	Carolina Bichrome	M Preclassic to E Classic	4
Structure 326	Chacmay Incised: Grooved	L to T Classic	2
Structure 326	Chancenote Striated	M Preclassic to E Classic	9
Structure 326	Dzilam Verde	M Preclassic to E Classic	1
Structure 326	Dzitas Slate	L to T Classic	1
Structure 326	Huachinango Bichrome	M Preclassic to E Classic	9
Structure 326	Lakin Impressed	E to L Classic	1
Structure 326	Maxcanu Ante	E to L Classic	3
Structure 326	Muna Slate	L to T Classic	8
Structure 326	Navula Unslipped	Postclassic	3
Structure 326	Olive Jar	Colonial	1
Structure 326	Polvero Black	M to L Preclassic	1
Structure 326	Saban Unslipped	M Preclassic to E Classic	7
Structure 326	Sacalum Black-on-Slate	L to T Classic	3
Structure 326	Saxche Orange Polychrome	E to L Classic	3
Structure 326	Sierra Red	M Preclassic to E Classic	4
Structure 326	Teabo Red	L to T Classic	14
Structure 326	Tituc Orange Polychrome	E to L Classic	1
Structure 326	Unknown	Preclassic	6
Structure 326	Unknown	Unknown	38
Structure 326	Unknown Slateware	L to T Classic	22

Location	Type	Chronology	Count
Structure 326	Yacman Striated	Colonial	2
Structure 326	Yuncu Unslipped	Colonial	13
Structure 327	Chancenote Striated	M Preclassic to E Classic	5
Structure 327	China	Historical	1
Structure 327	Dzudzuquil Buff	M to L Preclassic	1
Structure 327	Huachinango Bichrome	M Preclassic to E Classic	1
Structure 327	Mama Red	Postclassic	6
Structure 327	Maxcanu Ante	E to L Classic	1
Structure 327	Muna Slate	L to T Classic	4
Structure 327	Navula Unslipped	Postclassic	2
Structure 327	Saban Unslipped	M Preclassic to E Classic	2
Structure 327	San Luis Polychrome	Colonial	1
Structure 327	Sapote Striated	M Preclassic to E Classic	1
Structure 327	Sierra Red	M Preclassic to E Classic	1
Structure 327	Teabo Red	L to T Classic	3
Structure 327	Unknown	Unknown	11
Structure 327	Vista Alegre Striated	Late Classic	2
Structure 327	Xanaba Red	L Preclassic to E Classic	1
Structure 327	Yacman Striated	Colonial	1
Structure 327	Yuncu Unslipped	Colonial	15
Structure 400	Carolina Bichrome	M Preclassic to E Classic	1
Structure 400	Huachinango Bichrome	M Preclassic to E Classic	1
Structure 400	Slateware	L to T Classic	3
Structure 400	Unknown	Unknown	31
Structure 403	Sakpokana Red	Colonial	1
Structure 403	Unknown	Unknown	23
Structure 403	Yuncu Unslipped	Colonial	11
Structure 407	Olive Jar	Colonial	1
Structure 407	Sakpokana Red	Colonial	1
Structure 407	Unknown	Unknown	2
Structure 408	Bichrome	M Preclassic to E Classic	1
Structure 408	Chancenote Striated	M Preclassic to E Classic	2
Structure 408	Sierra Red	M Preclassic to E Classic	1
Structure 408	Unknown	Unknown	5
Structure 408	Yuncu Unslipped	Colonial	4

APPENDIX B: TABLE OF PLANTS DOCUMENTED IN *REJOLLADAS* DURING PLANT SURVEYS AND INTERVIEWS

Rejo	Family	Binomial Scientific Name	Introduced?
A	Acanthaceae	*Henrya insularis*	No
A	Amaranthaceae	*Achyranthes aspera*	Unknown
A	Anacardiaceae	*Mangifera indica*	Yes
A	Anacardiaceae	*Spondias purpurea*	No
A	Annonaceae	*Annona muricata*	No
A	Annonaceae	*Annona reticulata*	No
A	Apocynaceae	*Cascabela gaumeri*	No
A	Apocynaceae	*Metastelma sp.*	No
A	Apocynaceae	*Pentalinon andrieuxii*	No
A	Apocynaceae	*Rauvolfia tetraphylla*	No
A	Apocynaceae	*Thevetia ahouai*	No
A	Araceae	*Xanthosoma yucatanensis*	No
A	Arecaceae	*Cocos nucifera*	Yes
A	Arecaceae	*Sabal yapa*	No
A	Asteraceae	*Cyanthillium cinereum*	Yes
A	Asteraceae	*Sonchus oleraceus*	Yes
A	Asteraceae	*Tridax procumbens*	No
A	Bignoniaceae	*Pithecoctenium crucigerum*	No
A	Bignoniaceae	*Tecoma stans*	No
A	Bixaceae	*Bixa orellana*	No
A	Boraginaceae	*Ehretia tinifolia*	No
A	Burseraceae	*Bursera simaruba*	No
A	Cactaceae	*Hylocereus* sp.	No
A	Caricaceae	*Carica papaya*	No
A	Combretaceae	*Terminalia catappa*	Yes
A	Convolvulaceae	*Ipomoea batatas*	No
A	Cucurbitaceae	*Cucurbita* sp.	No
A	Cucurbitaceae	*Momordica charantia*	Yes
A	Cucurbitaceae	*Sechium edule*	No
A	Euphorbiaceae	*Cnidoscolus aconitifolius*	No
A	Euphorbiaceae	*Manihot esculenta*	No
A	Fabaceae	*Arachis hypogaea*	Yes
A	Fabaceae	*Chamaecrista chamaecristoides*	No
A	Fabaceae	*Desmodium affine*	No
A	Fabaceae	*Enterolobium cyclocarpum*	No
A	Fabaceae	*Pachyrhizus erosus*	No
A	Fabaceae	*Rhynchosia minima*	No
A	Fabaceae	*Swartzia cubensis*	No
A	Fabaceae	*Tamarindus indica*	Yes
A	Lamiaceae	*Callicarpa acuminata*	No
A	Lauraceae	*Persea americana*	No
A	Malpighiaceae	*Byrsonima crassifolia*	No
A	Malvaceae	*Ceiba pentandra*	No
A	Malvaceae	*Malvaviscus arboreus*	No
A	Malvaceae	*Melochia pyramidata*	No
A	Meliaceae	*Cedrela odorata*	No

Rejo	Family	Binomial Scientific Name	Introduced?
A	Menispermaceae	*Cissampelos pareira*	No
A	Moraceae	*Brosimum alicastrum*	No
A	Musaceae	*Musa paradisiaca*	Yes
A	Myrtaceae	*Eugenia acapulcensis*	No
A	Myrtaceae	*Psidium guajava*	No
A	Piperaceae	*Piper auritum*	No
A	Piperaceae	*Piper pseudolindenii*	No
A	Poaceae	*Saccharum officinarum*	Yes
A	Polygonaceae	*Coccoloba spicata*	No
A	Portulacaceae	*Talinum paniculatum*	No
A	Rhamnaceae	*Colubrina arborescens*	No
A	Rubiaceae	*Hamelia patens*	No
A	Rubiaceae	*Morinda citrifolia*	Yes
A	Rubiaceae	*Morinda royoc*	No
A	Rutaceae	*Citrus × aurantifolia*	Yes
A	Rutaceae	*Citrus × aurantium*	Yes
A	Rutaceae	*Citrus × paradisi*	Yes
A	Rutaceae	*Citrus reticulata*	Yes
A	Rutaceae	*Citrus sinensis*	Yes
A	Rutaceae	*Murraya paniculata*	Yes
A	Salicaceae	*Casearia corymbosa*	No
A	Salicaceae	*Laetia thamnia*	No
A	Sapindaceae	*Melicoccus oliviformis*	No
A	Sapindaceae	*Serjania goniocarpa*	No
A	Sapotaceae	*Manilkara zapota*	No
A	Sapotaceae	*Pouteria sapota*	No
A	Solanaceae	*Capsicum chinense*	No
A	Solanaceae	*Solanum lycopersicum*	No
A	Urticaceae	*Cecropia peltata*	No
A	Verbenaceae	*Petrea volubilis*	No
B	Amaranthaceae	*Amaranthus hybridus*	No
B	Amaranthaceae	*Celosia virgata*	No
B	Anacardiaceae	*Spondias purpurea*	No
B	Annonaceae	*Annona reticulata*	No
B	Asteraceae	*Brickellia diffusa*	No
B	Bignoniaceae	*Tecoma stans*	No
B	Boraginaceae	*Ehretia tinifolia*	No
B	Boraginaceae	*Heliotropium angiospermum*	No
B	Bromeliaceae	*Ananas comosus*	Yes
B	Caricaceae	*Carica papaya*	No
B	Convolvulaceae	*Cuscuta cozumeliensis*	No
B	Cucurbitaceae	*Momordica charantia*	Yes
B	Euphorbiaceae	*Acalypha diversifolia*	No
B	Fabaceae	*Coursetia caribaea*	No
B	Fabaceae	*Enterolobium cyclocarpum*	No
B	Fabaceae	*Leucaena leucocephala*	No
B	Fabaceae	*Lonchocarpus longistylus*	No
B	Fabaceae	*Senna pallida*	No
B	Lamiaceae	*Leonotis nepetifolia*	Yes
B	Malpighiaceae	*Bunchosia swartziana*	No

Rejo	Family	Binomial Scientific Name	Introduced?
B	Malvaceae	*Abutilon permolle*	No
B	Meliaceae	*Cedrela odorata*	No
B	Musaceae	*Musa paradisiaca*	Yes
B	Myrtaceae	*Eugenia aeruginea*	No
B	Nyctaginaceae	*Boerhavia coccinea*	No
B	Orchidaceae	*Oeceoclades maculata*	Yes
B	Passifloraceae	*Passiflora ciliata*	No
B	Phytolaccaceae	*Rivina humilis*	No
B	Plumbaginaceae	*Plumbago zeylanica*	No
B	Polygonaceae	*Antigonon leptopus*	No
B	Rubiaceae	*Morinda royoc*	No
B	Rutaceae	*Casimiroa tetrameria*	Unknown
B	Rutaceae	*Citrus sinensis*	Yes
B	Rutaceae	*Murraya paniculata*	Yes
B	Sapindaceae	*Melicoccus oliviformis*	No
B	Sapindaceae	*Sapindus saponaria*	No
B	Sapindaceae	*Serjania goniocarpa*	No
B	Scrophulariaceae	*Capraria biflora*	No
B	Solanaceae	*Cestrum diurnum*	Yes
B	Solanaceae	*Solanum americanum*	No
B	Solanaceae	*Solanum lycopersicum*	No
B	Verbenaceae	*Petrea volubilis*	No
C[a]	Anacardiaceae	*Mangifera indica*	Yes
C	Anacardiaceae	*Spondias purpurea*	No
C	Annonaceae	*Annona purpurea*	No
C	Annonaceae	*Annona reticulata*	No
C	Bixaceae	*Bixa orellana*	No
C	Boraginaceae	*Ehretia tinifolia*	No
C	Cactaceae	*Hylocereus* sp.	No
C	Cactaceae	*Opuntia stricta*	No
C	Cannaceae	*Canna indica*	No
C	Caricaceae	*Carica papaya*	No
C	Euphorbiaceae	*Cnidoscolus aconitifolius*	No
C	Euphorbiaceae	*Euphorbia pulcherrima*	No
C	Euphorbiaceae	*Manihot esculenta*	No
C	Fabaceae	*Leucaena leucocephala*	No
C	Malpighiaceae	*Byrsonima crassifolia*	No
C	Malvaceae	*Ceiba pentandra*	No
C	Malvaceae	*Guazuma ulmifolia*	No
C	Malvaceae	*Hibiscus sabdariffa*	Yes
C	Meliaceae	*Cedrela odorata*	No
C	Moraceae	*Brosimum alicastrum*	No
C	Piperaceae	*Piper auritum*	No
C	Rutaceae	*Citrus × aurantifolia*	Yes
C	Rutaceae	*Citrus × aurantium*	Yes
C	Rutaceae	*Citrus × paradisi*	Yes
C	Rutaceae	*Citrus reticulata*	Yes
C	Rutaceae	*Murraya paniculata*	Yes
C	Sapindaceae	*Melicoccus oliviformis*	No
C	Sapotaceae	*Pouteria sapota*	No

Rejo	Family	Binomial Scientific Name	Introduced?
C	Xanthorrhoeaceae	*Aloe vera*	Yes
D	Acanthaceae	*Elytraria imbricata*	No
D	Amaranthaceae	*Iresine diffusa*	No
D	Annonaceae	*Annona muricata*	No
D	Annonaceae	*Annona reticulata*	No
D	Apocynaceae	*Asclepias curassavica*	No
D	Arecaceae	*Acrocomia aculeata*	No
D	Arecaceae	*Cocos nucifera*	Yes
D	Arecaceae	*Sabal yapa*	No
D	Asteraceae	*Brickellia diffusa*	No
D	Asteraceae	*Chromolaena odorata*	No
D	Asteraceae	*Cyanthillium cinereum*	Yes
D	Asteraceae	*Erechtites hieraciifolius*	No
D	Asteraceae	*Parthenium hysterophorus*	No
D	Asteraceae	*Porophyllum ruderale*	No
D	Bignoniaceae	*Parmentiera aculeata*	No
D	Boraginaceae	*Nama jamaicensis*	No
D	Burseraceae	*Bursera simaruba*	No
D	Cannaceae	*Canna indica*	No
D	Caricaceae	*Carica papaya*	No
D	Cucurbitaceae	*Cucurbita* sp.	No
D	Cucurbitaceae	*Ibervillea millspaughii*	No
D	Euphorbiaceae	*Acalypha diversifolia*	No
D	Euphorbiaceae	*Cnidoscolus aconitifolius*	No
D	Euphorbiaceae	*Manihot esculenta*	No
D	Fabaceae	*Centrosema virginianum*	No
D	Fabaceae	*Coursetia caribaea*	No
D	Fabaceae	*Enterolobium cyclocarpum*	No
D	Fabaceae	*Piscidia piscipula*	No
D	Fabaceae	*Stizolobium pruriens*	Yes
D	Lamiaceae	*Salvia misella*	No
D	Lauraceae	*Persea americana*	No
D	Malpighiaceae	*Byrsonima crassifolia*	No
D	Malvaceae	*Abutilon permolle*	No
D	Malvaceae	*Guazuma ulmifolia*	No
D	Meliaceae	*Cedrela odorata*	No
D	Meliaceae	*Trichilia hirta*	No
D	Moraceae	*Brosimum alicastrum*	No
D	Musaceae	*Musa paradisiaca*	Yes
D	Myrtaceae	*Eugenia aeruginea*	No
D	Nyctaginaceae	*Boerhavia diffusa*	Yes
D	Piperaceae	*Piper auritum* Kunth	No
D	Piperaceae	*Piper pseudolindenii*	No
D	Poaceae	*Lasiacis divaricata*	No
D	Rubiaceae	*Psychotria sp.*	No
D	Rutaceae	*Citrus × aurantium*	Yes
D	Rutaceae	*Citrus reticulata*	Yes
D	Rutaceae	*Citrus sinensis*	Yes
D	Salicaceae	*Casearia corymbosa*	No
D	Smilacaceae	*Smilax spinosa*	No

Rejo	Family	Binomial Scientific Name	Introduced?
D	Solanaceae	*Solanum americanum*	No
D	Solanaceae	*Solanum lycopersicum*	No
D	Violaceae	*Hybanthus yucatanensis*	No
E	Agavaceae	*Agave angustifolia*	No
E	Amaranthaceae	*Alternanthera flavescens*	No
E	Amaranthaceae	*Chamissoa altissima*	No
E	Amaranthaceae	*Iresine diffusa*	No
E	Anacardiaceae	*Mangifera indica*	Yes
E	Anacardiaceae	*Spondias purpurea*	No
E	Annonaceae	*Annona purpurea*	No
E	Annonaceae	*Annona reticulata*	No
E	Araceae	*Xanthosoma yucatanensis*	No
E	Arecaceae	*Acrocomia aculeata*	No
E	Arecaceae	*Cocos nucifera*	Yes
E	Arecaceae	*Sabal yapa*	No
E	Asteraceae	*Brickellia diffusa*	No
E	Asteraceae	*Tridax procumbens*	No
E	Bignoniaceae	*Cydista potosina*	No
E	Bignoniaceae	*Tecoma stans*	No
E	Bixaceae	*Bixa orellana*	No
E	Boraginaceae	*Ehretia tinifolia*	No
E	Bromeliaceae	*Ananas comosus*	Yes
E	Cactaceae	*Hylocereus* sp.	No
E	Caricaceae	*Carica papaya*	No
E	Convolvulaceae	*Ipomoea batatas*	No
E	Cucurbitaceae	*Cucurbita* sp.	No
E	Euphorbiaceae	*Acalypha diversifolia*	No
E	Euphorbiaceae	*Cnidoscolus aconitifolius*	No
E	Euphorbiaceae	*Euphorbia sp.*	Unknown
E	Euphorbiaceae	*Manihot esculenta*	No
E	Fabaceae	*Abrus precatorius*	Yes
E	Fabaceae	*Leucaena leucocephala*	No
E	Fabaceae	*Pachyrhizus erosus*	No
E	Fabaceae	*Stizolobium pruriens*	Yes
E	Lauraceae	*Persea americana*	No
E	Malpighiaceae	*Byrsonima crassifolia*	No
E	Malvaceae	*Ceiba pentandra*	No
E	Malvaceae	*Malvaviscus arboreus*	No
E	Malvaceae	*Melochia nodiflora*	No
E	Meliaceae	*Cedrela odorata*	No
E	Moraceae	*Brosimum alicastrum*	No
E	Musaceae	*Musa paradisiaca*	Yes
E	Nyctaginaceae	*Boerhavia erecta*	No
E	Nyctaginaceae	*Pisonia aculeata*	No
E	Orchidaceae	*Oeceoclades maculata*	Yes
E	Passifloraceae	*Passiflora edulis*	No
E	Piperaceae	*Piper auritum*	No
E	Poaceae	*Bambusa* sp.	Yes
E	Poaceae	*Panicum maximum*	Yes
E	Poaceae	*Saccharum officinarum*	Yes

Rejo	Family	Binomial Scientific Name	Introduced?
E	Poaceae	*Zea mays*	No
E	Portulacaceae	*Talinum fruticosum*	No
E	Rutaceae	*Citrus × aurantifolia*	Yes
E	Rutaceae	*Citrus reticulata*	Yes
E	Rutaceae	*Murraya paniculata*	Yes
E	Sapindaceae	*Melicoccus oliviformis*	No
E	Sapindaceae	*Serjania goniocarpa*	No
E	Sapotaceae	*Manilkara zapota*	No
E	Smilacaceae	*Smilax spinosa*	No
E	Solanaceae	*Capsicum chinense*	No
F	Anacardiaceae	*Spondias purpurea*	No
F[b]	Annonaceae	*Annona reticulata*	No
F	Bignoniaceae	*Crescentia cujete*	No
F	Fabaceae	*Leucaena leucocephala*	No
F	Malvaceae	*Ceiba pentandra*	No
F	Moraceae	*Brosimum alicastrum*	No
F	Rutaceae	*Citrus × aurantium*	Yes
F	Rutaceae	*Citrus reticulata*	Yes
F	Rutaceae	*Murraya paniculata*	Yes
F	Sapindaceae	*Melicoccus oliviformis*	No

[a] List from Rejollada C derived from interviews only.
[b] List from Rejollada F derived from interviews only.

APPENDIX C: ORIGINAL INTERVIEW QUESTIONS (IN ENGLISH)

1. Which portion of the *rejollada* do you own or use?
2. Who owned the *rejollada* before you did? Do you know who used it before that?
3. What types of plants do you grow in the *rejollada*? How did you choose what to grow? Are they different from what you grow in the rest of your garden? Are there plants that grow better here? What plants grow easily? What plants are harder to grow? Are there plants that will not grow in *rejolladas*? How is the environment different in the *rejollada*?
4. How do you use the plants that you grow?
5. What does it take to maintain the plants that you grow? Who in the family works in the *rejollada*? Do you (does she/he) use fertilizer? Do you prune shrubs or trees? Do you use burning in your *rejollada*, and if so, how regularly? What is it that burns, and what plants survive? Do you ever try to increase what you are able to produce in the *rejollada*, and how?
6. To what extent do you depend on what you grow for household consumption? How much is produced? Do you sell any of the plants that you grow here? If so, what do you sell and how much?
7. Do you know how the previous owner used the *rejollada*? Does it differ from what you do? What plants grew here in the time of your parents and grandparents?
8. Besides cultivation, what else do you use *rejolladas* for? Do you have animal pens in them? Are there other structures? Did you build any retaining walls to keep soil in place?

APPENDIX D: EXCAVATION FORMS

Excavation Lot Form (front)

☐ Done ☐ Entered into Database PACOY 2017

Excavators Line1 ______________________ Operation ________ Capa ____

Excavators Line 2 ______________________ Unit __________ Inc __________

Dimensions ______________ Lot __________

Start date ____/____/17 Method (instrument; natural or cultural;

End date ____/____/17 screen size): ______________________

Elevations

Datum

ID # (TS) ________

Elev. __________

Seeking: _______ bd

☐ Relative ☐ Absolute

Top Elevations NW __________ NE __________

C __________ SW __________ SE __________

☐ Relative ☐ Absolute

Bottom Elevations NW __________ NE __________

C __________ SW __________ SE __________

Artifacts

Density (circle): none light medium heavy solid Sediment Bucket Count ________

Artifact Count (+/-) _______ (check all found)

☐ animal bone
☐ debitage
☐ chipped tools
☐ complete vessels
☐ daub
☐ groundstone tools
☐ human bone
☐ obsidian
☐ pottery sherds
☐ other
☐ unworked shell
☐ worked shell

Sediment Characteristics

Density (circle): very loose loose semi-compact compact very compact solid

Munsell Color: ____________ Humidity Level (wet, moist, dry): __________ pH: ________

Texture (circle): clay silty-clay silt sandy-silt sand gravelly-sand gravel cobbles

Inclusions: type max size min size description/distribution

Limestone ____

Ash ____

Other ____

Analytic Samples ☐ other, describe: ______________________________

☐ C-14 ☐ soil chemistry ☐ flotation ☐ pollen ☐ phytolith/starch grain ☐ soil carbon isot.

Comments (contamination likelihood, weather, time of day, etc.)

____

____

____

____

____

Excavation Lot Form (back)

Description and Interpretation

Description:____

____

____

____

____

Interpretation:____

____

____

____

Category (fill, floor, wall, pit, etc.): ________________________ Time phase: ___________________

Stratigraphic Relationships

Below: _____________________________ Contains: ___________________________

Above: _____________________________ Equivalent to: _______________________

Within: _____________________________ Next to: ____________________________

Photo #s	Desc	Photographer	Date	Photo #s	Desc	Photographer	Date
(101-)							

(graph paper added here upon photocopy)

Excavation Feature Form (front)

☐ Done ☐ Entered into Database PACOY 2017—Tahcabo

Feature Number: ____________________ Op ____ Unit ____ Capa ____ Inc ____

Feature Type: ________________________ Lot # ________

Feature Length: ______________________ Date Begun ____/____/17

Feature Width: _______________________ Date Ended ____/____/17

Depth or Height of Feature ______________ Recorded by: ________________________

Elevations and Coordinates

Datum

ID # (TS) ________

Elev. ____________

Top Elevations ☐ Relative ☐ Absolute ________________ ________________

Bottom Elevations ☐ Relative ☐ Absolute ________________ ________________

UTM Coordinates taken? YES NO (If yes, please indicate locations on plan)

N E ; N E

Description and Chronology

Describe Feature and its Components: ____

____

____

____

____

Time period and justification: ____

____

____

Excavation Feature Form (back)

Inclusions and Soil Changes (if applicable)

Description of soil and inclusions within feature:

____

____

Description of soil and inclusions outside of feature:

____

____

Additional Information

Separate lot assigned? YES NO

(If NO, complete the following):

Associated Artifacts: YES NO

type: density:

chronological estimate: collected: YES NO

Associated Samples:

☐ C-14 ☐ soil chemistry ☐ flotation ☐ pollen ☐ phytolith/starch grain ☐ soil carbon isotope

Plan view (on graph paper)

Profile (optional)

Excavation Structure Form

☐ Done ☐ Entered into Database PACOY 2017—Tahcabo

Structure Number: ____________________ Associated Operation ________

Coordinates N _______________________ Property Owner _____________

Coordinates E _______________________ Date _____/_____/17

Recorded by: ________________________

General structure location:

Type of Structure: platform pyramid other _______________________________

Orientation of structure's long axis (1-180 degrees): _______________

Base Length (m): _______________ Base Width (m): ________________ Height: __________

Description and sketch of structure configuration:

Associated Artifacts: YES NO

(If YES, fill out information below):

type: density:

time period collected: YES NO

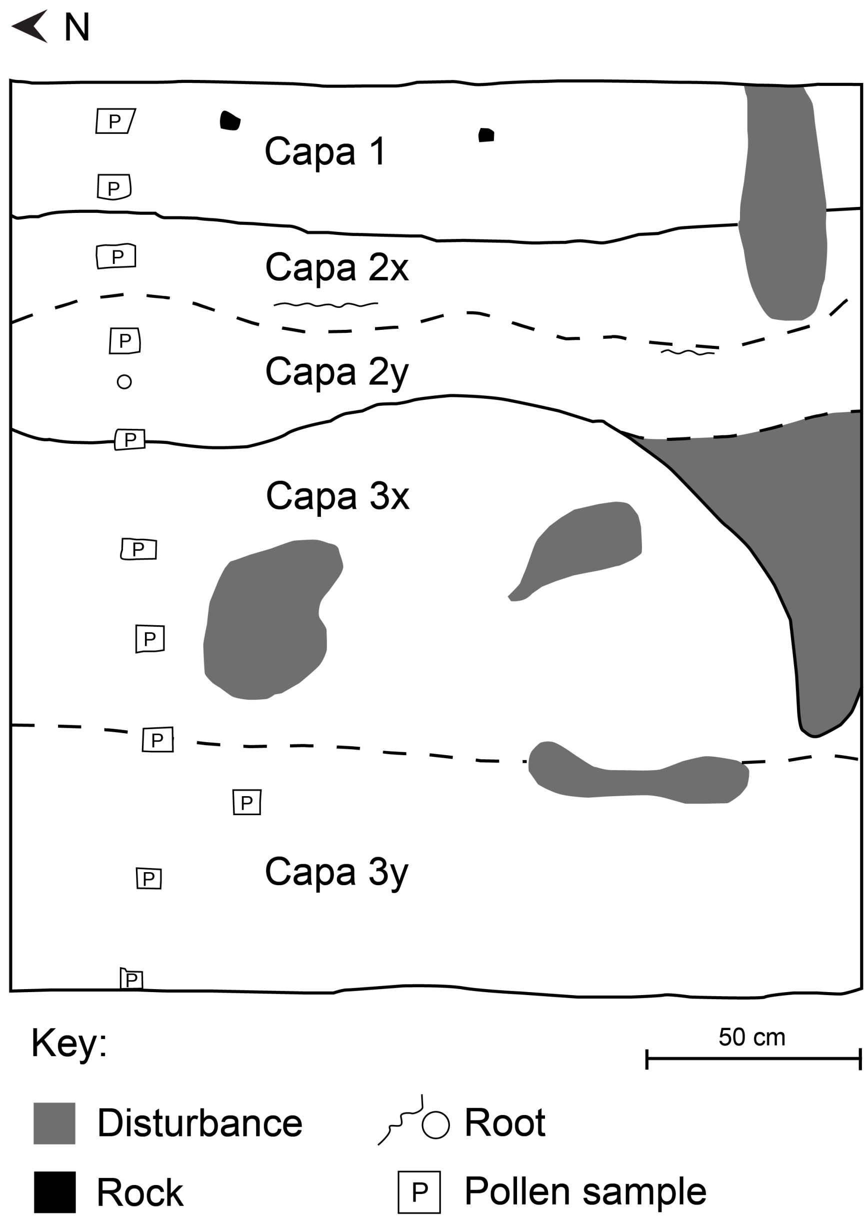
Associated structures (list number and sketch spatial relationahip):

Bedrock characteristics:

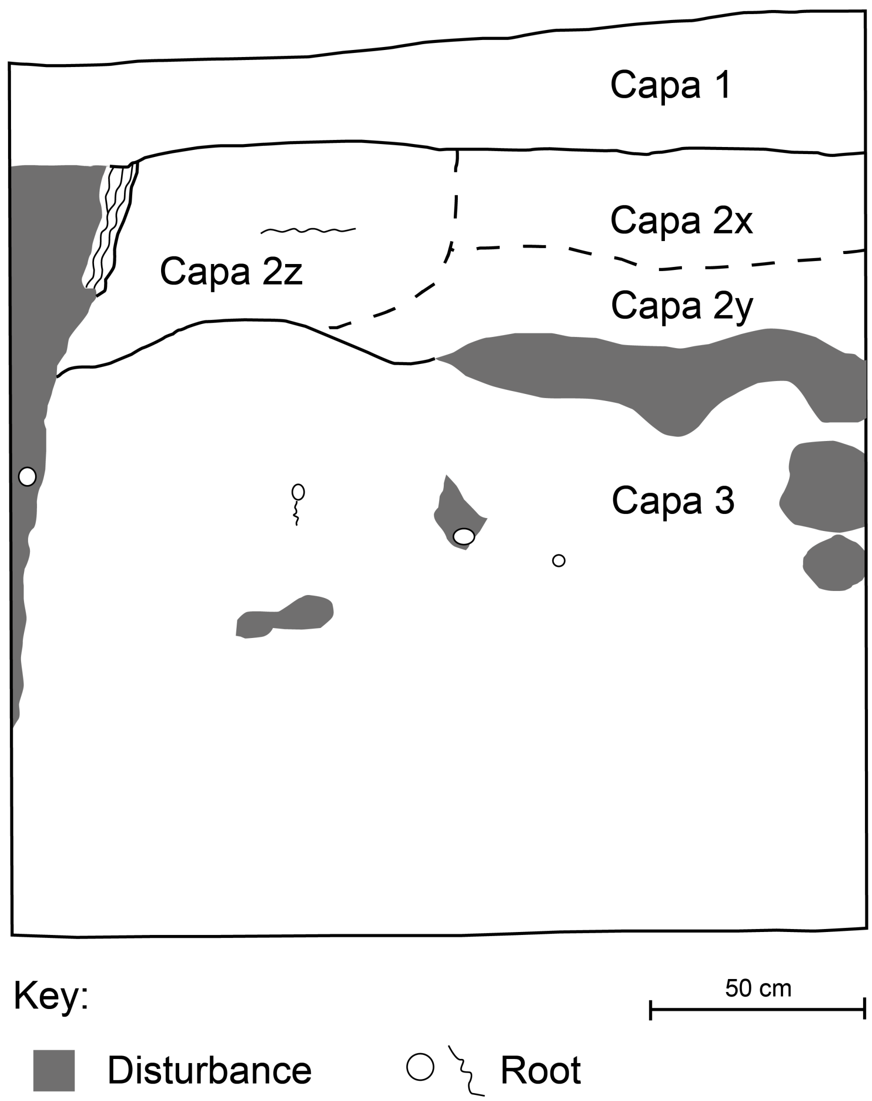
Dominant vegetation:

APPENDIX E: *REJOLLADA* EXCAVATION UNIT WALL PROFILES

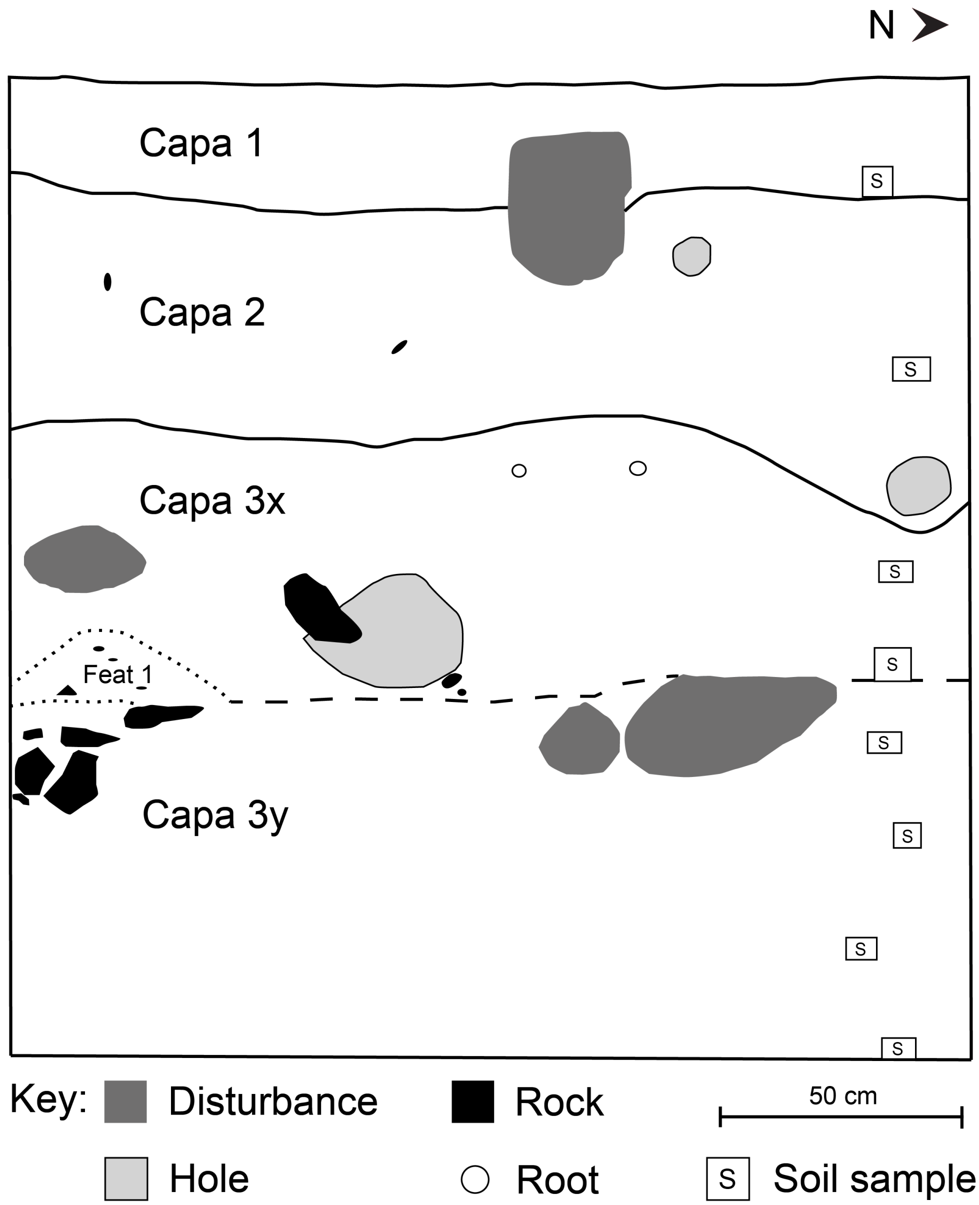
Operation 1, Rejollada A, East Unit Wall



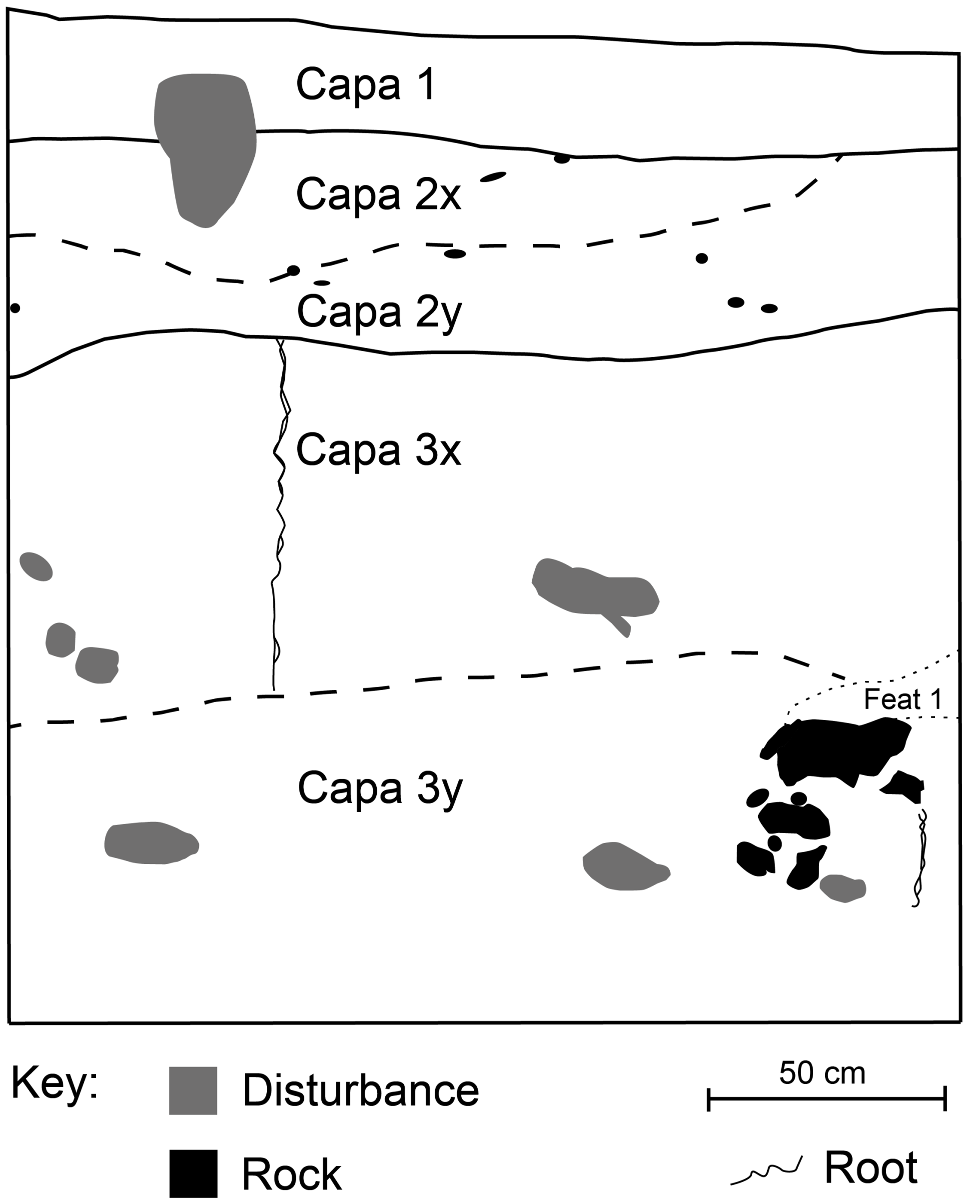
Operation 1, Rejollada A, North Unit Wall



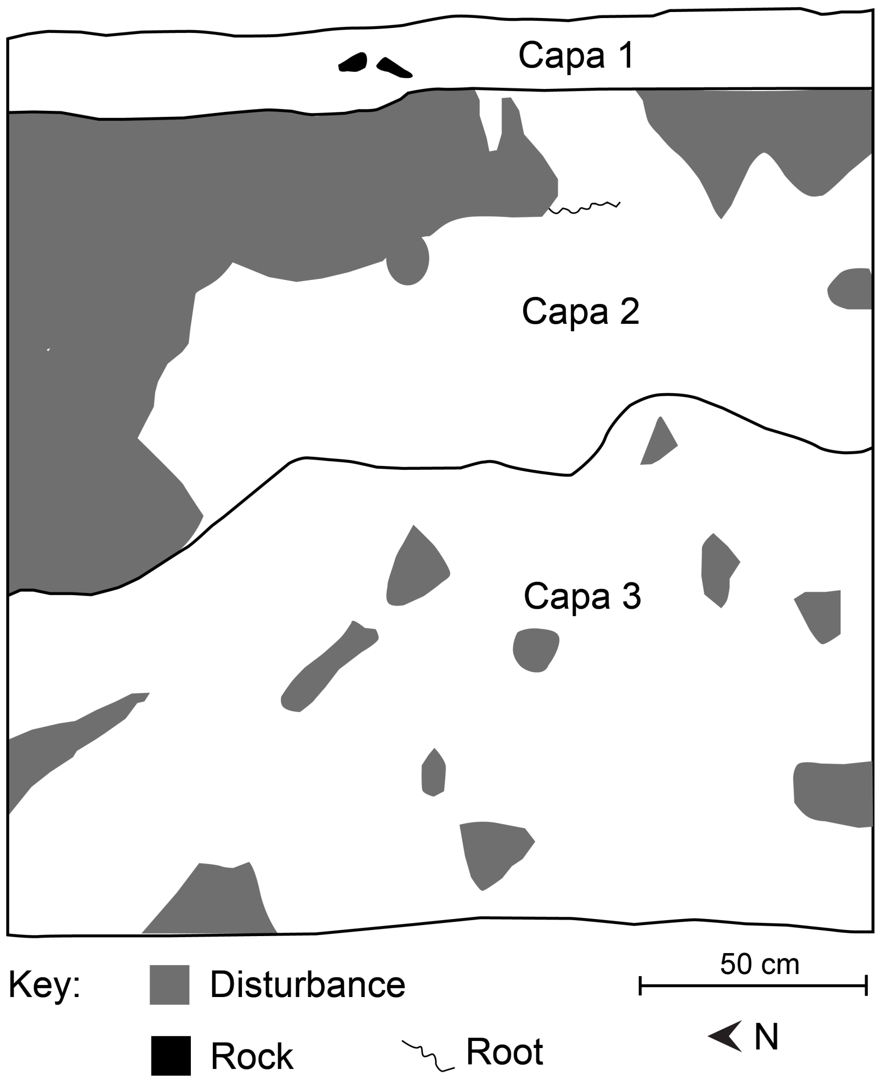
Operation 1, Rejollada A, West Unit Wall



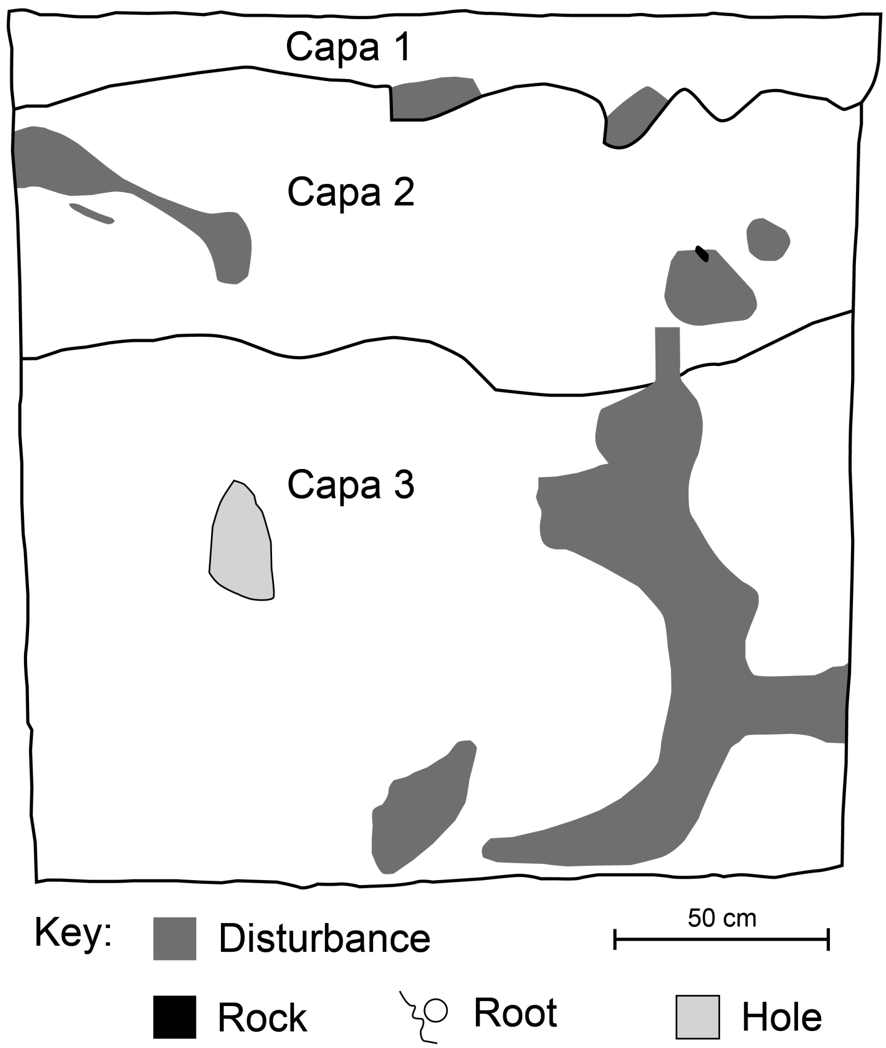
Operation 1, Rejollada A, South Unit Wall



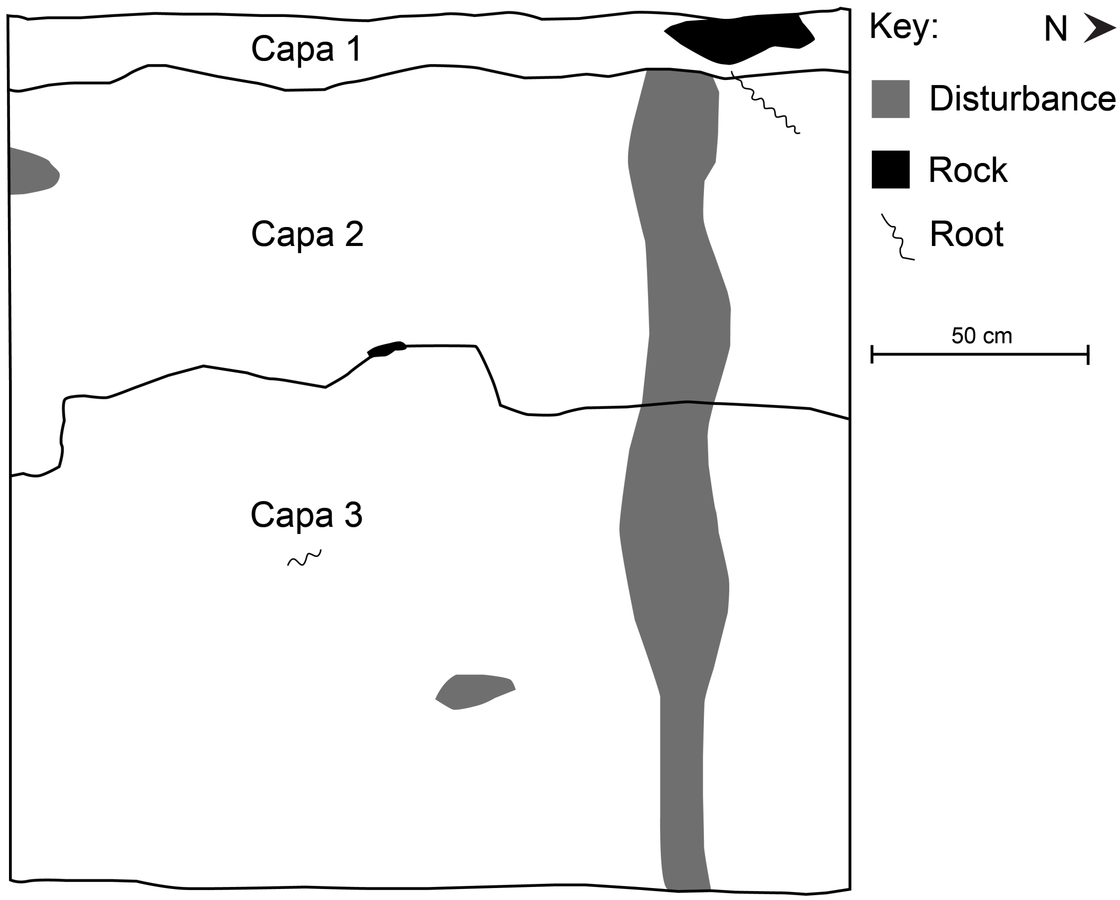
Operation 2, Rejollada E, East Unit Wall



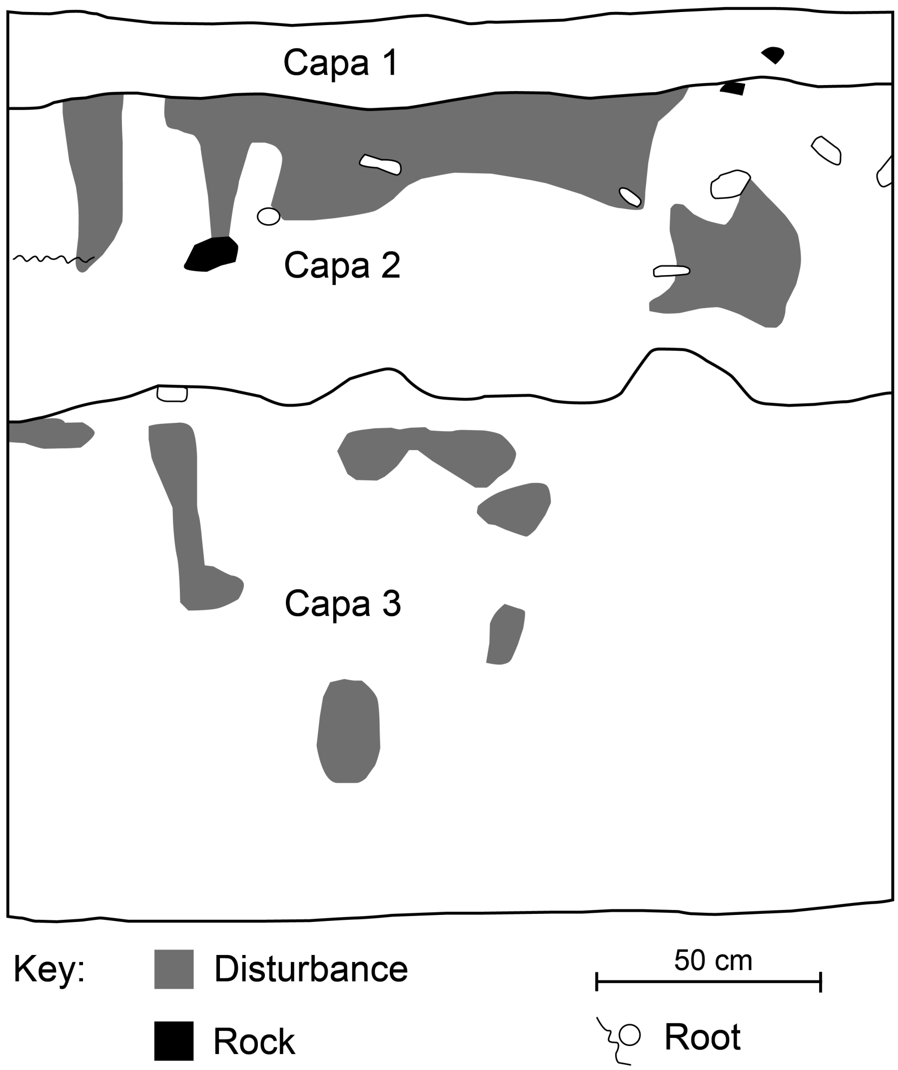
Operation 2, Rejollada E, North Unit Wall



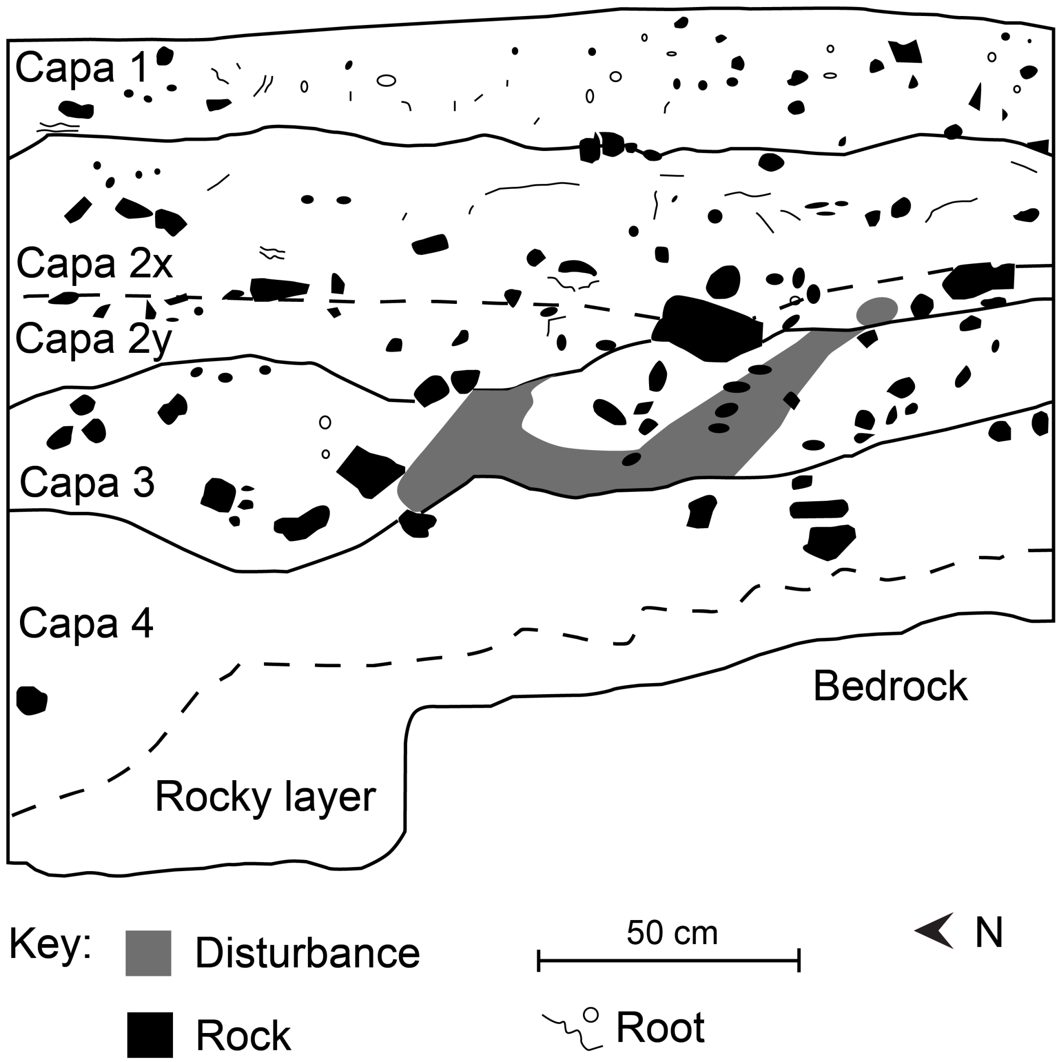
Operation 2, Rejollada E, West Unit Wall



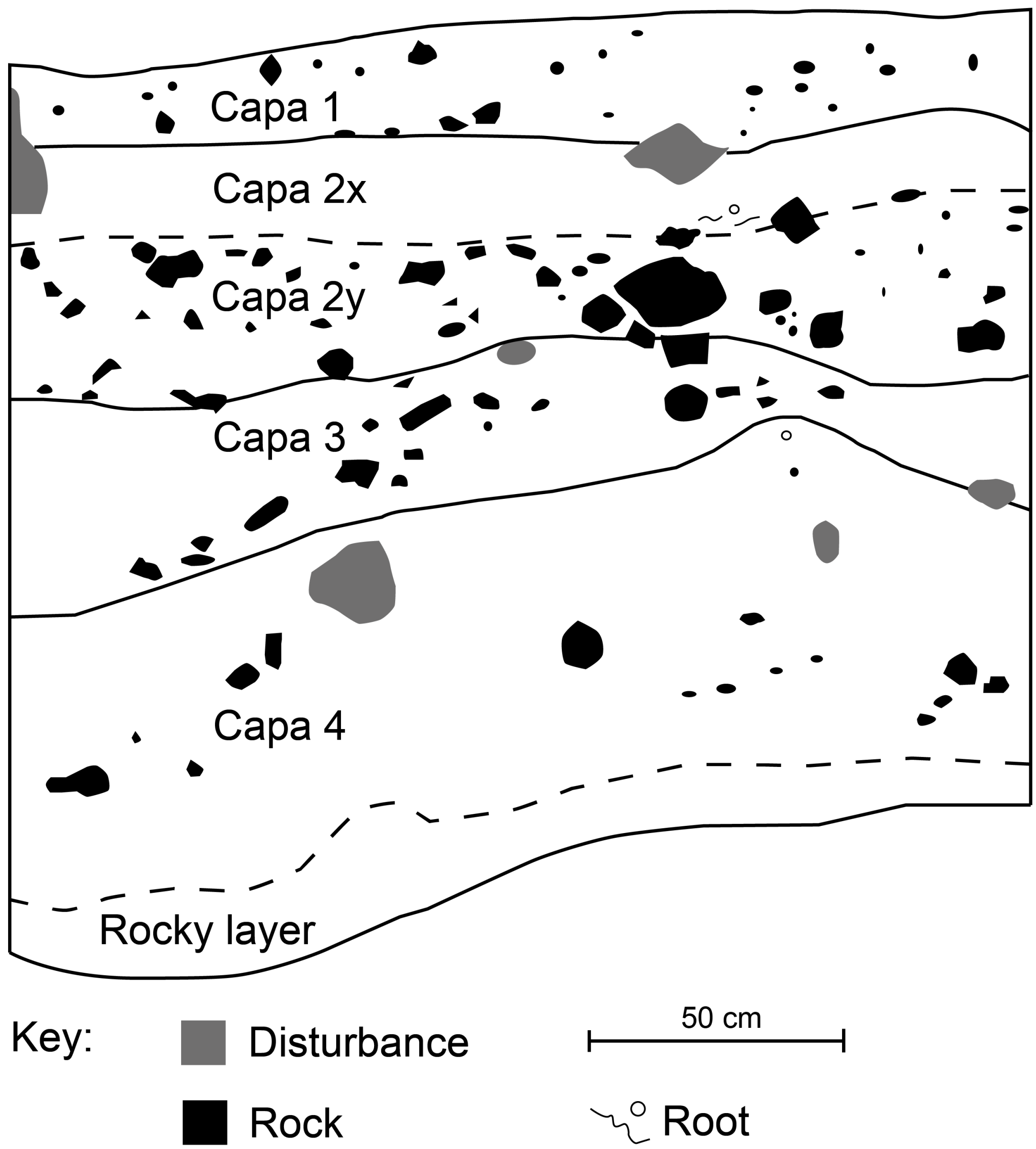
Operation 2, Rejollada E, South Unit Wall



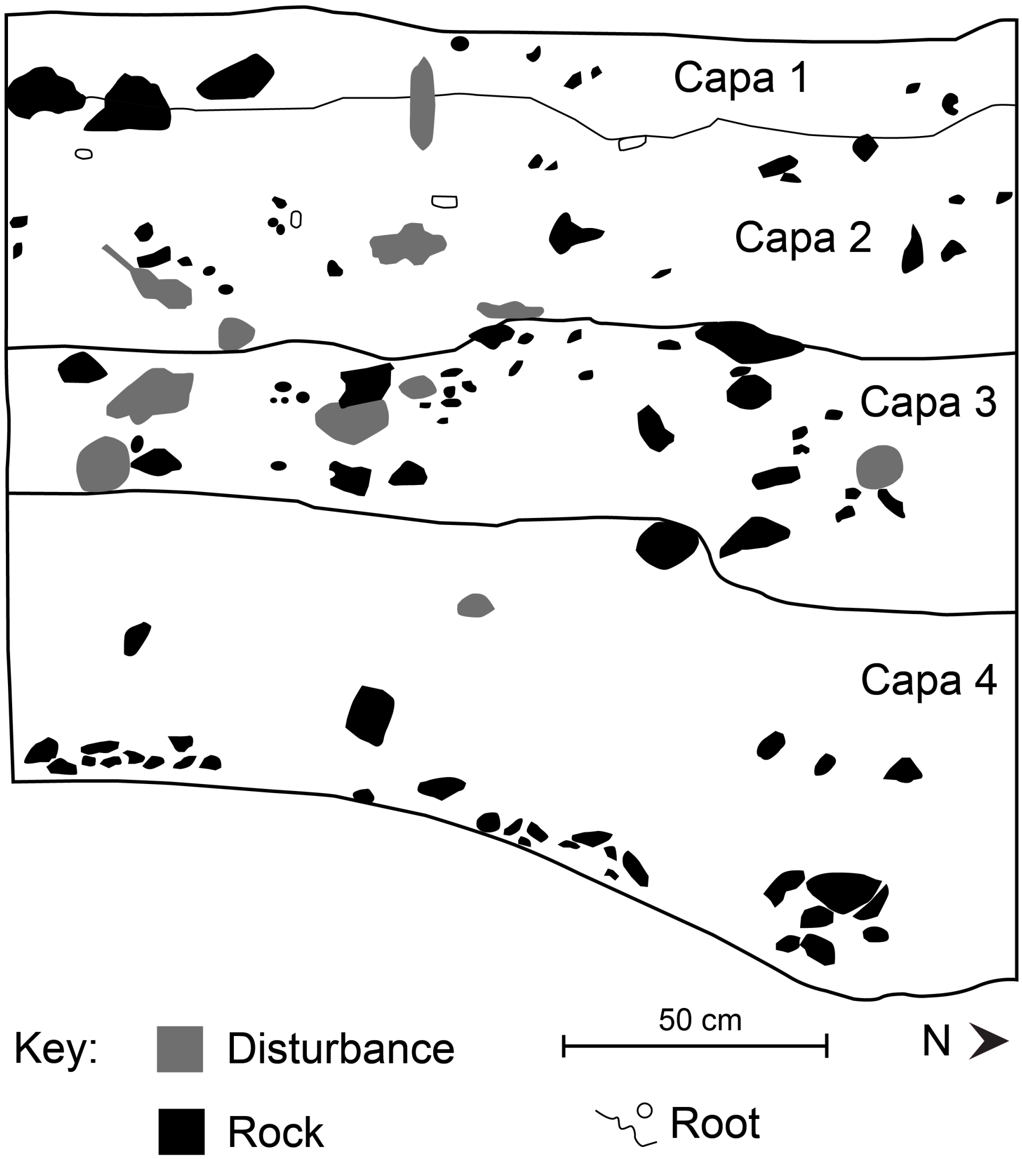
Operation 3, Rejollada G, East Unit Wall



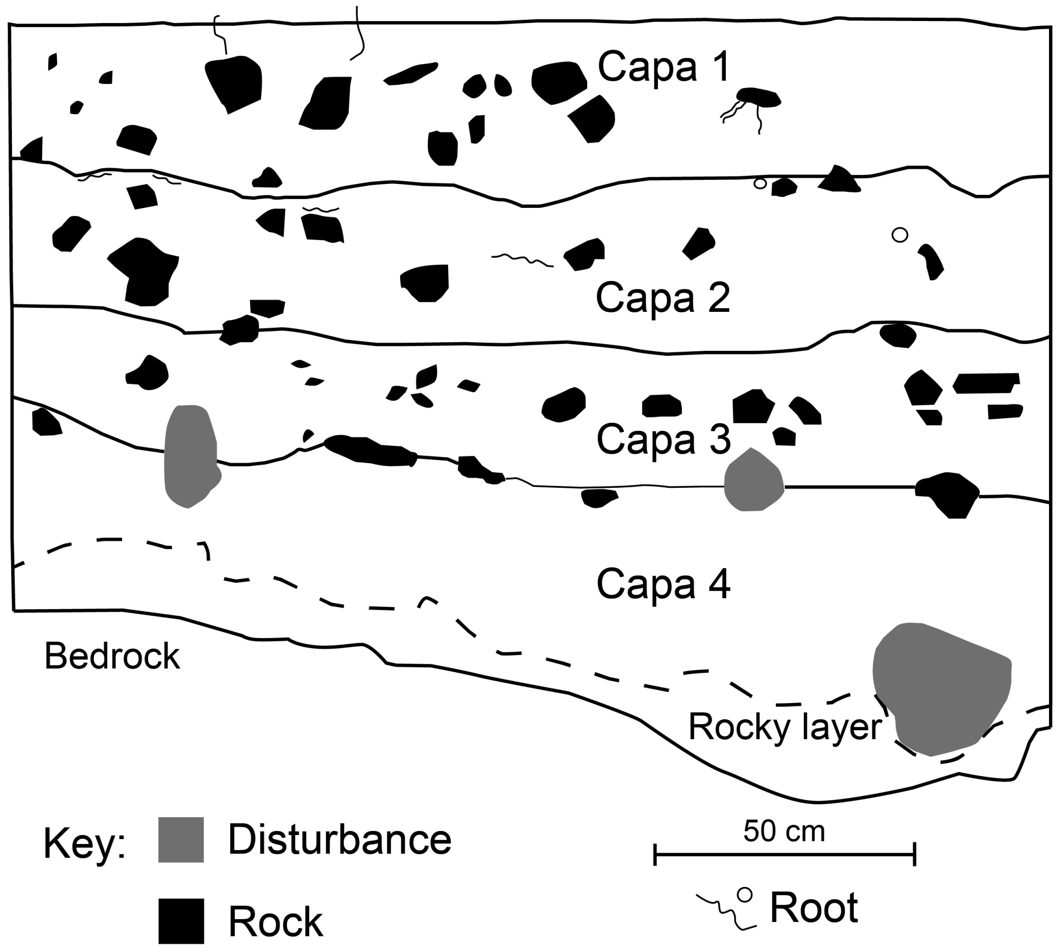
Operation 3, Rejollada G, North Unit Wall



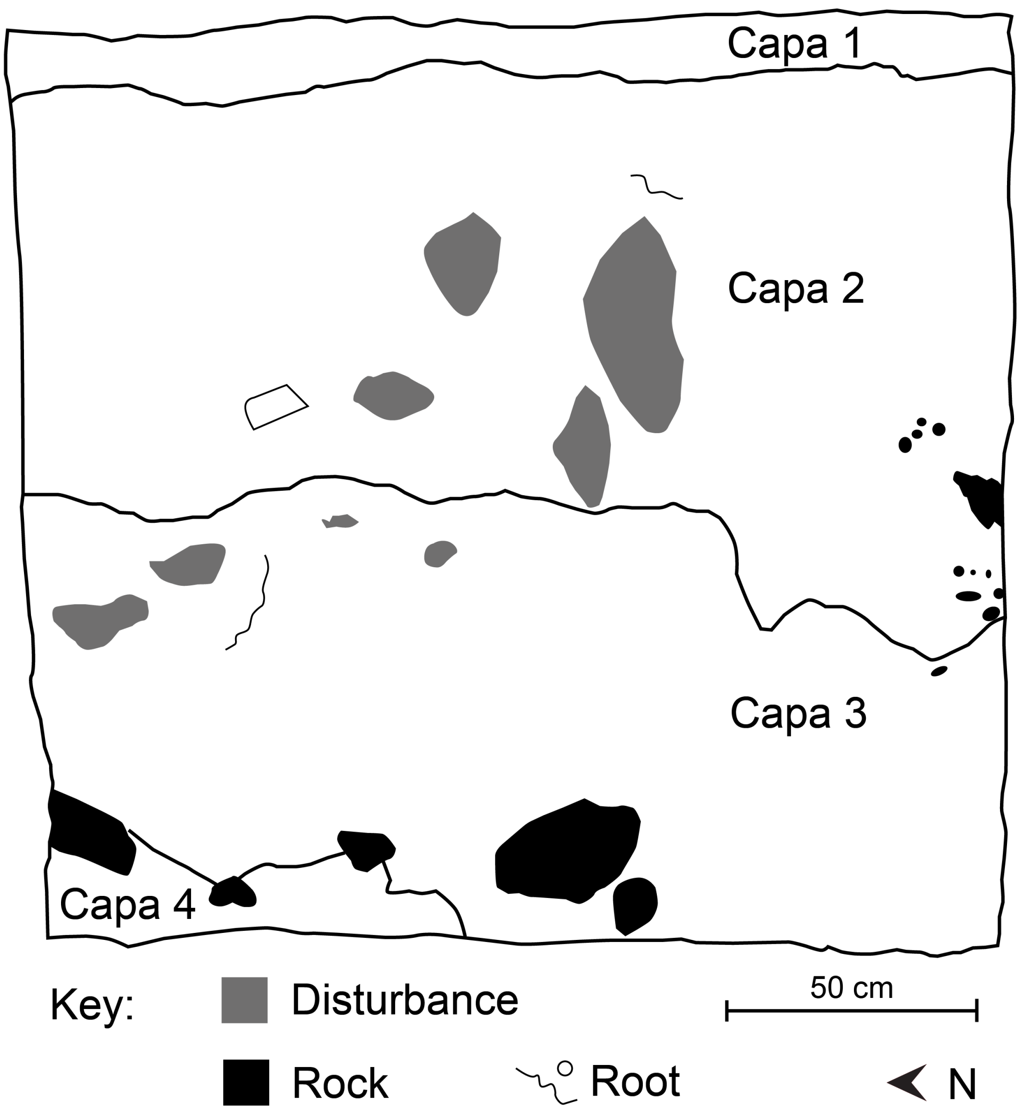
Operation 3, Rejollada G, West Unit Wall



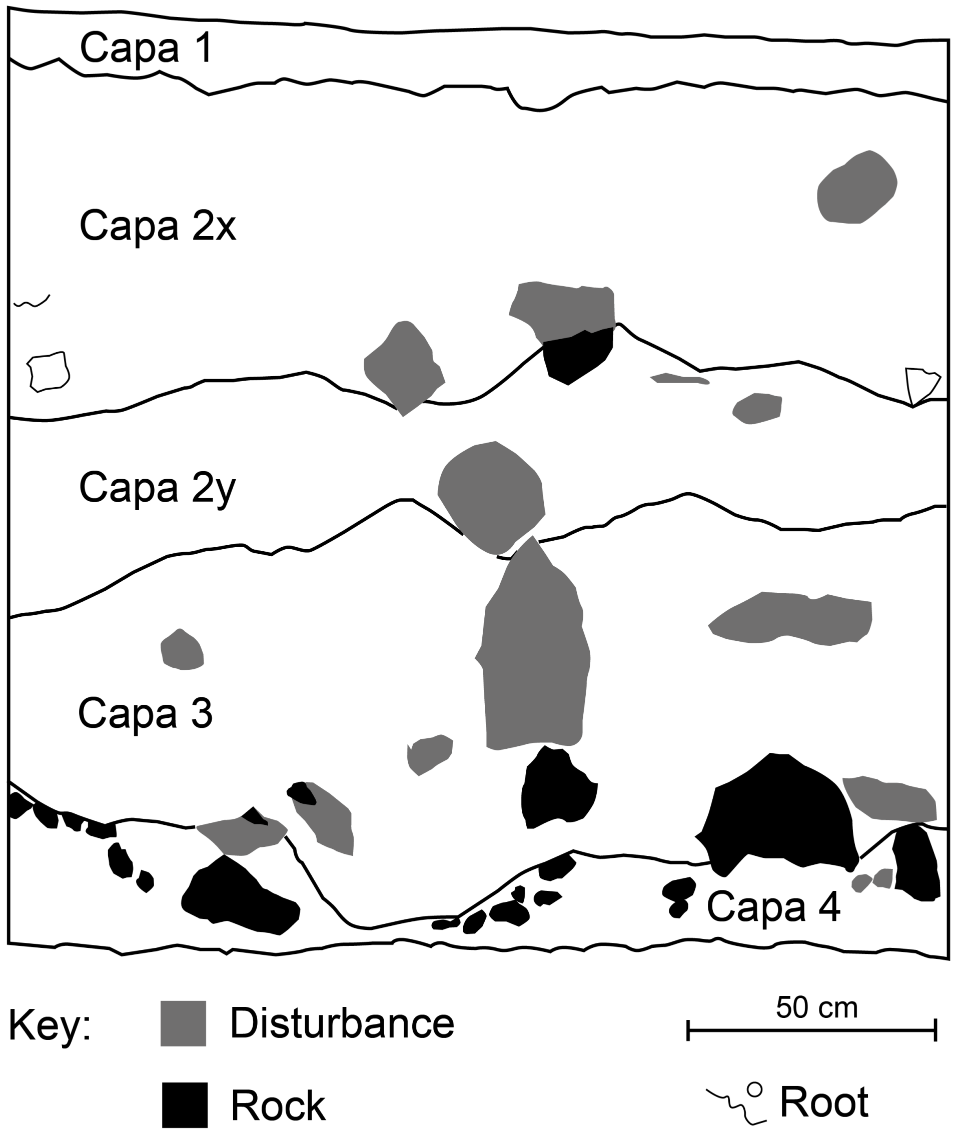
Operation 3, Rejollada G, South Unit Wall



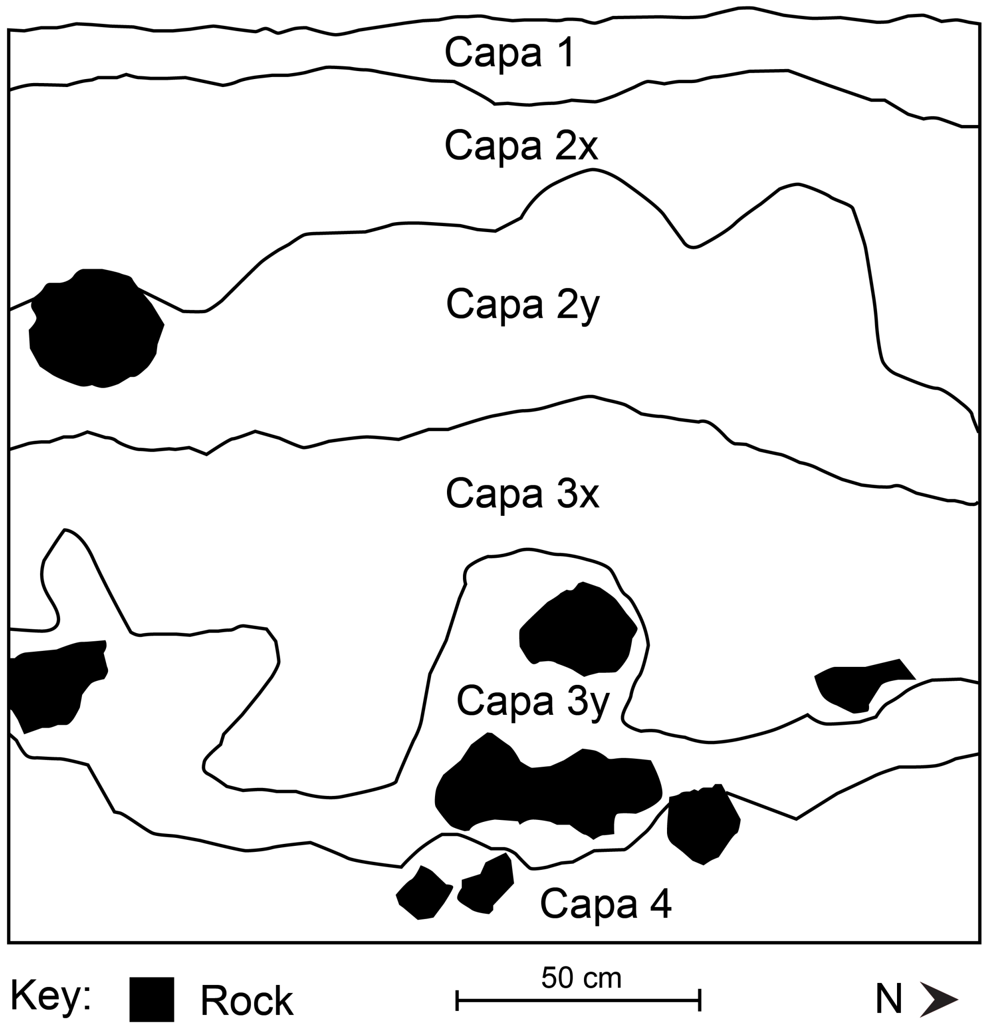
Operation 4, Rejollada D, East Unit Wall



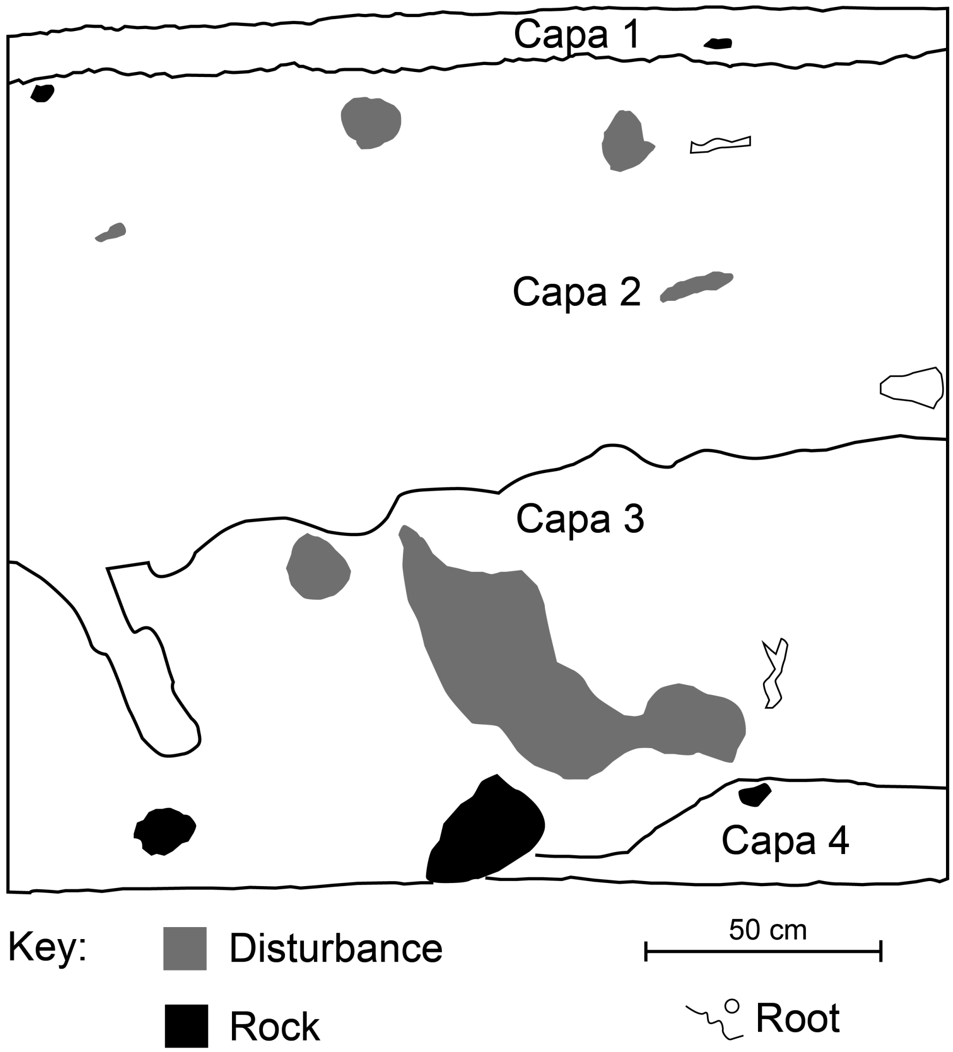
Operation 4, Rejollada D, North Unit Wall



Operation 4, Rejollada D, West Unit Wall



Operation 4, Rejollada D, South Unit Wall



APPENDIX F: TABLES OF CHRONOLOGICAL ASSESSMENTS FOR EXCAVATED CERAMIC TYPES, BY TERESA CEBALLOS GALLARETA

Ceramics dating to the Middle to Late Preclassic period (400/300 BC – AD 250/300)

Group	Type	Variety
Pital	Pital Cream	Unspecified
Tancah	Tancah Unslipped	Tancah
	Chancenote Striated	Chiquilá
Joventud	Joventud Red	Unspecified
	Guitara Incised	Unspecified
	Totoh Grooved	Unspecified
	Repollo Impressed	Unspecified
	Special Dark Red on Orange-Red	
	Special Incised and Impressed	
Chunhinta	Chunhinta Black	Ucu
	Dzocobel Red on Black	Dzocobel
	Nacolal Incised	Nacolal
	Nacolal Incised	Unspecified
	Special Bichrome	
Dzudzuquil	Dzudzuquil Cream to Buff	Dzudzuquil
	Dzudzuquil Cream to Buff	Unspecified
	Majan Red and Cream to Buff	Majan
	Bakxoc Black and Cream to Buff	Bakxoc
	Bakxoc Black and Cream to Buff	Incised
	Petjal Red on Black and Cream	Petjal
	Kuche Incised	Kuche
	Tumben Incised	Tumben
	Kikteil Grooved	Unspecified
	Canaima Bichrome Incised	Canaima
	Special Channeled	
Unto	Unto Black on Striated	Unto
Tipikal	Tipikal Red on Striated	Tipikal
	Special Striated on Channeled	
Sierra	Sierra Red	Light Slip
	Sierra Red	Unspecified
	Laguna Verde Incised	Unspecified
Dzilam	Dzilam Verde Incised	Dzilam
	Dzilam Verde Incised	Unspecified
	Special Cream Incised Punctate	
Carolina	Carolina Bichrome Incised	Carolina
	Special Bichrome Channeled	
Habana	Habana Club Punctate	Unspecified
Tamanche	Tamanche Buff Variegated	Unspecified
Flor	Mateo Red on Cream	Unspecified

Ceramics dating to the Early Classic period (AD 250/300 – 550/600)

Group	Type	Variety
Tancah	Tancah Unslipped	Tancah
	Tancah Unslipped	White Slip
	Chancenote Striated	Chiquilá
Saban	Saban Unslipped	Saban
	Saban Unslipped	Becoob
	Saban Unslipped	White Slip
	Saban Unslipped	Applied
Sierra	Sierra Red	Unspecified
Dzilam	Dzilam Verde Incised	Dzilam
Carolina	Carolina Bichrome Incised	Carolina
Habana	Habana Club Punctate	Unspecified
Huachinango	Huachinango Bichrome Incised	Huachinango
	Fango Bichrome	Fango
Xanaba	Xanaba Red	Xanaba
	Xanaba Red	Incised
Polvero	Polvero Black	Unspecified
Zotz	Zotz Black-Cream Incised	Zotz
Cetelac	Cetelac Fiber Tempered	Xcan
	Cetelac Fiber Tempered	Cetelac
Shangurro	Shangurro Red on Orange	Shangurro
Tituc	Tituc Orange Polychrome	Tituc
Timucuy	Timucuy Orange Polychrome	Timucuy
Aguila	Dos Arroyos Orange Polychrome	Unspecified
Balanza	Balanza Black	Unspecified
	Lucha Incised	Unspecified
	Paradero Channeled	Unspecified
Arena	Arena Red	Unspecified
Batres	Batres Red	Batres
	Tixmas Incised	Unspecified
Maxcanú	Maxcanú Buff	Maxcanú
	Tacopate Trickle on Brown	Unspecified

Ceramics dating to the Late to Terminal Classic period (AD 550/600 – 1100)

Group	Type	Variety
Arena	Arena Red	Unspecified
Cetelac	Cetelac Fiber Tempered	Cetelac
Batres	Batres Red	Batres
Maxcanú	Maxcanú Buff	Maxcanú
Chablekal	Chicxulub Incised	Chicxulub
Chum	Yokat Striated	Yokat
Petkanche	Petkanche Orange Polychrome	Unspecified
Encanto	Encanto Striated	Unspecified
Achote	Carro Modeled	Unspecified
Vista Alegre	Vista Alegre Striated	Vista Alegre
Teabo	Teabo Red	Teabo
Balancan	Balancan Fine Orange	Balancan
Muna	Muna Slate	Brown Slip
	Muna Slate	Unspecified
	Sacalum Black on Slate	Brown Slip
	Tekit Incised	Brown Slip
	Akil Impressed	Brown Slip
	Dzibalchen Channeled	Brown Slip
	Dzan Composite	Brown Slip
	Kitam Composite	Kitam
Ticul	Ticul Thin Slate	Xelha
	Ticul Thin Slate	Unspecified
	Tabi Gouged Incised	Muyil
Dzitya	Dzitya Black	Dzitya
Dzitás	Dzitas Slate	Dzitas
	Balantun Black on Slate	Balantun
	Chacmay Incised	Chacmay
Sisal	Sisal Unslipped	Sisal
	Piste Striated	Piste
Dzibiac	Dzibiac Red	Dzibiac
Silho	Silho Orange	Silho
Tohil	Tohil Plumbate	Tohil

Ceramics dating to the Postclassic period (AD 1100-1550)

Group	Type	Variety
Navula	Navula Unslipped	Navula
	Chen Mul Modeled	Chen Mul
	Thul Applied	Thul
Mama	Mama Red	Mama
Sulche	Sulche Black	Sulche
Kukula	Kukula Cream	Kukula
Polbox	Tecoh Red on Cream	Tecoh

Ceramics dating to the Colonial period through recent times (AD 1550-1950)

Group	Type	Variety
Majolica	Columbia Plain	
	Ichtucknee Blue on Blue	
	San Luis Blue on White	
	San Luis Polychrome	
	White lines on blue, white exterior	
	Unidentified	
Glazed	Olive Jar, Middle Style	
Whiteware	Sirena White	
	Medusa White Embossed	
	Blue exterior, white interior	
	Green band on white	
	Polychrome leafchain on white	
	Unidenitified bichrome	
Yuncu	Yuncu Unslipped	Yuncu
	Yuncu Unslipped	Brown Slip
	Yuncu Unslipped	Incised
	Yuncu Unslipped	Striated
	Yuncu Unslipped	Textile-Impressed
	Yuncu Unslipped	Channeled
	Yuncu Unslipped	Trickle
Sacpokana	Sacpokana Red	Sacpokana
	Sacpokana Red	Incised
Oxcum	Oxcum Brown	Oxcum

APPENDIX G: STUDY OF EXCAVATED CERAMICS

Studied sherds from *rejollada* excavation units, analyzed by Teresa Ceballos Gallareta

Rejo	Op	Capa[a]	Depth[b]	Ceramic Type	Chronology[c]	Count
A	1	2A	2-12	Dzudzuquil Cream-to-Buff	M to L Preclassic	3
A	1	2A	2-12	Kuche Incised	M to L Preclassic	2
A	1	2B	12-30	Dzudzuquil Cream-to-Buff	M to L Preclassic	6
A	1	2C	30-50	Dzudzuquil Cream-to-Buff	M to L Preclassic	2
A	1	2D	50-65	Habana Club Punctate	L Preclassic to E Classic	9
A	1	2E	65-80	Dzilam Verde Incised	L Preclassic to E Classic	2
A	1	3A	80-95	Dzudzuquil Cream-to-Buff	M to L Preclassic	2
A	1	3B	95-115	Joventud Red	M to L Preclassic	16
A	1	3B	95-115	Saban Unslipped	Early Classic	5
A	1	3D	135-155	Habana Club Punctate	L Preclassic to E Classic	3
A	1	3G	195-210	Dzudzuquil Cream-to-Buff	M to L Preclassic	1
E	2	2A	2-18	Chunhinta Black	M to L Preclassic	9
E	2	2A	2-18	Dzudzuquil Cream-to-Buff	M to L Preclassic	1
E	2	2A	2-18	Saban Unslipped	Early Classic	4
E	2	2B	18-36	Dzudzuquil Cream-to-Buff	M to L Preclassic	1
E	2	2B	18-36	Saban Unslipped	Early Classic	5
E	2	2B	18-36	Yuncu Unslipped	Colonial	1
E	2	2C	36-63	Chancenote Striated	M Preclassic to E Classic	1
E	2	2C	36-63	Joventud Red	M to L Preclassic	1
G	3	1A	0-15	Dzudzuquil Cream-to-Buff	M to L Preclassic	1
G	3	1A	0-15	Sacpokana Red	Colonial	1
G	3	1A	0-15	Yuncu Unslipped	Colonial	1
G	3	2A	15-35	Dzilam Verde Incised	L Preclassic to E Classic	1
G	3	2A	15-35	Joventud Red	M to L Preclassic	2
G	3	2B	35-55	Carolina Bichrome-Incised	L Preclassic to E Classic	1
G	3	2B	35-55	Dzilam Verde Incised	L Preclassic to E Classic	2
G	3	2B	35-55	Saban Unslipped	Early Classic	6
G	3	3A	55-75	Dzilam Verde Incised	L Preclassic to E Classic	2
G	3	4A	90-128	Chancenote Striated	M Preclassic to E Classic	1
D	4	1A	0-12	Tancah Unslipped	M Preclassic to E Classic	3
D	4	2B	36-56	Dzudzuquil Cream-to-Buff	M to L Preclassic	2
D	4	2B	36-56	Dzudzuquil Special Chan	M to L Preclassic	1
D	4	2B	36-56	Tancah Unslipped	M Preclassic to E Classic	2
D	4	2C	56-80	Carolina Bichrome-Incised	L Preclassic to E Classic	1
D	4	2C	56-80	Cetelac Fiber Tempered	Early to Late Classic	1
D	4	2C	56-80	Dzilam Verde Incised	L Preclassic to E Classic	18
D	4	2C	56-80	Dzudzuquil Cream-to-Buff	M to L Preclassic	1
D	4	2C	56-80	Joventud Red	M to L Preclassic	4
D	4	2C	56-80	Majan Red and Cream	M to L Preclassic	2
D	4	2D	80-100	Dzudzuquil Special Chan	M to L Preclassic	3
D	4	2D	80-100	Habana Club Punctate	L Preclassic to E Classic	3
D	4	2D	80-100	Joventud Red	M to L Preclassic	5
D	4	2D	80-100	Tancah Unslipped	M Preclassic to E Classic	1
D	4	2D	80-100	Unidentifiable	N/A	2
D	4	3A	100-120	Dzilam Verde Incised	L Preclassic to E Classic	2
D	4	3A	100-120	Dzudzuquil Cream-to-Buff	M to L Preclassic	3

Rejo	Op	Capa[a]	Depth[b]	Ceramic Type	Chronology[c]	Count
D	4	3A	100-120	Habana Club Punctate	L Preclassic to E Classic	2
D	4	3A	100-120	Joventud Red	M to L Preclassic	3
D	4	3B	120-140	Chancenote Striated	M Preclassic to E Classic	2
D	4	3B	120-140	Chunhinta Black	M to L Preclassic	3
D	4	3B	120-140	Muna Slate	L to T Classic	1
D	4	3C	140-155	Tancah Unslipped	M Preclassic to E Classic	1
D	4	3D	155-165	Chancenote Striated	M Preclassic to E Classic	1
D	4	3D	155-165	Unidentifiable	N/A	1
B	5	1A	0-12	Cetelac Fiber Tempered	Early to Late Classic	1
B	5	1A	0-12	Chunhinta Black	M to L Preclassic	1
B	5	1A	0-12	Joventud Red	M to L Preclassic	3
B	5	1A	0-12	Sacpokana Red	Colonial	3
B	5	1A	0-12	Sirena White	Recent	3
B	5	1A	0-12	Tancah Unslipped	M Preclassic to E Classic	15
B	5	1A	0-12	Unidentifiable	N/A	1
B	5	1A	0-12	Yuncu Unslipped	Colonial	39
B	5	1B	12-32	Carolina Bichrome-Incised	L Preclassic to E Classic	2
B	5	1B	12-32	Cetelac Fiber Tempered	Early to Late Classic	8
B	5	1B	12-32	Chunhinta Black	M to L Preclassic	1
B	5	1B	12-32	Dzilam Verde Incised	L Preclassic to E Classic	5
B	5	1B	12-32	Dzudzuquil Cream-to-Buff	M to L Preclassic	2
B	5	1B	12-32	Joventud Red	M to L Preclassic	1
B	5	1B	12-32	Sacpokana Red	Colonial	2
B	5	1B	12-32	Sirena White	Recent	1
B	5	1B	12-32	Tancah Unslipped	M Preclassic to E Classic	10
B	5	1B	12-32	Tituc Orange Polychrome	Early Classic	1
B	5	1B	12-32	Unidentifiable	N/A	3
B	5	1B	12-32	Yuncu Unslipped	Colonial	9
B	5	2A	32-54	Carolina Bichrome-Incised	L Preclassic to E Classic	2
B	5	2A	32-54	Cetelac Fiber Tempered	Early to Late Classic	3
B	5	2A	32-54	Chancenote Striated	M Preclassic to E Classic	5
B	5	2A	32-54	Chunhinta Black	M to L Preclassic	2
B	5	2A	32-54	Dzilam Verde Incised	L Preclassic to E Classic	4
B	5	2A	32-54	Dzudzuquil Cream-to-Buff	M to L Preclassic	10
B	5	2A	32-54	Habana Club Punctate	L Preclassic to E Classic	3
B	5	2A	32-54	Joventud Red	M to L Preclassic	4
B	5	2A	32-54	Tancah Unslipped	M Preclassic to E Classic	37
B	5	2A	32-54	Tituc Orange Polychrome	Early Classic	3
B	5	2A	32-54	Unto Black-on-Striated	M to L Preclassic	1
B	5	2A	32-54	Yuncu Unslipped	Colonial	4
B	5	2B	54-76	Carolina Bichrome-Incised	L Preclassic to E Classic	2
B	5	2B	54-76	Cetelac Fiber Tempered	Early to Late Classic	9
B	5	2B	54-76	Chancenote Striated	M Preclassic to E Classic	44
B	5	2B	54-76	Habana Club Punctate	L Preclassic to E Classic	3
B	5	2B	54-76	Huachinango Bichrome	Early Classic	3
B	5	2B	54-76	Joventud Red	M to L Preclassic	1
B	5	2B	54-76	Majan Red and Cream	M to L Preclassic	2
B	5	2B	54-76	Saban Unslipped	Early Classic	10
B	5	2B	54-76	Shangurro Red-on-Orange	Early Classic	3
B	5	2B	54-76	Unidentifiable	N/A	15

Rejo	Op	Capa[a]	Depth[b]	Ceramic Type	Chronology[c]	Count
B	5	2B	54-76	Yuncu Unslipped	Colonial	7
B	5	F. 2[d]	65-90	Cetelac Fiber Tempered	Early to Late Classic	1
B	5	F. 2	65-90	Chancenote Striated	M Preclassic to E Classic	6
B	5	F. 2	65-90	Chunhinta Black	M to L Preclassic	1
B	5	F. 2	65-90	Dzilam Verde Incised	L Preclassic to E Classic	3
B	5	F. 2	65-90	Fango Bichrome	Early Classic	2
B	5	F. 2	65-90	Huachinango Bichrome	Early Classic	2
B	5	F. 2	65-90	Joventud Red	M to L Preclassic	3
B	5	F. 2	65-90	Saban Unslipped	Early Classic	7
B	5	F. 2	65-90	Unidentifiable	N/A	2
B	5	F. 2	65-90	Yuncu Unslipped	Colonial	30
B	5	3	90-95	Joventud Red	M to L Preclassic	1
B	5	3	90-95	Yuncu Unslipped	Colonial	1
B	5	4	95-110	Chunhinta Black	M to L Preclassic	2
B	5	4	95-110	Tancah Unslipped	M Preclassic to E Classic	1

[a] Refers to visible excavation layer (number) and arbitrary level (letter).
[b] Approximate depths indicated in cm beneath the surface.
[c] For the sake of space, "E" refers to Early, "M" refers to Middle, "L" refers to Late, and "T" refers to Terminal.
[d] Indicates Feature 2, and ceramics associated with the Early Classic period burial.

Studied sherds from residential excavation units, analyzed by Teresa Ceballos Gallareta

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
9	B10	1A	Carolina Bichrome Incised	M Preclassic to E Classic	1	
9	B10	1A	Joventud Red	M to L Preclassic	1	
9	B10	1A	Saban Unslipped	Early Classic	4	
9	B10	1A	Sacpokana Red	Colonial	13	
9	B10	1A	Yuncu Unslipped	Colonial	88	
9	B10	1A	Yuncu Unslipped: Textile	Colonial	2	
9	B10	1B	Chancenote Striated	Early to Late Classic	3	22.39
9	B10	1B	Muna Slate	L to T Classic	1	5.38
9	B10	1B	Not identified	Unknown	3	12.26
9	B10	1B	Saban Unslipped	Early Classic	4	31.42
9	B10	1B	Sacpokana Red	Colonial	9	69.43
9	B10	1B	Yuncu Unslipped	Colonial	71	380.73
9	B10	1C	Carolina Bichrome Incised	M Preclassic to E Classic	1	4.97
9	B10	1C	Dzilam Verde Incised	M Preclassic to E Classic	1	6.2
9	B10	1C	Dzocobel Red and Black	M to L Preclassic	1	7.02
9	B10	1C	Majan Red and Cream	M to L Preclassic	1	5.05
9	B10	1C	Saban Unslipped	Early Classic	3	4.81
9	B10	1C	Sacpokana Red	Colonial	7	86.33
9	B10	1C	Tumben Incised	M to L Preclassic	1	4.84
9	B10	1C	Yuncu Unslipped	Colonial	16	96.63
9	B10	1C	Yuncu Unslipped: Textile	Colonial	1	6.11
9	B8	1A	Huachinango Bichrome	Early Classic	2	17
9	B8	1A	Sacpokana Red	Colonial	18	43
9	B8	1A	Sierra Red	M Preclassic to E Classic	8	12
9	B8	1A	Yokat Striated	L to T Classic	10	23

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
9	B8	1A	Yuncu Unslipped	Colonial	277	693
9	B8	1A	Yuncu Unslipped: Textile	Colonial	6	3
9	B8	1B	Joventud Red	M to L Preclassic	2	2
9	B8	1B	Not identified	Unknown	6	12
9	B8	1B	Sacpokana Red	Colonial	56	171.79
9	B8	1B	Yokat Striated	L to T Classic	4	7.86
9	B8	1B	Yuncu Unslipped	Colonial	283	1708.68
9	B8	1B	Yuncu Unslipped: Textile	Colonial	20	62.69
9	B8	1C	Dzocobel Red and Black	M to L Preclassic	1	0.66
9	B8	1C	Dzocobel Red and Black	M to L Preclassic	1	1
9	B8	1C	Dzudzuquil Cream to Buff	M to L Preclassic	2	1.98
9	B8	1C	Saban Unslipped	Early Classic	4	21.87
9	B8	1C	Saban Unslipped	Early Classic	2	20
9	B8	1C	Sacpokana Red	Colonial	11	36.74
9	B8	1C	Sacpokana Red	Colonial	7	18
9	B8	1C	Sirena White	Recent	2	1.71
9	B8	1C	Yuncu Unslipped	Colonial	58	287.39
9	B8	1C	Yuncu Unslipped	Colonial	16	65
9	B8	1D	Saban Unslipped	Early Classic	2	4
9	B8	1D	Yuncu Unslipped	Colonial	2	4
9	B9	1A	Carolina Bichrome Incised	M Preclassic to E Classic	1	
9	B9	1A	Dzudzuquil Cream to Buff	M to L Preclassic	1	
9	B9	1A	Habana Club Incised Punct	M Preclassic to E Classic	1	
9	B9	1A	Joventud Red	M to L Preclassic	1	
9	B9	1A	Saban Unslipped	Early Classic	2	
9	B9	1A	Sacpokana Red	Colonial	9	
9	B9	1A	Sirena White	Recent	1	
9	B9	1A	Yuncu Unslipped	Colonial	105	
9	B9	1A	Yuncu Unslipped: Textile	Colonial	10	
9	B9	1B	Dzudzuquil Cream to Buff	M to L Preclassic	2	8.17
9	B9	1B	Joventud Red	M to L Preclassic	1	1.68
9	B9	1B	Muna Slate	L to T Classic	1	3.42
9	B9	1B	Nacolal Incised	M to L Preclassic	1	9.26
9	B9	1B	Saban Unslipped	Early Classic	6	17.72
9	B9	1B	Sacpokana Red	Colonial	16	90.01
9	B9	1B	Sulche Black?	Colonial?	2	11.89
9	B9	1B	Yuncu Unslipped	Colonial	153	794.38
9	B9	1B	Yuncu Unslipped: Textile	Colonial	7	20.43
9	B9	1C	Dzudzuquil Cream to Buff	M to L Preclassic	1	1.94
9	B9	1C	Majan Red and Cream	M to L Preclassic	1	1.75
9	B9	1C	Olive Jar, Middle Style	Colonial	1	232.86
9	B9	1C	Saban Unslipped	Early Classic	1	1.96
9	B9	1C	Sacpokana Red	Colonial	13	73.95
9	B9	1C	Sulche Black?	Colonial?	1	6.04
9	B9	1C	Timucuy Orange Polychro	Early Classic	1	69.95
9	B9	1C	Yuncu Unslipped	Colonial	57	253.17
9	B9	1C	Yuncu Unslipped: Textile	Colonial	7	35.34
9	C10	1A	Cetelac Fiber Temper	Early to Late Classic	2	
9	C10	1A	Dzilam Verde Incised	M Preclassic to E Classic	2	
9	C10	1A	Dzudzuquil Cream to Buff	M to L Preclassic	6	

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
9	C10	1A	Joventud Red	M to L Preclassic	6	
9	C10	1A	Not identified	Unknown	26	
9	C10	1A	Piste Striated	L to T Classic	2	
9	C10	1A	Sacpokana Red	Colonial	36	
9	C10	1A	Tipikal: Special Striated	M to L Preclassic	2	
9	C10	1A	Yokat Striated	L to T Classic	24	
9	C10	1A	Yuncu Unslipped	Colonial	165	
9	C10	1A	Yuncu Unslipped: Brown	Colonial	1	
9	C10	1B	Carolina Bichrome Incised	M Preclassic to E Classic	4	3
9	C10	1B	Chancenote Striated	Early to Late Classic	6	8
9	C10	1B	Dzudzuquil Cream to Buff	M to L Preclassic	12	16
9	C10	1B	Joventud Red	M to L Preclassic	4	8
9	C10	1B	Not identified	Unknown	14	7
9	C10	1B	Polvero Black	Early Classic	2	3
9	C10	1B	Saban Unslipped	Early Classic	28	54
9	C10	1B	Sacpokana Red	Colonial	16	34
9	C10	1B	Tumben Incised	M to L Preclassic	2	3
9	C10	1B	Yuncu Unslipped	Colonial	47	64
9	C10	1B	Yuncu Unslipped: Textile	Colonial	4	2
9	C10	1C	Chancenote Striated	Early to Late Classic	67	
9	C10	1C	Joventud Red	M to L Preclassic	6	
9	C10	1C	Majan Red and Cream	M to L Preclassic	4	
9	C10	1C	Not identified	Unknown	1	
9	C10	1C	Petjal Red on Black	M to L Preclassic	2	
9	C10	1C	Saban Unslipped	Early Classic	53	
9	C10	1C	Sacpokana Red	Colonial	4	
9	C10	1C	Sierra Red	M Preclassic to E Classic	11	
9	C10	1C	Sierra Red: Light slip	M to L Preclassic	7	
9	C10	1C	Tituc Orange Polychrome	Early Classic	4	
9	C10	1C	Unto Black on Striated	M to L Preclassic	4	
9	C10	1C	Yokat Striated	L to T Classic	2	
9	C10	1C	Yuncu Unslipped	Colonial	18	
9	C5	1A	Bakxoc Black and Cream	M to L Preclassic	1	
9	C5	1A	Cetelac Fiber Temper	Early to Late Classic	1	
9	C5	1A	Cetelac Fiber Temper: Xcan	Early Classic	1	
9	C5	1A	Dzudzuquil Cream to Buff	M to L Preclassic	7	
9	C5	1A	Guitara Incised	M to L Preclassic	1	
9	C5	1A	Muna Slate	L to T Classic	1	
9	C5	1A	Sacpokana Red	Colonial	7	
9	C5	1A	Sirena White	Recent	1	
9	C5	1A	Yuncu Unslipped	Colonial	81	
9	C5	1A	Yuncu Unslipped: Textile	Colonial	4	
9	C8	1A	Carolina Bichrome Incised	M Preclassic to E Classic	1	1.19
9	C8	1A	Chancenote Striated	Early to Late Classic	3	9.71
9	C8	1A	Chunhinta Black	M to L Preclassic	1	6.95
9	C8	1A	Dzilam Verde Incised	M Preclassic to E Classic	2	12.77
9	C8	1A	Dzudzuquil Cream to Buff	M to L Preclassic	1	3.87
9	C8	1A	Fine White	Recent	1	0.22
9	C8	1A	Joventud Red	M to L Preclassic	4	12.4
9	C8	1A	Sacpokana Red	Colonial	11	52.85

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
9	C8	1A	Yuncu Unslipped	Colonial	92	401.8
9	C8	1A	Yuncu Unslipped: Textile	Colonial	1	4.25
9	C8	1B	Carolina Bichrome Incised	M Preclassic to E Classic	1	1.94
9	C8	1B	Chancenote Striated	Early to Late Classic	5	14.86
9	C8	1B	Chunhinta Black	M to L Preclassic	2	6.88
9	C8	1B	Dzudzuquil Cream to Buff	M to L Preclassic	1	11.19
9	C8	1B	Huachinango Bichrome	Early Classic	1	28.53
9	C8	1B	Joventud Red	M to L Preclassic	5	22.3
9	C8	1B	Majan Red and Cream	M to L Preclassic	3	34.1
9	C8	1B	Saban Unslipped	Early Classic	8	24.06
9	C8	1B	Sacpokana Red	Colonial	17	64.97
9	C8	1B	San Luis Blue on White	Colonial	1	3.46
9	C8	1B	Totoh Grooved	M to L Preclassic	1	3.28
9	C8	1B	Yuncu Unslipped	Colonial	52	179.54
9	C8	1B	Yuncu Unslipped: Textile	Colonial	2	11.15
9	C8	1C	Guitara Incised	M to L Preclassic	1	
9	C8	1C	Yuncu Unslipped	Colonial	2	
9	C9	1A	Dzocobel Red and Black	M to L Preclassic	1	
9	C9	1A	Habana Club Incised Punct	M Preclassic to E Classic	2	
9	C9	1A	Joventud Red	M to L Preclassic	3	
9	C9	1A	Sacpokana Red	Colonial	18	
9	C9	1A	Yuncu Unslipped	Colonial	91	
9	C9	1A	Yuncu Unslipped: Textile	Colonial	6	
9	C9	1B	Dzudzuquil Cream to Buff	M to L Preclassic	1	
9	C9	1B	Joventud Red	M to L Preclassic	6	
9	C9	1B	Sacpokana Red	Colonial	11	
9	C9	1B	Yuncu Unslipped	Colonial	43	
9	C9	1B	Yuncu Unslipped: Textile	Colonial	2	
9	C9	1C	Chancenote Striated	Early to Late Classic	3	
9	C9	1C	Dzilam Verde Incised	M Preclassic to E Classic	1	
9	C9	1C	Dzudzuquil Cream to Buff	M to L Preclassic	1	
9	C9	1C	Joventud Red	M to L Preclassic	4	
9	C9	1C	Maxcanu Buff	Early to Late Classic	1	
9	C9	1C	Olive Jar, Middle Style	Colonial	1	
9	C9	1C	Saban Unslipped	Early Classic	2	
9	C9	1C	Sacpokana Red	Colonial	8	
9	C9	1C	Yuncu Unslipped	Colonial	13	
9	C9	1D	Dzudzuquil Cream to Buff	M to L Preclassic	2	
9	C9	1D	Joventud Red	M to L Preclassic	3	
9	C9	1D	Saban Unslipped	Early Classic	1	
9	C9	1D	Sacpokana Red	Colonial	3	
9	C9	1D	Yuncu Unslipped	Colonial	18	
9	C9	1D	Yuncu Unslipped: Textile	Colonial	3	
9	C9	1D	Yuncu: Special Orange?	Colonial	1	
9	D9	1	Chancenote Striated	Early to Late Classic	5	
9	D9	1	Dzocobel Red and Black	M to L Preclassic	1	
9	D9	1	Dzudzuquil Cream to Buff	M to L Preclassic	1	
9	D9	1	Joventud Red	M to L Preclassic	10	
9	D9	1	Kuche Incised	M to L Preclassic	1	
9	D9	1	Majan Red and Cream	M to L Preclassic	3	

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
9	D9	1	Not identified	Unknown	1	
9	D9	1	Saban Unslipped	Early Classic	8	
9	D9	1	Sacpokana Red	Colonial	5	
9	D9	1	Yuncu Unslipped	Colonial	66	
9	D9	2	Canaima Bichrome Incised	M to L Preclassic	1	
9	D9	2	Chancenote Striated	Early to Late Classic	3	
9	D9	2	Chunhinta Black	M to L Preclassic	1	
9	D9	2	Dzilam Verde Incised	M Preclassic to E Classic	2	
9	D9	2	Dzilam: Special Cream Incis	M to L Preclassic	4	
9	D9	2	Dzocobel Red and Black	M to L Preclassic	1	
9	D9	2	Dzudzuquil Cream to Buff	M to L Preclassic	3	
9	D9	2	Joventud Red	M to L Preclassic	1	
9	D9	2	Kuche Incised	M to L Preclassic	1	
9	D9	2	Saban Unslipped	Early Classic	1	
9	D9	2	Tituc Orange Polychrome	Early Classic	2	
9	D9	2	Yuncu Unslipped	Colonial	5	
9	E9	1A	Cetelac Fiber Temper	Early to Late Classic	1	1.44
9	E9	1A	Chancenote Striated	Early to Late Classic	9	55.78
9	E9	1A	Chunhinta Black	M to L Preclassic	4	12.53
9	E9	1A	Dzilam Verde Incised	M Preclassic to E Classic	1	8.58
9	E9	1A	Dzocobel Red and Black	M to L Preclassic	1	2.16
9	E9	1A	Dzudzuquil Cream to Buff	M to L Preclassic	2	6.31
9	E9	1A	Huachinango Bichrome	Early Classic	1	3.48
9	E9	1A	Joventud Red	M to L Preclassic	10	30.75
9	E9	1A	Not identified	Unknown	2	11.25
9	E9	1A	Saban Unslipped	Early Classic	14	36.78
9	E9	1A	Sacpokana Red	Colonial	3	20.38
9	E9	1A	Tekit Incised	L to T Classic	1	2.05
9	E9	1A	Tituc Orange Polychrome	Early Classic	2	12.16
9	E9	1A	Xanaba Red	Early Classic	1	5.22
9	E9	1A	Yuncu Unslipped	Colonial	381	1303.2
9	E9	1A	Yuncu Unslipped: Textile	Colonial	5	6.56
9	F8	1C	Dzudzuquil Cream to Buff	M to L Preclassic	1	2.14
9	F8	1C	Fango Bichrome	Early Classic	1	2.72
9	F8	1C	Habana Club Incised Punct	M Preclassic to E Classic	2	6.59
9	F8	1C	Joventud Red	M to L Preclassic	2	2.53
9	F8	1C	Saban Unslipped	Early Classic	1	5.03
9	F8	1D	Chancenote Striated	Early to Late Classic	4	
9	F8	1D	Joventud Red	M to L Preclassic	7	
9	F8	1D	Joventud: Special Incised	M to L Preclassic	11	
9	F8	1D	Repollo Impressed	M to L Preclassic	1	
9	F8	1D	Saban Unslipped	Early Classic	1	
9	F8	1D	Sacpokana Red	Colonial	1	
9	F8	1D	Yuncu Unslipped	Colonial	5	
9	F9	1A	Chancenote Striated	Early to Late Classic	2	
9	F9	1A	Dzudzuquil Cream to Buff	M to L Preclassic	2	
9	F9	1A	Not identified	Unknown	1	
9	F9	1A	Sierra Red	M Preclassic to E Classic	3	
9	F9	1A	Tumben Incised	M to L Preclassic	1	
9	F9	1A	Yuncu Unslipped	Colonial	120	

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
9	F9	1A	Yuncu Unslipped: Textile	Colonial	16	
9	F9	1B	Chancenote Striated	Early to Late Classic	11	
9	F9	1B	Chunhinta Black	M to L Preclassic	1	
9	F9	1B	Dzilam Verde Incised	M Preclassic to E Classic	1	
9	F9	1B	Dzudzuquil Cream to Buff	M to L Preclassic	1	
9	F9	1B	Huachinango Bichrome Inci	Early Classic	1	
9	F9	1B	Joventud Red	M to L Preclassic	7	
9	F9	1B	Kikteil Grooved	M to L Preclassic	1	
9	F9	1B	Majan Red and Cream	M to L Preclassic	1	
9	F9	1B	Saban Unslipped	Early Classic	3	
9	F9	1B	Sacpokana Red	Colonial	2	
9	F9	1B	Shangurro Red on Orange	Early Classic	1	
9	F9	1B	Yuncu Unslipped	Colonial	76	
9	F9	1B	Yuncu Unslipped: Textile	Colonial	5	
9	G9	1	Chancenote Striated	Early to Late Classic	2	
9	G9	1	Dzilam Verde Incised	M Preclassic to E Classic	1	
9	G9	1	Dzudzuquil Cream to Buff	M to L Preclassic	3	
9	G9	1	Joventud Red	M to L Preclassic	8	
9	G9	1	Kuche Incised	M to L Preclassic	1	
9	G9	1	Tancah Unslipped	M Preclassic to E Classic	1	
9	G9	1	Yuncu Unslipped	Colonial	55	
9	G9	1	Yuncu Unslipped: Textile	Colonial	5	
9	G9	1B	Carolina Bichrome Incised	M Preclassic to E Classic	5	
9	G9	1B	Chancenote Striated	Early to Late Classic	5	
9	G9	1B	Chunhinta Black	M to L Preclassic	1	
9	G9	1B	Dzudzuquil Cream to Buff	M to L Preclassic	1	
9	G9	1B	Huachinango Bichrome	Early Classic	1	
9	G9	1B	Joventud Red	M to L Preclassic	8	
9	G9	1B	Joventud: Special Dark Red	M to L Preclassic	4	
9	G9	1B	Not identified	Unknown	2	
9	G9	1B	Saban Unslipped	Early Classic	3	
9	G9	1B	Sacpokana Red	Colonial	1	
9	G9	1B	Shangurro Red on Orange	Early Classic	1	
9	G9	1B	Yuncu Unslipped	Colonial	23	
9	I9	1	Joventud Red	M to L Preclassic	1	
9	I9	1	Sacpokana Red	Colonial	4	
9	I9	1	Yuncu Unslipped	Colonial	26	
9	I9	1	Yuncu Unslipped: Textile	Colonial	1	
9	I9	2	Balanza Black	Early Classic	2	
9	I9	2	Chancenote Striated	Early to Late Classic	5	
9	I9	2	Dzilam Verde Incised	M Preclassic to E Classic	1	
9	I9	2	Dzudzuquil Cream to Buff	M to L Preclassic	2	
9	I9	2	Joventud Red	M to L Preclassic	2	
9	I9	2	Sacpokana Red	Colonial	2	
9	I9	2	Yuncu Unslipped	Colonial	23	
12	B5	1B	Carolina Bichrome Incised	M Preclassic to E Classic	1	9.19
12	B5	1B	Chancenote Striated	M Preclassic to E Classic	4	12.59
12	B5	1B	Chunhinta Black	M to L Preclassic	1	4.13
12	B5	1B	Dzilam Verde Incised	M Preclassic to E Classic	2	6.83
12	B5	1B	Dzudzuquil Cream to Buff	M to L Preclassic	2	5.90

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
12	B5	1B	Joventud Red	M to L Preclassic	4	5.48
12	B5	1B	Majan Red and Cream	M to L Preclassic	1	11.60
12	B5	1B	Not identified	Unknown	10	20.97
12	B5	1B	Saban Unslipped	Early Classic	12	35.58
12	B5	1B	Sacpokana Red	Colonial	2	26.91
12	B5	1B	Sierra Red	M Preclassic to E Classic	2	7.83
12	B5	1B	Tituc Orange Polychrome	Early Classic	2	4.04
12	B5	1B	Yuncu Unslipped	Colonial	57	224.88
12	B5	1C	Cetelac Fiber Temper	Early to Late Classic	1	1.58
12	B5	1C	Chunhinta Black	M to L Preclassic	1	4.30
12	B5	1C	Dzudzuquil Cream to Buff	M to L Preclassic	1	10.14
12	B5	1C	Saban Unslipped	Early Classic	2	13.33
12	B5	1C	Yuncu Unslipped	Colonial	8	45.29
12	B6	1	Chancenote Striated	M Preclassic to E Classic	3	34
12	B6	1	Dzilam Verde Incised	M Preclassic to E Classic	6	32
12	B6	1	Dzudzuquil Cream to Buff	M to L Preclassic	2	9
12	B6	1	Leaf chain polychrome	Recent	2	2
12	B6	1	Not identified	Unknown	1	2
12	B6	1	Olive Jar, Middle Style	Colonial (1560-1800)	2	35
12	B6	1	Oxcum Brown	Colonial	1	4
12	B6	1	Saban Unslipped	Early Classic	2	39
12	B6	1	Sacpokana Red	Colonial	17	138
12	B6	1	Yuncu Unslipped	Colonial	65	327
12	C6	1A	Dzilam Verde Incised	M Preclassic to E Classic	4	
12	C6	1A	Huachinango Bichrome	Early Classic	1	
12	C6	1A	Joventud Red	M to L Preclassic	1	
12	C6	1A	Kuche Incised	M to L Preclassic	1	
12	C6	1A	Nacolal Incised	M to L Preclassic	1	
12	C6	1A	Piste Striated	L to T Classic	2	
12	C6	1A	Saban Unslipped	Early Classic	1	
12	C6	1A	Sacpokana Red	Colonial	50	
12	C6	1A	Tumben Incised	M to L Preclassic	1	
12	C6	1A	Yuncu Unslipped	Colonial	1	
12	C6	1A	Yuncu Unslipped	Colonial	146	
12	C6	1B	Chancenote Striated	M Preclassic to E Classic	1	
12	C6	1B	Dzilam Verde Incised	M Preclassic to E Classic	1	
12	C6	1B	Dzilam Verde Incised	M Preclassic to E Classic	2	
12	C6	1B	Dzudzuquil Cream to Buff	M to L Preclassic	1	
12	C6	1B	Dzudzuquil Cream to Buff	M to L Preclassic	1	
12	C6	1B	Dzudzuquil Cream to Buff	M to L Preclassic	1	
12	C6	1B	Huachinango Bichrome	Early Classic	2	
12	C6	1B	Joventud Red	M to L Preclassic	1	
12	C6	1B	Joventud Red	M to L Preclassic	1	
12	C6	1B	Not identified	Unknown	1	
12	C6	1B	Saban Unslipped	Early Classic	1	
12	C6	1B	Saban Unslipped	Early Classic	2	
12	C6	1B	Saban Unslipped	Early Classic	2	
12	C6	1B	Sacpokana Red	Colonial	1	
12	C6	1B	Sacpokana Red	Colonial	2	
12	C6	1B	Sacpokana Red	Colonial	2	

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
12	C6	1B	Sacpokana Red	Colonial	4	
12	C6	1B	Sacpokana Red	Colonial	5	
12	C6	1B	Shangurro Red on Orange	Early Classic	1	
12	C6	1B	Tituc Orange Polychrome	Early Classic	2	
12	C6	1B	Tituc Orange Polychrome	Early Classic	2	
12	C6	1B	Yuncu Unslipped	Colonial	1	
12	C6	1B	Yuncu Unslipped	Colonial	1	
12	C6	1B	Yuncu Unslipped	Colonial	1	
12	C6	1B	Yuncu Unslipped	Colonial	4	
12	C6	1B	Yuncu Unslipped	Colonial	9	
12	C6	1B	Yuncu Unslipped	Colonial	14	
12	C6	1B	Yuncu Unslipped	Colonial	17	
12	C8	1B	Chancenote Striated	M Preclassic to E Classic	3	5.43
12	C8	1B	Sacpokana Red	Colonial	30	436.50
12	C8	1B	Yuncu Unslipped	Colonial	14	90.49
12	D3	1A	Chunhinta Black	M to L Preclassic	2	
12	D3	1A	Dzudzuquil Cream to Buff	M to L Preclassic	1	
12	D3	1A	Dzudzuquil Cream to Buff	M to L Preclassic	2	
12	D3	1A	Dzudzuquil: Special Groove	M to L Preclassic	1	
12	D3	1A	Joventud Red	M to L Preclassic	2	
12	D3	1A	Majan Red and Cream	M to L Preclassic	1	
12	D3	1A	Not identified	Unknown	2	
12	D3	1A	Piste Striated	L to T Classic	1	
12	D3	1A	Sacpokana Red	Colonial	4	
12	D3	1A	Tituc Orange Polychrome	Early Classic	1	
12	D3	1A	Yuncu Unslipped	Colonial	8	
12	D3	1A	Yuncu Unslipped	Colonial	80	
12	D3	1B	Cetelac Fiber Temper	Early to Late Classic	1	
12	D3	1B	Chancenote Striated	M Preclassic to E Classic	14	
12	D3	1B	Chunhinta Black	M to L Preclassic	1	
12	D3	1B	Dzilam Verde Incised	M Preclassic to E Classic	1	
12	D3	1B	Dzudzuquil Cream to Buff	M to L Preclassic	1	
12	D3	1B	Dzudzuquil Cream to Buff	M to L Preclassic	2	
12	D3	1B	Dzudzuquil Cream to Buff	M to L Preclassic	2	
12	D3	1B	Habana Club Punctate Incis	M Preclassic to E Classic	1	
12	D3	1B	Habana Club Punctate Incis	M Preclassic to E Classic	3	
12	D3	1B	Huachinango Bichrome	Early Classic	2	
12	D3	1B	Joventud Red	M to L Preclassic	1	
12	D3	1B	Joventud Red	M to L Preclassic	1	
12	D3	1B	Olive Jar, Middle Style	Colonial (1560-1800)	1	
12	D3	1B	Saban Unslipped	Early Classic	1	
12	D3	1B	Saban Unslipped	Early Classic	2	
12	D3	1B	Saban Unslipped	Early Classic	3	
12	D3	1B	Sacpokana Red	Colonial	1	
12	D3	1B	Sacpokana Red	Colonial	3	
12	D3	1B	Sacpokana Red	Colonial	3	
12	D3	1B	Sacpokana Red	Colonial	8	
12	D3	1B	Tituc Orange Polychrome	Early Classic	1	
12	D3	1B	Tituc Orange Polychrome	Early Classic	1	
12	D3	1B	Yuncu Unslipped	Colonial	1	

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
12	D3	1B	Yuncu Unslipped	Colonial	10	
12	D3	1B	Yuncu Unslipped	Colonial	14	
12	D3	1B	Yuncu Unslipped	Colonial	22	
12	D3	1B	Yuncu Unslipped	Colonial	22	
12	D7	1A	Cetelac Fiber Temper	Early to Late Classic	1	19
12	D7	1A	Chancenote Striated	M Preclassic to E Classic	2	9.37
12	D7	1A	Dzilam Verde Incised	M Preclassic to E Classic	2	17
12	D7	1A	Dzudzuquil Cream to Buff	M to L Preclassic	2	9.31
12	D7	1A	Habana Club Punctate Incis	M Preclassic to E Classic	1	1
12	D7	1A	Huachinango Bichrome	Early Classic	3	10.12
12	D7	1A	Joventud Red	M to L Preclassic	1	4
12	D7	1A	Leaf chain polychrome	Recent	5	11.80
12	D7	1A	Not identified	Unknown	3	4.28
12	D7	1A	Olive Jar, Middle Style	Colonial (1560-1800)	1	46
12	D7	1A	Sacpokana Red	Colonial	10	91.35
12	D7	1A	Yuncu Unslipped	Colonial	534	3338.36
12	D7	1A	Yuncu Unslipped: Textile	Colonial	4	28.32
12	D7	1B	Chancenote Striated	M Preclassic to E Classic	1	3.47
12	D7	1B	Chunhinta Black	M to L Preclassic	1	5.44
12	D7	1B	Habana Club Punctate Incis	M Preclassic to E Classic	1	1.63
12	D7	1B	Huachinango Bichrome	Early Classic	2	80.32
12	D7	1B	Joventud Red	M to L Preclassic	2	4.11
12	D7	1B	Not identified	Unknown	2	1.71
12	D7	1B	Sacpokana Red	Colonial	2	8.18
12	D7	1B	Sierra Red	M Preclassic to E Classic	2	30.98
12	D7	1B	Yuncu Unslipped	Colonial	385	2579.8
12	D7	1C	Arena Red	Early to Late Classic	1	0.82
12	D7	1C	Batres Red	Early to Late Classic	2	3.07
12	D7	1C	Chancenote Striated	M Preclassic to E Classic	2	6.40
12	D7	1C	Dzilam Verde Incised	M Preclassic to E Classic	2	56.16
12	D7	1C	Dzudzuquil Cream to Buff	M to L Preclassic	2	4.44
12	D7	1C	Habana Club Punctate Incis	M Preclassic to E Classic	1	3.31
12	D7	1C	Kuche Incised	M to L Preclassic	1	8.66
12	D7	1C	Saban Unslipped	Early Classic	1	1.60
12	D7	1C	Saban Unslipped	Early Classic	1	6.65
12	D7	1C	Yuncu Unslipped	Colonial	52	200.41
12	D8	1	Dzilam Verde Incised	M Preclassic to E Classic	3	11.31
12	D8	1	Dzudzuquil Cream to Buff	M to L Preclassic	1	11.90
12	D8	1	Leaf chain polychrome	Recent	8	14.84
12	D8	1	Sacpokana Red	Colonial	50	138.63
12	D8	1	Yuncu Unslipped	Colonial	531	2848.54
12	D8	1	Yuncu Unslipped: Textile	Colonial	5	20.32
12	D8	1B	Carolina Bichrome Incised	M Preclassic to E Classic	1	12.01
12	D8	1B	Chancenote Striated	M Preclassic to E Classic	2	5
12	D8	1B	Dzilam Verde Incised	M Preclassic to E Classic	3	22.75
12	D8	1B	Dzudzuquil Cream to Buff	M to L Preclassic	6	15.92
12	D8	1B	Guitara Incised	M to L Preclassic	1	2.17
12	D8	1B	Habana Club Punctate Incis	M Preclassic to E Classic	2	19.00
12	D8	1B	Huachinango Bichrome	Early Classic	1	7.66
12	D8	1B	Leaf chain polychrome	Recent	1	3.54

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
12	D8	1B	Not identified	Unknown	2	18.26
12	D8	1B	Olive Jar, Middle Style	Colonial (1560-1800)	3	69
12	D8	1B	Saban Unslipped	Early Classic	2	10
12	D8	1B	Sacpokana Red	Colonial	15	234
12	D8	1B	Yuncu Unslipped	Colonial	286	1243
12	D8	1B	Yuncu Unslipped: Textile	Colonial	5	10.72
12	E7	1B	Chancenote Striated	M Preclassic to E Classic	1	
12	E7	1B	Habana Club Punctate Incis	M Preclassic to E Classic	1	
12	E7	1B	Sacpokana Red	Colonial	1	
12	E7	1B	Yuncu Unslipped	Colonial	2	
12	E7	1B	Yuncu Unslipped	Colonial	57	
12	E8	1	Columbia Plain	Colonial (1490-1650)	2	26
12	E8	1	Dzudzuquil Cream to Buff	M to L Preclassic	1	0.93
12	E8	1	Leaf chain polychrome	Recent	3	5.58
12	E8	1	Sacpokana Red	Colonial	2	2.03
12	E8	1	Yuncu Unslipped	Colonial	882	3652
12	E8	1	Yuncu Unslipped: Textile	Colonial	21	79.55
12	E8	1B	Dzudzuquil Cream to Buff	M to L Preclassic	2	3.60
12	E8	1B	Joventud Red	M to L Preclassic	1	2.12
12	E8	1B	Laguna Verde Incised	M to L Preclassic	1	20.77
12	E8	1B	Leaf chain polychrome	Recent	2	0.87
12	E8	1B	Saban Unslipped	Early Classic	2	5.95
12	E8	1B	Yuncu Unslipped	Colonial	390	1940.71
12	E8	1B	Yuncu Unslipped: Textile	Colonial	11	19.40
12	E8	1C	Batres Red	Early to Late Classic	1	3
12	E8	1C	Chancenote Striated	M Preclassic to E Classic	11	28
12	E8	1C	Dzilam Verde Incised	M Preclassic to E Classic	3	8
12	E8	1C	Dzudzuquil Cream to Buff	M to L Preclassic	1	3
12	E8	1C	Joventud Red	M to L Preclassic	1	21
12	E8	1C	Saban Unslipped	Early Classic	1	8
12	E8	1C	Sacpokana Red	Colonial	3	10
12	E8	1C	Yuncu Unslipped	Colonial	133	1282
12	E8	1C	Yuncu Unslipped: Textile	Colonial	1	2
12	F5	1A	Chancenote Striated	M Preclassic to E Classic	8	56.27
12	F5	1A	Chunhinta Black	M to L Preclassic	1	1.43
12	F5	1A	Habana Club Punctate Incis	M Preclassic to E Classic	4	17.37
12	F5	1A	Joventud Red	M to L Preclassic	1	9.71
12	F5	1A	Majan Red and Cream	M to L Preclassic	7	32.51
12	F5	1A	Yuncu Unslipped	Colonial	107	430.90
12	F7	1	Dzilam Verde Incised	M Preclassic to E Classic	1	5.40
12	F7	1	Dzudzuquil Cream to Buff	M to L Preclassic	2	7.51
12	F7	1	Guitara Incised	M to L Preclassic	1	1.58
12	F7	1	Habana Club Punctate Incis	M Preclassic to E Classic	1	27.51
12	F7	1	Joventud Red	M to L Preclassic	4	11.27
12	F7	1	Yuncu Unslipped	Colonial	478	1801.24
12	F7	1	Yuncu Unslipped: Textile	Colonial	1	1.55
12	F8	1A	Chancenote Striated	M Preclassic to E Classic	1	36.01
12	F8	1A	Dzilam Verde Incised	M Preclassic to E Classic	1	10.03
12	F8	1A	Dzudzuquil Cream to Buff	M to L Preclassic	2	5.81
12	F8	1A	Fango Bichrome	Early Classic	1	7.81

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
12	F8	1A	Joventud Red	M to L Preclassic	5	15.20
12	F8	1A	Leaf chain polychrome	Recent	1	4.75
12	F8	1A	Yuncu Unslipped	Colonial	308	1363.66
12	F8	1A	Yuncu Unslipped: Textile	Colonial	116	465.79
12	F8	1B	Dzilam Verde Incised	M Preclassic to E Classic	2	5.66
12	F8	1B	Saban Unslipped	Early Classic	1	9.34
12	F8	1B	Yuncu Unslipped	Colonial	77	644.35
12	F8	1B	Yuncu Unslipped: Textile	Colonial	5	14.28
12	F9	1A	Dzudzuquil Cream to Buff	M to L Preclassic	1	
12	F9	1A	Dzudzuquil Cream to Buff	M to L Preclassic	3	
12	F9	1A	Joventud Red	M to L Preclassic	2	
12	F9	1A	Leaf chain polychrome	Recent	2	
12	F9	1A	Saban Unslipped	Early Classic	1	
12	F9	1A	Saban Unslipped	Early Classic	3	
12	F9	1A	Sacpokana Red	Colonial	6	
12	F9	1A	Yuncu Unslipped	Colonial	15	
12	F9	1A	Yuncu Unslipped	Colonial	334	
12	F9	1A	Yuncu Unslipped: Textile	Colonial	27	
12	H7	1	Chancenote Striated	M Preclassic to E Classic	1	2.17
12	H7	1	Dzudzuquil Cream to Buff	M to L Preclassic	3	9.93
12	H7	1	Guitara Incised	M to L Preclassic	1	8.65
12	H7	1	Habana Club Punctate Incis	M Preclassic to E Classic	1	1.66
12	H7	1	Maxcanu Buff	Early to Late Classic	3	15.83
12	H7	1	Saban Unslipped	Early Classic	5	18.17
12	H7	1	Sacpokana Red	Colonial	9	41.09
12	H7	1	Yuncu Unslipped	Colonial	29	92.14
12	H7	1	Yuncu Unslipped: Textile	Colonial	3	5.32
14	C2	1A	Carolina Bichrome Incised	M Preclassic to E Classic	3	11.99
14	C2	1A	Cetelac Fiber Temper	Early to Late Classic	1	1.01
14	C2	1A	Chancenote Striated	M Preclassic to E Classic	7	16.43
14	C2	1A	Chancenote Striated	M Preclassic to E Classic	10	43.52
14	C2	1A	Dzilam Verde Incised	M Preclassic to E Classic	1	14.63
14	C2	1A	Dzilam Verde Incised	M Preclassic to E Classic	3	33.13
14	C2	1A	Dzudzuquil Cream to Buff	M to L Preclassic	2	3.84
14	C2	1A	Habana Club Punctate	M Preclassic to E Classic	2	11.76
14	C2	1A	Huachinango Bichrome	Early Classic	3	7.56
14	C2	1A	Huachinango Bichrome	Early Classic	8	36.05
14	C2	1A	Joventud Red	M to L Preclassic	1	1.68
14	C2	1A	Joventud Red	M to L Preclassic	3	28.34
14	C2	1A	Kuche Incised	M to L Preclassic	1	1.66
14	C2	1A	Majan Red and Cream	M to L Preclassic	6	47.79
14	C2	1A	Majan Red and Cream	M to L Preclassic	1	3.46
14	C2	1A	Mateo Red on Cream	M to L Preclassic	1	3.61
14	C2	1A	Muna Slate	L to T Classic	2	7.69
14	C2	1A	Not identified	Unknown	3	7.31
14	C2	1A	Not identified	Unknown	4	9.24
14	C2	1A	Saban Unslipped	Early Classic	1	1.44
14	C2	1A	Saban Unslipped	Early Classic	5	11.48
14	C2	1A	Sacpokana Red	Colonial	1	5.64
14	C2	1A	Sacpokana Red	Colonial	14	113.80

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
14	C2	1A	Sirena White	Recent	1	2.70
14	C2	1A	Tancah Unslipped	M Preclassic to E Classic	1	26.02
14	C2	1A	Lituc Orange Polychrome	Early Classic	1	1.59
14	C2	1A	Unidentified bichrome	M Preclassic to E Classic	1	0.09
14	C2	1A	Yuncu Unslipped	Colonial	47	127.89
14	C2	1A	Yuncu Unslipped	Colonial	138	375.01
14	C2	1A	Yuncu Unslipped: Textile	Colonial	1	3.87
14	C2	1A	Yuncu Unslipped: Textile	Colonial	5	13.85
14	C2	1B	Blue ext and white int	Recent	1	1.05
14	C2	1B	Cetelac Fiber Temper	Early to Late Classic	2	5.25
14	C2	1B	Cetelac Fiber Temper: Xcan	Early to Late Classic	1	2.54
14	C2	1B	Chancenote Striated	M Preclassic to E Classic	22	126.68
14	C2	1B	Dzudzuquil Cream to Buff	M to L Preclassic	2	3.02
14	C2	1B	Huachinango Bichrome	Early Classic	9	68.09
14	C2	1B	Joventud Red	M to L Preclassic	5	37.30
14	C2	1B	Majan Red and Cream	M to L Preclassic	1	3.35
14	C2	1B	Maxcanu Buff	Early to Late Classic	1	1.12
14	C2	1B	Nacolal Incised	M to L Preclassic	1	14.23
14	C2	1B	Not identified	Unknown	9	22.14
14	C2	1B	Saban Unslipped	Early Classic	20	56.82
14	C2	1B	Sacpokana Red	Colonial	12	25.58
14	C2	1B	Yuncu Unslipped	Colonial	135	318.26
14	C2	1B	Yuncu Unslipped: Channel	Colonial	1	1.89
14	C2	1B	Yuncu Unslipped: Textile	Colonial	4	13.94
14	C2	1C	Chancenote Striated	M Preclassic to E Classic	25	97.87
14	C2	1C	Chancenote Striated	M Preclassic to E Classic	3	27.97
14	C2	1C	Chunhinta Black	M to L Preclassic	3	11.56
14	C2	1C	Dzilam Verde Incised	M Preclassic to E Classic	1	2.92
14	C2	1C	Dzudzuquil Cream to Buff	M to L Preclassic	4	10.95
14	C2	1C	Huachinango Bichrome	Early Classic	3	12.81
14	C2	1C	Joventud Red	M to L Preclassic	4	17.94
14	C2	1C	Muna Slate	L to T Classic	1	2.47
14	C2	1C	Navula Unslipped	Postclassic	1	1.92
14	C2	1C	Not identified	Unknown	6	32.96
14	C2	1C	Saban Unslipped	Early Classic	9	15.48
14	C2	1C	Sacpokana Red	Colonial	7	20.45
14	C2	1C	Tancah Unslipped	M Preclassic to E Classic	1	30.69
14	C2	1C	Lituc Orange Polychrome	Early Classic	1	5.48
14	C2	1C	Yuncu Unslipped	Colonial	79	249.15
14	C2	1C	Yuncu Unslipped: Textile	Colonial	4	1.75
14	C2	1D	Chancenote Striated	M Preclassic to E Classic	23	75.24
14	C2	1D	Chunhinta Black	M to L Preclassic	1	1.84
14	C2	1D	Dzudzuquil Cream to Buff	M to L Preclassic	4	10.27
14	C2	1D	Huachinango Bichrome	Early Classic	1	7.52
14	C2	1D	Joventud Red	M to L Preclassic	3	10.46
14	C2	1D	Majan Red and Cream	M to L Preclassic	3	7.29
14	C2	1D	Saban Unslipped	Early Classic	1	2.16
14	C2	1D	Sacpokana Red	Colonial	4	15.19
14	C2	1D	Yuncu Unslipped	Colonial	30	74.40
14	C2	1D	Yuncu Unslipped: Textile	Colonial	1	2.19

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
14	D1	1A	Cetelac Fiber Temper	Early to Late Classic	2	6.11
14	D1	1A	Chancenote Striated	M Preclassic to E Classic	6	15.59
14	D1	1A	Chunhinta Black	M to L Preclassic	1	1.28
14	D1	1A	Dzilam Verde Incised	M Preclassic to E Classic	3	5.91
14	D1	1A	Dzudzuquil Cream to Buff	M to L Preclassic	9	19.21
14	D1	1A	Majan Red and Cream	M to L Preclassic	3	10.93
14	D1	1A	Muna Slate	L to T Classic	1	71.51
14	D1	1A	Not identified	Unknown	1	3.65
14	D1	1A	Saban Unslipped	Early Classic	19	44.26
14	D1	1A	Sacpokana Red	Colonial	19	58.28
14	D1	1A	San Luis Blue on White	Colonial (1550-1700)	1	1.41
14	D1	1A	Tituc Orange Polychrome	Early Classic	2	4.96
14	D1	1A	Xanaba Red	Early Classic	2	12.30
14	D1	1A	Yuncu Unslipped	Colonial	125	379.74
14	D1	1A	Yuncu Unslipped: Textile	Colonial	13	24.94
14	D1	1B	Balancan Fine Orange	L to T Classic	1	4.64
14	D1	1B	Carolina Bichrome Incised	M Preclassic to E Classic	1	0.60
14	D1	1B	Chancenote Striated	M Preclassic to E Classic	6	25.72
14	D1	1B	Chunhinta Black	M to L Preclassic	1	3.17
14	D1	1B	Dzilam Verde Incised	M Preclassic to E Classic	1	16.81
14	D1	1B	Dzudzuquil Cream to Buff	M to L Preclassic	4	13.32
14	D1	1B	Green band on white	Recent	1	0.98
14	D1	1B	Habana Club Punctate	M Preclassic to E Classic	1	2.10
14	D1	1B	Huachinango Bichrome Inci	Early Classic	2	7.97
14	D1	1B	Joventud Red	M to L Preclassic	2	4.20
14	D1	1B	Not identified	Unknown	10	26.51
14	D1	1B	Saban Unslipped	Early Classic	17	48.85
14	D1	1B	Sacpokana Red	Colonial	20	86.74
14	D1	1B	Sierra Red	M Preclassic to E Classic	1	1.10
14	D1	1B	Tituc Orange Polychrome	Early Classic	6	9.44
14	D1	1B	Yuncu Unslipped	Colonial	138	368.28
14	D1	1B	Yuncu Unslipped: Textile	Colonial	9	16.38
14	D1	1C	Chancenote Striated	M Preclassic to E Classic	12	38.32
14	D1	1C	Chunhinta Black	M to L Preclassic	1	2.54
14	D1	1C	Dzilam Verde Incised	M Preclassic to E Classic	1	6.17
14	D1	1C	Dzudzuquil Cream to Buff	M to L Preclassic	1	5.02
14	D1	1C	Huachinango Bichrome	Early Classic	2	16.57
14	D1	1C	Joventud Red	M to L Preclassic	1	3.79
14	D1	1C	Kuche Incised	M to L Preclassic	1	1.92
14	D1	1C	Not identified	Unknown	2	4.80
14	D1	1C	Sacpokana Red	Colonial	3	16.09
14	D1	1C	San Luis Blue on White	Colonial (1550-1700)	1	1.88
14	D1	1C	Yuncu Unslipped	Colonial	73	226.20
14	D1	1C	Yuncu Unslipped: Textile	Colonial	3	18.12
14	D1	1D	Chancenote Striated	M Preclassic to E Classic	4	11.99
14	D1	1D	Dzilam Verde Incised	M Preclassic to E Classic	2	6.00
14	D1	1D	Dzudzuquil Cream to Buff	M to L Preclassic	3	16.50
14	D1	1D	Joventud Red	M to L Preclassic	1	2.39
14	D1	1D	Kuche Incised	M to L Preclassic	1	1.56
14	D1	1D	Not identified	Unknown	1	1.64

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
14	D1	1D	Saban Unslipped	Early Classic	3	3.30
14	D1	1D	Tancah Unslipped	M Preclassic to E Classic	1	53.63
14	D1	1D	Yuncu Unslipped	Colonial	20	33.03
14	D1	1E	Yuncu Unslipped	Colonial	4	15.38
14	D14	2	Sacpokana Red	Colonial	2	7.77
14	D14	2	Yuncu Unslipped	Colonial	5	14.00
14	D14	3	Not identified	Unknown	2	3.39
14	D14	3	Sacpokana Red	Colonial	1	1.52
14	D14	3	Yuncu Unslipped	Colonial	17	38.30
14	D14	4	Not identified	Unknown	2	6.04
14	D14	4	Sacpokana Red	Colonial	4	12.08
14	D14	4	San Luis Blue on White	Colonial (1550-1700)	1	0.58
14	D14	4	Tituc Orange Polychrome	Early Classic	1	4.92
14	D14	4	Yuncu Unslipped	Colonial	32	144.87
14	D14	4	Yuncu Unslipped: Textile	Colonial	20	143.67
14	D14	1A	Columbia Plain	Colonial (1490-1650)	1	
14	D14	1A	Medusa White Embossed	Recent	1	
14	D14	1A	Sacpokana Red	Colonial	15	
14	D14	1A	Sirena White	Recent	2	
14	D14	1A	Yuncu Unslipped	Colonial	226	
14	D14	1A	Yuncu Unslipped: Textile	Colonial	10	
14	D14	1B	Chancenote Striated	M Preclassic to E Classic	3	
14	D14	1B	Joventud Red	M to L Preclassic	1	
14	D14	1B	Petkanche Orange Poly	L to T Classic	1	
14	D14	1B	Saban Unslipped	Early Classic	5	
14	D14	1B	Sacpokana Red	Colonial	23	
14	D14	1B	Sirena White	Recent	2	
14	D14	1B	Yuncu Unslipped	Colonial	125	
14	D14	1C	Saban Unslipped	Early Classic	1	2.32
14	D14	1C	Sacpokana Red	Colonial	9	28.43
14	D14	1C	San Luis Polychrome	Colonial (1650-1750)	1	0.98
14	D14	1C	Tituc Orange Polychrome	Early Classic	1	0.74
14	D14	1C	Yuncu Unslipped	Colonial	60	196.44
14	D14	1C	Yuncu Unslipped: Textile	Colonial	6	142.34
14	D14	1D	Sacpokana Red	Colonial	9	32.78
14	D14	1D	Sirena White	Recent	1	0.76
14	D14	1D	Yuncu Unslipped	Colonial	59	172.22
14	D14	1E	Sacpokana Red	Colonial	2	2.68
14	D14	1E	Yuncu Unslipped	Colonial	12	46.13
14	D15	5	Yuncu Unslipped	Colonial	2	
14	D18	1B	Dzitas Slate	L to T Classic	1	
14	D18	1B	Medusa White Embossed	Recent	1	
14	D18	1B	Not identified	Unknown	1	
14	D18	1B	Sacpokana Red	Colonial	15	
14	D18	1B	Yuncu Unslipped	Colonial	76	
14	D2	1A	Bakxoc Black and Cream	M to L Preclassic	1	6.70
14	D2	1A	Carolina Bichrome Incised	M Preclassic to E Classic	1	2.92
14	D2	1A	Cetelac Fiber Temper	Early to Late Classic	5	13.45
14	D2	1A	Chancenote Striated	M Preclassic to E Classic	13	71.27
14	D2	1A	Columbia Plain	Colonial (1490-1650)	1	8.96

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
14	D2	1A	Dzilam Verde Incised	M Preclassic to E Classic	4	12.93
14	D2	1A	Dzudzuquil Cream to Buff	M to L Preclassic	2	4.24
14	D2	1A	Huachinango Bichrome	Early Classic	1	3.81
14	D2	1A	Joventud Red	M to L Preclassic	2	3.55
14	D2	1A	Majan Red and Cream	M to L Preclassic	1	4.36
14	D2	1A	Muna Slate	L to T Classic	2	10.56
14	D2	1A	Not identified	Unknown	93	252.31
14	D2	1A	Saban Unslipped	Early Classic	34	135.41
14	D2	1A	Sacpokana Red	Colonial	25	101.38
14	D2	1A	Sierra Red	M Preclassic to E Classic	1	45.22
14	D2	1A	Tipikal Red on Striated	M to L Preclassic	1	1.77
14	D2	1A	Yuncu Unslipped	Colonial	188	497.68
14	D2	1A	Yuncu Unslipped: Textile	Colonial	11	17.93
14	D2	1B	Cetelac Fiber Temper	Early to Late Classic	5	28.90
14	D2	1B	Chancenote Striated	M Preclassic to E Classic	3	4.54
14	D2	1B	Huachinango Bichrome	Early Classic	2	5.86
14	D2	1B	Joventud Red	M to L Preclassic	2	2.66
14	D2	1B	Maxcanu Buff	Early to Late Classic	1	5.64
14	D2	1B	Not identified	Unknown	4	12.40
14	D2	1B	Saban Unslipped	Early Classic	3	4.66
14	D2	1B	Sacpokana Red	Colonial	9	37.06
14	D2	1B	White lines on blue, white	Recent	1	1.31
14	D2	1B	Yuncu Unslipped	Colonial	75	217.82
14	D2	1B	Yuncu Unslipped: Textile	Colonial	2	4.88
14	D2	1C	Cetelac Fiber Temper	Early to Late Classic	1	1.41
14	D2	1C	Chancenote Striated	M Preclassic to E Classic	2	4.31
14	D2	1C	Sacpokana Red	Colonial	6	34.52
14	D2	1C	Yuncu Unslipped	Colonial	31	69.39
14	D2	1C	Yuncu Unslipped: Textile	Colonial	1	0.92
15	B11	1A	Batres Red	Early to Late Classic	3	8.47
15	B11	1A	Cetelac Fiber Temper	Early to Late Classic	4	16.19
15	B11	1A	Chunhinta Black	M to L Preclassic	4	18.18
15	B11	1A	Dzilam Verde Incised	M Preclassic to E Classic	3	55.46
15	B11	1A	Dzudzuquil Cream to Buff	M to L Preclassic	13	39.17
15	B11	1A	Habana Club Incised Punct	M Preclassic to E Classic	8	22.62
15	B11	1A	Huachinango Bichrome	Early Classic	1	4.23
15	B11	1A	Majan Red and Cream	M to L Preclassic	1	27.42
15	B11	1A	Mama Red	Postclassic	11	87.36
15	B11	1A	Maxcanu Buff	Early to Late Classic	1	2.31
15	B11	1A	Not identified	Unknown	61	166.91
15	B11	1A	Saban Unslipped	Early Classic	24	61.4
15	B11	1A	Sacpokana Red	Colonial	14	49.35
15	B11	1A	Sierra Red	M Preclassic to E Classic	1	2.55
15	B11	1A	Timucuy Orange Polychro	Early Classic	14	99.87
15	B11	1A	Tituc Orange Polychrome	Early Classic	3	2.93
15	B11	1A	Unto Black on Striated	M to L Preclassic	1	1.85
15	B11	1A	Yuncu Unslipped	Colonial	321	1021.64
15	B11	1B	Chancenote Striated	Early to Late Classic	9	44.93
15	B11	1B	Chunhinta Black	M to L Preclassic	3	7.43
15	B11	1B	Dzudzuquil Cream to Buff	M to L Preclassic	3	8.68

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
15	B11	1B	Habana Club Incised Punct	M Preclassic to E Classic	1	1.63
15	B11	1B	Huachinango Bichrome	Early Classic	2	5.21
15	B11	1B	Joventud Red	M to L Preclassic	1	1.41
15	B11	1B	Muna Slate	L to T Classic	1	0.44
15	B11	1B	Not identified	Unknown	1	4.89
15	B11	1B	Saban Unslipped	Early Classic	19	37.12
15	B11	1B	Sacpokana Red	Colonial	13	52.22
15	B11	1B	Timucuy Orange Poly	Early Classic	1	7.64
15	B11	1B	Tituc Orange Polychrome	Early Classic	4	21.99
15	B11	1B	Yuncu Unslipped	Colonial	196	496.7
15	C10	1	Chancenote Striated	Early to Late Classic	1	
15	C10	1	Dzudzuquil Cream to Buff	M to L Preclassic	2	
15	C10	1	Guitara Incised	M to L Preclassic	1	
15	C10	1	Habana Club Incised Punct	M Preclassic to E Classic	4	
15	C10	1	Joventud Red	M to L Preclassic	2	
15	C10	1	Sacpokana Red	Colonial	26	
15	C10	1	Yuncu Unslipped	Colonial	308	
15	C10	1B	Carolina Bichrome Incised	M Preclassic to E Classic	1	
15	C10	1B	Chancenote Striated	Early to Late Classic	12	
15	C10	1B	Chunhinta Black	M to L Preclassic	1	
15	C10	1B	Dzilam Verde Incised	M Preclassic to E Classic	2	
15	C10	1B	Dzudzuquil Cream to Buff	M to L Preclassic	6	
15	C10	1B	Habana Club Incised Punct	M Preclassic to E Classic	7	
15	C10	1B	Huachinango Bichrome	Early Classic	2	
15	C10	1B	Joventud Red	M to L Preclassic	2	
15	C10	1B	Not identified	Unknown	2	
15	C10	1B	Sacpokana Red	Colonial	34	
15	C10	1B	Sierra Red	M Preclassic to E Classic	1	
15	C10	1B	Tipikal Red on Striated	M to L Preclassic	1	
15	C10	1B	Tumben Incised	M to L Preclassic	1	
15	C10	1B	Yuncu Unslipped	Colonial	276	
15	C11	1	Chancenote Striated	Early to Late Classic	4	29.28
15	C11	1	Chen Mul Modeled	Postclassic	3	17.72
15	C11	1	Chunhinta Black	M to L Preclassic	4	6.52
15	C11	1	Dzilam Verde Incised	M Preclassic to E Classic	7	94.02
15	C11	1	Dzudzuquil Cream to Buff	M to L Preclassic	7	26.09
15	C11	1	Habana Club Incised Punct	M Preclassic to E Classic	1	3.09
15	C11	1	Joventud Red	M to L Preclassic	1	6.56
15	C11	1	Mama Red	Postclassic	5	29.32
15	C11	1	Navula Unslipped	Postclassic	3	6.91
15	C11	1	Not identified	Unknown	1	4.56
15	C11	1	Saban Unslipped	Early Classic	21	59.29
15	C11	1	Sacpokana Red	Colonial	12	72.98
15	C11	1	Sierra Red	M Preclassic to E Classic	2	12.37
15	C11	1	Timucuy Orange Poly	Early Classic	4	23.1
15	C11	1	Yuncu Unslipped	Colonial	359	1310.63
15	C11	1B	Chancenote Striated	Early to Late Classic	18	73.46
15	C11	1B	Chen Mul Modeled	Postclassic	4	11.89
15	C11	1B	Dzilam Verde Incised	M Preclassic to E Classic	5	33.95
15	C11	1B	Dzudzuquil Cream to Buff	M to L Preclassic	4	18.2

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
15	C11	1B	Habana Club Incised Punct	M Preclassic to E Classic	2	5.45
15	C11	1B	Huachinango Bichrome	Early Classic	2	5.68
15	C11	1B	Joventud Red	M to L Preclassic	2	8.07
15	C11	1B	Majan Red and Cream	M to L Preclassic	2	26.82
15	C11	1B	Navula Unslipped	Postclassic	1	1.23
15	C11	1B	Not identified	Unknown	3	21.09
15	C11	1B	Saban Unslipped	Early Classic	10	24.75
15	C11	1B	Sacpokana Red	Colonial	11	41.73
15	C11	1B	Timucuy Orange Poly	Early Classic	3	21.54
15	C11	1B	Yuncu Unslipped	Colonial	214	739.78
15	C11	1C	Chancenote Striated	Early to Late Classic	1	6.68
15	C11	1C	Chunhinta Black	M to L Preclassic	1	4.71
15	C11	1C	Dzocobel Red and Black	M to L Preclassic	1	1.58
15	C11	1C	Dzudzuquil Cream to Buff	M to L Preclassic	3	9.82
15	C11	1C	Huachinango Bichrome	Early Classic	1	2.23
15	C11	1C	Navula Unslipped	Postclassic	2	83.69
15	C11	1C	Not identified	Unknown	3	6.66
15	C11	1C	Sacpokana Red	Colonial	21	192.31
15	C11	1C	Yuncu Unslipped	Colonial	39	197.1
15	C11	2A	Bakxoc Black and Cream	M to L Preclassic	1	1.24
15	C11	2A	Carolina Bichrome Incised	M Preclassic to E Classic	1	1.58
15	C11	2A	Chancenote Striated	Early to Late Classic	12	105.1
15	C11	2A	Chen Mul Modeled	Postclassic	2	3.93
15	C11	2A	Chunhinta Black	M to L Preclassic	1	25.5
15	C11	2A	Dzilam Verde Incised	M Preclassic to E Classic	1	4.95
15	C11	2A	Dzudzuquil Cream to Buff	M to L Preclassic	3	22.95
15	C11	2A	Habana Club Incised Punct	M Preclassic to E Classic	3	6.77
15	C11	2A	Huachinango Bichrome	Early Classic	4	16.16
15	C11	2A	Joventud Red	M to L Preclassic	1	4.22
15	C11	2A	Majan Red and Cream	M to L Preclassic	2	7.44
15	C11	2A	Saban Unslipped	Early Classic	7	14.35
15	C11	2A	Sacpokana Red	Colonial	2	9.09
15	C11	2A	Tituc Orange Polychrome	Early Classic	1	2.42
15	C11	2A	Xanaba Red	Early Classic	1	4.46
15	C11	2A	Yuncu Unslipped	Colonial	44	99.83
15	C11	Feat1	Chancenote Striated	Early to Late Classic	5	10.16
15	C11	Feat1	Habana Club Incised Punct	M Preclassic to E Classic	2	2.99
15	C11	Feat1	Mama Red	Postclassic	6	22.35
15	C11	Feat1	Sacpokana Red	Colonial	2	4.6
15	C11	Feat1	Yuncu Unslipped	Colonial	20	80.71
15	C12	1	Chancenote Striated	Early to Late Classic	10	31.84
15	C12	1	Chunhinta Black	M to L Preclassic	1	1.71
15	C12	1	Dzilam Verde Incised	M Preclassic to E Classic	12	47.71
15	C12	1	Dzudzuquil Cream to Buff	M to L Preclassic	5	10.25
15	C12	1	Huachinango Bichrome	Early Classic	3	25.93
15	C12	1	Joventud Red	M to L Preclassic	4	9.93
15	C12	1	Majan Red and Cream	M to L Preclassic	1	5.7
15	C12	1	Not identified	Unknown	9	32.6
15	C12	1	Oxcum Brown	Colonial	1	5.7
15	C12	1	Saban Unslipped	Early Classic	8	31.86

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
15	C12	1	Sacpokana Red	Colonial	9	37.01
15	C12	1	Tituc Orange Polychrome	Early Classic	2	32.99
15	C12	1	Yuncu Unslipped	Colonial	196	766.16
15	C12	2	Carolina Bichrome Incised	M Preclassic to E Classic	1	
15	C12	2	Dzilam Verde Incised	M Preclassic to E Classic	1	
15	C12	2	Joventud Red	M to L Preclassic	1	
15	C12	2	Maxcanu Buff	Early to Late Classic	1	
15	C12	2	Not identified	Unknown	3	
15	C12	2	Sacpokana Red	Colonial	7	
15	C12	2	Tancah Unslipped	M Preclassic to E Classic	4	
15	C12	2	Yuncu Unslipped	Colonial	73	
15	C12	3	Chancenote Striated	Early to Late Classic	17	42.8
15	C12	3	Chen Mul Modeled	Postclassic	29	163.91
15	C12	3	Chunhinta Black	M to L Preclassic	1	3.2
15	C12	3	Dzilam Verde Incised	M Preclassic to E Classic	1	2.21
15	C12	3	Dzudzuquil Cream to Buff	M to L Preclassic	7	27.63
15	C12	3	Habana Club Incised Punct	M Preclassic to E Classic	3	10.33
15	C12	3	Joventud Red	M to L Preclassic	1	2.38
15	C12	3	Navula Unslipped	Postclassic	17	71.52
15	C12	3	Not identified	Unknown	25	37.15
15	C12	3	Saban Unslipped	Early Classic	12	39.64
15	C12	3	Sacpokana Red	Colonial	2	11.62
15	C12	3	Xanaba Red	Early Classic	2	4.04
15	C12	3	Yuncu Unslipped	Colonial	72	283.77
15	C12	4	Chancenote Striated	Early to Late Classic	5	21.93
15	C12	4	Chen Mul Modeled	Postclassic	8	17.73
15	C12	4	Dzilam Verde Incised	M Preclassic to E Classic	3	7.09
15	C12	4	Dzudzuquil Cream to Buff	M to L Preclassic	6	14.39
15	C12	4	Dzudzuquil: Special Chann	M to L Preclassic	1	
15	C12	4	Habana Club Incised Punct	M Preclassic to E Classic	1	1.38
15	C12	4	Joventud Red	M to L Preclassic	1	12.84
15	C12	4	Mama Red	Postclassic	3	9.09
15	C12	4	Not identified	Unknown	1	2.16
15	C12	4	Saban Unslipped	Early Classic	13	50.74
15	C12	4	Yuncu Unslipped	Colonial	27	113.43
15	E14	1A	Dzudzuquil Cream to Buff	M to L Preclassic	1	
15	E14	1A	Habana Club Incised Punct	M Preclassic to E Classic	2	
15	E14	1A	Joventud Red	M to L Preclassic	1	
15	E14	1A	Polvero Black	Early Classic	1	
15	E14	1A	Sacpokana Red	Colonial	6	
15	E14	1A	Xanaba Red	Early Classic	2	
15	E14	1A	Yuncu Unslipped	Colonial	195	
15	E14	1B	Carolina Bichrome Incised	M Preclassic to E Classic	2	
15	E14	1B	Chen Mul Modeled	Postclassic	2	
15	E14	1B	Dzilam Verde Incised	M Preclassic to E Classic	3	
15	E14	1B	Dzudzuquil Cream to Buff	M to L Preclassic	2	
15	E14	1B	Joventud Red	M to L Preclassic	1	
15	E14	1B	Not identified	Unknown	1	
15	E14	1B	Saban Unslipped	Early Classic	1	
15	E14	1B	Sacpokana Red	Colonial	17	

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
15	E14	1B	Yuncu Unslipped	Colonial	267	
15	E14	1C	Chancenote Striated	Early to Late Classic	47	172.05
15	E14	1C	Chunhinta Black	M to L Preclassic	2	4
15	E14	1C	Dzudzuquil Cream to Buff	M to L Preclassic	9	36.61
15	E14	1C	Habana Club Incised Punct	M Preclassic to E Classic	10	23.68
15	E14	1C	Joventud Red	M to L Preclassic	7	19.33
15	E14	1C	Mama Red	Postclassic	9	44.48
15	E14	1C	Maxcanu Buff	Early to Late Classic	2	29
15	E14	1C	Not identified	Unknown	5	14.58
15	E14	1C	Saban Unslipped	Early Classic	118	319.01
15	E14	1C	Sacpokana Red	Colonial	25	81.8
15	E14	1C	Shangurro Red on Orange	Early Classic	3	16.12
15	E14	1C	Sierra Red	M Preclassic to E Classic	1	3.55
15	E14	1C	Sisal Unslipped	L to T Classic	1	
15	E14	1C	Tipikal Red on Striated	M to L Preclassic	2	8
15	E14	1C	Unto Black on Striated	M to L Preclassic	4	6
15	E14	1C	Xanaba Red	Early Classic	2	48.03
15	E14	1C	Yuncu Unslipped	Colonial	134	172.55
15	E14	1D	Bakxoc Black and Cream	M to L Preclassic	1	1.57
15	E14	1D	Carolina Bichrome Incised	M Preclassic to E Classic	7	14.39
15	E14	1D	Cetelac Fiber Temper	Early to Late Classic	2	6
15	E14	1D	Chancenote Striated	Early to Late Classic	44	120.96
15	E14	1D	Chunhinta Black	M to L Preclassic	8	12.82
15	E14	1D	Dzilam Verde Incised	M Preclassic to E Classic	6	52.34
15	E14	1D	Dzudzuquil Cream to Buff	M to L Preclassic	18	39.48
15	E14	1D	Habana Club Incised Punct	M Preclassic to E Classic	10	36.25
15	E14	1D	Joventud Red	M to L Preclassic	8	18.28
15	E14	1D	Mama Red	Postclassic	2	43.51
15	E14	1D	Not identified	Unknown	42	42.05
15	E14	1D	Pital Cream	M to L Preclassic	2	2.05
15	E14	1D	Saban Unslipped	Early Classic	36	107.3
15	E14	1D	Sacpokana Red	Colonial	20	46.26
15	E14	1D	Tipikal Red on Striated	M to L Preclassic	2	4
15	E14	1D	Xanaba Red	Early Classic	6	6.21
15	E14	1D	Yuncu Unslipped	Colonial	151	672.73
15	E14	1E	Canaima Bichrome Incised	M to L Preclassic	1	13.86
15	E14	1E	Carolina Bichrome Incised	M Preclassic to E Classic	5	19.61
15	E14	1E	Cetelac Fiber Temper	Early to Late Classic	11	24.07
15	E14	1E	Chancenote Striated	Early to Late Classic	37	183.13
15	E14	1E	Chunhinta Black	M to L Preclassic	2	6.48
15	E14	1E	Dzilam Verde Incised	M Preclassic to E Classic	6	52
15	E14	1E	Dzudzuquil Cream to Buff	M to L Preclassic	18	55.15
15	E14	1E	Encanto Striated	L to T Classic	3	12.28
15	E14	1E	Habana Club Incised Punct	M Preclassic to E Classic	4	20
15	E14	1E	Joventud Red	M to L Preclassic	9	23.97
15	E14	1E	Maxcanu Buff	Early to Late Classic	1	2.38
15	E14	1E	Muna Slate	L to T Classic	2	38
15	E14	1E	Not identified	Unknown	1	14.97
15	E14	1E	Pital Cream	M to L Preclassic	1	3.85
15	E14	1E	Saban Unslipped	Early Classic	113	272

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
15	E14	1E	Sacpokana Red	Colonial	9	67.48
15	E14	1E	Tamanche Buff Mottled	M to L Preclassic	1	6.31
15	E14	1E	Xanaba Red	Early Classic	2	10.98
15	E14	1E	Yuncu Unslipped	Colonial	24	102.67
15	E14	1F	Cetelac Fiber Temper	Early to Late Classic	2	8.33
15	E14	1F	Chancenote Striated	Early to Late Classic	8	62.41
15	E14	1F	Chunhinta Black	M to L Preclassic	6	18.88
15	E14	1F	Dzilam Verde Incised	M Preclassic to E Classic	9	147.79
15	E14	1F	Dzudzuquil Cream to Buff	M to L Preclassic	5	71.11
15	E14	1F	Habana Club Incised Punct	M Preclassic to E Classic	2	16
15	E14	1F	Joventud Red	M to L Preclassic	1	2.63
15	E14	1F	Majan Red and Cream	M to L Preclassic	1	4.65
15	E14	1F	Saban Unslipped	Early Classic	33	109.86
15	E14	1F	Shangurro Red on Orange	Early Classic	6	15.19
15	E14	1F	Tituc Orange Polychrome	Early Classic	3	26.46
15	E14	1F	Xanaba Red	Early Classic	2	12
15	E14	1F	Yuncu Unslipped	Colonial	3	12.72
15	E5	1B	Carolina Bichrome Incised	M Preclassic to E Classic	1	
15	E5	1B	Cetelac Fiber Temper	Early to Late Classic	6	
15	E5	1B	Chancenote Striated	Early to Late Classic	11	
15	E5	1B	Chunhinta Black	M to L Preclassic	6	
15	E5	1B	Dzocobel Red and Black	M to L Preclassic	1	
15	E5	1B	Dzudzuquil Cream to Buff	M to L Preclassic	18	
15	E5	1B	Habana Club Incised Punct	M Preclassic to E Classic	7	
15	E5	1B	Huachinango Bichrome	Early Classic	2	
15	E5	1B	Ichtucknee Blue on Blue	Colonial	1	
15	E5	1B	Joventud Red	M to L Preclassic	10	
15	E5	1B	Majan Red and Cream	M to L Preclassic	2	
15	E5	1B	Nacolal Incised	M to L Preclassic	2	
15	E5	1B	Not identified	Unknown	6	
15	E5	1B	Saban Unslipped	Early Classic	18	
15	E5	1B	Sacpokana Red	Colonial	12	
15	E5	1B	Sierra Red	M Preclassic to E Classic	1	
15	E5	1B	Tipikal Red on Striated	M to L Preclassic	1	
15	E5	1B	Totoh Grooved	M to L Preclassic	1	
15	E5	1B	Yuncu Unslipped	Colonial	650	
15	F11	2B	Dzilam Verde Incised	M Preclassic to E Classic	1	2.46
15	F5	1A	Chancenote Striated	Early to Late Classic	14	58.72
15	F5	1A	Dzilam Verde Incised	M Preclassic to E Classic	5	21.05
15	F5	1A	Dzudzuquil Cream to Buff	M to L Preclassic	7	3.07
15	F5	1A	Habana Club Incised Punct	M Preclassic to E Classic	2	4.21
15	F5	1A	Huachinango Bichrome	Early Classic	7	32.11
15	F5	1A	Not identified	Unknown	2	6.4
15	F5	1A	Saban Unslipped	Early Classic	14	43.46
15	F5	1A	Sacpokana Red	Colonial	21	66.8
15	F5	1A	Sierra Red	M Preclassic to E Classic	3	10.89
15	F5	1A	Sulche Black?	Colonial?	1	5.53
15	F5	1A	Yuncu Unslipped	Colonial	292	810.69
15	F5	1B	Cetelac Fiber Temper	Early to Late Classic	3	3.6
15	F5	1B	Chancenote Striated	Early to Late Classic	6	14.39

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
15	F5	1B	Dzudzuquil Cream to Buff	M to L Preclassic	5	34.25
15	F5	1B	Fango Bichrome	Early Classic	1	12.25
15	F5	1B	Habana Club Incised Punct	M Preclassic to E Classic	1	1.09
15	F5	1B	Huachinango Bichrome	Early Classic	3	5.21
15	F5	1B	Saban Unslipped	Early Classic	7	25.37
15	F5	1B	Tixmas Incised	Early Classic	1	11.38
15	F5	1B	Yuncu Unslipped	Colonial	19	74.69
15	G14	1	Chancenote Striated	Early to Late Classic	13	50.78
15	G14	1	Dzilam Verde Incised	M Preclassic to E Classic	9	32.25
15	G14	1	Habana Club Incised Punct	M Preclassic to E Classic	6	18.65
15	G14	1	Sacpokana Red	Colonial	11	100.71
15	G14	1	Yuncu Unslipped	Colonial	193	660.18
15	G14	2	Chancenote Striated	Early to Late Classic	4	7.13
15	G14	2	Chunhinta Black	M to L Preclassic	1	1.99
15	G14	2	Dzilam Verde Incised	M Preclassic to E Classic	1	2.88
15	G14	2	Dzudzuquil Cream to Buff	M to L Preclassic	3	59.84
15	G14	2	Joventud Red	M to L Preclassic	1	2.79
15	G14	2	Nacolal Incised	M to L Preclassic	1	3.05
15	G14	2	Sacpokana Red	Colonial	7	41.54
15	G14	2	Tituc Orange Polychrome	Early Classic	1	2.17
15	G14	2	Yuncu Unslipped	Colonial	46	166.83
15	G14	1B	Batres Red	Early to Late Classic	1	5.69
15	G14	1B	Cetelac Fiber Temper	Early to Late Classic	1	4.71
15	G14	1B	Chancenote Striated	Early to Late Classic	21	58.15
15	G14	1B	Chunhinta Black	M to L Preclassic	3	3.13
15	G14	1B	Dzilam Verde Incised	M Preclassic to E Classic	3	6.36
15	G14	1B	Dzudzuquil Cream to Buff	M to L Preclassic	1	2.8
15	G14	1B	Fango Bichrome	Early Classic	2	2.48
15	G14	1B	Habana Club Incised Punct	M Preclassic to E Classic	1	11.9
15	G14	1B	Joventud Red	M to L Preclassic	2	11.99
15	G14	1B	Nacolal Incised	M to L Preclassic	1	2.55
15	G14	1B	Not identified	Unknown	3	4.43
15	G14	1B	Piste Striated	L to T Classic	7	33.42
15	G14	1B	Saban Unslipped	Early Classic	13	32.51
15	G14	1B	Sacpokana Red	Colonial	8	37.46
15	G14	1B	Shangurro Red on Orange	Early Classic	1	4.27
15	G14	1B	Tituc Orange Polychrome	Early Classic	1	1.39
15	G14	1B	Yuncu Unslipped	Colonial	126	484.97
15	G15	2	Carolina Bichrome Incised	M Preclassic to E Classic	1	3.68
15	G15	2	Chancenote Striated	Early to Late Classic	2	12.47
15	G15	2	Dzilam Verde Incised	M Preclassic to E Classic	2	9.74
15	G15	2	Dzudzuquil Cream to Buff	M to L Preclassic	2	5.7
15	G15	2	Saban Unslipped	Early Classic	3	10.32
15	G15	2	Yuncu Unslipped	Colonial	19	53.33
15	G15	1A	Carolina Bichrome Incised	M Preclassic to E Classic	4	7.12
15	G15	1A	Chancenote Striated	Early to Late Classic	18	42.74
15	G15	1A	Chunhinta Black	M to L Preclassic	4	2.78
15	G15	1A	Columbia Plain	Colonial	2	16.53
15	G15	1A	Dzilam Verde Incised	M Preclassic to E Classic	4	25.64
15	G15	1A	Habana Club Incised Punct	M Preclassic to E Classic	8	10.56

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
15	G15	1A	Joventud Red	M to L Preclassic	16	30.78
15	G15	1A	Saban Unslipped	Early Classic	22	56.42
15	G15	1A	Sacpokana Red	Colonial	14	58.31
15	G15	1A	Yuncu Unslipped	Colonial	496	975.31
15	G15	1B	Bakxoc Black and Cream	M to L Preclassic	1	1.9
15	G15	1B	Carolina Bichrome Incised	M Preclassic to E Classic	1	2.11
15	G15	1B	Chancenote Striated	Early to Late Classic	8	21.87
15	G15	1B	Dzilam Verde Incised	M Preclassic to E Classic	2	7.06
15	G15	1B	Joventud Red	M to L Preclassic	1	11.55
15	G15	1B	Mama Red	Postclassic	2	
15	G15	1B	Not identified	Unknown	10	21.82
15	G15	1B	Oxcum Brown	Colonial	1	5.87
15	G15	1B	Sacpokana Red	Colonial	10	100.37
15	G15	1B	Xanaba Red	Early Classic	2	8.66
15	G15	1B	Yuncu Unslipped	Colonial	125	374.06
15	G15	1C	Batres Red	Early to Late Classic	2	7.05
15	G15	1C	Carolina Bichrome Incised	M Preclassic to E Classic	1	3.4
15	G15	1C	Cetelac Fiber Temper	Early to Late Classic	1	2.07
15	G15	1C	Chancenote Striated	Early to Late Classic	47	115.35
15	G15	1C	Chunhinta Black	M to L Preclassic	3	5.39
15	G15	1C	Dzilam Verde Incised	M Preclassic to E Classic	4	31.5
15	G15	1C	Dzudzuquil Cream to Buff	M to L Preclassic	8	18.05
15	G15	1C	Habana Club Incised Punct	M Preclassic to E Classic	4	2.18
15	G15	1C	Joventud Red	M to L Preclassic	5	6.77
15	G15	1C	Mama Red	Postclassic	3	6.24
15	G15	1C	Maxcanu Buff	Early to Late Classic	1	0.86
15	G15	1C	Navula Unslipped	Postclassic	3	25.93
15	G15	1C	Saban Unslipped	Early Classic	4	8.74
15	G15	1C	Sacpokana Red	Colonial	45	428.13
15	G15	1C	Shangurro Red on Orange	Early Classic	2	4.08
15	G15	1C	Sulche Black?	Colonial?	2	5.54
15	G15	1C	Tecoh Red on Cream	Postclassic	2	5.82
15	G15	1C	Yuncu Unslipped	Colonial	505	1443.2
15	G15	1D	Bakxoc Black and Cream	M to L Preclassic	1	0.63
15	G15	1D	Batres Red	Early to Late Classic	8	34.4
15	G15	1D	Carolina Bichrome Incised	M Preclassic to E Classic	2	40.52
15	G15	1D	Cetelac Fiber Temper	Early to Late Classic	4	11.56
15	G15	1D	Chancenote Striated	Early to Late Classic	17	94.88
15	G15	1D	Chunhinta Black	M to L Preclassic	4	15.48
15	G15	1D	Dzilam Verde Incised	M Preclassic to E Classic	6	26.62
15	G15	1D	Dzocobel Red and Black	M to L Preclassic	1	1.09
15	G15	1D	Dzudzuquil Cream to Buff	M to L Preclassic	17	65.58
15	G15	1D	Habana Club Incised Punct	M Preclassic to E Classic	4	19.6
15	G15	1D	Huachinango Bichrome	Early Classic	6	22.92
15	G15	1D	Joventud Red	M to L Preclassic	2	7.28
15	G15	1D	Kuche Incised	M to L Preclassic	1	14.72
15	G15	1D	Mama Red	Postclassic	5	8.43
15	G15	1D	Maxcanu Buff	Early to Late Classic	1	10.68
15	G15	1D	Nacolal Incised	M to L Preclassic	1	1.63
15	G15	1D	Not identified	Unknown	70	125.9

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
15	G15	1D	Saban Unslipped	Early Classic	30	180.3
15	G15	1D	Sacpokana Red	Colonial	37	320.22
15	G15	1D	Sierra Red	M Preclassic to E Classic	1	5.85
15	G15	1D	Sulche Black?	Colonial?	3	20.04
15	G15	1D	Tecoh Red on Cream	Postclassic	1	3.62
15	G15	1D	Timucuy Orange Poly	Early Classic	2	74.28
15	G15	1D	Unto Black on Striated	M to L Preclassic	1	2.09
15	G15	1D	Yuncu Unslipped	Colonial	608	2356.49
15	G2	3	Navula Unslipped	Postclassic	3	27.22
15	G2	1A	Cetelac Fiber Temper: Xcan	Early Classic	4	6.05
15	G2	1A	Chancenote Striated	Early to Late Classic	14	122.76
15	G2	1A	Chunhinta Black	M to L Preclassic	1	2.62
15	G2	1A	Dzilam Verde Incised	M Preclassic to E Classic	7	47.41
15	G2	1A	Dzudzuquil Cream to Buff	M to L Preclassic	14	37.64
15	G2	1A	Habana Club Incised Punct	M Preclassic to E Classic	1	3.13
15	G2	1A	Huachinango Bichrome	Early Classic	5	19.44
15	G2	1A	Joventud Red	M to L Preclassic	4	4.85
15	G2	1A	Majan Red and Cream	M to L Preclassic	1	5.96
15	G2	1A	Not identified	Unknown	10	33.56
15	G2	1A	Oxcum Brown	Colonial	3	24.41
15	G2	1A	Saban Unslipped	Early Classic	38	82.01
15	G2	1A	Sacpokana Red	Colonial	16	108.59
15	G2	1A	Yuncu Unslipped	Colonial	553	1682.38
15	G2	1B	Cetelac Fiber Temper	Early to Late Classic	1	3.22
15	G2	1B	Chancenote Striated	Early to Late Classic	16	100.64
15	G2	1B	Dzilam Verde Incised	M Preclassic to E Classic	2	5.11
15	G2	1B	Dzudzuquil Cream to Buff	M to L Preclassic	2	
15	G2	1B	Habana Club Incised Punct	M Preclassic to E Classic	2	4.15
15	G2	1B	Joventud Red	M to L Preclassic	3	0.88
15	G2	1B	Not identified	Unknown	1	2.68
15	G2	1B	Saban Unslipped	Early Classic	10	16.3
15	G2	1B	Sacpokana Red	Colonial	18	38.12
15	G2	1B	Yuncu Unslipped	Colonial	355	579.56
15	G2	1B	Yuncu: Special Modeled	Colonial	1	
15	G2	1C	Chen Mul Modeled	Postclassic	3	16.04
15	G2	1C	Chunhinta Black	M to L Preclassic	1	2.33
15	G2	1C	Dzudzuquil Cream to Buff	M to L Preclassic	2	7.32
15	G2	1C	Saban Unslipped	Early Classic	3	6.92
15	G2	1C	Sacpokana Red	Colonial	5	23.14
15	G2	1C	Tituc Orange Polychrome	Early Classic	1	1.8
15	G2	1C	Yuncu Unslipped	Colonial	144	431.08
15	G2	1D	Cetelac Fiber Temper	Early to Late Classic	1	0.78
15	G2	1D	Chancenote Striated	Early to Late Classic	3	
15	G2	1D	Chunhinta Black	M to L Preclassic	1	1.44
15	G2	1D	Habana Club Incised Punct	M Preclassic to E Classic	1	4.03
15	G2	1D	Huachinango Bichrome	Early Classic	3	10.48
15	G2	1D	Joventud Red	M to L Preclassic	2	7.61
15	G2	1D	Saban Unslipped	Early Classic	10	23.79
15	G2	1D	Sacpokana Red	Colonial	13	89.55
15	G2	1D	Sulche Black?	Colonial?	1	9.59

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
15	G2	1D	Tancah Unslipped	M Preclassic to E Classic	1	
15	G2	1D	Yuncu Unslipped	Colonial	206	577.88
15	G2	3A	Carolina Bichrome Incised	M Preclassic to E Classic	1	0.7
15	G2	3A	Cetelac Fiber Temper	Early to Late Classic	4	4.65
15	G2	3A	Cetelac Fiber Temper: Xcan	Early Classic	1	1.26
15	G2	3A	Chancenote Striated	Early to Late Classic	12	54.8
15	G2	3A	Dzilam Verde Incised	M Preclassic to E Classic	5	21.5
15	G2	3A	Dzudzuquil Cream to Buff	M to L Preclassic	5	18.35
15	G2	3A	Habana Club Incised Punct	M Preclassic to E Classic	1	0.6
15	G2	3A	Joventud Red	M to L Preclassic	1	14.13
15	G2	3A	Not identified	Unknown	7	9.8
15	G2	3A	Saban Unslipped	Early Classic	36	136.13
15	G2	3A	Sacpokana Red	Colonial	2	6.5
15	G2	3A	Unto Black on Striated	M to L Preclassic	1	2.3
15	G2	3A	Yuncu Unslipped	Colonial	66	276.89
15	G2	3B	Carolina Bichrome Incised	M Preclassic to E Classic	1	17.64
15	G2	3B	Cetelac Fiber Temper	Early to Late Classic	3	3.11
15	G2	3B	Chancenote Striated	Early to Late Classic	1	15.82
15	G2	3B	Dzilam Verde Incised	M Preclassic to E Classic	5	7.45
15	G2	3B	Dzudzuquil Cream to Buff	M to L Preclassic	4	18.17
15	G2	3B	Huachinango Bichrome	Early Classic	2	3.46
15	G2	3B	Joventud Red	M to L Preclassic	1	0.97
15	G2	3B	Kuche Incised	M to L Preclassic	1	6.6
15	G2	3B	Not identified	Unknown	1	2.52
15	G2	3B	Saban Unslipped	Early Classic	4	16.61
15	G2	3B	Tipikal Red on Striated	M to L Preclassic	1	18.9
15	G2	3B	Yuncu Unslipped	Colonial	51	263.5
15	I11	Feat2	Chancenote Striated	Early to Late Classic	1	0.74
15	I11	Feat2	Chunhinta Black	M to L Preclassic	1	1.29
15	I11	Feat2	Dzilam Verde Incised	M Preclassic to E Classic	8	252.22
15	I11	Feat2	Not identified	Unknown	1	2.46
15	I11	Feat2	Saban Unslipped	Early Classic	1	1.13
15	I11	Feat2	Sierra Red	M Preclassic to E Classic	1	0.35
15	J11	2	Chancenote Striated	Early to Late Classic	18	63.02
15	J11	2	Chunhinta Black	M to L Preclassic	10	44.77
15	J11	2	Dzudzuquil Cream to Buff	M to L Preclassic	3	9.97
15	J11	2	Habana Club Incised Punct	M Preclassic to E Classic	1	2.62
15	J11	2	Joventud Red	M to L Preclassic	9	23.96
15	J11	2B	Yuncu Unslipped	Colonial	1	1.29
15	J12	1A	Chancenote Striated	Early to Late Classic	26	195.98
15	J12	1A	Chunhinta Black	M to L Preclassic	28	83.02
15	J12	1A	Dzilam Verde Incised	M Preclassic to E Classic	14	223.35
15	J12	1A	Dzudzuquil Cream to Buff	M to L Preclassic	32	110.03
15	J12	1A	Guitara Incised	M to L Preclassic	2	6.58
15	J12	1A	Habana Club Incised Punct	M Preclassic to E Classic	24	164.84
15	J12	1A	Joventud Red	M to L Preclassic	24	77.05
15	J12	1A	Kuche Incised	M to L Preclassic	2	11.34
15	J12	1A	Majan Red and Cream	M to L Preclassic	4	77.6
15	J12	1A	Nacolal Incised	M to L Preclassic	2	5.91
15	J12	1A	Saban Unslipped	Early Classic	233	561.91

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
15	J12	1A	Yuncu Unslipped	Colonial	3	32.97
15	J12	1B	Bakxoc Black and Cream	M to L Preclassic	2	52.53
15	J12	1B	Canaima Bichrome Incised	M to L Preclassic	1	7.52
15	J12	1B	Carolina Bichrome Incised	M Preclassic to E Classic	2	17.87
15	J12	1B	Chancenote Striated	Early to Late Classic	79	293.69
15	J12	1B	Chunhinta Black	M to L Preclassic	34	144.97
15	J12	1B	Dzilam Verde Incised	M Preclassic to E Classic	58	274.58
15	J12	1B	Dzocobel Red and Black	M to L Preclassic	3	8.14
15	J12	1B	Dzudzuquil Cream to Buff	M to L Preclassic	23	143.79
15	J12	1B	Habana Club Incised Punct	M Preclassic to E Classic	62	278.68
15	J12	1B	Joventud Red	M to L Preclassic	13	94.89
15	J12	1B	Kuche Incised	M to L Preclassic	1	7.95
15	J12	1B	Majan Red and Cream	M to L Preclassic	3	7.47
15	J12	1B	Not identified	Unknown	6	33.63
15	J12	1B	Saban Unslipped	Early Classic	65	168.09
15	J12	1B	Sacpokana Red	Colonial	3	49.59
15	J12	1B	Timucuy Orange Poly	Early Classic	1	7.14
15	J12	1B	Yuncu Unslipped	Colonial	64	205.28
15	L11	1B	Bakxoc Black and Cream	M to L Preclassic	1	2.6
15	L11	1B	Carolina Bichrome Incised	M Preclassic to E Classic	2	4.88
15	L11	1B	Chancenote Striated	Early to Late Classic	56	170.93
15	L11	1B	Chunhinta Black	M to L Preclassic	13	24.98
15	L11	1B	Dzilam Verde Incised	M Preclassic to E Classic	23	69.68
15	L11	1B	Dzudzuquil Cream to Buff	M to L Preclassic	13	51.94
15	L11	1B	Habana Club Incised Punct	M Preclassic to E Classic	19	52.07
15	L11	1B	Huachinango Bichrome Inci	Early Classic	1	15.46
15	L11	1B	Joventud Red	M to L Preclassic	2	7.94
15	L11	1B	Not identified	Unknown	3	8.44
15	L11	1B	Saban Unslipped	Early Classic	22	70.33
15	L11	1B	Sacpokana Red	Colonial	1	1.75
15	L11	1B	Xanaba Red	Early Classic	3	22.05
15	L11	1B	Yuncu Unslipped	Colonial	75	332.19
15	L16	1B	Bakxoc Black and Cream	M to L Preclassic	1	9.35
15	L16	1B	Chancenote Striated	Early to Late Classic	22	147.24
15	L16	1B	Chunhinta Black	M to L Preclassic	1	1.15
15	L16	1B	Dzilam Verde Incised	M Preclassic to E Classic	4	13.1
15	L16	1B	Dzudzuquil Cream to Buff	M to L Preclassic	7	18.83
15	L16	1B	Habana Club Incised Punct	M Preclassic to E Classic	1	1.11
15	L16	1B	Joventud Red	M to L Preclassic	5	9.87
15	L16	1B	Saban Unslipped	Early Classic	24	108.75
15	L16	1B	Sacpokana Red	Colonial	10	25.32
15	L16	1B	Sulche Black?	Colonial?	4	34.82
15	L16	1B	Yuncu Unslipped	Colonial	232	645.71
15	O11	2A	Chunhinta Black	M to L Preclassic	2	
15	O11	2A	Habana Club Incised Punct	M Preclassic to E Classic	4	
15	O11	2A	Huachinango Bichrome	Early Classic	2	
15	O11	2A	Joventud Red	M to L Preclassic	4	
15	O11	2A	Saban Unslipped	Early Classic	1	
15	O11	2A	Sacpokana Red	Colonial	17	
15	O11	2A	Yuncu Unslipped	Colonial	290	

Op	Unit	Capa	Ceramic Type	Chronology	Ct (#)	Wgt (g)
15	O11	2B	Carolina Bichrome Incised	M Preclassic to E Classic	1	
15	O11	2B	Chancenote Striated	Early to Late Classic	1	
15	O11	2B	Dzudzuquil Cream to Buff	M to L Preclassic	2	
15	O11	2B	Habana Club Incised Punct	M Preclassic to E Classic	3	
15	O11	2B	Huachinango Bichrome	Early Classic	1	
15	O11	2B	Saban Unslipped	Early Classic	2	
15	O11	2B	Sacpokana Red	Colonial	2	
15	O11	2B	Yuncu Unslipped	Colonial	57	
15	O4	1C	Carolina Bichrome Incised	M Preclassic to E Classic	3	2.11
15	O4	1C	Cetelac Fiber Temper	Early to Late Classic	1	8.85
15	O4	1C	Cetelac Fiber Temper: Xcan	Early Classic	2	2.49
15	O4	1C	Chancenote Striated	Early to Late Classic	1	4.06
15	O4	1C	Dzilam Verde Incised	M Preclassic to E Classic	2	2.24
15	O4	1C	Dzocobel Red and Black	M to L Preclassic	1	8.02
15	O4	1C	Dzudzuquil Cream to Buff	M to L Preclassic	4	13.26
15	O4	1C	Huachinango Bichrome	Early Classic	1	1.87
15	O4	1C	Nacolal Incised	M to L Preclassic	1	9
15	O4	1C	Not identified	Unknown	6	9.91
15	O4	1C	Saban Unslipped	Early Classic	21	21.39
15	O4	1C	Sacpokana Red	Colonial	4	27.04
15	O4	1C	Yuncu Unslipped	Colonial	75	198.84

APPENDIX H: TABLES OF SPECIAL FINDS AND CHIPPED STONE DEBITAGE

Beads and spindle whorls from colonial residential contexts

Str	Unit	Lot	Capa	Material	Artifact	Diam. (mm)	Height (mm)	Weight (g)
206	E14	173271	1A	shell	irregular bead	29	45.6	7.18
206	E14	173271	1A	ceramic	disk bead	11.9	6.5	0.43
206	F5	173259	1A	bone	tube bead	5.8	12.1	0.44
206	F5	173259	1A	ceramic	spindle whorl	25	11.8	2.86
206	F5	173261	1B	ceramic	tube bead	9	10.6	0.85
206	G2	173273	1D	bone	rectangular bead	16.7	4.2	1.17
407	C2	173187	1A	ceramic	tube bead	10.2	10.5	0.99
407	C2	173187	1A	stone	rectangular bead	18.7	4	0.78

Metal artifacts from colonial residential contexts

Str	Unit	Lot	Capa	Material	Artifact	Length (mm)	Width (mm)	Height (mm)	Weight (g)
206	C10	173254	1A	iron	sheet	15.7	12.1	3.9	1.58
206	C11	173227	1B	copper	axe frag.	32.5	20	6.7	17.03
206	G15	173285	1C	hematite	nodule	12.5	12	8.5	0.99
206	G2	173262	1A	iron	nail	79.1	33.8	11.2	14.89
206	L16	173272	1B	copper	sheet	30.7	7.2	0.9	0.6
317	D2	163148	1C	iron	fastener	20.5	20.1	10.8	4.03
317	D9	163113	1	iron	cast nail	88.6	23.5	22	32.92
403	B6	173033	1	silver	coin	16.7	17	1.2	1.58
403	B6	173033	1	iron	scissors	95.5	19.5	4.9	6.89
403	B7	173001	1	iron	key	67.5	30.6	9.1	20.56
403	E8	173028	1	iron	key	45.5	16	6.4	5.05
403	F3	173022	1	lead	munition	7.2	6.9	7	2.13
403	I5	173027	1	lead	munition	7	7.1	7.2	1.96
403	I5	173027	1	iron	nail	75.9	50.3	7	9.58
407	D2	173185	1A	lead	munition	10.4	9.2	9.1	5.89

Spheres and fishing line weights from colonial residential contexts

Str	Unit	Lot	Capa	Material	Artifact	Diam. (mm)	Height (mm)	Weight (g)
206	C12	173246	1	ceramic	sphere	13.4		1.59
206	F5	173259	1	ceramic	line weight	16.7	16.4	3.1
206	G14	173284	1B	ceramic	line weight	15.6	15.5	3.1
206	G15	173287	1D	ceramic	line weight	18.1	17.7	5.3
206	G2	173262	1A	ceramic	line weight	19.3	18.2	4.01
206	G2	173273	1D	ceramic	line weight	16.2	16.1	2.58
206	G2	173273	1D	ceramic	line weight	16.1	16.1	3.13
206	L16	173272	1B	ceramic	line weight	17.8	16.5	2.61
407	C2	173187	1A	ceramic	sphere	12.6	11.2	1.4
407	D14	173166	1A	stone	sphere	13.3	13.65	3.3

Str	Unit	Lot	Capa	Material	Artifact	Diam. (mm)	Height (mm)	Weight (g)
407	D14	173182	1B	ceramic	sphere	11.2	10	1
407	D15	173184	5A	stone	sphere	14.4	13.9	3.47
407	D18	173165	1C	stone	sphere	14.3	13.9	3.16
407	D2	173185	1A	stone	sphere	13.9	13.8	3.11

Groundstone tools from colonial residential contexts

Str	Unit	Lot	Capa	Type	Part	Length (mm)	Width (mm)	Height (mm)	Weight (g)
206	C11	173212	1A	bark beater	whole	60	59.67	29.82	129
206	G15	173287	1D	mano	whole	117	66	69	725
206	G2	173273	1D	molcajete?	foot?	42.06	41.65	42.34	120
317	B10	163107	1B	pestle	whole	182	51	52	676
317	B8	163101	1C	metate	fragment	186	74	115	1091
317	C8	163109	1B	mano	medial, end	125	75	63	914
317	E9	163115	1	ball	whole	45			125
403	D7	173003	1A	mano	medial, end	80.11	55.6	55.31	302
403	D7	173003	1A	mano	medial, end	55.64	50.66	43.76	182
403	D7	173005	1B	mano	medial	36.75	54.21	45.18	117
403	D7	173005	1B	metate?	corner	72.36	28.76	24.25	51
403	D7	173005	1B	mano	medial	98	57	59	462
403	D7	173012	1C	mano?	medial	40.24	33.86	31.05	40
403	D7	173012	1C	mano	whole	150	58	54	651
403	D8	173015	1	mano	fragments	103	49	45	216
403	D8	173015	1	mano	medial	33.48	50.58	31.64	73
403	D8	173015	1	mano	medial	53.88	30.03	21.95	48
403	D8	173015	1	mano	medial	53.35	50.2	42.29	110
403	D8	173015	1	mano	medial, end	57.95	52.72	54.65	181
403	D8	173015	1	mano	medial	53.47	38.6	24.5	70
403	D8	173015	1	mano	medial	50.16	43.26	42.91	98
403	D8	173015	1	mano	medial				
403	D8	173015	1A	mano	medial	33.18	53.51	43.33	83
403	D8	173020	1B	mano	medial	67.3	47.67	43.56	211
403	D8	173020	1B	mano	medial	47.13	54.49	28.47	85
403	D8	173020	1B	mano	medial	54.44	53.87	39.43	117
403	D8	173020	1B	mano	medial	49.55	26.98	28.35	30
403	D8	173020	1B	mano	medial	33.93	57.01	28.98	64
403	D8	173020	1B	mano	medial	31.43	57.51	33.22	80
403	D8	173020	1B	mano	medial	51.75	47.94	26.09	83
403	D8	173020	1B	mano	medial	52.3	38.55	30.95	61
403	D8	173068	1B	mano	medial				
403	D8	173026	1B	mano	medial				
403	D8	173026	1B	mano	medial				
403	E8	173036	1C	mano	medial, end	172	62	62	1035
403	H7	173009	1	metate	fragments	124.45	133.93	91.2	1133
407	D1	173183	1A	mano	half	111.3	66.9	62.2	594
407	D14	173166	1A	mano	half	102	57.3	56.7	512
407	D14	173203	1D	mano	half	134.9	109.81	71.67	1046

Str	Unit	Lot	Capa	Type	Part	Length (mm)	Width (mm)	Height (mm)	Weight (g)
407	D2	173185	1A	mano?	medial	17	23.32	18.48	9
407	D2	173191	1B	mano		64	66	49	289

Chipped stone tools from colonial residential contexts

Str	Unit	Lot	Capa	Tool type	Portion	Length (mm)	Width (mm)	Thick (max)	Weight (mm)
206	A11	173210	1A	biface	medial	29.83	15.5	6.26	3.31
206	A11	173210	1A	blade?	distal?	23.18	10.43	3.45	
206	B11	173211	1A	projectile pt	proximal	28.38	13.44	3.58	1.12
206	B11	173211	1A	projectile pt	whole	8.64	11.49	2.1	0.27
206	B11	173211	1A	projectile pt	distal	14.82	9.37	2.34	0.34
206	B11	173211	1A	projectile pt	distal	20.84	10.64	4.24	1.05
206	B11	173211	1A	spear point	proximal	35.52	15.28	5.68	2.22
206	C10	173254	1A	projectile pt	proximal	33.39	13.99	3.13	2
206	C10	173254	1A	projectile pt	distal	17.34	7.28	1.32	0.21
206	C10	173258	1B	blade?	whole?	25.24	13.14	2.96	1.1
206	C10	173258	1B	prismatic blade	medial?	20.17	12.15	3.3	0.99
206	E11	173217	1B	projectile pt	proximal	76.6	60.23	54.2	
206	E14	173271	1A	projectile pt	distal	24.12	12.8	2.51	1.28
206	E14	173276	1C	projectile pt	distal	28.53	13.1	2.45	0.97
206	E14	173283	1E	projectile pt	distal	38.71	15.26	3.83	2.38
206	E5	173260	1A	projectile pt	medial	25.41	13.57	4.82	2
206	E5	173260	1A	projectile pt	distal	13.25	11.2	2.65	0.3
206	E5	173263	1B	?	medial	16.75	13.91	3.97	0.98
206	F11	173216	1A	projectile pt	whole	17.37	12.09	2.74	0.54
206	G14	173279	1A	?	medial	27.86	12.16	3.4	1.1
206	G14	173279	1A	projectile pt	proximal	15.02	12.32	3.26	2
206	G14	173284	1B	?	medial	14.91	17.04	3.51	0.99
206	G14	173284	1B	?	distal	29.84	14.47	3.99	1
206	G14	173284	1B	projectile pt	distal	28.77	14.8	2.49	1.18
206	G14	173284	1B	projectile pt	distal	14.24	12.33	3.95	1.48
206	G14	173284	1B	projectile pt	whole	30.34	15.12	3.4	2
206	G14	173284	1B	projectile pt	medial	33.4	15.18	3.9	2.29
206	G14	173284	1B	projectile pt	proximal	28.91	17.34	4.8	3
206	G14	173284	1B	projectile pt	distal	29.71	14.52	4.08	1
206	G15	173277	1A	projectile pt	medial	33.52	13.95	3.56	2.07
206	G15	173281	1B	projectile pt	whole	20.57	12.66	1.95	0.56
206	G15	173281	1B	projectile pt	distal	18.15	12.08	3.08	0.79
206	G15	173285	1C	projectile pt	medial	25.75	12.78	2.78	1.03
206	G15	173285	2C	projectile pt	proximal	22.85	13.41	4.58	1.1
206	G15	173285	1C	projectile pt	whole	16.13	11.74	2.93	0.48
206	G15	173287	1D	blade?	distal?	21.14	12.75	2.34	0.91
206	G15	173287	1D	prismatic blade	distal?	22.2	15.01	3.75	1.3
206	G15	173287	1D	projectile pt	whole	22.19	9.37	8.88	1
206	G15	173287	1D	projectile pt	whole	21.45	11.23	4.09	1.15
206	G2	173262	1A	blade?		6.77	9.38	4.5	0.42
206	G2	173262	1A	projectile pt	proximal	8.98	6.11	3.53	0.15

Str	Unit	Lot	Capa	Tool type	Portion	Length (mm)	Width (mm)	Thick (max)	Weight (mm)
206	G2	173264	1B	blade	medial				0.32
206	G2	173264	1B	projectile pt	distal	16.02	11.11	3.6	0.52
206	G2	173264	1B	projectile pt	distal	14.61	11.85	2.43	1
206	G2	173264	1B	projectile pt	distal	42.8	13.26	4.09	2.24
206	G2	173264	1B	projectile pt	distal	41.71	13.77	4.54	2.11
206	G2	173264	1B	projectile pt	medial?	43.36	13.47	4.13	2.24
206	G2	173273	1D	projectile pt	proximal	45.29	12.44	5.57	3.11
206	G2	173282	3B	projectile pt	distal	21.01	20.26	3.6	2.46
206	I11	173233	1B	projectile pt	distal	19.21	6.21	2.78	2
206	J12	173248	1	projectile pt	distal	24.02	12.13	4.54	1.48
206	L11	173245	1B	projectile pt	whole	22.47	12.78	3.53	0.98
206	L11	173245	1B	projectile pt	medial	21.91	10.24	3.22	0.87
206	L11	173245	1B	projectile pt	medial	16.17	8.17	1.26	0.54
206	N11	173250	1B	projectile pt	medial	33.94	13.77	5.2	2.38
206	O11	173247	1B	projectile pt	whole	27.81	11.71	4.2	1.2
206	O11	173252	2	projectile pt	proximal	23.56	16.19	3.45	2
206	O11	173252	2	projectile pt	proximal	32.62	14.53	4.35	3
206	O11	173252	2	projectile pt	distal	31.35	13.51	4.03	1.87
206	O4	173269	1B	projectile pt	distal	26.62	16.8	3.63	2.27
206	O4	173270	1C	projectile pt	whole	25.96	15.92	3.45	1.52
206	O4	173270	1C	projectile pt	whole	19.27	7.32	1.36	0.24
317	H9	163128	1A	projectile pt	whole	51.55	38.34	16.97	4.21
403	E8	173031	1B	projectile pt?	proximal	29.51	8.93	4.42	1.17
407	C2	173190	1B	projectile pt	medial	21.62	12.85	3.84	1.28
407	D1	173195	1C	projectile pt	proximal	30.45	14.01	4.33	1.79

Chipped stone debitage from colonial contexts

Str	Unit	Lot	Capa	Quad	Count	Wt (g)
206	B11	173211	1A		8	22
206	B11	173218	1B	SE	5	4
206	B11	173218	1B	SW	5	17
206	B11	173218	1B	NE	2	5
206	B11	173218	1B	NW	2	3
206	C10	173254	1A		12	22
206	C10	173258	1B	NE	1	2
206	C10	173258	1B	SW	9	49
206	C11	173212	1A		7	6
206	C11	173227	1B	NE of Feat 1	1	1
206	C11	173235	1C	East	2	2
206	C11	173238	Feat 3		2	2
206	C11	173243	2A		4	32
206	C12	173246	1		15	90
206	C12	173249	2		1	25
206	C12	173251	3	NW	2	5
206	C12	173251	3	NW	1	1
206	C12	173251	3	SW	3	4
206	C12	173251	3	NE	4	94

Str	Unit	Lot	Capa	Quad	Count	Wt (g)
206	C12	173257	4		1	6
206	D11	173213	1A		12	102
206	D11	173219	1B	NW	6	4
206	D11	173219	1B	NE	9	23
206	D11	173219	1B	SW	1	4
206	E14	173271	1A		3	15
206	E14	173276	1C	NE	1	<1
206	E14	173276	1C	NW	2	1
206	E5	173260	1A		13	51
206	E5	173263	1B	SE	3	5
206	E5	173263	1B	SW	1	1
206	E5	173263	1B	NW	1	1
206	E5	173263	1B	NE	11	26
206	E5	173263	1B	SW	1	1
206	F5	173259	1A		5	22
206	G14	173279	1A		14	10
206	G14	173284	1B	SW	2	1
206	G14	173289	2A		2	2
206	G15	173277	1A		1	1
206	G15	173281	1B	SE	1	0.56
206	G15	173285	1C	NE	1	1.03
206	G15	173285	1C	SW	2	2
206	G15	173285	1C	SE	1	<1
206	G15	173285	1C	NE	2	1
206	G15	173287	1D	NE	5	90
206	G15	173287	1D	SE	4	3
206	G15	173287	1D	SW	2	3
206	G15	173288	2	SW	1	1
206	G2	173262	1A		10	91
206	G2	173264	1B	SE	1	0.52
206	G2	173264	1B	NW	5	10
206	G2	173264	1B	NW	1	1
206	G2	173267	1C	NW	2	8
206	G2	173267	1C	NE	2	3
206	G2	173273	1D	SE	1	37
206	G2	173273	1D	NE	1	3.11
206	G2	173278	3A	NW	3	1
206	L16	173266	1A		7	5
317	B10	163107	1B		1	1
317	B10	163120	1C	NE	11	24
317	B10	163120	1C	SW	16	86
317	B5	163149	1		4	7
317	B9	163104	1B	SE	7	39
317	C10	163112	1A		1	<1
317	C10	163119	1B	NW	2	3
317	C10	163119	1B	NE	2	2
317	C10	163119	1B	SE	2	2
317	C10	163119	1B	SW	2	2
317	C10	163125	1C	SE	1	5
317	C5	163141	1A		19	114

Str	Unit	Lot	Capa	Quad	Count	Wt (g)
317	C5	163146	1B		2	1
317	C8	163108	1A		1	22
317	C8	163109	1B	SE	5	43
317	C9	163111	1A	S of wall	1	14
317	C9	163122	1B	SW	4	28
317	C9	163122	1B	SE	9	40
317	C9	163127	1C	NW	4	57
317	C9	163127	1C	SW	1	4
317	C9	163127	1C	SE	4	17
317	C9	163132	1D		2	1
317	E9	163115	1A		2	3
317	F8	163136	1A	NE	4	25
317	F9	163117	1A		1	<1
317	G4	163138	1		12	65
317	G9	163130	1B	NW	5	5
403	B5	173024	1A		4	11
403	B5	173029	1B	SW	1	6
403	B5	173029	1B	NW	3	9
403	B6	173033	1		6	39
403	C6	173034	1B	SE	1	6
403	C7	173002	1		2	18
403	C8	173025	1B	NW	1	1
403	D3	173017	1A		7	61
403	D8	173020	1B	SE	2	11
403	E8	173028	1A		1	5
403	E8	173031	1B		1	1.17
403	F3	173022	1A		8	35
403	F4	173026	1A		3	14
403	F5	173032	1A		4	37
403	F8	173018	1B	SE	1	2
403	F9	173014	1A		3	3
403	F9	173019	1B	NW	1	9
403	F9	173019	1B	SW	2	5
403	G7	173007	1		7	26
403	H7	173009	1		3	17
407	C16	173160	1A		9	18
407	C16	173176	1C		1	3
407	C2	173186	1A		8	46
407	C2	173187	1A		17	46
407	C2	173190	1B	SW	2	9
407	C2	173190	1B	SE	6	38
407	D1	173183	1A		21	53
407	D1	173188	1B	NE	5	14
407	D1	173188	1B	NW	2	62
407	D14	173166	1A		16	227
407	D15	173159	1		33	71
407	D15	173170	1B	NW	1	2
407	D15	173180	3B		2	2
407	D15E	173199	1		5	8
407	D15E	173207	2A		2	18

Str	Unit	Lot	Capa	Quad	Count	Wt (g)
407	D17	173161	1A		3	5
407	D17	173163	1B	NE	2	2
407	D17	173169	1C	SE	2	3
407	D18	173162	1		19	23
407	D18	173164	1B	SW	1	1
407	D18	173164	1B	SE	4	5
407	D18	173164	1B	NW	2	4
407	D18	173164	1B	NE	7	5
407	D18	173165	1C	NW	2	7
407	D18	173165	1C	SW	2	4
407	D18	173165	1C	NE	3	3
407	D2	173185	1A		28	311
407	D2	173191	1B		10	74
407	D2	173196	1C		4	15

APPENDIX I: FAUNAL REPORTS, STRUCTURE 206, BY NAYELI G. JIMÉNEZ CANO

Report 1. Zooarchaeological Report: Faunal Analysis at Units C11 and G15 from Tahcabo, Yucatán

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Introduction

This report presents the zooarchaeological analysis of the fauna from Tahcabo, Yucatán, Mexico. The main objective of the zooarchaeological examination was to understand which animals were consumed and processed on the site, as well as to identify the management of fauna at the residential spaces.

Materials and Methods

The analyzed material came from the archaeological excavations of the 2017 field season. The remains come from a series of high priority residential contexts of two units, Unit C11 and Unit G15 (Table 1) dated from the Postclassic to the Colonial period (Maia Dedrick, pers. comm.).

Table 1. Provenance contexts of the archaeofauna from Tahcabo.

Bag #	Op	Unit	Lot	Capa	Inc	Location	Period
#0919	15	C11	173243	2	A		Postclassic-Colonial
#1501	15	C11	173212	1	A		
#0966	15	C11	173227	1	B	NE of wall 2 (feature 1)	Postclassic-Colonial
#1499	15	C11	173227	1	B	to the SW of alignment #2	Postclassic-Colonial
#1628	15	C11	173235	1	C	west side area	Postclassic-Colonial
#1674	15	C11	173235	1	C	east side area	Postclassic-Colonial
#1476	15	C11	173238	feature 1			Postclassic-Colonial
#1604	15	G15	173277	1	A		
#0881	15	G15	173281	1	B	NE	Postclassic-Colonial
#1620	15	G15	173281	1	B	NW	Postclassic-Colonial
#1622	15	G15	173281	1	B	SW	Postclassic-Colonial
#1630	15	G15	173281	1	B	SE	Postclassic-Colonial
#0865	15	G15	173285	1	C	NE	Postclassic-Colonial
#1500	15	G15	173285	1	C	SW	Postclassic-Colonial
#1504	15	G15	173285	1	C	NW	Postclassic-Colonial
#1616	15	G15	173285	1	C	SE	Postclassic-Colonial

#0765	15	G15	173287	1	D	SE	Postclassic-Colonial
#0745	15	G15	173287	1	D	SW	Postclassic-Colonial
#0746	15	G15	173287	1	D	NW	Postclassic-Colonial
#1641	15	G15	173287	1	D	NE	Postclassic-Colonial
#0888	15	G15	173288	2		SW	Colonial

The anatomical and taxonomical identification was performed using reference osteological specimens housed at the Laboratorio de Biodiversidad y Colecciones Científicas del Centro de Estudios de la Biodiversidad y Desarrollo Sustentable de la Universidad Autónoma de Campeche. In addition, bibliographical references such as Olsen (1982, 1968) and digital material (EA FLMNH 2016; Abel and Butler 2016) were consulted.

The remains that did not present specific criteria for their identification or when the comparative collection did not have the related specimens, were grouped in the indeterminate category (indet.). The taphonomic marks were also registered, indicating marks of thermal affectation, cut marks or gnawing.

The abundance estimators used in this study were the Number of Identified Specimens (NISP) and the Minimum Number of Individuals (MNI). To calculate MNI, the criteria of Clason (1972) was followed by separating left and right bones and obtaining MNI from the side of the largest number of specimens.

Measurements were also taken for future comparisons and analyses. These data are in mm and follow the criteria of Von Den Dreisch (1976).

Results

The archaeofauna from Tahcabo presented a high level of fragmentation although the remains, in most of the cases, remained robust. It is possible that this condition might be due to taphonomic processes or to the prehispanic utilization of the fauna. Also, it was observed that in general, faunal remains presented a shiny appearance. That appearance might be due to the dry cleaning process using tooth brushes that was carried out to clean these materials (Maia Dedrick, pers.

comm.). Otherwise, it would be necessary to observe the appearance of other materials and sediment conditions.

Despite the fragmentary condition of the zooarchaeological material, several species were identified. The faunal assemblage resembles to the exploited traditional animals from the Yucatan peninsula. Interestingly, no domesticated European taxa were identified. The species diversity was moderate and it included animals such as fish, reptiles, birds and mammals which were grouped into a total of 821 identified remains comprising 14 families, 15 genera and 11 species. In addition, one human remain—a molar—was found in the faunal assemblage (see Table 2 and Figure 1).

The details of the taxonomic and anatomical identifications as well as metric data can be found at Annex 1.

Table 2. Taxa identified at Tahcabo.

TAXON	COMMON NAME	C11		G15		TOTAL	
		NISP	MNI	NISP	MNI	NISP	MNI
Cichlidae indet.	cichlids	1	1			1	1
Sparidae indet.	sea brams			1	1	1	1
Teleósteos indet.	bony fishes	2	1			2	1
Serpentes indet.	snakes	1	1	2		3	1
Rhinoclemmys areolata	furrowed wood turtle	2	1			2	1
Terrapene carolina	box turtle	3	1			3	1
Kinosternon sp.	mud turtle	6	3	9	2	15	5
Testudines indet.	turtles	7	3	3	1	10	4
Galliforme indet.	turkey, chickens	2	2			2	2
Meleagris sp.	turkey	1	1			1	1
Ave (big)	big birds	3	-	9	-	12	0
Ave (medium)	medium birds	3	-			3	0
Ave (small)	small birds			3	-	3	0
Aves indet.	birds	11	-	28	-	39	0
Dasypus novemcinctus	nine-banded armadillo	48	1	74	2	122	3
Sylvilagus floridanus	eastern cottontail			2	2	2	2
Orthogeomys hispidus	hispid pocket gopher	1	1	2	1	3	2
Cricetidae indet.	small rodents	1	1			1	1
Cuniculus paca	lowland paca	10	1	4	1	14	2
Agutidae indet.	paca	4	-			4	0
Canidae indet.	canids			1	1	1	1
Canis sp.	dog/coyote			5	2	5	2
Pecari tajacu	collared peccary	2	1	2	1	4	2
Tayassu pecari	white-lipped peccary			1	1	1	1
Tayassuidae indet.	peccary	2	-	3	-	5	0
Mazama pandora	Yucatan brown brocket deer			1	1	1	1
Mazama sp.	brocket deer	1	1			1	1
Odocoileus virginianus	white tailed deer	2	1	32	3	34	4

TAXON	COMMON NAME	C11		G15		TOTAL	
		NISP	MNI	NISP	MNI	NISP	MNI
Cervidae indet.	deer	13	-	2	-	15	0
Homo sapiens sapiens	human			1	1	1	1
Mammal (big)	big mammal	1	1	5	-	6	1
Mammal (medium)	medium mammal	30	-	1	1	31	1
Mammal (small)	small mammal	110	-	4	-	114	0
Mammal indet.	mammals	123	-	236	-	359	0
TOTAL		**390**	**22**	**431**	**21**	**821**	**43**

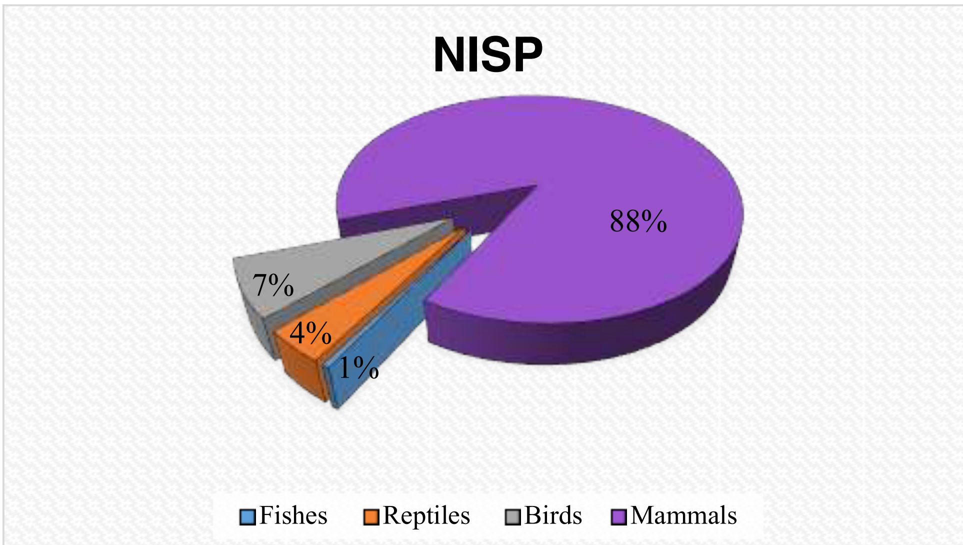

Figure 1. Taxa distribution at Tahcabo.

The most frequent animals at the zooarchaeological assemblage were those used as food resource. Among these, armadillos (*Dasypus novemcinctus*) dominated the assemblage, although this over-represented since most of their remains were composed by bony scutes (Figure 2).

Figure 2. Bony scutes of armadillo.

Other food animals at the assemblage were tepezcuintles (*Cuniculus paca*) white-tailed deer (*Odocoileus virginianus*), white-lipped peccary (*Tayassu pecari*), collared peccary (*Pecary tajacu*) peccaries (Tayassuidae), rabbits (*Sylvilagus floridanus*) and large birds, possibly turkeys (Figures 3-6). These animals may have represented an important caloric input in the ancient diet of Tahcabo inhabitants. It is important to note that these resources are currently hunted and consumed by the modern Mayan communities (Montiel Ortega and Arias Reyes 2008).

Figure 3. Skeletal elements of white-tailed deer: a) right femur, b) right calcaneus, c) left astragalus.

Figure 4. Right mandible of collared peccary.

Figure 5. Left femur of eastern cottontail.

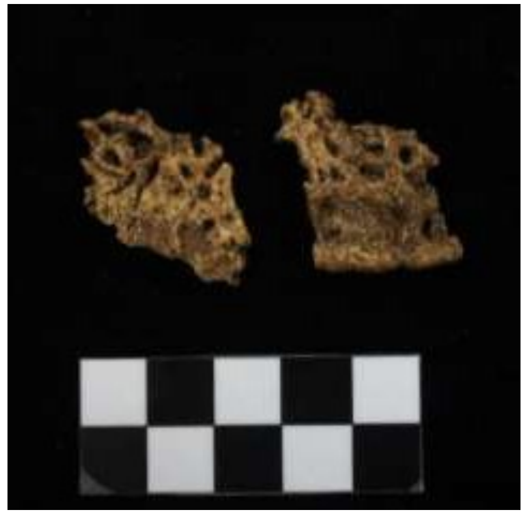

Figure 6. Skull fragments of *tepezcuintle*.

Age estimations were done with the mostly hunted animals, such as deer and peccary, in order to understand exploitation patterns. In these sense, adults and sub adults were found in both animal populations among the two units studied. In the case of the deer remains, these were mostly adult (see Figure 7), which follows the same pattern found at other zooarchaeological assemblages of the Maya area indicating a low pressure in hunting practices (Carr 1996).

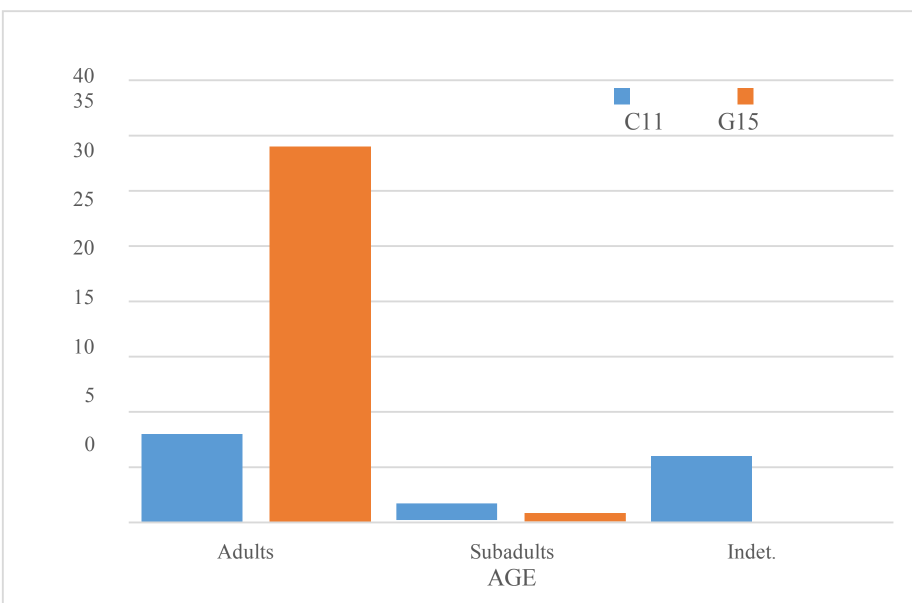

Figure 7. Age estimation of deer.

On the contrary, peccaries were represented mostly by adult remains at Unit C11 while in G15 most of them were sub adults (see Figure 8). This might indicate that hunting practices of this species at Tahcabo were extensive, or that sub adult individuals were reserved for others proposals. Age estimation of both fauna groups represent an interesting approach regarding faunal management in Tahcabo. However, it is evident that the sample is reduced and thus it is necessary to conduct more zooarchaeological studies at the site to find patterns in these practices.

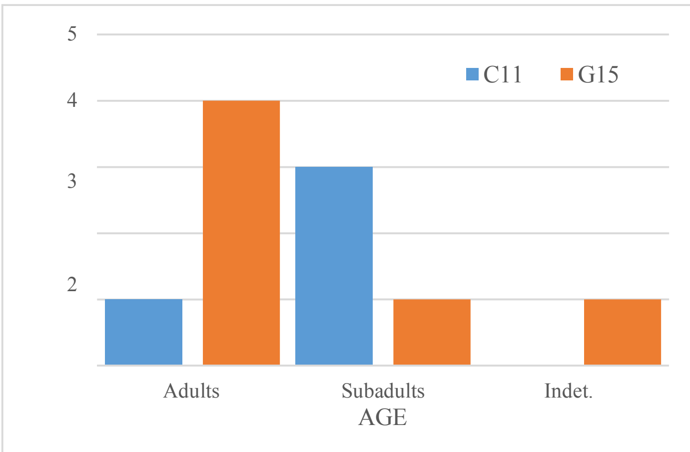

Figure 8. Age estimation of peccary.

Possible evidence of bone tool production was found at Tahcabo since there were found remains of worked animal bones. According to Emery's bone artifact production model (Emery and Aoyama 2005), the remains of our study represented both primary reduction bone artifacts and secondary reduction. The small sample consisted of three bones, one sectioned cervid metapodial and two sectioned and polished mammal long bones (see Annex 1).

On the other hand, it was interesting to record the presence of large canid remains (*Canis* sp.). Their morphological characteristics correspond to either a dog or a coyote (Figure 9). The taxonomical identification of these remains is uncertain since they present similarities with bot species. In this sense, it will be necessary to compare them with more reference specimens. In the case that the remains belong to a dog, their size would be interesting for a domestic animal, and if it belongs to a coyote it would represent a biogeographical change or trade from other places, since this species is not currently endemic to Yucatan.

Figure 9. Canid remains.

In addition, evidence of intrusive fauna was identified in the contexts (Figure 10 and 11). Among them were remains of mice (Cricetidae) and gophers (*Orthogeomys hispidus*), these taxa are often associated with formations of zooarchaeological groups after the abandonment of the settlements.

Figure 10. Mouse mandible.

Figure 11. Humerus of gopher.

Conclusions

The archeological fauna of Tahcabo represent an opportunity to understand the use and consumption practices of animals during the Postclassic and Colonial periods in Yucatán.

Contrary to what was expected, no European domestic fauna such as horses, pigs or cows were found in the analyzed sample. This is possibly due to an adaptation of the inhabitants of Tahcabo to the environment and to a continuity in the prehispanic tradition of hunting and consumption of local fauna.

The fauna in general represented the use of the ecosystems of the dry and sub-humid Yucatan jungle, as well as of inland water sources such as cenotes and aguadas. In addition, the wild fauna also indicates the preferences of these species at the time of European contact. However, the sample studied does not represent the entire fauna of the site, so it is necessary to perform more studies that could confirm or change the patterns observed in this report.

References

Abel, S. M., and E. B. Butler
2016 Bone ID. Digital resource for bone identification. http://www.boneid.net/

Clason, A. T.
1972 Some remarks on the use and presentation of archaeozoological data. *Helenium* 12:139-153.

EA FLMNH
2016 Environmental Archaeology Image Search: Digital resource. https://www.floridamuseum.ufl.edu/envarch-gallery/. Vol. 2018.

Emery, K. F., and K. Aoyama
2005 La elaboración de herramientas de hueso en los grupos domésticos de la elite Maya de Aguateca, Guatemala. In *XVIII Simposio de Investigaciones Arqueológicas en Guatemala, 2005,* edited by J.P. Laporte, B. Arroyo and H. Escobedo, pp. 1-18. Instituto de Antropología e Historia, Guatemala.

Montiel Ortega, S., and L. M. Arias Reyes
2008 La cacería tradicional en el Mayab contemporáneo: una mirada desde la ecología humana. *Avances y prespectica* 1(1):21-27.

Olsen, S.
1982 *An osteology of some Maya mammals.* Papers of the Peabody Museum of Archaeology and Ethnology, vol. 73. Harvard University, Cambridge.

Olsen, S.
1968 *Fish, amphibian and reptile remains from archaeological sites.* Papers of the Peabody Museum of Archaeology and Ethnology, vol. 56(2). Harvard University, Cambridge.

Von Den Driesch, A.

1976 *A guide to the measurements of animal bones from archaeological sites.* Bulletin 1. Peabody Museum Bulletins. Peabody Museum of Archaeology and Ethnology, Harvard University, Cambridge.

Report 2. Zooarchaeological Analysis of Operation 15 from Tahcabo, Yucatán

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Introduction

This report presents the second zooarchaeological analysis of the faunal remains from Tahcabo, Yucatán, Mexico. The main objective of the zooarchaeological examination was to continue the faunal analyses of Operation 15 in order to understand animal consumption and management at the site.

Materials and Methods

The faunal materials came from the archaeological excavations of the 2017 field season which comprised the study of eight units including C10, C12, E5, E14, F5, G2, L16 and O11 (Table 1).

The anatomical and taxonomical identification was performed using the osteological reference collection housed at the *Laboratorio de Zooarqueología Facultad de Ciencias Antropológicas, Universidad Autónoma de Yucatán*. In addition, several bibliographical references were consulted such as Olsen (1982, 1968) and digital material (EA FLMNH 2016; Abel and Butler 2016). Taxonomical identification was specified at the lowest taxonomical level possible, when remains did not present specific criteria for identification due to fragmentation they were group at highest taxonomical levels. Taphonomical marks were recorded and included signatures of thermal affectation (burned or calcined), modifications (flattened or sectioned) and consumption (gnawing and chewing) as well as highly fragmented remains or bone flakes.

Quantification methods used in this report included the Number of Identified Specimens (NISP) and age estimations based on epiphyseal fusion and dental wear. Measurements were also taken for future comparisons and analyses. These data are in mm and follow the criteria of Von Den Dreisch (1976).

Table 1. List of contexts studied in this report.

Bag #	Flot #	Size fraction	Op	Unit	Lot	Capa
#0883			15	C12	173246	1
#1639			15	C12	173249	2
#0886			15	C12	173251	2
#0930			15	C12	173251	3
#1672			15	C12	173251	3
#0870			15	C12	173251	3
#0920			15	C12	173251	3
#0717			15	C12	173251	3
#0869			15	C10	173254	1
#1596			15	C12	173257	4
#0874			15	C10	173258	1
#0895			15	C10	173258	1
#0880			15	C10	173258	1
	#0208	>1/4" <2 mm	15	C10	173258	1
	#0208	< 1/4"	15	C10	173258	1
#1502			15	E5	173260	1
#0877			15	E5	173260	1
#0734			15	G2	173262	1
#0726			15	E5	173263	1
#0789			15	E5	173263	1
#0780			15	E5	173263	1
#1618			15	E5	173263	1
#0866			15	G2	173264	1
#1652			15	G2	173264	1
#0808			15	L16	173266	1
#3278			15	L16	173266	1
#0818			15	L16	173272	1
#0876			15	L16	173272	1
#1656			15	L16	173272	1
#1634			15	E14	173283	1
#1680			15	C12	173251	3
#0896			15	F5	173261	1
#1648			15	F5	173261	1
#0924			15	O11	173252	2
#1665			15	O11	173255	2

Results

Faunal remains from Tahcabo were in good conservation conditions but presented a high level of fragmentation even in robust bones. As in Report 1, animal bones also presented a shiny appearance possible due to cleaning processes or sediment conditions.

The faunal assemblage comprised a total of 1095 remains (NISP) with Unit E5 the most abundant in terms of faunal remains. The taxonomical composition of the faunal assemblage, reflects the exploitation of both wild and domestic animals. The assemblage was dominated by mammals, followed by reptiles, birds, fishes and mollusks (Figure 1). Taxonomical composition of the assemblage is composed by 21 families, 17 genera and 12 species (Table 1).

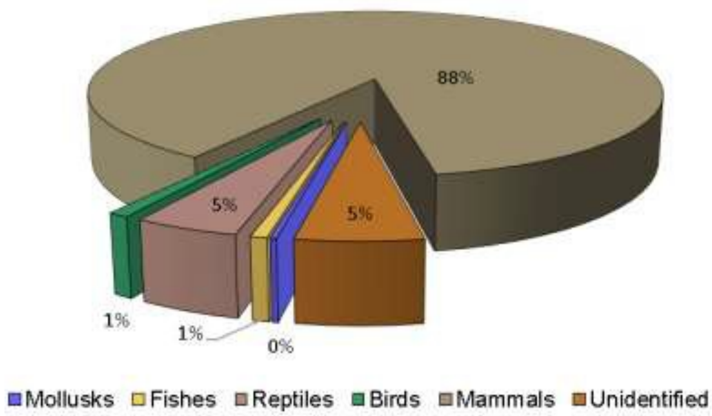

Figure 1. Taxonomical distribution of animal remains at Tahcabo.

The details of the taxonomic and anatomical identificaitons as well as metric data can be found at Annex 1.

Table 2. Taxonomical composition of the Tahcabo archaeofaunal assemblage.

Taxon	**Common name**	**C12**	**C10**	**E14**	**E5**	**F5**	**G2**	**L16**	**O11**	**TOTAL**
cf. *Dinocardium robustum*?	cockle	2								2
Mollusca indet.	unidentified mollusks		1							1
Ariopsis felis	hardhead sea catfish		1							1
Ariidae indet.	catfish		1							1
Cynoscion sp.	seatrout		2							2
Cichlidae indet.	fresh water mojarra		3							3
Osteichthyes indet.	bony fishes		1							1
Boidae cf. *Boa constrictor*	common boa		1							1
Ctenosaura sp.	iguana	9								9
cf. *Kinosternon*	mud turtle						1			1
Dermatemys mawii	white turtle		4							4
cf. *Dermatemys mawii*	white turtle						1			1
Trachemys scripta	pond slider	1						2		3
Trachemys cf. *scripta*	pond slider	1								1
Trachemys sp.	pond slider	2			7			8		17
Rhinoclemmys sp.	wood turtle	1								1
Testudines indet.	unidentified turtles	3	3		3			1		10
Testudines indet. (small)	small unidentified turtles				1					1
Reptilia indet.	unidentified reptiles	1								1
Meleagris sp.	turkey				1					1

Taxon	Common name	C12	C10	E14	E5	F5	G2	L16	O11	TOTAL
Aves indet.	unidentified birds		1		3		1	4		9
Dasypus novemcinctus	nine bands armadillo	36	38	5	19		15	51		164
Odocoileus virginianus	white tailed deer	7	3	3	6		7	6		32
cf. *Odocoileus virginianus*	white tailed deer		4							4
Cervidae indet.	unidentified deer		7		10			1		18
Tayassuidae indet.	unidentified peccari	3					1			4
Equus caballus	horse	1								1
Equus sp.	equines	1								1
cf. *Puma concolor*	cougar							1		1
Canis lupus familiaris	dog	1					5	1		7
Canis cf. *lupus familiaris*	dog	2			4					6
Carnivora indet.	unidentified carnivores		4					1		5
Cuniculus paca	lowland paca, tepezcuintle	5	5		1			1		12
Agutidae indet.	unidentified agutis				1					1
Orthogeomys cf. *hispidus*	hispid pocket gopher		2							2
Muridae indet.	unidentified murids		5							5
Rodentia indet.	unidentifed rodents		2							2
Mammalia indet. (small)	unid. small mammals						1			1
Mammalia indet. (large)	unid. large mammals	1			1					2
Mammalia indet.	unidentified mammals	111	83	6	255	5	104	119	13	696
Sin identificar	unidentified	5	49			6				60
TOTAL		**193**	**220**	**14**	**312**	**11**	**136**	**196**	**13**	**1095**

The animal assemblage was dominated by the presence of armadillo remains comprising the 14.77% (NISP= 164) of the total assemblage. The abundance of these animals in Operation 15 is overrepresented due to the high presence of dermal plates, elements that cover their bodies and that can be counted in hundreds in just one individual.

Notwithstanding the overrepresentation of armadillos in the assemblage, it is an animal usually consumed as a food resource in the northern Maya Lowlands both in prehispanic (Götz and Emery 2013) and modern times (Montiel Ortega and Arias Reyes 2013).

In addition to armadillo, ancient inhabitants of Tahcabo were also consuming white-tailed deer, *tepezcuintle*, agouti and peccary. Of these, white-tailed deer were the most abundant in the assemblage and included elements from complete animals, with the presence of the axial and cranial skeleton. These indicate that deer were capture in the vicinity of the site and consumed complete. Exploited deer population included adults and sub-adults, although adult sub-adults were scarce in the assemblage (Figure 2). This proportion indicates a local exploitation of a balanced deer population, although more studies are needed to understand specific patterns of deer exploitation.

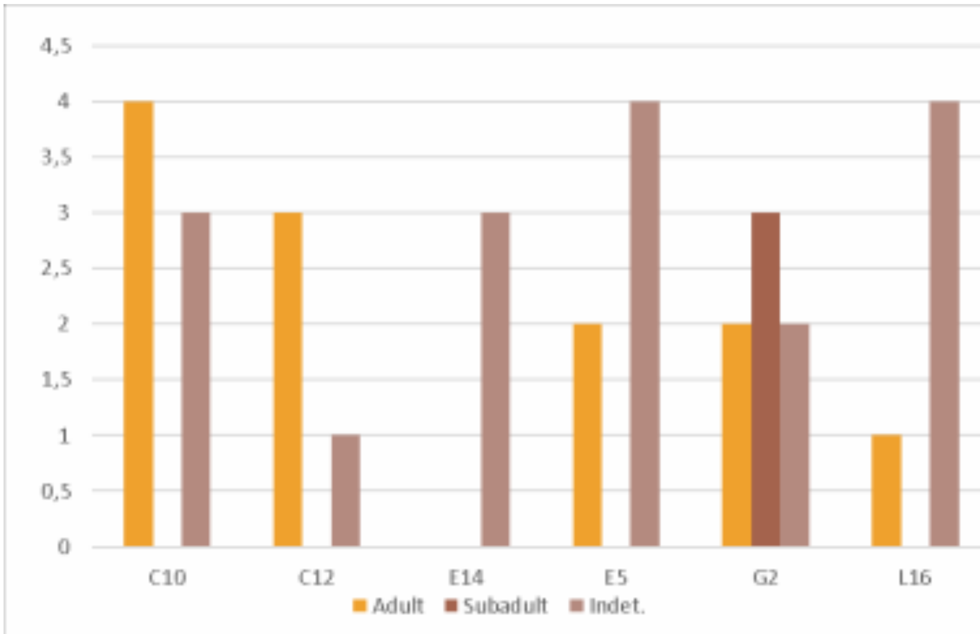

Figure 2. Age distribution of deer remains from Tahcabo.

On the other hand, although peccary sample was small (NISP=4) its presence at the site indicates its use as food resource. Age estimation of peccaries was possible for all remains, and it is observed a similar pattern as in deer, where adults are more abundant than sub-adult individuals (Figure 4).

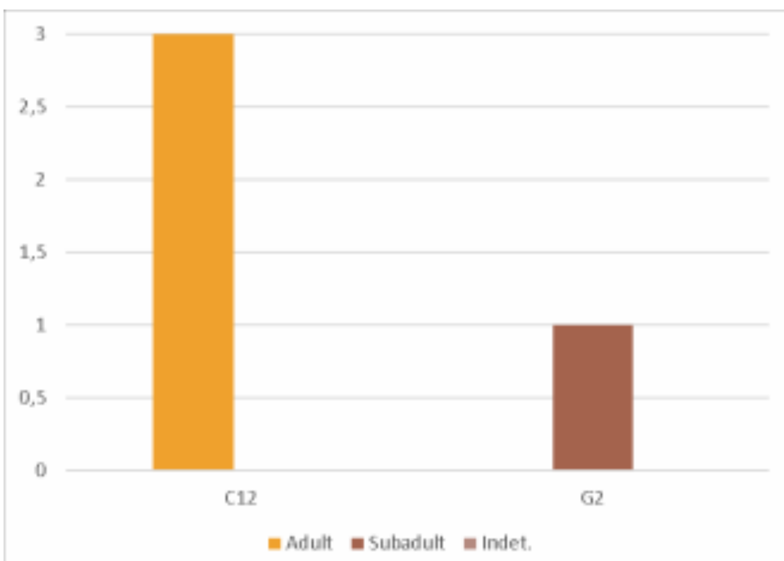

Figure 3. Age distribution of peccary remains from Tahcabo.

Other important animal presence at the site were dogs remains. Dogs comprised a small sample (NISP=3) but its relevance at the site is due because they are one of the few domesticated animals by prehispanic Mayas who considered them a company animal but also but also food source (Götz and Emery 2013). According to age estimations of dogs, two remains corresponded to sub-adult individuals at Units G2 and C12, while one adult was present at Unit C12. The remains did not present any taphonomical signature of thermal affectations or cut marks.

Figure 4. Dog lower incisor.

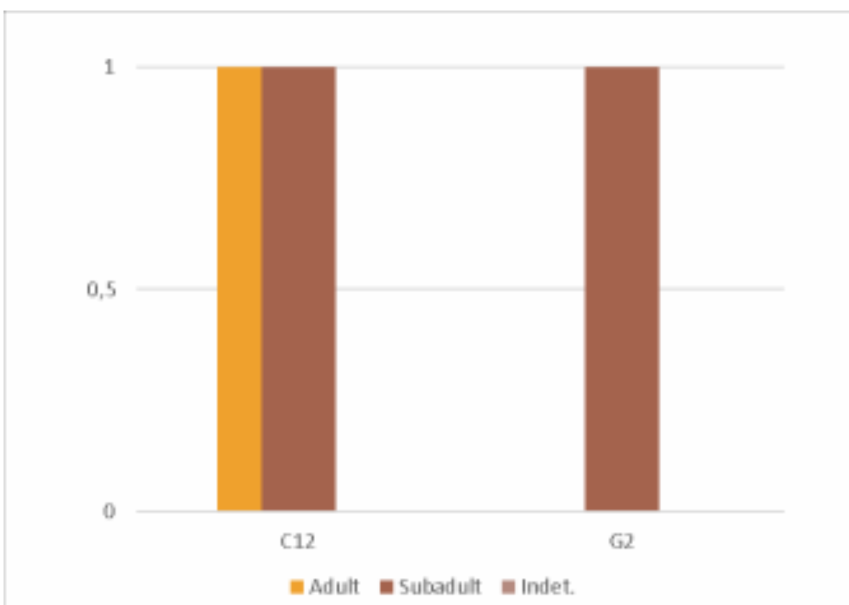

Figure 5. Age distribution of dog remains from Tahcabo.

In addition, it is important to note the presence, for the first time at the site, of turkey remains (*Meleagris* sp.) whose identification as wild (*Meleagris ocellata*) or domestic (*Melegaris gallopavo*) was not possible due to fragmentation and erosion. Also, there were identified three different fishes including catfishes, mojarras and seatrout. These animals were found in small screening contexts (see Annex 1) and indicates the exploitation of fresh water resources (Cichlids) such as cenotes or ojos de agua, as well as estuarine environments (*Ariopsis felis* and *Cynoscion* sp.). Aquatic resources exploitation was also represented by the presence of reptiles such as mud turtle, pond slider and white turtles.

On the other hand, it is also relevant to highlight the presence of a cougar molar. The molar of this individual was not worked of perforated for its use as a decorative element, but its presence possible indicates the special storage of this element and tropical forest exploitation.

Interestingly, it was identified for the first time domestic European faunal remains. This is represented by the presence of horse molars although it is possible that more elements might be present in the unidentified mammal fragments. The occurrence of this animal is particularly important at Tahcabó because it clearly indicates European inhabitants at the site and new animal husbandry practices by using horses probably as transportation and work force. As of this writing there is no evidence of other European domestic fauna, such as cows or domestic pigs, at the assemblage but it might be possible to find them in unstudied contexts.

Figure 6. Horse molar from Tahcabo: a) lingual view, b) dorsal view.

Taphonomical comments

Taphonomical signatures in the faunal assemblage were diverse and represented the 16.35% (NISP=179) of the total remains. These signatures included burned and calcinated marks due to thermal affectations, worked signatures such as flattening and sectioning and consumption signatures such as gnawing and chewing. Interestingly, there were found a high number of small bone flakes.

Table 3. Taphonomical record of faunal remains at Tahcabo.

Taphonomic mark/Unit	C10	C12	E5	G2	L16	Total
Burned	10	28	81	18	27	164
Calcined		3	2		1	6
Flattened		1				1
Secctioned		1		1		2
Gnawned				3		3
Chewed		2	1			3
Flakes	39	23	159	91	98	
Total	**49**	**58**	**243**	**113**	**126**	**179**

Thermal affectations, can be caused due to cooking practices such as roasting or boiling. At Tahcabo, it is interesting to note the high presence of burned remains (blackened bones) while calcined remains (white-greyish bones) were scarce. However, it is possible that the thermal affectations were caused by other reasons beside food consumption such as trash burning or occasional fires (Nicholson 1995).

On the other hand, there was evidence of bone manufacture due to the presence of signatures such as flattening and sectioning of bones signatures characteristic of bone modification (Emery and Aoyama 2005). Although any complete tool was identified, it is possible that bone manufacturing was taking place at Tahcabo at least at a small scale. In this sense it is interesting to record the high presence of small bone fragments or flakes. These remains, in some cases with thermal affectations, had uniform rectangular shape and it is unclear what caused this shape. Other authors (Newman 2013) have indicated that these are vestigial parts of bone manufacturing processes and this might be possible at Tahcabo, although it is necessary to deepen this study.

Figure 7. Bone flakes with thermal affectations.

Conclusions

The archeological fauna of Tahcabo is interesting in terms of animal diversity. It is the first time that European domestic fauna—horses—are identified at the site although wild animals dominated the assemblage. This is interesting because it represents an opportunity to understand animal management in early colonial periods in the northern Maya lowlands.

Regarding exploited environments, faunal remains reflected animal capture focused on the nearby ecosystems of the site such as dry and subhumit forest as well as fresh water environments. In addition, ancient inhabitants of Tahcabo were consuming estuarine fish resources, probably from the northern coast of Yucatán. It is not clear how these coastal animals came into the site, if preserved or not, but it is probably that they were part of a commercial network.

There was also evidence of incipient animal tool manufacture practices due to the presence of taphonomical signatures. However, the sample is small and more studies are needed in order to confirm this possibility.

References

Abel, S. M., and E. B. Butler
2016 Bone ID. Digital resource for bone identification. http://www.boneid.net/

EA FLMNH
2016 Environmental Archaeology Image Search: Digital resource. https://www.floridamuseum.ufl.edu/envarch-gallery/. Vol. 2018.

Emery, K. F., and K. Aoyama
2005 La elaboración de herramientas de hueso en los grupos domésticos de la elite Maya de Aguateca, Guatemala. In *XVIII Simposio de Investigaciones Arqueológicas en Guatemala, 2005*, edited by J.P. Laporte, B. Arroyo and H. Escobedo, pp. 1-18. Instituto de Antropología e Historia, Guatemala.

Götz, C. M. and Emery, K. F.
2013 *The archaeology of Mesoamerican animals*. Lockwood Press, Atlanta.

Montiel Ortega, S., and L. M. Arias Reyes
2008 La cacería tradicional en el Mayab contemporáneo: una mirada desde la ecología humana. *Avances y prespectica* 1(1):21-27.

Newman, S.
2013 Animales como artefactos: el uso ritual de los restos de fauna por los antiguos mayas. In *XXVI Simposio de Investigaciones Arqueológicas en Guatemala, 2012*. Edited by B. Arroyo and L. Méndez Salinas), pp. 587-596. Museo Nacional de Arqueología y Etnología, Guatemala.

Nicholson, R.
1995 Out of the frying pan into the fire: what value are burnt fish bones to archaeology? *Archaeofauna* 4: 47-64.

Olsen, S.
1982 *An osteology of some Maya mammals*. Papers of the Peabody Museum of Archaeology and Ethnology, vol. 73 ed. Harvard University, Cambridge.

1986 *Fish, amphibian and reptile remains from archaeological sites*. Papers of the Peabody Museum of Archaeology and Ethnology, vol. 56(2) ed. Harvard University, Cambridge.

Von Den Driesch, A.
1976 *A guide to the measurements of animal bones from archaeological sites*. Bulletin 1. Peabody Museum Bulletins. ed. Peabody Museum of Archaeology and Ethnology, Harvard University, Cambridge.

Annex 1. Consolidated tables from both reports (age and side information and comments omitted).

Op	Unit	Lot	Capa	Quad or Flote	NISP	Taxon	Elemento
15	C12	173246	1		1	Dasypus novencimtus	vértebra troncal
15	C12	173246	1		1	Dasypus novencimtus	vértebra caudal
15	C12	173246	1		16	Dasypus novencimtus	placas dérmicas
15	C12	173246	1		2	Dasypus novencimtus	placas dérmicas
15	C12	173246	1		1	Canis cf. lupus familiaris	incisivo inferior
15	C12	173246	1		1	Canis cf. lupus familiaris	F1
15	C12	173246	1		2	Cunniculus paca	molares
15	C12	173246	1		1	Cunniculus paca	incisivo
15	C12	173246	1		1	Ctenosaura sp.	mandíbula
15	C12	173246	1		1	Ctenosaura sp.	cráneo
15	C12	173246	1		2	Ctenosaura sp.	vértebras
15	C12	173246	1		1	Equus caballus	M1 inferior
15	C12	173246	1		1	Odocoileus virginianus	M2 superior
15	C12	173246	1		2	Odocoileus virginianus	molar indet.
15	C12	173246	1		1	Rhinoclemmys	placa caparazón
15	C12	173246	1		2	Testudines indet.	placa caparazón
15	C12	173246	1		5	Mamíferos indet.	hueso largo
15	C12	173246	1		1	Mamíferos indet.	hueso largo
15	C12	173246	1		1	Mamíferos indet.	hueso largo
15	C12	173246	1		1	Mamíferos indet.	hueso largo
15	C12	173246	1		2	Mamíferos indet.	hueso largo
15	C12	173246	1		1	Mamífero grande	escápula
15	C12	173246	1		9	Mamíferos indet.	hueso largo
15	C12	173246	1		3	Mamíferos indet.	costilla
15	C12	173246	1		3	Mamíferos indet.	hueso largo
15	C12	173246	1		1	Mamíferos indet.	ulna
15	C12	173246	1		1	Mamíferos indet.	carpal
15	C12	173246	1		1	Mamíferos indet.	hueso largo
15	C12	173246	1		2	cf. Dinocardum robustum?	valva
15	C12	173249	2		1	Odocoileus virginianus	M2 superior
15	C12	173249	2		1	Equus sp.	molar
15	C12	173249	2		11	Mamíferos indet.	huesos largos
15	C12	173249	2		4	Sin identificar	indeterminados
15	C12	173249	2		4	Mamíferos indet.	huesos largos
15	C12	173249	2		2	Trachemys sp.	placas caparazón
15	C12	173249	2		1	Dasypus novencimtus	F1

Op	Unit	Lot	Capa	Quad or Flote	NISP	Taxon	Elemento
15	C12	173251	2	NE quad	3	Mamífero indet.	hueso largo
15	C12	173251	2	NE quad	1	Mamífero indet.	hueso largo
15	C12	173251	2	NE quad	2	Mamífero indet.	hueso largo
15	C12	173251	2	NE quad	3	Mamífero indet.	costilla
15	C12	173251	2	NE quad	1	Mamífero indet.	cráneo
15	C12	173251	2	NE quad	1	Tayassuidae	incisivo inferior
15	C12	173251	3	NE quad	1	Ctenosaura sp.	articular/angular
15	C12	173251	3	NE quad	1	Ctenosaura sp.	palatino
15	C12	173251	3	NE quad	1	Dasypus novencimtus	placa dérmica
15	C12	173251	3	NE quad	2	Mamífero indet.	hueso largo
15	C12	173251	3	NE quad	1	Testudines indet.	placa caparazón
15	C12	173251	3	NW quad	1	Dasypus novencimtus	pelvis
15	C12	173251	3	NW quad	1	Dasypus novencimtus	placa dérmica
15	C12	173251	3	NW quad	1	Ctenosaura sp.	dentario
15	C12	173251	3	NW quad	4	Dasypus novencimtus	placas dérmicas
15	C12	173251	3	NW quad	1	Dasypus novencimtus	placas dérmicas
15	C12	173251	3	NW quad	1	Dasypus novencimtus	falange
15	C12	173251	3	NW quad	1	Cunniculus paca	bulla timpánica
15	C12	173251	3	NW quad	12	Mamíferos indet.	huesos largos
15	C12	173251	3	NW quad	1	Mamíferos indet.	costilla
15	C12	173251	3	NW quad	5	Mamíferos indet.	indeterminados
15	C12	173251	3	NW quad	3	Mamíferos indet.	cráneo
15	C12	173251	3	NW quad	2	Mamíferos indet.	hueso largo
15	C12	173251	3	NW quad	1	Mamíferos indet.	huesos largos
15	C12	173251	3	NW quad	1	Cunniculus paca	incisivo
15	C12	173251	3	NW quad	1	Trachemys cf. scripta	placa caparazón
15	C12	173251	3	SW quad	1	Odocoileus virginianus	F3
15	C12	173251	3	SW quad	1	Odocoileus virginianus	M1 superior
15	C12	173251	3	SW quad	1	Odocoileus virginianus	vértebra
15	C12	173251	3	SW quad	4	Mamíferos indet.	huesos largos
15	C12	173251	3	SW quad	9	Mamíferos indet.	huesos largos
15	C12	173251	3	SE quad	1	Canis lupus familiaris	húmero
15	C12	173251	3	SE quad	2	Mamíferos indet.	huesos largos
15	C12	173251	3	SE quad	1	Mamíferos indet.	vértebra caudal
15	C12	173251	3	SE quad	2	Dasypus novencimtus	placas dérmicas
15	C12	173251	3	SE quad	1	Reptilia	cráneo
15	C10	173254	1A		1	Cunniculus paca	incisivo

Op	Unit	Lot	Capa	Quad or Flote	NISP	Taxon	Elemento
15	C10	173254	1A		2	Cunniculus paca	cráneo
15	C10	173254	1A		1	Cunniculus paca	bulla timpánica
15	C10	173254	1A		4	Dasypus novencimtus	placas dérmicas
15	C10	173254	1A		1	Dasypus novencimtus	falange
15	C10	173254	1A		1	Dasypus novencimtus	ulna
15	C10	173254	1A		3	Mamífero indet.	costilla
15	C10	173254	1A		6	Mamífero indet.	hueso largo
15	C10	173254	1A		5	Mamífero indet.	hueso largo
15	C10	173254	1A		4	Mamífero indet.	hueso largo
15	C10	173254	1A		1	Mamífero indet.	hueso largo
15	C10	173254	1A		5	Mamífero indet.	indet.
15	C10	173254	1A		3	Testudines indet.	placas caparazón
15	C10	173254	1A		1	Boidae cf. Boa constrictor	vértebra
15	C12	173257	4		1	Tayassuidae	incisivo superior
15	C12	173257	4		1	Tayassuidae	costilla
15	C12	173257	4		4	Dasypus novencimtus	placas dérmicas
15	C12	173257	4		1	Trachemys scripta	placa marginal caparazòn
15	C12	173257	4		4	Mamífero	fragmento costilla
15	C12	173257	4		3	Mamífero	cráneo
15	C12	173257	4		6	Mamífero	fragm. Diáfisis
15	C12	173257	4		2	Mamífero	lascas calcinadas
15	C12	173257	4		1	Mamífero	lasca quemada
15	C10	173258	1B	SW quad	2	Odocoileus virginianus	tibia
15	C10	173258	1B	SW quad	5	Dasypus novencimtus	placas dérmicas
15	C10	173258	1B	SW quad	1	Dasypus novencimtus	vértebra
15	C10	173258	1B	SW quad	20	Mamíferos indet.	huesos largos
15	C10	173258	1B	NE quad	1	cf. Odocoileus virginianus	metatarso
15	C10	173258	1B	NE quad	1	cf. Odocoileus virginianus	escápula
15	C10	173258	1B	NE quad	7	Cervidae	huesos largos
15	C10	173258	1B	NE quad	1	Carnívoro indet.	mandíbula
15	C10	173258	1B	NE quad	1	Carnívoro indet.	cráneo
15	C10	173258	1B	NE quad	1	Carnívoro indet.	escápula
15	C10	173258	1B	NE quad	1	Odocoileus virginianus	cráneo/cuerno
15	C10	173258	1B	NE quad	9	Mamíferos indet.	huesos largos
15	C10	173258	1B	NE quad	1	Dasypus novencimtus	placas dérmicas
15	C10	173258	1B	NE quad	1	Dasypus novencimtus	ulna
15	C10	173258	1B	NE quad	3	Mamíferos indet.	huesos largos

Op	Unit	Lot	Capa	Quad or Flote	NISP	Taxon	Elemento
15	C10	173258	1B	NE quad	1	Dermatemys mawii	placa caparazón
15	C10	173258	1B	NE quad	3	Dermatemys mawii	plastron
15	C10	173258	1B	SE quad	1	Mamíferos indet.	hueso largo
15	C10	173258	1B	SE quad	2	Mamíferos indet.	hueso largo
15	C10	173258	1B	SE quad	1	Mamíferos indet.	hueso largo
15	C10	173258	1B	SE quad	2	Mamíferos indet.	hueso largo
15	C10	173258	1B	SE quad	5	Sin identificar	indet.
15	C10	173258	1B	SE quad	1	Molusco	indet
15	C10	173258	1B	SE quad	1	Aves indet.	indet.
15	C10	173258	1B	SE quad	2	Dasypus novemcinctus	placas dérmicas
15	C10	173258	1B	SE quad	2	Rodentia	ulnas
15	C10	173258	1B	NW quad	1	cf. Odocoileus virginianus	tibia
15	C10	173258	1B	NW quad	1	cf. Odocoileus virginianus	ulna
15	C10	173258	1B	NW quad	2	Mamíferos indet.	hueso largo
15	C10	173258	1B	NW quad	8	Mamíferos indet.	hueso largo
15	C10	173258	1B	NW quad	2	Dasypus novemcinctus	placas dérmicas
15	C10	173258	1B	NW quad	1	Cichlidae	vértebra precaudal
15	C10	173258	1B	#0208 (flote)	1	Cichlidae	vértebra
15	C10	173258	1B	#0208 (flote)	1	Cuniculus paca	molar
15	C10	173258	1B	#0208 (flote)	3	Dasypus novencimtus	placas dérmicas
15	C10	173258	1B	#0208 (flote)	1	Cynoscion sp.	vértebra caudal
15	C10	173258	1B	#0208 (flote)	1	Ariopsis felis	cleitro
15	C10	173258	1B	#0208 (flote)	9	Mamíferos indet.	indet.
15	C10	173258	1B	#0208 (flote)	1	Ariidae indet.	basioccipital
15	C10	173258	1B	#0208 (flote)	4	Sin identificar	indet.
15	C10	173258	1B	#0208 (flote)	2	Mamíferos indet.	huesos largos
15	C10	173258	1B	#0208 (flote)	2	Dasypus novemcinctus	placas dérmicas
15	C10	173258	1B	#0208 (flote)	15	Dasypus novemcinctus	placas dérmicas
15	C10	173258	1B	#0208 (flote)	1	Cynoscion sp.	vértebra
15	C10	173258	1B	#0208 (flote)	1	Muridae indet.	maxilar
15	C10	173258	1B	#0208 (flote)	1	Muridae indet.	maxilar
15	C10	173258	1B	#0208 (flote)	1	Muridae indet.	maxilar
15	C10	173258	1B	#0208 (flote)	1	Muridae indet.	pelvis
15	C10	173258	1B	#0208 (flote)	1	Muridae indet.	cráneo
15	C10	173258	1B	#0208 (flote)	1	Orthogeomys cf. hispidus	incisivo
15	C10	173258	1B	#0208 (flote)	1	Orthogeomys cf. hispidus	molar
15	C10	173258	1B	#0208 (flote)	1	Carnívoro indet.	falange

Op	Unit	Lot	Capa	Quad or Flote	NISP	Taxon	Elemento
15	C10	173258	1B	#0208 (flote)	1	Cichlidae	molar
15	C10	173258	1B	#0208 (flote)	1	Osteíctios indet.	radio aleta
15	C10	173258	1B	#0208 (flote)	40	Sin identificar	indet.
15	E5	173260	1A		45	Mamífero indet.	hueso largo
15	E5	173260	1A		33	Mamífero indet.	hueso largo
15	E5	173260	1A		31	Mamífero indet.	hueso largo
15	E5	173260	1A		8	Dasypus novencimtus	placas dérmicas
15	E5	173260	1A		4	Odocoileus virginianus	vértebra cervical
15	E5	173260	1A		1	Cunniculus paca	tibia
15	E5	173260	1A		3	Canis lupus cf. familiaris	F1
15	E5	173260	1A		1	Canis lupus cf. familiaris	falange vestigial
15	E5	173260	1A		2	Aves indet.	indet.
15	E5	173260	1A		5	Mamífero indet.	cráneo
15	E5	173260	1A		1	Mamífero indet.	vértebra
15	E5	173260	1A		5	Trachemys sp.	placa caparazón
15	E5	173260	1A		2	Testudines indet.	placa caparazón
15	E5	173260	1A		1	Mamíferos indet.	húmero
15	E5	173260	1A		1	Mamíferos indet.	hueso largo
15	E5	173260	1A		1	Meleagris sp.	tarso metatarso
15	G2	173262	1A		1	Odocoileus virginianus	escápula
15	G2	173262	1A		1	Odocoileus virginianus	calcáneo
15	G2	173262	1A		1	Odocoileus virginianus	metapodio
15	G2	173262	1A		1	Canis lupus familiaris	maxilar
15	G2	173262	1A		1	Canis lupus familiaris	costilla
15	G2	173262	1A		1	Tayassuidae	metapodio
15	G2	173262	1A		1	Dasypus novencimtus	húmero
15	G2	173262	1A		8	Dasypus novencimtus	placas dérmicas
15	G2	173262	1A		1	Odocoileus virginianus	tibia
15	G2	173262	1A		1	Mamífero pequeño indet.	hueso largo
15	G2	173262	1A		1	cf. Dermatemys mawii	placa caparazón
15	G2	173262	1A		55	Mamíferos indet.	hueso largo
15	G2	173262	1A		3	Mamíferos indet.	hueso largo
15	G2	173262	1A		2	Mamíferos indet.	cráneo
15	G2	173262	1A		13	Mamíferos indet.	hueso largo
15	G2	173262	1A		1	cf. *Kinosternon*	placa caparazón
15	E5	173263	1B	SE quad	25	Mamifero	lascas diafisis
15	E5	173263	1B	SE quad	5	Mamifero	lascasdiafisis

Op	Unit	Lot	Capa	Quad or Flote	NISP	Taxon	Elemento
15	E5	173263	1B	SE quad	1	Dasypus novencimtus	placa dermal
15	E5	173263	1B	SE quad	3	cervidae	diafisis
15	E5	173263	1B	SE quad	2	cervidae	espina neural vertebraa
15	E5	173263	1B	SE quad	1	Odocoileus virginianus	radio izquierdo
15	E5	173263	1B	NW quad	1	Odocoileus virginianus	F1
15	E5	173263	1B	NW quad	15	Mamíferos indet.	hueso largo
15	E5	173263	1B	NW quad	22	Mamíferos indet.	hueso largo
15	E5	173263	1B	NW quad	4	Mamíferos indet.	hueso largo
15	E5	173263	1B	NW quad	2	Dasypus novencimtus	placas dérmicas
15	E5	173263	1B	NW quad	1	Dasypus novencimtus	placas dérmicas
15	E5	173263	1B	NW quad	1	Dasypus novencimtus	vértebra caudal
15	E5	173263	1B	NW quad	1	Agutidae	molar
15	E5	173263	1B	NW quad	1	Aves indet.	indeterminados
15	E5	173263	1B	NW quad	1	Testudines indet.	placa caparazón
15	E5	173263	1B	NW quad	2	Trachemys sp.	placa caparazón
15	AE5	173263	1B	SW quad	21	Mamíferos indet.	huesos largos
15	EA5	173263	1B	SW quad	1	Cervidae	metapodio
15	E5A	173263	1B	SW quad	2	Cervidae	fémur
15	E5A	173263	1B	SW quad	11	Mamíferos indet.	huesos largos
15	E5A	173263	1B	SW quad	3	Dasypus novencimtus	placas dérmicas
15	E5A	173263	1B	SW quad	4	Mamíferos indet.	costilla
15	E5A	173263	1B	SW quad	2	Mamíferos indet.	huesos largos
15	E5A	173263	1B	NE quad	1	Mamífero grande	costilla
15	E5	173263	1B	NE quad	16	Mamíferos indet.	huesos largos
15	E5	173263	1B	NE quad	1	Cervidae	metapodio
15	E5	173263	1B	NE quad	3	Dasypus novencimtus	placas dérmicas
15	E5	173263	1B	NE quad	1	Testudines pequeño	marginal caparazón
15	E5	173263	1B	NE quad	1	Mamífero indet.	costilla
15	E5	173263	1B	NE quad	12	Mamífero indet.	huesos largos
15	E5	173263	1B	NE quad	1	Cervidae	metapodio
15	G2	173264	1B	NE quad	1	Canis lupus familiaris	astrágalo
15	G2	173264	1B	NE quad	1	Canis lupus familiaris	M1
15	G2	173264	1B	NE quad	1	Canis lupus familiaris	tibia
15	G2	173264	1B	NE quad	15	Mamífero indet.	hueso largo
15	G2	173264	1B	NE quad	1	Mamífero indet.	tibia
15	G2	173264	1B	NE quad	1	Mamífero indet.	vértebra
15	G2	173264	1B	NE quad	1	Mamífero indet.	cráneo

Op	Unit	Lot	Capa	Quad or Flote	NISP	Taxon	Elemento
15	G2	173264	1B	NE quad	5	Mamífero indet.	hueso largo
15	G2	173264	1B	NE quad	3	Dasypus novencimtus	placas dérmicas
15	G2	173264	1B	NE quad	1	Odocoileus virginianus	F3
15	G2	173264	1B	NW quad	3	Dasypus novemcinctus	placas dérmicas
15	G2	173264	1B	NW quad	1	Odocoileus virginianus	húmero
15	G2	173264	1B	NW quad	1	Odocoileus virginianus	rótula
15	G2	173264	1B	NW quad	8	Mamíferos indet.	hueso largo
15	G2	173264	1B	NW quad	1	Aves indet.	hueso largo
15	L16	173266	1A		23	Dasypus novencimtus	placas dérmicas
15	L16	173266	1A		1	Dasypus novencimtus	radio
15	L16	173266	1A		1	Odocoileus virginianus	radio
15	L16	173266	1A		2	Odocoileus virginianus	radio
15	L16	173266	1A		64	Mamíferos indet.	huesos largos
15	L16	173266	1A		7	Mamíferos indet.	huesos largos
15	L16	173266	1A		4	Mamíferos indet.	huesos largos
15	L16	173266	1A		1	Mamíferos indet.	huesos largos
15	L16	173266	1A		3	Mamíferos indet.	huesos largos
15	L16	173266	1A		4	Aves indet.	huesos largos
15	L16	173266	1A		8	Trachemys sp.	placas caparazón
15	L16	173266	1C		1	Dasypus novencimtus	F2
15	L16	173266	1C		1	Testudines indet.	marginal caparazón
15	L16	173272	1B	NW	6	Dasypus novencimtus	placas dérmicas
15	L16	173272	1B	NW	1	Dasypus novencimtus	vértebra caudal
15	L16	173272	1B	NW	1	Dasypus novencimtus	fémur
15	L16	173272	1B	NW	1	Odocoileus virginianus	fémur
15	L16	173272	1B	NW	2	Odocoileus virginianus	tibia
15	L16	173272	1B	NW	1	Carnívoro indet.	vértebra
15	L16	173272	1B	NW	15	Mamífero indet.	hueso largo
15	L16	173272	1B	NW	1	Mamífero indet.	costilla
15	L16	173272	1B	NE quad	1	Canis lupus familiaris	Canino superior
15	L16	173272	1B	NE quad	1	Cervidae	metapodio
15	L16	173272	1B	NE quad	2	Mamífero indet.	hueso largo
15	L16	173272	1B	SW quad	1	cf. Puma concolor	M3 superior
15	L16	173272	1B	SW quad	1	Dasypus novemcinctus	vértebra
15	L16	173272	1B	SW quad	14	Dasypus novemcinctus	placas dérmicas
15	L16	173272	1B	SW quad	2	Dasypus novemcinctus	placas dérmicas
15	L16	173272	1B	SW quad	1	Cunniculus paca	incisivo

Op	Unit	Lot	Capa	Quad or Flote	NISP	Taxon	Elemento
15	L16	173272	1B	SW quad	1	Dasypus novemcinctus	cráneo
15	L16	173272	1B	SW quad	2	Trachemys scripta	placas caparazón
15	L16	173272	1B	SW quad	3	Mamíferos indet.	hueso largo
15	L16	173272	1B	SW quad	19	Mamíferos indet.	hueso largo
15	E14	173283	1E	NE quad	5	Dasypus novemcinctus	placas dérmicas
15	E14	173283	1E	NE quad	3	Odocoileus virginianus	cráneo
15	E14	173283	1E	NE quad	6	Mamíferos indet.	hueso largo
15	C12	173251	3	South side	1	Ctenosaura sp.	vértebra
15	C12	173251	3	South side	1	Ctenosaura sp.	cráneo
15	C12	173251	3	South side	1	Sin identificar	indeterminados
15	F5	173261	1B	SW	3	Mamíferos indet.	lascas diáfisis
15	F5	173261	1B	SW	6	Sin identificar	indet.
15	F5	173261	1B	NW	2	Mamíferos indet.	lascas diafisis
15	O11	173252	2	NW	8	Mamíferos indet.	lascas diáfisis
15	O11	173255	2B	NW	5	Mamíferos indet.	lascas diáfisis
15	G15	173287	1D	SW quad	5	Aves indet.	diáfisis
15	G15	173287	1D	SW quad	2	Dasypus novemcinctus	placas dermales
15	G15	173287	1D	SW quad	1	Dasypus novemcinctus	placas dermales
15	G15	173287	1D	SW quad	1	Mamífero indet.	fragmento indet.
15	G15	173287	1D	SW quad	10	Mamífero indet.	diáfisis
15	G15	173287	1D	SW quad	1	Odocoileus virginianus	M3
15	G15	173287	1D	NW qd	8	Aves indet.	diáfisis
15	G15	173287	1D	NW qd	1	Canis sp.	1er molar
15	G15	173287	1D	NW qd	1	Canis sp.	Ulna
15	G15	173287	1D	NW qd	1	Canis sp.	canino
15	G15	173287	1D	NW qd	4	Dasypus novemcinctus	placas dermales
15	G15	173287	1D	NW qd	5	Kinosternon sp.	fragmentos de caparazon
15	G15	173287	1D	NW qd	13	Mammal indet.	diáfisis
15	G15	173287	1D	NW qd	10	Mammal indet.	diafisis
15	G15	173287	1D	NW qd	4	Mammal indet.	diáfsis
15	G15	173287	1D	NW qd	1	Mammal indet.	carpal indet.
15	G15	173287	1D	NW qd	1	Odocoileus virginianus	Calcáneo
15	G15	173287	1D	NW qd	1	Odocoileus virginianus	femur
15	G15	173287	1D	Se qd	2	Aves big	húmero
15	G15	173287	1D	Se qd	3	Aves big	hueso largo
15	G15	173287	1D	Se qd	1	Canis sp.	1er molar, superior
15	G15	173287	1D	Se qd	1	Canis sp.	3er incisivi inferior

Op	Unit	Lot	Capa	Quad or Flote	NISP	Taxon	Elemento
15	G15	173287	1D	Se qd	14	Dasypus novemcinctus	placas dermales
15	G15	173287	1D	Se qd	1	Dasypus novemcinctus	vértebra caudal
15	G15	173287	1D	Se qd	26	Mammal indet.	hueso tibular
15	G15	173287	1D	Se qd	1	Mammal indet.	tibia
15	G15	173287	1D	Se qd	2	Mammal indet.	fragmentos de cráneo
15	G15	173287	1D	Se qd	6	Mammal indet.	hueso laminar indet.
15	G15	173287	1D	Se qd	5	Mammal indet.	hueso largo
15	G15	173287	1D	Se qd	1	Odocoileus virginianus	fémur
15	G15	173287	1D	Se qd	1	Pecari tajacu	2do molar, inferior
15	G15	173287	1D	Se qd	1	Tayassu pecari	3er molar inferior
15	G15	173287	1D	Se qd	1	Tayassuidae indet.	frontal
15	G15	173285	1C	NE qd	1	Aves indet.	tarsometarso
15	G15	173285	1C	NE qd	5	Aves indet.	diáfisis
15	G15	173285	1C	NE qd	1	Canidae indet.	ulna
15	G15	173285	1C	NE qd	1	Cervidae indet.	húmero
15	G15	173285	1C	NE qd	1	Cervidae indet.	escápula
15	G15	173285	1C	NE qd	1	Cuniculus paca	incisivo
15	G15	173285	1C	NE qd	1	Cuniculus paca	incisivo
15	G15	173285	1C	NE qd	3	Dasypus novemcinctus	placas dermales
15	G15	173285	1C	NE qd	10	Mammal indet.	diáfisis
15	G15	173285	1C	NE qd	1	Mammal indet.	diáfisis
15	G15	173285	1C	NE qd	1	Sylvilagus floridanus	fémur
15	G15	173281	1B	NE quad	12	Dasypus novemcinctus	placas dermales
15	G15	173281	1B	NE quad	2	Mammal indet.	diáfisis
15	G15	173281	1B	NE quad	18	Mammal indet.	diáfisis
15	G15	173281	1B	NE quad	1	Sparidae indet.	fragm. Dentario
15	G15	173288	2	SW	2	Mammal small	diáfisis
15	C11	173243	2A		2	Aves big	fragmentos de costilla
15	C11	173243	2A		1	Cichlidae indet.	urostilo
15	C11	173243	2A		1	Cricetidae indet.	mandíbula
15	C11	173243	2A		9	Dasypus novemcinctus	placas dermales
15	C11	173243	2A		11	Mammal medium	fragmentos de hueso largo
15	C11	173243	2A		1	Mammal small	fragmento de escápula
15	C11	173243	2A		1	Mammal small	fragmento de costilla
15	C11	173243	2A		1	Mammal small	epifisis dital radio
15	C11	173243	2A		1	Mammal small	fragmento carpal indet
15	C11	173243	2A		2	Mammal small	fragmento hueso largo

Op	Unit	Lot	Capa	Quad or Flote	NISP	Taxon	Elemento
15	C11	173243	2A		3	Mammal small	fragmentos de cráneo
15	C11	173243	2A		1	Mammal small	carpal
15	C11	173243	2A		1	Odocoileus virginianus	2 molar superior
15	C11	173243	2A		1	Odocoileus virginianus	3er molar sup
15	C11	173243	2A		2	Teleósteos indet.	fragmento de hueso laminar
15	C11	173243	2A		1	Testudines indet.	fragmento de plastron indet.
15	C11	173227	1B	NE of wall 2	3	Aves indet.	fragmentos de hueso largo
15	C11	173227	1B	NE of wall 2	2	Cervidae indet.	molar
15	C11	173227	1B	NE of wall 2	1	Cervidae indet.	metapodio
15	C11	173227	1B	NE of wall 2	1	Cuniculus paca	incisivo inferior
15	C11	173227	1B	NE of wall 2	1	Cuniculus paca	incisivo superior
15	C11	173227	1B	NE of wall 2	1	Cuniculus paca	4to (ultimo) molar
15	C11	173227	1B	NE of wall 2	1	Cuniculus paca	bula timpánica
15	C11	173227	1B	NE of wall 2	7	Dasypus novemcinctus	placas dermales
15	C11	173227	1B	NE of wall 2	1	Dasypus novemcinctus	placa dermal
15	C11	173227	1B	NE of wall 2	1	Dasypus novemcinctus	fibula
15	C11	173237	1B	NE of wall 2	1	Kinosternon sp.	humero derecho
15	C11	173237	1B	NE of wall 2	1	Mammal indet.	pelvis
15	C11	173227	1B	NE of wall 2	1	Mammal indet.	metapodio
15	C11	173227	1B	NE of wall 2	24	Mammal indet.	hueso largo
15	C11	173227	1B	NE of wall 2	28	Mammal indet.	hueso largo
15	C11	173227	1B	NE of wall 2	5	Mammal indet.	fragmento cráneo
15	C11	173237	1B	NE of wall 2	1	Meleagris sp.	fémur
15	C11	173237	1B	NE of wall 2	1	Rhinoclemmys areolata	marginal caparazón
15	C11	173237	1B	NE of wall 2	1	Rhinoclemmys areolata	costal caparazón
15	C11	173237	1B	NE of wall 2	1	Serpentes indet.	vertebra caudal
15	C11	173227	1B	NE of wall 2	1	Tayassuidae indet.	astrágalo
15	C11	173227	1B	NE of wall 2	1	Tayassuidae indet.	tibia
15	C11	173237	1B	NE of wall 2	1	Terrapene carolina	marginal caparazón
15	C11	173238	Feat 1		4	Cervidae indet.	fragmentos de molares
15	C11	173238	Feat 1		1	Cervidae indet.	metapodio
15	C11	173238	Feat 1		1	Cervidae indet.	metapodio
15	C11	173238	Feat 1		1	Dasypus novemcinctus	ulna
15	C11	173238	Feat 1		3	Dasypus novemcinctus	placas dermales
15	C11	173838	Feat 1		1	Kinosternon sp.	marginal caparazón
15	C11	173238	Feat 1		28	Mammal indet.	fragmentos no identificados
15	C11	173238	Feat 1		1	Orthogeomys hispidus	húmero

Op	Unit	Lot	Capa	Quad or Flote	NISP	Taxon	Elemento
15	C11	173227	1B	SW of align	4	Aves indet.	fragmentos de hueso largo
15	C11	173227	1B	SW of align	5	Dasypus novemcinctus	placas dermales
15	C11	173227	1B	SW of align	1	Mammal indet.	tercera falange
15	C11	173227	1B	SW of align	1	Mammal indet.	fragmento de hueso largo
15	C11	173227	1B	SW of align	8	Mammal medium	fragmentos de hueso largo
15	C11	173227	1B	SW of align	3	Mammal medium	fragmentos de hueso largo
15	C11	173227	1B	SW of align	4	Mammal medium	fragmentos de cráneo indet.
15	C11	173227	1B	SW of align	2	Mammal medium	faceta articular de escápulas
15	C11	173227	1B	SW of align	2	Mammal medium	hueso laminal indet.
15	C11	173227	1B	SW of align	2	Terrapene carolina	marginal caparazón
15	C11	173227	1B	SW of align	4	Testudines indet.	frahemtos de plastron
15	G15	173285	1C	SW	7	Aves indet.	diáfisis
15	G15	173285	1C	SW	1	Dasypus novemcinctus	ulna
15	G15	173285	1C	SW	3	Dasypus novemcinctus	placas dermales
15	G15	173285	1C	SW	10	Mammal indet.	diáfisis indet.
15	G15	173285	1C	SW	1	Mammal indet.	fémur
15	G15	173285	1C	SW	1	Odocoileus virginianus	fémur
15	G15	173285	1C	SW	1	Odocoileus virginianus	tibia
15	G15	173285	1C	SW	1	Odocoileus virginianus	escápula
15	G15	173285	1C	SW	1	Serpentes indet.	vértebra
15	G15	173285	1C	SW	1	Tayassuidae indet.	dp4
15	C11	173212	1A		3	Agoutidae indet.	fragmentos de incisivos
15	C11	173212	1A		1	Aves big	costilla fragmento
15	C11	173212	1A		1	Aves medium	húmero izquierdo
15	C11	173212	1A		2	Aves medium	fragmentos de hueso largo
15	C11	173212	1A		1	Cervidae indet.	fragmento de molar indet.
15	C11	173212	1A		5	Cuniculus paca	fragmentos de esplacnocráneo
15	C11	173212	1A		1	Cuniculus paca	bulla timpánica
15	C11	173212	1A		12	Dasypus novemcinctus	placas dermales
15	C11	173212	1A		1	Dasypus novemcinctus	placa dermal
15	C11	173212	1A		1	Galliforme indet.	espolon tarso
15	C11	173212	1A		1	Kinosternon sp.	costal caparazón
15	C11	173212	1A		3	Kinosternon sp.	marginal caparazón
15	C11	173212	1A		1	Mammal big	fragmento de hueso largo
15	C11	173212	1A		25	Mammal indet.	fragmentos no identificados.
15	C11	173212	1A		1	Mammal indet.	hueso largo
15	C11	173212	1A		1	Mammal small	cabeza femoral

Op	Unit	Lot	Capa	Quad or Flote	NISP	Taxon	Elemento
15	C11	173212	1A		45	Mammal small	costilla fragmento
15	C11	173212	1A		38	Mammal small	lascas de hueso largo
15	C11	173212	1A		5	Mammal small	fragmentos de cráneo
15	C11	173212	1A		11	Mammal small	fragmentos de hueso largo
15	C11	173212	1A		1	Mazama sp.	metapodio (epifisis distal)
15	C11	173212	1A		1	Pecari tajacu	3 molar de la mandíbula
15	C11	173212	1A		1	Pecari tajacu	incisivo cetral
15	C11	173212	1A		2	Testudines indet.	costal caparazón
15	G15	173285	1C	NW qd	1	Dasypus novemcinctus	vértebra troncal
15	G15	173285	1C	NW qd	3	Dasypus novemcinctus	placas dermales
15	G15	173285	1C	NW qd	22	Mammal indet.	hueso largo
15	G15	173285	1C	NW qd	1	Odocoileus virginianus	astrágalo
15	G15	173285	1C	NW qd	1	Odocoileus virginianus	fémur
15	G15	173285	1C	NW qd	9	Odocoileus virginianus	hueso largo
15	G15	173285	1C	NW qd	1	Odocoileus virginianus	hueso largo
15	G15	173285	1C	NW qd	1	Orthogeomys hispidus	húmero
15	G15	173285	1C	NW qd	1	Orthogeomys hispidus	escápula
15	G15	173277	1A		5	Dasypus novemcinctus	placas dermales
15	G15	173277	1A		1	Dasypus novemcinctus	placas dermales
15	G15	173277	1A		4	Kinosternon sp.	fragmentos de caparazon
15	G15	173277	1A		9	Mammal indet.	diáfisis
15	G15	173277	1A		23	Mammal indet.	diáfisis
15	G15	173285	1C	Se qd	3	Dasypus novemcinctus	placas dermales
15	G15	173285	1C	Se qd	1	Dasypus novemcinctus	tibia
15	G15	173285	1C	Se qd	5	Mammal big	fragmentos diafisis hueso largo
15	G15	173285	1C	Se qd	7	Mammal indet.	fragmentos pequeño diafisis
15	G15	173285	1C	Se qd	1	Mazama pandora	astrágalo
15	G15	173285	1C	Se qd	1	Pecari tajacu	mandíbula
15	G15	173281	1B	NW quad	1	Dasypus novemcinctus	tibia
15	G15	173281	1B	NW quad	1	Dasypus novemcinctus	placa dermal
15	G15	173281	1B	NW quad	1	Mammal indet.	diáfisis
15	G15	173281	1B	NW quad	2	Mammal indet.	diáfisis
15	G15	173281	1B	NW quad	1	Mammal small	costilla
15	G15	173281	1B	NW quad	1	Odocoileus virginianus	escápula
15	G15	173281	1B	NW quad	1	Sylvilagus floridanus	fémur
15	G15	173281	1B	NW quad	1	Tayassuidae indet.	tibia
15	G15	173281	1B	SW quad	2	Aves indet.	fragmentos diafisis hueso largo

Op	Unit	Lot	Capa	Quad or Flote	NISP	Taxon	Elemento
15	G15	173281	1B	SW quad	1	Dasypus novemcinctus	vértera
15	G15	173281	1B	SW quad	1	Dasypus novemcinctus	tibia
15	G15	173281	1B	SW quad	2	Mammal indet.	diáfisis fragmentos
15	G15	173281	1B	SW quad	5	Mammal indet.	diáfisis
15	G15	173281	1B	SW quad	1	Odocoileus virginianus	Pm2 sup
15	c11	173235	1C	west side area	1	Agoutidae indet.	incisivo cetral
15	c11	173235	1C	west side area	3	Dasypus novemcinctus	placa dermal
15	G15	173281	1B	Se qd	2	Cuniculus paca	bulla timpánica
15	G15	173281	1B	Se qd	1	Dasypus novemcinctus	placa dermal
15	G15	173281	1B	Se qd	1	Dasypus novemcinctus	placa dermal
15	G15	173281	1B	Se qd	12	Mammal indet.	diáfisis
15	G15	173281	1B	Se qd	1	Mammal indet.	diáfisis
15	G15	173281	1B	Se qd	1	Serpentes indet.	vertebra
15	G15	173287	1D	NE qd	4	Ave grande	diáfisis
15	G15	173287	1D	NE qd	1	Ave pequeña	coracoide
15	G15	173287	1D	NE qd	2	Ave pequeña	coracoide
15	G15	173287	1D	NE qd	1	Dasypus novemcinctus	ulna
15	G15	173287	1D	NE qd	12	Dasypus novemcinctus	placas dermales
15	G15	173287	1D	NE qd	37	Mammal indet.	diáfisis
15	G15	173287	1D	NE qd	1	Mammal medium	diafisis
15	G15	173287	1D	NE qd	1	Mammal small	diáfisis
15	G15	173287	1D	NE qd	1	Odocoileus virginianus	tibia
15	G15	173287	1D	NE qd	2	Odocoileus virginianus	hueso largo
15	G15	173287	1D	NE qd	1	Odocoileus virginianus	palatino
15	G15	173287	1D	NE qd	1	Odocoileus virginianus	PM1 sup
15	G15	173287	1D	NE qd	3	Testudines indet.	fragmentos caparazon
15	C11	173235	1B	East side area	4	Aves indet.	fragmentos de hueso largo
15	C11	173235	1B	East side area	1	Cervidae indet.	faceta vertebra
15	C11	173235	1B	East side area	1	Cervidae indet.	fragmento de molar indet.
15	C11	173235	1B	East side area	1	Cervidae indet.	fémur (epifisis proximal no fusionada)
15	C11	173235	1B	East side area	4	Dasypus novemcinctus	placas dermales
15	C11	173235	1B	East side area	1	Dasypus novemcinctus	placa dermal
15	C11	173235	1B	East side area	1	Galliforme indet.	garra
15	C11	173235	1B	East side area	6	Mammal indet.	lascas de hueso largo
15	C11	173235	1B	East side area	2	Mammal indet.	fragmentos de hueso laminar

APPENDIX J: POLLEN REPORT, BY JOHN G. JONES

Analysis of Pollen Samples from Yucatan

John G. Jones, Ph.D.

Archaeological Consulting Services, Ltd.

Pollen samples were collected from a series of sediment profiles from *rejolladas* or wetland depressions near the site of Tahcabo in the northern state of Yucatan in Mexico. These profile sequences are thought to represent deposits dating from modern through late Classic/post Classic times, and it was anticipated that these pollen sequences would provide information on past environmental conditions, human activity in the site area, and insights into local agricultural efforts including evidence of past plants cultivated in the region. Table 1 provides a listing of proveniences for all samples examined in this study.

Table 1. Pollen Proveniences from The Yucatan *Rejollada* Samples.

Lab #	Sample #	Lot #	Operation	Capa/Increment	Depth BS*
1	1	163002	1	2A	3-15cms
2	3	163004	1	2C	30-45cms
3	4	163005	1	2D	57-62cms
4	8	163010	1	3D	140-145cms
5	13	163016	2	2B	15-35cms
6	14	163017	2	2C	35-55cms
7	22	163025	3	1A	0-15cms
8	23	163026	3	2A	15-30cms
9	24	163027	3	2B	30-50cms
10	25	163028	3	3A	55-75cms

*BS = below surface.

Research Orientation

Pollen analyses are often related to questions of paleoenvironment, subsistence and other aspects of human/environmental interaction. Thus, the collection of the *rejollada* sequence samples from a series of former or seasonal wetland feature profiles was oriented toward collecting stratigraphically contiguous and discrete sediments, affording the opportunity to examine the data in a graphic format. By monitoring changes in identified pollen taxa, corresponding changes in prehistoric activities can be documented.

Archaeological sediment samples can provide a wealth of information on regional and local vegetation, agricultural efforts, human/plant interactions and specific events as they relate to conditions affecting site formation, use, and abandonment. Interpretations based on sediments of this nature, however, have some important limitations. The pollen encountered in archaeological samples may not be in primary context, but rather may have been carried into the sampling area by wind or water action, thus giving a broad picture of past background vegetation. The usual limitations on pollen production, dispersion, and preservation apply to these samples; for instance some taxa will be over-represented because they are produced in large numbers or are particularly durable.

Ecology, Ethnobotany, and Taphonomy of Important Resources

Ethnographic accounts document procurement strategies, agricultural practices, and economic uses for both collected and cultivated plant taxa. These accounts help paleoethnobotanists conceptualize how prehistoric groups may have utilized such resources in the past. Ethnographic accounts are of particular value in documenting the range of potential uses for various plants, including food, fuel, building materials, and medicine. It must be kept in mind, however, that ethnographic plant uses are not necessarily identical to prehistoric plant uses, and ethnographic analogy must be applied with caution.

Domesticates are obviously important resources, and the significance of the New World triad of corn, beans, and squash to Central American agriculturalists has long been understood (see also Doolittle 2000:141-145; Mood 1937). Native arboreal resources were also of considerable importance in the Yucatan area. In addition to maize, cotton and squash were likely to have been important prehistoric resources whose importance continued into the historic period. Plants of potential economic importance recovered from the pollen analyses are described below, while a listing of all pollen taxa observed is provided in Table 2.

Table 2. Pollen Taxa Identified in the Tahcabo Sediment Samples.

Taxon	Common Name
Agave	Henequen
Alismaceae	Pickerelweed family
Alternanthera	Strawflower
Asteraceae low-spine	Ragweed type
Asteraceae high-spine	Sunflower type
Borreria	False buttonweed
Cheno-Am	Goosefoot, pigweed
Cyperaceae	Sedge family
Euphorbiaceae	Spurge family
Fabaceae	Legume family
Gossypium	Cotton
Malvaceae	Mallow family
Poaceae	Grass family
Polygonaceae	Knotweed family
Typha	Cattail
Zea mays	Maize
Acacia	Acacia
Alchornea	Tapia
Alnus	Alder
Anacardiaceae	Cashew family
Apocynaceae	Dogbane family
Bursera	Gumbolimbo
Cecropia	Trumpet
Cedrela	Spanish cedar
Celtis	Hackberry
Coccoloba	Bob, Sea grape
Combretaceae	White mangrove family
Haematoxylum	Logwood
Hippocratea	Provision vine
Hiraea	Hiraea
Loranthaceae	Mistletoe family
Moraceae	Ramon, breadnut
Myrtaceae small	cf *Eugenia*, stopper vine
Pinus	Pine
Pithecellobium-type	Blackbead, monkeyear
Quercus	Oak
Salix	Willow
Sapotaceae	Sapote family
Spondias	Hogplum, ciruela
Rhizophoraceae	Red mangrove family
Zanthoxylum	Prickly ash
Indeterminate	Too poorly preserved to identify

Domesticates

Maize

Maize (*Zea mays*) has long been recognized as a staple in the diet of the Olmec, Maya, and all other cultures in the Yucatan Peninsula. Cultivated at least since 5200 BC (Pope et al. 2001), maize was thought to have formed a major part of the diet of the peoples of the region, and is still widely cultivated in the area. The dietary importance, in combination with the structure of the maize rachis ("cob") and the common practice of roasting/parching as a means of preparation, has often lead maize to be an abundant domesticate at archaeological sites (Gasser and Kwiatkowski 1991). Through the process of domestication, the pollen grains of maize have become enlarged, possessing distinctive micromorphological features, and thus allowing for the positive identification of this important cultigen. Further, phytoliths produced in the leaves, stems, and fruit of maize are also distinctive, making this plant among the most recognizable cultigens.

Maize processing began with roasting unhusked ears, burning much of the husk away. Various drying and storage procedures would then preserve the ears for later use. Depending upon the variety, sometimes ears were completely husked prior to storage. Sometimes shelled kernels were ground into meal and stored that way. Other times the kernels themselves or the whole cob was stored. The variety or race of maize would factor into preparation and storage procedures. The hard endosperm of flint maize (*Z. mays* var *indurata*), for example, facilitates storage but is better prepared by boiling, while the soft starchy kernel of flour maize (*Z. mays* var. *amylacea*) is more prone to insect and rodent predation, but facilitates grinding. Stalks and leaves were also valuable to the ancient farmers, as these could be dried and used for fuel or matting at nearly any time during the growing season. Stray kernels removed during shelling and grinding were probably swept into hearths or deposited in middens. Cooking accidents could also result in kernels or cobs being deposited in middens and hearths. Dried cobs were also used as fuel, resulting in the destruction of many but possible carbonization and preservation of a few.

Various characteristics of *Zea* pollen grains allow them to be differentiated from other grass grains. Often size alone is sufficient to allow for its identification, as *Zea* pollen is usually larger than that of other grasses. Their large size also precludes their remaining effectively airborne, and most maize pollen is deposited either on the source plant itself or within a meter of the plant (Raynor et al. 1972). Therefore, an elevated frequency of maize pollen removed from agricultural field areas implies introduction (transport) and processing of mature ears. Analysis of soil surface samples, on the other hand, indicates that maize pollen percentages can be as low as, or lower than, two percent in modern maize fields. Consequently, even low percentages of maize pollen in inter-site areas may document the presence of a former maize field.

Pollen is removed progressively with maize processing. For example, higher frequencies of pollen are expected on fresh, unhusked ears with some tassel remaining. Maize stored in this form should also leave pollen aggregates. After roasting, shelling, and processing, little pollen may remain with the fruit (Smith and Geib 1999). On the other hand, processing, feasting, and communal rituals—maize pollen is ethnographically known to have played a ritual role amongst, for example, the Navajo (Elmore 1944)—could potentially spread pollen grains throughout a series of synchronic deposits.

Gossypium

Cotton (*Gossypium hirsutum*) pollen is generally scarce in archaeological deposits for several reasons. First, the grains are produced in low numbers and are poorly dispersed, relying upon insects for transport from one flower to another. Further, the plant part harvested for use by prehistoric populations, the fiber-bearing “boll” or seed pod, was collected in the field and then removed to the site area for further processing into thread and cloth. Its characteristic seeds are often found carbonized, as they were used for food, but the pollen would have remained in the field area with the plant’s flowers. Fortunately, cotton pollen is moderately durable and highly distinctive, making it identifiable if pollen preservation conditions are favorable.

Agave

Agave fourcroydes (henequen) is a sterile hybrid agave widely cultivated throughout the Yucatan Peninsula, where its fibers are used for cordage, and its heart is used in the manufacture of an alcoholic beverage (Gentry 1982). Agaves are insect pollinated and consequently produce little pollen, thus agave pollen is usually rare in pollen assemblages.

Agricultural and Disturbance Weeds

Field Weeds

Several pollen types were identified that represent what were likely to have been weeds associated with settlement or agricultural efforts, including members of the Asteraceae, Cheno-Am, and Poaceae families.

Asteraceae

The Aster family (Asteraceae; formerly Compositae), the largest family of flowering plants, consists of numerous herbs, ornamental flowers, and a few shrubs in the Yucatan Peninsula. Most of these plants are encountered in open field or meadow areas, and serve to identify ancient agricultural fields when identified in archaeological sediments.

Palynologically in North America, most members of the Asteraceae can be placed into one of two large groups, the low-spine Asteraceae (into which most researchers group ragweed/*Franseria* pollen) and the high-spine Asteraceae. Members of the former group are generally of limited ethnobotanical value, but are more commonly observed palynologically as they are primarily anemophilous (Solomon and Hayes 1972). Members of the high-spine group are predominately zoophilous (Solomon and Hayes 1972) and less frequently (albeit still commonly) observed palynologically, but include ethnobotanically important taxa such as sunflower (*Helianthus*) and *Wedelia* (Xtau ulum; snake weed). Other types of Asteraceae pollen can also be identified, including wormwood-type (*Artemisia*), dandelion-type (Liguliflorae), and thistle-type (*Cirsium*). Other pollen categories and classification schemes within this family exist for different regions of the world.

Collectively, Asteraceae pollen grains tend to be over-represented in archaeological assemblages for several reasons. First, the plants are genuinely abundant on the landscape, particularly in disturbed and open areas. Second, wind-pollinated forms produce copious quantities of readily dispersed pollen. Further, these grains are usually very durable, persisting in fossil sediments when many other pollen types have been lost to degradation. Finally, these pollen grains, like Cheno-Ams, are readily recognizable even when highly degraded. As Asteraceae pollen grains are common constituents of the pollen rain, discerning prehistoric use (expressed by very high percentages, concentrations, or the presence of many large aggregates) often is difficult, though forests effectively filter out most windborne Asteraceae grains; thus, their presence usually signals local disturbance/agriculture. Given the context of the samples, Asteraceae pollen within the current assemblage likely reflects nearby settlements or agricultural clearing.

Cheno-Ams

The term Cheno-Am refers to a morphologically similar group of pollen grains of the Chenopodiaceae family and *Amaranthus* genus. This group includes a broad range of plants including those used as food, such as amaranth (*Amaranthus* spp.) and goosefoot (*Chenopodium*), as well as a variety of weedy herbaceous plants encouraged by soil disturbance and the sort of salt enrichment common to both cultivated fields and domestic habitation areas (Cummings 1990; Fish 1994). Though attempts have been made palynologically to separate grain amaranths from other Cheno-Ams (e.g. González Quintero 1986), such attempts have not been reliably replicated. Because these plants are widespread, wind pollinated, and produce abundant pollen, grains are generally widely dispersed. Further, these grains are notably durable and can readily be recognized even when highly degraded, leading to their usual over-representation in pollen samples. Thus, whether high percentages of Cheno-Am pollen reflect *Chenopodium*-dominated vegetation, human disturbance, cultivation, or food preparation is often unclear. *Alternanthera* (straw flower) is another uncommon member of the Amaranthaceae family, represented in the samples by a few grains. Pollen from *Althernanthera* is insect-pollinated; thus, it is much less commonly encountered in most archaeological assemblages.

Grasses

Grass (Poaceae, formerly Gramineae) pollen is common in most samples from disturbed environments, reflecting both their natural abundance and resource use, though grass pollen is rare in a forested setting. Most grass pollen reflects naturally occurring species favoring naturally open or artificially cleared areas, including agricultural fields and site settings. While most grasses are edible, there is little evidence the ancient Maya utilized grasses for food. All grasses are wind pollinated and produce copious amounts of distinctive pollen; thus, these grains sometimes make up a significant proportion of pollen assemblages. However, the morphology of grass pollen does not allow for identification below the family level, with the exception of cultivated Old World grains (Cerealea, including wheat [*Triticum*], barley [*Hordeum*], rye [*Secale*], oats [*Avena*]), and corn or maize (*Zea mays*). The domestication process has led to a significant enlargement of the pollen grains in these genera. In the case of maize, a New World domesticated Panicoid grass, unique micro-morphological features of the pollen grain allow for a positive specific identification of this important plant. Pollen between 40 and 60 microns in size includes some wild grasses, such as maize's wild relative teosinte and *Tripsacum*, as well as Old World cereal grains.

Disturbance associated with habitations and cultivated fields results in increased amounts of several additional weedy taxa. Pollen grains from *Borreria*, Euphorbiaceae, Fabaceae, Malvaceae, and Polygonaceae may represent disturbance types, though each of these groups has representatives that could also represent native forest taxa.

Wetland Taxa

Alismaceae

Pollen from the pickerelweed family is occasionally found in sediment samples from Yucatan. These plants favor permanent wetlands, slow-moving channels, and marshes. Grains found in the *rejollada* samples probably represent *Sagittaria* (arrowroot), a common marsh weed with edible tubers; thus, these grains may well signal the cultivation or utilization of this important plant.

Cattail

Cattail (*Typha*) is an aggressive taxon favoring phosphate-rich wetlands and marshes. Most parts of the plant, including the pollen, are edible (see Gibbons 1962) and in North America, various portions of the plant were eaten raw, made into soups or porridge, formed into cakes, or dried for future use (e.g. Curtin 1984; Rea 1997:108); there is scant evidence that cattails were much utilized in the Maya world.

Pollen from cattail can usually be identified to the species or sub-generic level in North and Central American samples, based on the occurrence as a single grain (*Typha angustifolia* [narrowleaf cattail] or *T. dominguensis* [southern cattail]) or as a tetrad (*Typha latifolia* [broadleaf cattail]). These grains are readily recognizable and are transported by the wind over long distances, but the grains are moderately fragile; thus, they tend to be found only in sediments containing well-preserved pollen.

Arboreal Types

Arboreal pollen types have been broken down into categories based on their preferred habitats, namely swamp forest taxa, upland forest taxa, long-distance or extra-local taxa, and other miscellaneous types.

Swamp Forest Types

Plants of the swamp forests prefer to have their roots at or near the water table. Members of this forest association include *Bursera* (gumbolimbo), *Coccoloba* (bob, sea grape), Combretaceae (probably *Bucida* [pucte, bullet tree]), *Haematoxylum* (logwood), *Salix* (willow), Rhizophoraceae (*Rhizophora* [red mangrove], *Cassipourea* [waterwood]), and water-loving ferns including *Acrostichum* (leather fern), and *Salvinia* (watermoss). Some of these taxa can also occur in upland forest settings; thus, their pollen grains are not necessarily an assurance of a swamp forest setting. Several species of *Coccoloba* produce panicles of edible fruit, while the liquid in gumbolimbo's cambium has been used as an antidote to toxins found in poisonwood (*Metopium*[chechem]), another swamp forest tree (Standley and Record 1936).

Upland Types

Pollen thought to represent upland forests include Anacardiaceae (cashew family), Apocynaceae (dogbane family), *Cecropia* (trumpet, guarumo), *Cedrela* (cedar), *Celtis* (hackberry), Moraceae (probable all representing *Brosimum alicastrum* [breadnut]), Myrtaceae (guava, allspice, *Eugenia*), Sapotaceae (sapote, chicle, star apple), *Spondias* (hogplum, ciruela), and *Zanthoxylum* (prickly ash). While hundreds of arboreal or shrub species can be found in this environment, most are strictly insect pollinated; thus, these trees are usually under-represented in the pollen record. Wind pollinated types identified in the *rejollada* samples include *Cecropia*, Moraceae, and Myrtaceae (in part). Members of the Fabaceae family representing upland trees include *Acacia* and *Pithecellobium* types.

Long-Distance Taxa

Pollen representing taxa of a non-local origin likely includes *Pinus* (pine), *Quercus* (oak), and *Alnus* (alder). All of these taxa can be found in low numbers within a few miles of the *rejolladas*; however, their preferred habitats are mostly in the higher Puuc Hills, and in the Guatemala and Belize highlands where these taxa form dense stands. As their grains can readily travel hundreds of miles, a distant highland source is likely for these grains.

Other Types

Several pollen types were identified in the samples whose geographic origin is more problematic, including the small tree *Alchornea*, two lianas or vines including *Hippocratea* (provisionvine) and *Hirea*, and pollen from the mistletoe family (Loranthaceae). These plants are commonly encountered in a number of environments including swamp forests, upland forests, forest margins, and overgrown gardens.

Pollen Analysis

The foundation of palynological analysis lies in the observation that proportions of various pollen types contained within a sediment sample vary proportionally with the increasing or decreasing abundance of the source plants in the surrounding area, and with the relative proximity of those plants to the sampling locus. However, the relationship between plant and pollen is not straightforward. Certainly, one pollen grain cannot be equated to one plant since different species produce vastly different amounts of pollen. Anemophilous (wind pollinated) plants produce the most pollen, typically between 10,000 and 70,000 pollen grains per anther (Bryant and Holloway 1983). Zoophilous plants generally produce far fewer pollen grains, and rely on some animal (bats, birds) or insect (for example bees, moths, butterflies, flies) to transport the pollen from the anther of one flower to the stigma of another. An evolutionary outcome of this more efficient means of pollination method is decreased pollen production of approximately 1,000 or fewer grains per anther (Bryant and Holloway 1983). Furthermore, pollinators rapidly deplete the pollen content of a zoophilous flower (Harder and Thomson 1989; Young and Stanton 1990), leaving little potential for such pollen to become incorporated into the pollen record.

On the other hand, some ostensibly zoophilous plants, such as willow and knotweed, are facultatively anemophilous, producing more pollen than is typical and therefore standing a far greater chance of being observed in the pollen record of a sediment sample. Pollen of anemophilous and facultatively anemophilous taxa also can be transported and deposited hundreds of meters, and, particularly in the case of the anemophilous taxa, sometimes even hundreds of kilometers from their source (Faegri and Iversen 1989). Therefore, anemophilous pollen is both much more abundant and much more widely dispersed than zoophilous pollen. The result is that anemophilous plants are much better represented in the pollen record of archaeological sediment samples. If those plants are also common members of the vegetation community, their pollen will tend to dominate palynological assemblages.

Consequently, three pollen types—Cheno-Am, Asteraceae (Compositae) and Poaceae (Gramineae)—dominate most New World pollen rain, typically accounting for 50 percent or more of the pollen samples (Anderson and Koehler 2003; Hevly et al. 1965; Martin 1963; Orvis 1998; Schoenwetter and Doerschlag 1971; Solomon et al. 1982). As a result, common tropical zoophilous perennials such as members of the Apocynaceae, Fabaceae, and Rubiaceae families tend to be poorly represented in the pollen record (Jones 1991), despite their abundance on the landscape.

In cultural settings, pollen samples are also affected by human activity. Often this activity directly affects the local source vegetation, enhancing and expanding suitable habitats for some plants, while degrading and reducing suitable habitats for others. Impacts on the vegetation associated with clearing the land for cultivation or construction, the introduction and use of irrigation or other forms of disturbance, and the cultivation or encouragement of selected native taxa are prime examples. Furthermore, amounts of local pollen can be augmented and nonlocal pollen introduced through collection of comestibles, fuel wood, or construction materials; and, during historic and recent times, by the planting of non-local taxa for aesthetic reasons. Thus, components of the pollen record can be interpreted culturally. Consequently, some fossil pollen grains are, in a sense, artifacts, and can be used to examine certain aspects of behavior, such as subsistence.

Preservation also affects the pollen record. If preservation is so poor that pollen is absent, then interpretation is straightforward though negative. Of greater concern is whether differential preservation—the prospect that one pollen taxon may be better or less well preserved than other pollen taxa deposited as members of the same suite of grains—might lead to erroneous interpretation (Delcourt and Delcourt 1980). Pollen preservation is often of particular concern in archaeological palynology as preservation in terrestrial deposits is seldom as good as in lacustrine deposits (Dimbleby 1985; Faegri and Iversen 1989). Further, and all else being equal, the older a terrestrial sample is the more degraded its pollen (Dimbleby 1985).

Preservation factors can be grouped as 1) mechanical, 2) biological, and 3) chemical. (Bryant and Holloway 1983) methodically review each so only a few comments are presented here:

1) Mechanical degradation can begin during transportation and sedimentation stages, and can continue following deposition on a surface; soil disturbance by farmers may further enhance it. Other physical factors as well as temperature and moisture can act to alter a pollen grain (Bryant and Holloway 1983). Pollen walls are reported to be especially susceptible to alternating episodes of

wetting and drying (Holloway 1989), such as might be expected to occur at most open-air archaeological sites, particularly in a tropical setting.

2) The vast majority of pollen is consumed by macroscopic and microscopic herbivores; after deposition, bacteria and various fungi can cause extensive pollen destruction. These biological degraders dissolve and penetrate the spore wall and, as several attacks occur simultaneously, several areas of the exine may become weakened, allowing further decomposition of the grain by physical or chemical means (Goldstein 1960). Ultimately, the entire grain is destroyed. To compound matters, some fungi are selective in their pollen preferences (Bryant and Holloway 1983), which may lead to differential preservation problems.

3) Corrosion of the pollen wall also arises from chemical processes (Birks and Birks 1980). Chemical oxidation of pollen grains is an important factor in many types of sediment, with pollen being best preserved in a reducing acidic environment (but see also Martin 1963). Greater amounts of sporopollenin in the pollen wall also enhance the grain's ability to withstand oxidation (Havinga 1964, 1965).

Methodology

Sample Processing and Identification

The Palynology Laboratories at the Institute for Integrative Research in Materials, Environments, and Society (IIRMES) at California State University in Long Beach, California processed the pollen samples, using a protocol favored by ACS (Jones 2013). First, 10 milliliter subsamples were collected from each sample and 20,848 grains of European *Lycopodium clavatum* (Danish club moss) spores were added to the samples to serve as tracers for calculating pollen concentrations. Carbonates were removed by soaking the sample in 10 percent hydrochloric acid. The sample was screened and swirled effectively removing larger and heavier materials. Next, the sample was immersed in 50 percent hydrofluoric acid for 12 or more hours to remove unwanted silicates. After the samples were neutralized, they were washed in 2 percent potassium hydroxide to remove humates, followed by an acetolysis treatment (Erdtman 1960) in a solution of nine parts acetic anhydride to one part sulfuric acid to remove unwanted organic materials. After this step, the samples were rinsed repeatedly in water to remove water-soluble humates and were further cleaned by a heavy density separation using sodium polytungstate (Sp. G. 2.00). The lighter organic materials, essentially pollen and charcoal, were collected, dehydrated in absolute ethanol, and curated in vials in glycerine.

Pollen analysis was conducted at the ACS laboratory. Pollen extracts were mounted on slides in glycerol; cellulose specific stain was used to facilitate pollen identification. A Nikon E200 compound microscope was used to view the slides at 400× magnifications to obtain 200 grain counts. Pollen grain abundances and taxa (or types) observed were: a) recorded until at least 200 pollen grains had been counted, or b) pollen concentrations were calculated after 75 or more tracer spores were counted yielding values of 1,000 pollen grains per ml of sediment (grains/ml) or less. For each sample, the remainder of the slide was scanned at 200× magnification to identify pollen of domesticates or other economically significant taxa. Aggregates or anther fragments, when identified during counting, were noted as they are not efficiently transported by wind, thus indicating a source in the immediate sampling area (Fish 1995:661) or their introduction into the site sediments by humans (Gish 1991). Pollen grain identification was facilitated through the use of the ACS pollen reference collection as well as standard pollen references (e.g., Kapp et al. 2000). Pollen was identified to the finest taxonomic level possible. Those grains that were too degraded to be taxonomically identified were assigned to the indeterminate category but were still tabulated within the 200+ grain counts because such values are of aid in assessing preservation levels and potential biases in the sample.

Pollen percentages were calculated from the 200 grain count; concentrations (grains/ml) were calculated using the following formula:

$$\text{Concentration} = \frac{\text{Tracer spores added}}{\text{Tracers counted}} \times \frac{\text{Pollen grains counted}}{\text{Sample volume}}$$

Analytical Results

Pollen Sample Characteristics

Productivity

Forty-one different pollen taxa were noted in the Tahcabo *rejollada* samples (Table 2), including 16 non-arboreal and 25 arboreal pollen types. Nine of the ten sediment samples yielded 200-grain pollen counts and had pollen concentrations greater than 1,000 grains/ml, although the actual pollen preservation varied from poor to very good. Concentration values ranged from 1,644 to 7,826 fossil grains/ml of sediment, values considered to be low to fair. The single sample containing insufficient pollen had a concentration value of only 193 grains per ml of sediment, a value considered to be exceedingly low, reflecting the high degree of oxidation that occurred in this sediment sample. Pollen counts and percentages are presented in Table 3and Table 4. Some taxa were over-represented in these pollen samples, particularly Cheno-Ams, while several other pollen types that would ordinarily be considered as fragile grains (e.g., Alismaceae and *Pithecellobium*) were also noted in the samples; their occurrences reflect the sometimes good level of pollen preservation in the samples.

Table 3. Pollen Counts from Tahcabo, Yucatan.

Operation	**1**	**1**	**1**	**1**	**2**	**2**	**3**	**3**	**3**	**3**
Taxon/Sample Number	**1**	**3**	**4**	**8**	**13**	**14**	**22**	**23**	**24**	**25**
Agave	1									
Alismaceae								1		
Alternanthera	36	6	4			2	2		2	
Asteraceae low-spine	44	48	48		56	54	59	87	87	68
Asteraceae high-spine	8	13	13		28	10	10	34	27	36
Borreria	1				1		1			
Cheno-Am	42	50	26		44	60	26	14	13	23
Cyperaceae	7	2	2		3	3	3	4	2	5
Euphorbiaceae									1	
Fabaceae	1		7				4			3
Gossypium						1				
Malvaceae					3	2				
Poaceae	11	28	26	1	18	38	25	13	22	17
Polygonaceae	2	9	5	1	1	2	4	3	2	2
Typha								2	1	
Zea mays	1						3	2		1

Table 3. Pollen Counts from Tahcabo, Yucatan.

Acacia	4		12							
Alchornea			1					2		3
Alnus		1								
Anacardiaceae					1			1		
Apocynaceae						1			1	
Bursera	1									
Cecropia					2					
Cedrela			5							
Celtis		2			1		2			1
Coccoloba	7	7	11		8	1	10	9	6	4
Combretaceae		2				5	5	1	6	3
Haematoxylum							1			
Hippocratea			1							
Hirea	1	3	2			3	2		1	
Loranthaceae									1	
Moraceae	2		8		8	2	15	13	7	13
Myrtaceae small			1		1					
Pinus	1		2		2	1	4		2	4
Pithecellobium-type	3		1							
Quercus					1	2				
Salix	1		4						2	1
Sapotaceae						2				
Spondias	3	1	1		2					
Rhizophoraceae	3	3	2			1	1			
Zanthoxylum	1	2					1		1	
Indeterminate	21	24	18	1	20	10	22	14	16	16
Total Pollen Count	**202**	**201**	**200**	**3**	**200**	**200**	**200**	**200**	**200**	**200**
Lycopodium Tracers	173	651	532	84	520	657	138	204	209	532
Concentration Value	6,305	1667	2030	193	2077	1644	7826	5294	5167	2030
Polypodiaceae					1			2		
Polypodium Type B						1	2	1		
Acrostichum							1			
Salvinia			1					2	4	

Table 4. Pollen Percentages from Tahcabo, Yucatan.

Operation	**1**	**1**	**1**	**1**	**2**	**2**	**3**	**3**	**3**	**3**
Taxon/Sample Number	**1**	**3**	**4**	**8**	**13**	**14**	**22**	**23**	**24**	**25**
Agave	0.5									
Alismaceae								0.5		
Alternanthera	17.8	3	2			1	1		1	
Asteraceae low-spine	21.8	23.9	24		28	27	29.5	43.5	43.5	34
Asteraceae high-spine	4	6.5	6.5		14	5	5	17	13.5	18
Borreria	0.5				0.5		0.5			
Cheno-Am	20.8	24.9	13		22	30	13	7	6.5	11.5
Cyperaceae	3.5	1	1		1.5	1.5	1.5	2	1	2.5
Euphorbiaceae									0.5	
Fabaceae	0.5		3.5				2			1.5

Table 4. Pollen Percentages from Tahcabo, Yucatan.

Gossypium						0.5				
Malvaceae					1.5	1				
Poaceae	5.4	13.9	13	*	9	19	12.5	6.5	11	8.5
Polygonaceae	1	4.5	2.5	*	0.5	1	2	1.5	1	1
Typha								1	0.5	
Zea mays	0.5						1.5	1		0.5
Acacia	2		6							
Alchornea			0.5					1		1.5
Alnus		0.5								
Anacardiaceae					0.5			0.5		
Apocynaceae						0.5			0.5	
Bursera	0.5									
Cecropia					1					
Cedrela			2.5							
Celtis		1			0.5		1			0.5
Coccoloba	3.5	3.5	5.5		4	0.5	5	4.5	3	2
Combretaceae		1				2.5	2.5	0.5	3	1.5
Haematoxylum							0.5			
Hippocratea			0.5							
Hirea	0.5	1.5	1			1.5	1		0.5	
Loranthaceae									0.5	
Moraceae	1		4		4	1	7.5	6.5	3.5	6.5
Myrtaceae small			0.5		0.5					
Pinus	0.5		1		1	0.5	2		1	2
Pithecellobium-type	1.5		0.5							
Quercus					0.5	1				
Salix	0.5		2						1	0.5
Sapotaceae						1				
Spondias	1.5	0.5	0.5		1					
Rhizophoraceae	1.5	1.5	1			0.5	0.5			
Zanthoxylum	0.5	1					0.5		0.5	
Indeterminate	10.4	11.9	9	*	10	5	11	7	8	8
Total Pollen Count	**100.2**	**100.1**	**100**	**0**	**100**	**100**	**100**	**100**	**100**	**100**
Lycopodium Tracers	173	651	532	84	520	657	138	204	209	532
Concentration Value	6,305	1,667	2,030	193	2,077	1,644	7,826	5,294	5,167	2,030
Polypodiaceae					1			2		
Polypodiaceae Type B						1	2	1		
Acrostichum							1			
Salvinia			1					2	4	

Pollen Types

Forty-one different pollen taxa were identified in the Tahcabo samples, the majority representing arboreal elements. Domesticates observed while compiling the 200+ grain counts from the samples were *Zea mays* (maize), *Gossypium* (cotton), and *Agave* (probably henequen). Other non-arboreal types represent aquatic species and disturbance type plants, while the arboreal pollen types represent probable cultivated species and background forest taxa. Several arboreal types of known economic value were also identified in the samples. These taxa—including Alsimataceae, *Coccoloba*, Myrtaceae, Sapotaceae, and *Spondias*—may represent taxa from nearby kitchen gardens (Jones 1991, 1994).

Sample Composition

All of the Yucatan *rejollada* samples were dominated by both low- and high-spine Asteraceae, Cheno-Ams, and grasses. These taxa are usually over-represented in many pollen samples because of their ubiquity, morphology, and durability.

Many of the pollen taxa identified in the samples are wind-pollinated and likely represent normal background pollen rain typical of the Tahcabo region. Some of these probable background taxa include Cyperaceae (sedge family), Polygonaceae (knotweed family), *Typha* (cattail), Combretaceae (white mangrove family), Moraceae (mulberry family), Myrtaceae (myrtle family), *Pinus* (pine), *Quercus* (oak), and *Salix* (willow). Although many of these taxa have economic value in some sense, their occurrence in the samples was usually at such a low frequency that an economic usage is not indicated. Some of these pollen types, in fact, may represent long-distance transport from the nearby mountains. Additional taxa, however, are more telling and shed some light on past economic activity and paleoenvironmental conditions. Pollen sequences are discussed by strata within the *rejollada* sequences, starting with the basal sample following geologic convention.

Feature Results

Operation 1

Four samples were examined from Operation 1, representing sediments from 140–145 cms below surface (BS) in Sample 8; from 57–62 cms BS in Sample 4; from 30–45 cms BS in Sample 3; and from 3–15 cms BS in Sample 1. Pollen preservation was variable in this column, generally decreasing in quality with depth. The basal sample, Sample 8 from 140–145 cms BS, tentatively dated to the late Preclassic to early Classic based on an associated ceramic assemblage, contained only a few very poorly preserved grains revealing a concentration value of 193 grains per ml of sediment, well below the minimally acceptable threshold of around 2,000 grains/ml. This sample was likely to have been significantly older than other samples, resulting in the near complete loss of the organic component of the sediments.

Sample 4, from 57–62 cms BS and possibly dating to the early to late Classic period, contained pollen preserved in fair condition, with grains exhibiting some oxidation and erosion, though producing a full sample count. Dominant grains in the sample included both high-, and low-spine Asteraceae, Cheno-Ams, and grasses. Cultigens were lacking in the sample, although potentially economic tree pollen was noted, including *Coccoloba, Spondias,* and Myrtaceae. *Acacia* was well represented with a 6 percent occurrence; pollen from this tree is ordinarily rare, suggesting that an acacia tree was once located very near the sampling location. A single *Salvinia* spore was also noted in the sample, suggesting that water was present in or very near the *rejollada* at the time of sediment deposition.

Sample 3, from 30–45cms BS and likely dating to the early Colonial period, exhibited poor to fair pollen preservation, though a full count was achieved in the sample. Dominant grains included both high-, and low-spine Asteraceae, Cheno-Ams, and grasses. Though cultigens were absent from Sample 3, both *Coccoloba* and *Spondias* were noted in the sample, similar to the pollen assemblage from Sample 4.

Sample 1, representing the uppermost sample in Operation 1 and likely dating to the late Colonial period, contained well-preserved pollen grains with a concentration value of 6,305 grains per ml of sediment, a value considered to be moderate. These sediments are likely to be fairly young in age. Dominant grains included high-, and low-spine Asteraceae, Cheno-Ams, and grasses. Cultigens noted in the sample included a single maize grain and a single *Agave* grain, almost certainly representing historically cultivated henequen. *Alternanthera* pollen, represented in all three pollen-yielding sediment samples from Operation 1, was present in a high quantity within Sample 1 of 17.8 percent. The relative abundance of this taxon in these sediments likely reflects an environment favorable for this plant's growth rather than a plant of any particular economic significance. The presence of *Coccoloba* and *Spondias* pollen suggest either the persistence of economically important kitchen garden type trees, or perhaps that the environment near the sampling location was favorable for the growth of these trees.

Overall, the Operation 1 sequence shows evidence of fairly recent agriculture in the *rejollada* area in the form of maize and probably henequen cultivation. Traces of economically important trees, including *Coccoloba*, Myrtaceae and *Spondias*, are present in the sediments, although whether these represent encouraged or wild trees is not known. Evidence of standing water in or near the *rejollada* is supported by a single *Salvinia* spore, by sedge grains in three samples, and willow pollen in two samples. While the sedge and willow pollen may have been transported from some short distance away by the action of the wind, the *Salvinia* spore is large and heavy and would only be transported in water.

Operation 2

Two pollen samples from the undated Operation 2 were examined representing sediments from 35–55 cms BS (Sample 14), and from 15–35 cms BS (Sample 13). Pollen preservation in these samples was fair with deeper Sample 14 yielding a concentration value of 1,644 grains per ml of sediment, while the shallower Sample 13 provided a concentration value of 2,077 grains per ml. Both samples were dominated by high-, and low-spine Asteraceae, Cheno-Ams, and grass pollen grains, reflecting what was likely to have been a fairly disturbed or open environment in the *rejollada* area. While most pollen grains identified in both of the Operation 2 samples represent typical background taxa, economically significant types were noted in both samples.

Basal Sample 14 from 35–55 cms BS contained a single *Gossypium* (cotton) pollen grain, indicating this plant was once present near the sampling location. Cotton pollen is large and heavy and is strictly pollinated by insects; thus, cotton pollen might be expected in a field area (Lavold 1997), but even then only rarely. Cotton, while native to southern Mexico and the Yucatan Peninsula, generally favors coastal areas. The pollen from wild and domesticated grains is largely indistinguishable, and while wild cotton would favor more coastal regions, it is at least possible that this grain could represent a wild rather than domesticated plant. Also noted in the basal sample were two Sapotaceae grains. Several members of this important family produce edible fruit, including *Achras* (chicle) and *Chrysophyllum* (caimito, star apple). In Belize, the percentage occurrences of Sapotaceae pollen increased when ancient agriculturalists cleared the forest for agriculture (Jones 1994), indicating that these important trees were intentionally spared.

Evidence of agriculture was absent from Sample 13, collected at 15–35 cms BS. A disturbed environment, however, is indicated by the weedy taxa in the sample. Two *Spondias* (hogplum, jocote) pollen grains were noted in the sample, suggesting that this tree was maintained in the area for its nutritious fruit. Hogplum pollen also increased in Belize when forests were initially cleared for agriculture (Jones 1994), reflecting the tree's value.

Overall, the Operation 2 samples, though undated, indicate that agriculture was practiced near the sampling area. Cotton was cultivated at the location, and economically important trees—namely Sapotaceae and *Spondias*—were present and their growth was probably encouraged in the *rejollada* area.

Operation 3

Four pollen samples were collected from Operation 3, all of which yielded fairly well preserved pollen grains. The basal sample (Sample 25) was collected from 55–75 cms BS and was thought to date from the late Preclassic to early Classic period, followed by Sample 24 collected from 30–50 cms BS and likely dating to the early Classic period. Sample 23 was collected from 15–30 cms BS, also probably dating to the early Classic period, followed by Sample 22 from 0–15 cms BS, dating to the Colonial to recent period. Pollen concentration values for this sequence ranged from 2,030 to 7,826 grains per ml of sediment and pollen preservation ranged from fair to good. All of the Operation 3 samples were dominated by pollen from high-, and low-spine Asteraceae, Cheno-Ams, and grasses, while the samples also contained notable quantities of *Coccoloba* (sea grape, bob) and Moraceae (probably all *Brosimum alicastrum* [breadnut]), reflecting common trees in the local forest.

As both of these taxa are economically important, it is likely that these species were encouraged as potential local foods.

The basal Sample 25 from Operation 3 at 55-75 cms BS contained a single maize pollen grain indicating that maize was being cultivated near the sampling area. Other cultigens were absent from the assemblage, and the presence of non-economic forest taxa suggests that kitchen gardens may not have been present near the site area though both *Coccoloba* and Moraceae probably represent notable forest taxa. Sample 24, from 30-50 cms BS also records typical forest taxa but only *Coccoloba* and Moraceae as potential economic forest types. Cultigens are absent from Sample 24.

Sample 23 from 15-30 cms BS contained two maize pollen grains, as well as a single Alismaceae (probably *Sagittaria*) possibly representing the cultivation of this tuber in the water-filled *rejollada*. Pollen from both *Coccoloba* and Moraceae increase slightly, reflecting the generally better state of pollen preservation. Pollen concentration values, along with the quantity of *Coccoloba* and Moraceae grains increase as sediments get younger likely reflecting better pollen preservation towards the top of the sequence, rather than increases in these pollen taxa. The uppermost sediment Sample 22 from Operation 3 collected at 0-15 cms BS contained three maize pollen grains indicating that maize was cultivated near the sampling location in comparatively modern times. Other cultigens were lacking in this uppermost sample.

Overall, aquatic taxa were common in the sequence, represented by sedge pollen in four samples; *Typha*, *Salix*, and *Salvinia* each present in two samples; and by Alismaceae pollen noted in one sample, the latter representing a potential economic, encouraged as a wetland plant throughout its range in the New World for its starchy tubers. The *rejollada* in Operation 3 likely held water fairly well, accounting for the sequence's better pollen preservation and higher concentration values. Little change was noted between samples in the sequence, suggesting the environment remained fairly stable through the period of sediment deposition. The Operation 3 samples record a *rejollada* likely to have held standing water through much of the year. Maize was cultivated near the sampling location, and the relatively common *Coccoloba* and Moraceae grains hint at the presence or possible encouragement of these important forest foods.

Summary

Ten pollen samples from three profiles through *rejolladas* at Tahcabo were examined. Pollen preservation was variable, but was generally fair, allowing for the identification of 41 different taxa. Pollen was present in nine of the sediment samples, and revealed that maize, *Agave*, and cotton were cultivated in the area. Wild economically important trees and possibly other plants were noted in the assemblages suggesting these plants, including *Spondias*, Sapotaceae, Moraceae, *Coccoloba*, and Alismaceae, were cultivated near the site area. Changes in local vegetation through time appears to be minimal throughout the sequences.

References Cited

Anderson, R. S., and P. A. Koehler
2003 Modern Pollen and Vegetation Relationships in the Mountains of Southern California, USA. *Grana* 42:129–144.

Birks, H. J. B., and H. H. Birks
1980 *Quaternary Palaeoecology*. University Park Press, Baltimore.

Bryant, V. M. Jr., and R. G. Holloway
1983 The Role of Palynology in Archaeology. In *Advances in Archaeological Method and Theory*, Vol. 6, edited by M. B. Schiffer, pp. 191–223. Academic Press, Orlando.

Cummings, L. S.
1990 Subsistence: Evidence from Pollen. In *Archaeological Investigations at La Ciudad de Los Hornos: [Salt River Project] Lassen Substation Parcel*, edited by Richard W. Effland, Jr., pp. 131–144. The Arizona Archaeologist. No. 24. Arizona Archaeological Society, Tempe.

Curtin, L.
1984 *By the Prophet of the Earth: Ethnobotany of the Pima*. University of Arizona Press, Tucson.

Delcourt, P. A., and H. R. Delcourt
1980 Pollen Preservation and Quaternary Environmental History in the Southeastern United States. *Palynology* 4:215–231.

Dimbleby, G. W.
1985 *The Palynology of Archaeological Sites*. Academic Press, London.

Doolittle, W. E.
2000 *Cultivated Landscapes of Native North America*. Oxford Geographical and Environmental Studies Series. Oxford University Press, New York.

Elmore, F. H.
1944 *Ethnobotany of the Navajo*. School of American Research, Santa Fe.

Erdtman, G.
1960 The Acetolysis Method: A Revised Description. *Svensk. Bot. Tidsk.* 54:561–564.

Faegri, K., and J. Iversen
1989 *Textbook of Pollen Analysis*. 4th ed. John Wiley and Sons, Chichester, U.K.

Fish, S. K.
1994 Archaeological Palynology of Gardens and Fields. In *The Archaeology of Garden and Field*, edited by Naomi F. Miller and K. L. Gleason, pp. 44–69. University of Pennsylvania Press, Philadelphia.

1995 Pollen Analysis. In *Archaeological Excavations at Pueblo Blanco: The MCDOT Alma School Road Project, Volume 2*, edited by David E. Doyel, Andrew T. Black, and Barbara S. Macnider, pp. 393–408. Cultural Resources Report No. 90. Archaeological Consulting Services, Tempe.

Gasser, R. E., and S. M. Kwiatkowski
1991 Food for Thought: Recognizing Patterns in Hohokam Subsistence. In *Exploring the Hohokam, Prehistoric Desert Peoples of the American Southwest*, edited by George J. Gumerman, pp. 417–460. Amerind Foundation New World Studies Series No. 1. University of New Mexico Press, Albuquerque.

Gentry, H. S.
1982 *Agaves of Continental North America*. University of Arizona Press, Tucson.

Gibbons, E.
1962 *Stalking the Wild Asparagus*. David McKay Company, New York.

Gish, J. W.
1991 Current Perceptions, Recent Discoveries, and Future Directions in Hohokam Palynology. *Kiva* 56:237–254.

Goldstein, S.
1960 Degradation of Pollen by Phycomycetes. *Ecology* 41(3):543–545.

González Quintero, L.
1986 *Contribuciones al Conocimiento Arqueobotánico de la Cuenca del Valle de México*. Instituto Nacional de Antropología e Historia, México, D.F.

Harder, L. D., and J. D. Thomson
1989 Evolutionary Options for Maximizing Pollen Dispersal of Animal-pollinated Plants. *The American Naturalist* 133(3):323–344.

Havinga, A. J.
1964 Investigation into the Differential Corrosion and Susceptibility of Pollen and Spores. *Pollen et Spores* VI(2):621–635.

1965 A 20-year Experimental Investigation into the Differential Corrosion Susceptibility of Pollen Spores in Various Soil Types. *Pollen Spores* 26:541–558.

Hevly, R. H., P. J. Mehringer, and H. G. Yocum
1965 Modern Pollen Rain in the Sonoran Desert. *Journal of the Arizona Academy of Science* 3:123–135.

Holloway, R. G.
1989 Experimental Mechanical Pollen Degradation and Its Application to Quaternary Age Deposit. *Texas Journal of Science* 41:131–145.

Jones, J. G.
1991 *Pollen Evidence for Agricultural Origins and Maya Subsistence Patterns in Northern Belize. Ph.D. Dissertation, Department of Anthropology, Texas A&M University, College Station, Texas*.

1994 Pollen Evidence for Early Settlement and Agriculture in Northern Belize. *Palynology* 18:207–213.

2013 Pollen and Phytolith Processing Protocols for ACS sediments. Manuscript on File, ACS, Ltd., Tempe, Arizona.

Kapp, R. O., O. K. Davis, and J. E. King
2000 *Pollen and Spores*. 2nd ed. American Association of Stratigraphic Palynologists Foundation, Texas A&M University, College Station.

Lavold, L.
1997 The Distribution of Pollen within a Cotton Field. Manuscript on file, Department of Anthropology, Arizona State University, Tempe.

Martin, P. S.
1963 *The Last 10,000 Years: A Fossil Pollen Record of the American Southwest*. University of Arizona Press, Tucson.

Mood, F.
1937 John Withrop, Jr., On Indian Corn. *New England Quarterly* 10:121–133.

Orvis, K. H.
1998 Modern Surface Pollen from Three Transects Across the Southern Sonoran Desert Margin, Northwestern Mexico. *Palynology* 22:197–211.

Pope, K., M. Pohl, J. Jones, D. Lentz, C. von Nagy, F. Vega, and I. Quitmyer
2001 Origin and Environmental Setting of Ancient Agriculture in the Lowlands of Mesoamerica. *Science* 292(5520):1370.

Raynor, G. S., E. C. Ogden, and J. V. Hayes
1972 Dispersion and Deposition of Corn Pollen from Experimental Sources. *Agronomy Journal* 64:420–427.

Rea, A. M.

1997 *At the Desert's Green Edge: An Ethnobotany of the Gila River Pima*. University of Arizona Press, Tucson.

Schoenwetter, J., and L. A. Doerschlag
1971 Surficial Pollen Records from Central Arizona, I: Sonoran Desert Scrub. *Journal of the Arizona Academy of Science* 6:216–221.

Smith, S. J., and P. R. Geib
1999 An Experimental Study of Grinding Tool Pollen Washes: Bridging the Inferential Gap between Pollen Counts and Past Behavior. of the 64th Annual Meeting of the Society for American Archaeology, Chicago.

Solomon, A. M., T. J. Blasing, and J. A. Solomon
1982 Interpretation of Floodplain Pollen in Alluvial Sediments from an Arid Region. *Quaternary Research* 18:52–71.

Solomon, A. M., and H. D. Hayes
1972 Desert Pollen Production I: Qualitative Influence of Moisture. *Journal of the Arizona Academy of Science* 7:65–74.

Standley, P. C., and S. J. Record
1936 The Forests and Flora of British Honduras. *Fieldana Bot* 12:1–432.

Young, H. J., and M. L. Stanton
1990 Influences of Floral Variation on Pollen Removal and Seed Production in Wild Radish. *Ecology* 71(2):536–547.

REFERENCES

Abel, Suzanne M., and Ella B. Butler. 2018. "Bone ID. Digital resource for bone identification." http://www.boneid.net.

Acabado, Stephen. 2018. "Zones of Refuge: Resisting Conquest in the Northern Philippine Highlands through Environmental Practice." *Journal of Anthropological Archaeology* 52:180-95.

Alayón-Gamboa, José A., and Francisco D. Gurri-García. 2008. "Home Garden Production and Energetic Sustainability in Calakmul, Campeche, Mexico." *Human Ecology* 36:395-407.

Alexander, Rani T. 2018. "Agrarian Ecology in Yucatán, 1450-2000." In *Colonial and Postcolonial Change in Mesoamerica: Archaeology as Historical Anthropology*, edited by Rani T. Alexander and Susan Kepecs, 255-82. Albuquerque: University of New Mexico Press.

———. 2012. "Prohibido Tocar Este Cenote: The Archaeological Basis for the Titles of Ebtun." *International Journal of Historical Archaeology* 16 (1):1-24.

———. 2006. "Maya Settlement Shifts and Agrarian Ecology in Yucatán, 1800-2000." *Journal of Anthropological Research* 62 (4):449-70.

———. 2004. *Yaxcabá and the Caste War of Yucatán: An Archaeological Perspective*. Albuquerque: University of New Mexico Press.

———. 2003. "Architecture, Haciendas, and Economic Change in Yaxcabá, Yucatán, Mexico." *Ethnohistory* 50 (1):191-220.

———. 1999. "Mesoamerican House Lots and Archaeological Site Structure: Problems of Inference in Yaxcaba, Yucatan, Mexico, 1750-1847." In, edited by Penelope M. Allison, 78-100. London and New York: Routledge.

———. 1998. "Community Organization in the Parroquia de Yaxcaba, Yucatan, Mexico, 1750-1847." *Ancient Mesoamerica* 9:39-54.

———. 1997. "Late Colonial Period Settlement Patterns in Yaxcabá Parish, Yucatan, Mexico: Implications for the Distribution of Land and Population before the Caste War." In *Approaches to the Historical Archaeology of Mexico, Central and South America*, edited by Janine Gasco, Greg Charles Smith and Patricia Fournier García, 29-40. Los Angeles: University of California, Los Angeles, Institute of Archaeology.

———. 1993. "Colonial Period Archaeology of the Parroquia de Yaxcabá, Yucatán, México: An Ethnohistorical and Site Structural Analysis." Unpublished Ph.D. dissertation, Department of Anthropology, University of New Mexico.

Alexander, Rani T., and Héctor Hernández Álvarez. 2018. "Agropastoralism and Household Ecology in Yucatán After the Spanish Invasion." *Environmental Archaeology* 23 (1):69-79.

Alonso Olvera, Alejandra. 2013. "Economic Strategies of Terminal Classic Households in the Northern Maya Lowlands: Multicrafting and Economic Diversification of a Mid-Elite Residential Compound at Xuenkal, Yucatan." Unpublished Ph.D. dissertation, University of Calgary.

Ambrosino, James. 2003. "The Function of a Maya Palace at Yaxuna: A Contextual Approach." In *Maya Palaces and Elite Residences: An Interdisciplinary Approach*, edited by Jessica Joyce Christie, 253-73. Austin: The University of Texas Press.

Ancona, Eligio. 1889. *Historia de Yucatan desde la época más remota hasta nuestros días*. Vol. 2. Barcelona, España: Jaime Jepús Roviralta.

Anderson, David S., Fernando Robles Castellanos, and Anthony P. Andrews. 2018. "The Preclassic Settlement of Northwest Yucatan: Rechrating the Pathway to Complexity." In *Pathways to Complexity: A View from the Maya Lowlands*, edited by M. Kathryn Brown and George J. Bey III, 195-222. Gainesville: University Press of Florida.

Anderson, E. N., Betty B. Faust, and John G. Frazier. 2004. "Introduction: An Environmental and Cultural History of Maya Communities in the Yucatan Peninsula." In *Rights, Resources, Culture, and Conservation in the Land of the Maya*, edited by Betty B. Faust, E. N. Anderson and John G. Frazier, 1-29. Westport, CT: Praeger Publishers.

Andrews, Anthony P. 2001. "Archaeological Reconnaissance of Northwest Yucatán, Mexico." *Inquiry* 4 (1):8-9.

———. 1991. "The Rural Chapels and Churches of Early Colonial Yucatán and Belize." In *The Spanish Borderlands in Pan-American Perspective*, edited by David Hurst Thomas. Washington, DC: Smithsonian Institution Press.

———. 1986. "Reconocimiento arqueológico de Cancún a Playa del Cármen, Quintana Roo." *Boletín de la Escuela de Ciencias Antropológicas de la Universidad de Yucatán* 13 (78):3-19.

———. 1984. "The Political Geography of the Sixteenth Century Yucatan Maya: Comments and Revisions." *Journal of Anthropological Research* 40 (4):589-96.

———. 1981. "Historical Archaeology in Yucatan: A Preliminary Framework." *Historical Archaeology* 15 (1):1-18.

———. 1977. "Reconocimiento arqueológico de la costa norte del estado de Campeche." *Boletín de la Escuela de Ciencias Antropológicas de la Universidad de Yucatán* 4 (24):64-77.

Andrews, Anthony P., Frank Asaro, Helen V. Michel, Fred H. Stross, and Pura Cervera Rivero. 1989. "The Obsidian Trade at Isla Cerritos, Yucatán, Mexico." *Journal of Field Archaeology* 16:355-63.

Andrews, Anthony P., Antonio Benavides Castillo, and Grant D. Jones. 2006. "Ecab: A Remote Encomienda of Early Colonial Yucatan." In *Reconstructing the Past. Studies in Mesoamerican and Central American Prehistory*, edited by David M. Pendergast and Anthony P. Andrews, 5-32. Oxford: British Archaeological Reports International Series.

Andrews, Anthony P., and Fernando Robles Castellanos. 2018. "The Paleo-American and Archaic Periods in Yucatan." In *Pathways to Complexity: A View from the Maya Lowlands*, edited by M. Kathryn Brown and George J. Bey III, 16-34. Gainesville: University Press of Florida.

———. 2009. "La Arqueología Histórica del Noroeste de Yucatán." In *Arqueología Colonial Latinoamericana: Modelos de estudio*, edited by Juan García Targa and Patricia Fournier García, 115-31. Oxford, UK: Archaeopress.

———. 2004. "An Archaeological Survey of Northwest Yucatan, Mexico." *Mexicon* XXVI (1):7-14.

Andrews, E. Wyllys, IV, and E. Wyllys Andrews V. 1980. *Excavations at Dzibilchaltún, Yucatán, Mexico*, *Middle American Research Institute Publication*. New Orleans: Tulane University.

Andrews, E. Wyllys, V, George J. Bey III, and Christopher M. Gunn. 2018. "The Earliest Ceramics of the Northern Maya Lowlands." In *Pathways to Complexity: A View from the Maya Lowlands*, edited by M. Kathryn Brown and George J. Bey III, 49-86. Gainesville: University Press of Florida.

Andrieu, Chloé. 2013. "Late Classic Maya Lithic Production and Exchange at Rio Bec and Calakmul, Mexico." *Journal of Field Archaeology* 38 (1):21-37.

Aragón-Moreno, Alejandro Antonio, Gerald A. Islebe, and Nuria Torrescano-Valle. 2012. "A ~3800-Yr, High-Resolution Record of Vegetation and Climate Change on the North Coast of the Yucatan Peninsula." *Review of Palaeobotany and Palynology* 178:35-42.

Archivo General del Estado de Yucatán (AGEY). 1841a. "Tahcabo. Padrón general de habitantes del pueblo de Tahcabo y su comprensión, del partido de Tizimin, con expresión de sexos, edades y ocupaciones. Tahcabo, mayo 22 de 1841." Poder Ejecutivo, Censos y Padrones, vol 5. Exp. 55.

Archivo General del Estado de Yucatán (AGEY). 1841b. "Calotmul. Padrón general de habitantes del pueblo de Calotmul y su comprensión, partido de Tizimin, con expresión de sexos, edades y ocupaciones. Calotmul, mayo 8 de 1841." Poder Ejecutivo, Censos y Padrones, vol 1. Exp. 3.

Ardren, Traci. 2015. *Social Identities in the Classic Maya Northern Lowlands: Gender, Age, Memory, and Place*. Austin: University of Texas Press.

Ardren, Traci, Alejandra Alonso, and T. Kam Manahan. 2016. "The Artisans of Terminal Classic Xuenkal, Yucatan, Mexico: Gender and Craft During a Period of Economic Change." In *Gendered Labor in Specialized Economies: Archaeological Perspectives on Male and Female Work*, edited by Sophia Kelly and Traci Ardren, 91-115. Boulder: University Press of Colorado.

Ardren, Traci, and Justin Lowry. 2011. "The Travels of Maya Merchants in the Ninth and Tenth Centuries AD: Investigations at Xuenkal and the Greater Cupul Province, Yucatan, Mexico." *World Archaeology* 43 (3):428-43.

Arnold, Philip J., III. 1990. "The Organization of Refuse Disposal and Ceramic Production within Contemporary Mexican Houselots." *American Anthropologist* 92:915-32.

Atran, Scott. 1993. "Itza Maya Tropical Agro-Forestry." *Current Anthropology* 34 (5):633-700.

Barrera-Bassols, Narciso, and Victor Manuel Toledo. 2005. "Ethnoecology of the Yucatec Maya: Symbolism, Knowledge and Management of Natural Resources." *Journal of Latin American Geography* 4 (1):9-41.

Barrera Rubio, Alfredo. 2015. "Kulubá: Asentamiento, Cosmovisión y Desarrollo de un Enclave Itzá del Nororiente de Yucatan." Tesis de doctorado, Escuela Nacional de Antropología e Historia.

Barrera Vásquez, Alfredo. 1957. *Códice de Calkini*. Campeche, Mexico: Biblioteca Campechana.

Baskes, Jeremy. 2005. "Colonial Institutions and Cross-Cultural trade: Repartimiento Credit and Indigenous Production of Cochineal in Eighteenth-Century Oaxaca, Mexico." *The Journal of Economic History* 65 (1):186-210.

Bassie-Sweet, Karen. 1996. *At the Edge of the World: Caves and Late Classic Maya World View*. Norman: University of Oklahoma Press.

Batún Alpuche, Adolfo Iván. 2009. "Agrarian Production and Intensification at a Postclassic Maya Community, Buena Vista, Cozumel, Mexico." Unpublished Ph.D. dissertation, University of Florida.

Batún Alpuche, Adolfo Iván, Patricia A. McAnany, and Maia Dedrick. 2017. "Tiempo y paisaje en Tahcabo, Yucatán." *Arqueología Mexicana* 145:66-71.

Bautista, Francisco, and J. Alfred Zinck. 2010. "Construction of an Yucatec Maya Soil Classification and Comparison with the WRB Framework." *Journal of Ethnobiology and Ethnomedicine* 6:7-17.

Beach, Timothy. 1998. "Soil Constraints on Northwest Yucatán, Mexico: Pedoarchaeology and Maya Subsistence at Chunchucmil." *Geoarchaeology* 13 (8):759-91.

Beach, Timothy, Sheryl Luzzadder-Beach, Ryan V. Sweetwood, Patrice Farrell, Daniel E. Mazeau, and Richard E. Terry. 2017. "Soils and Agricultural Carrying Capacity." In *Ancient Maya Commerce*, edited by Scott R. Hutson, 197-219. Boulder: University Press of Colorado.

Beach, Timothy, Sheryl Luzzadder-Beach, Richard Terry, Nicholas Dunning, Stephen D. Houston, and Thomas Garrison. 2011. "Carbon Isotopic Ratios of Wetland and Terrace Soil Sequences in the Maya Lowlands of Belize and Guatemala." *Catena* 85 (2):109-18.

Beach, Tim, Austin Ulmer, Duncan Cook, Michael L. Brennan, Sheryl Luzzadder-Beach, Colin Doyle, Sara Eshleman, Samantha Krause, Marisol Cortes-Rincon, and Richard Terry. 2018. "Geoarchaeology and Tropical Forest Soil Catenas of Northwestern Belize." *Quaternary International* 463:198-217.

Bennett, Jane. 2010. *Vibrant Matter: A Political Ecology of Things*. Durham, NC: Duke University Press.

Bermann, Marc. 1997. "Domestic Life and Vertical Integration in the Tiwanaku Heartland." *Latin American Antiquity* 8 (2):93-112.

Bey, George J III. 2006. "Changing Archaeological Perspectives on the Northern Maya Lowlands." In *Lifeways in the Northern Maya Lowlands: New Approaches to Archaeology in the Yucatán Peninsula*, edited by Jennifer P. Mathews and Bethany A. Morrison, 13-37. Tucson: The University of Arizona Press.

Berry, Kimberly, and Patricia A. McAnany. 2007. "Reckoning with the Wetlands and their Role in Ancient Maya Society." In *The Political Economy of Ancient Mesoamerica: Transformations during the Formative and Classic Periods*, edited by Vernon L. Scarborough and John E. Clark, 149-62. Albuquerque: University of New Mexico Press.

Bey, George J. III, Tara M. Bond, William M. Ringle, Craig A. Hanson, Charles W. Houck, and Carlos Peraza Lope. 1998. "The Ceramic Chronology of Ek Balam, Yucatan, Mexico." *Ancient Mesoamerica* 9:101-20.

Bey, George J. III, Craig A. Hanson, and William M. Ringle. 1997. "Classic to Postclassic at Ek Balam, Yucatan: Architectural and Ceramic Evidence for Defining the Transition." *Latin American Antiquity* 8 (3):237-54.

Bianco, Briana, Rani Alexander, and Gary Rayson. 2017. "Beekeeping Practices in Modern and Ancient Yucatán: Going from the Known to the Unknown." In *The Value of Things: Prehistoric to Contemporary Commodities in the Maya Region*, edited by Jennifer P. Mathews and Thomas H. Guderjan, 87-103. Tucson: The University of Arizona Press.

Bourdieu, Pierre. 1984. *Distinction: A Social Critique of the Judgement of Taste*. Translated by Richard Nice. London: Routledge.

Boutton, T. W., S. R. Archer, A. J. Midwood, S. F. Zitzer, and R. Bol. 1998. "$\delta^{13}C$ Values of Soil Organic Carbon and their Use in Documenting Vegetation Change in a Subtropical Savanna Ecosystem." *Geoderma* 82:5-41.

Bracamonte y Sosa, Pedro. 1984. "Haciendas, Ranchos y Pueblos en Yucatán (1821-1847)." *Boletín de la Escuela de Ciencias Antropológicas de la Universidad de Yucatán* 11 (66):3-12.

Brady, James E., and Wendy Ashmore. 1999. "Mountains, Caves, Water: Ideational Landscapes of the Ancient Maya." In *Archaeologies of Landscape: Contemporary Perspectives*, edited by Wendy Ashmore and A. Bernard Knapp, 124-45. Malden, MA: Blackwell Publishers Inc.

Brainerd, George W. 1958. *The Archaeological Ceramics of Yucatan*. *Anthropological Records* Vol. 19. Berkeley and Los Angeles: University of California Press.

Braswell, Geoffrey E. 2010. "The Rise and Fall of Market Exchange: A Dynamic Approach to Ancient Maya Economy." In *Archaeological Approaches to Market Exchange in Ancient Societies*, edited by Christopher P. Garraty and Barbara L. Stark, 127-39. Boulder: University Press of Colorado.

Braswell, Geoffrey E., and Michael D. Glascock. 2002. "The Emergence of Market Economies in the Ancient Maya World: Obsidian Exchange in Terminal Classic Yucatán, Mexico." In *Geochemical Evidence for Long-Distance Exchange*, edited by Michael D. Glascock, 33-52. Westport, CT: Bergin and Garvey.

Brookfield, Harold. 2001. "Intensification, and Alternative Approaches to Agricultural Change." *Asia Pacific Viewpoint* 42 (2/3):181-92.

Brown, Clifford T. 2005. "Caves, Karst, and Settlement at Mayapán, Yucatán." In *In the Maw of the Earth Monster: Mesoamerican Ritual Cave Use*, edited by James E. Brady and Keith M. Prufer, 373-402. Austin: University of Texas Press.

Brown, M. Kathryn, and George J. Bey III. 2018. "Charting the Pathways to Complexity in the Maya Lowlands." In *Pathways to Complexity: A View from the Maya Lowlands*, edited by M. Kathryn Brown and George J. Bey III, 387-414. Gainesville: University Press of Florida.

Brown, Linda A. 2005. "Planting the Bones: Hunting Ceremonialism at Contemporary and Nineteenth Century Shrines in the Guatemalan Highlands." *Latin American Antiquity* 16 (2):131-46.

Brumfiel, Elizabeth M. 1991. "Weaving and Cooking: Women's Production in Aztec Mexico." In *Engendering Archaeology: Women and Prehistory*, edited by Joan M. Gero and Margaret W. Conkey, 224-51. Oxford: Basil Blackwell.

Bryant, Vaughn M. Jr., and Richard G. Holloway. 1983. "The Role of Palynology in Archaeology." *Advances in Archaeological Method and Theory* 6:191-223.

Burgos Villanueva, Francisco Rafael. 1995. *El Olimpo: Un predio colonial en el lado poniente de la Plaza Mayor de Mérida, Yucatán, y análisis cerámico comparativo*. Colección Científica 261. Mexico: Instituto Nacional de Antropología e Historia.

Burgos Villanueva, Rafael, Yoly Palomo Carrillo, and Sara Dzul Góngora. 2010. *El Camino Real a Campeche: una perspectiva arqueológica e histórica*. Mérida, Yucatán, México: Ayuntamiento de Mérida y el Instituto Nacional de Antropología e Historia.

Caballero, Javier. 1992. "Maya Homegardens: Past, Present and Future." *Etnoecológica* 1 (1):35-54.

Cabrera Pacheco, Ana Julia. 2017. "Primitive Accumulation in Indigenous Mexico: The Contested Transformations of the Maya *Solar* of Yucatán." *City* 21 (3-4):503-19.

Campos Goenaga, María Isabel. 2011. *Entre crisis de subsistencia y crisis colonial: la sociedad yucateca y los desastres en la coyuntura 1765-1774*. México, D.F.: Instituto Nacional de Antropología e Historia.

Canton, Rodulfo G. 1880. *Memoria de la segunda exposición de Yucatan*. Edited by Gobierno del Estado de Yucatan. Mérida, Yucatán, México: La Librería Meridana de Canton.

Carlsen, Robert S., and Martin Prechtel. 1991. "The Flowering of the Dead: An Interpretation of Highland Maya Culture." *Man* 26 (1):23-42.

Carr, Sorayya H. 1996. "Precolumbian Maya Exploitation and Management of Deer Populations." In *The Managed Mosaic: Ancient Maya Agriculture and Resource Use*, edited by Scott Fedick, 251-61. Salt Lake City: University of Utah Press.

Carrillo-Bastos, Alicia, Gerald A. Islebe, and Nuria Torrescano-Valle. 2013. "3800 Years of Quantitative Precipitation Reconstruction from the Northwest Yucatan Peninsula." *PLoS ONE* 8 (12):1-10.

Carrillo-Bastos, Alicia, Gerald A. Islebe, Nuria Torrescano-Valle, and Norma Emilia González. 2010. "Holocene Vegetation and Climate History of Central Quintana Roo, Yucatán." *Review of Palaeobotany and Palynology* 160:189-96.

Castillo Cocom, Juan, Timoteo Rodriguez, and McCale Ashenbrener. 2017. "Ethnoexodus: Escaping Mayaland." In *'The Only True People': Linking Maya Identities Past and Present*, edited by Bethany J. Beyyette and Lisa J. LeCount, 47-71. Boulder: University Press of Colorado.

Ceballos Gallareta, Teresa, and Socorro Jiménez Álvarez. 2006. "Las esferas cerámicas del horizonte Cochuah del clásico temprano (ca. 250-600 d.C.) en el norte de Yucatán. Parte I: Las esferas del oeste y del centro." In *La producción alfarera en el México antiguo*, edited by Ángel García Cook and Beatriz Leonor Merino Carrión, 561-80. México, D.F.: Instituto Nacional de Antropología e Historia.

Ceballos Gallareta, Teresa, and Fernando Robles Castellanos. 2012. "Las etapas más tempranas de la alfarería Maya en el Noroeste de la Península de Yucatan." *Ancient Mesoamerica* 23 (2):403-19.

Centro de Investigación Científica de Yucatán (CICY). 2010. "Flora de la Península de Yucatán." https://www.cicy.mx/sitios/flora%20digital/index.php.

Chamberlain, Robert S. 1948. *The Conquest and Colonization of Yucatan, 1517-1550*. Washington, DC.

Chambers, Robert, and Gordon R. Conway. 1992. "Sustainable Rural Livelihoods: Practical Concepts for the 21st century." *IDS Discussion Paper* 296. Brighton, UK: Institute of Development Studies.

Chandler-Ezell, Karol, and Deborah M. Pearsall. 2003. "'Piggyback' microfossil processing: Joint starch and phytolith sampling from stone tools." *The Phytolitharien: Bulletin of the Society for Phytolith Research* 15 (3):2-8.

Charlton, Thomas H. 1969. "Texcoco Fabric-Marked Pottery, Tlatles, and Salt-Making." *American Antiquity* 34:73-6.

Chase, Diane Z., and Arlen F. Chase. 2006. "Framing the Maya Collapse: Continuity, Discontinuity, Method, and Practice in the Classic to Postclassic Southern Maya Lowlands." In *After Collapse: The Regeneration of Complex Societies*, edited by Glenn M. Schwartz and John J. Nichols, 168-87. Tucson: The University of Arizona Press.

Chuchiak, John F, IV. 2006. "*Yaab Uih Yetel Maya Cimil*: Colonial Plagues, Famines, Catastrophes and their Impact on Changing Yucatec Maya Concepts of Death and Dying, 1570-1794." In *The Jaws of the Underworld: Life, Death and Rebirth among* *the Ancient Maya*, edited by Pierre R. Colas, Genevieve LeFort and Bodil Liljefors Persson, 3-18. Markt Schwaben, Germany: Verlag Anton Saurwein.

———. 2003. "'It is Their Drinking that Hinders Them': *Balché* and the Use of Ritual Intoxicants among the Colonial Yucatec Maya, 1550-1780." *Estudios de Cultura Maya* 24:137-71.

Cipolla, Craig N. 2019. "Taming the Ontological Wolves: Learning from Iroquoian Effigy Objects." *American Anthropologist* 121 (3):613-27.

Ciudad Real, Antonio de, García Quintana, Josefina, Víctor M. Castillo. 1993. *Tratado curioso y docto de las grandezas de la Nueva España: Relación breve y verdadera de algunas cosas de las muchas que sucedieron al padre fray Alonso Ponce en las provincias de la Nueva España, siendo comisario general de aquellas partes*. Tomo I & II. México, D.F.: Universidad Nacional Autónoma de México.

Clark, Gracia. 1989. "Separation between Trading and Home for Asante Women in Kumasi Central Market, Ghana." In *The Household Economy: Reconsidering the Domestic Mode of Production*, edited by Richard R. Wilk, 91-118. Boulder: Westview Press.

Clason, Antje Trientje. 1972. "Some remarks on the use and presentation of archaeozoological data." *Helenium* 12:139-53.

Clendinnen, Inga. 1982. "Yucatec Maya Women and the Spanish Conquest: Role and Ritual in Historical Reconstruction." *Journal of Social History* 15 (3):427-42.

Cliff, M. B., and Cathy J. Crane. 1989. "Changing Maya Subsistence Economy at a Late Preclassic Maya Community." In *Prehistoric Maya Economies of Belize*, edited by Patricia A. McAnany and B. L. Isaac, 295-324. Greenwich, CT: JAI Press.

Cockrell, Bryan R., and Scott E. Simmons. 2017. "Recycling and Reconfiguring: Metalwork of Maya Communities at Lamanai and Tipu, Belize." *Ancient Mesoamerica* 28:157-81.

Cohen, Mark N., K. O'Connor, Marie Elaine Danforth, Keith P. Jacobi, and C. Armstrong. 1994. "Health and Death at Tipu." In *In the Wake of Contact: Biological Responses to Conquest*, edited by Clark Spencer Larsen and George R. Milner, 121-33. New York: Wiley-Liss.

Collins, Ryan H. 2018. "From Sedentism to Sprawl: Early Urban Process at Yaxuná, Yucatan, Mexico 1000 BCE to 250 CE." Unpublished Ph.D. dissertation, Department of Anthropology, Brandeis University.

Cook, Sherburne F., and Woodrow Borah. 1974. *Essays in Population History: Mexico and the Caribbean*. Vol. 2. Berkeley: University of California Press.

Corzo Márquez, Amilcar R., and Norman B. Schwartz. 2008. "Traditional Home Gardens of Petén, Guatemala: Resource Management, Food Security, and Conservation." *Journal of Ethnobiology* 28 (2):305-17.

Crane, Cathy J. 1996. "Archaeobotanical and Palynological Research at a Late Preclassic Maya Community, Cerros, Belize." In *The Managed Mosaic: Ancient Maya Agriculture and Resource Use*, edited by Scott L. Fedick, 251-77. Salt Lake City: University of Utah Press.

Crown, Patricia. 2000. "Women's Role in Changing Cuisine." In *Women and Men in the Prehispanic Southwest*, edited by Patricia Crown, 221-66. Santa Fe: School of American Research Press.

Cruz Alvarado, Wilberth Antonio. 2010. "Distribución y cronología cerámica de sitios arqueológicos del centro-sur de Yucatán." Tesis de maestría, Universidad Autónoma de Yucatán.

Curtis, Jason H., David A. Hodell, and Mark Brenner. 1996. "Climate Variability on the Yucatan Peninsula (Mexico) during the Past 3500 Years, and Implications for Maya Cultural Evolution." *Quaternary Research* 46 (1):37-47.

Cutright, Robin E. 2015. "Eating Empire in the Jequetepeque: A Local View of Chimú Expansion on the North Coast of Peru." *Latin American Antiquity* 26 (1):64-86.

Dahlin, Bruce H. 2009. "Ahead of Its Time? The Remarkable Early Classic Maya Economy of Chunchucmil." *Journal of Social Archaeology* 9:341-67.

Dahlin, Bruce H., Timothy Beach, Sheryl Luzzadder-Beach, David Hixson, Scott Hutson, Aline Magnoni, Eugenia Mansell, and Daniel E. Mazeau. 2005. "Reconstructing Agricultural Self-Sufficiency at Chunchucmil, Yucatan, Mexico." *Ancient Mesoamerica* 16:229-47.

Deagan, Kathleen A. 1987. *Artifacts of the Spanish Colonies of Florida and the Caribbean, 1500-1800*. Vol. 1: Ceramics, Glassware, and Beads. Washington, DC: Smithsonian Institution Press.

Deagan, Kathleen A., and José Maria Cruxent. 2002. *Archaeology at La Isabela: America's First European Town*. New Haven, CT: Yale University Press.

Deal, Michael. 1985. "Household Pottery Disposal in the Maya Highlands: An Ethnoarchaeological Interpretation." *Journal of Anthropological Archaeology* 4:243-91.

de Certeau, Michel. 1984. *The Practice of Everyday Life*. Translated by Steven Rendall. Berkeley: University of California Press.

De Clerck, Fabrice A. J., and Patricia Negreros-Castillo. 2000. "Plant Species of Traditional Mayan Homegardens of Mexico as Analogs for Multistrata Agroforests." *Agroforestry Systems* 48:303-17.

deFrance, Susan D., and Craig A. Hanson. 2008. "Labor, Population Movement, and Food in Sixteenth-Century Ek Balam, Yucatán." *Latin American Antiquity* 19 (3):299-316.

de la Garza, Mercedes, Ana Luisa Izquierdo, María del Carmen León, and Tolita Figueroa (editors). 1983. *Relaciones histórico-geográficas de la Gobernación de Yucatán (Mérida, Valladolid y Tabasco)*. México: Universidad Nacional Autónoma de México, Instituto de Investigaciones Filológicas, Centro de Estudios Mayas.

del Amo Rodríguez, Silvia, and José María Ramos Prado. 1993. "Use and Management of Secondary Vegetation in a Humid-Tropical Area." *Agroforestry Systems* 21 (1):27-42.

DeLanda, Manuel. 2006. *A New Philosophy of Society: Assemblage Theory and Social Complexity*. London: Bloomsbury Academic.

Delcourt, Paul A., and Hazel R. Delcourt. 1980. "Pollen Preservation and Quaternary Environmental History in the Southeastern United States." *Palynology* 4 (1):214-31.

Deleuze, Gilles, and Félix Guattari. 1987. *A Thousand Plateaus: Capitalism and Schizophrenia*. 2nd ed. Minneapolis: University of Minnesota Press.

De Lucia, Kristin. 2013. "Domestic Economies and Regional Transition: Household Multicrafting and Lake Exploitation in Pre-Aztec Central Mexico." *Journal of Anthropological Archaeology* 32:353-67.

de Montmollin, Olivier. 1989. "Land Tenure and Politics in the Late/Terminal Classic Rosario Valley, Chiapas, Mexico." *Journal of Anthropological Research* 45 (3):293-314.

Diemont, Stewart A. W., Jessica L. Bohn, Donald D. Rayome, Sarah J. Kelsen, and Kaity Cheng. 2011. "Comparisons of Mayan Forest Management, Restoration, and Conservation." *Forest Ecology and Management* 261 (10):1696-705.

Dine, Harper, Traci Ardren, Grace Bascopé, and Celso Gutiérrez Báez. 2019. "Famine Foods and Food Security in the Northern Maya Lowlands: Modern Lessons for Ancient Reconstructions." *Ancient Mesoamerica* First View:1-18. doi: 10.1017/S0956536118000408.

Dorsey Vinton, Sheila, Linda Perry, Karl J. Reinhard, Calogero M. Santoro, and Isabel Teixeira-Santos. 2009. "Impact of Empire Expansion on Household Diet: The Inka in Northern Chile's Atacama Desert." *PLoS ONE* 4 (11):1-5.

Dumond, Carol Steichen, and Don E. Dumond (editors). 1982. "Demography and Parish Affairs in Yucatan 1797-1897: Documents from the Archivo de la Mitra Emeritense Selected by Joaquín de Arrigunaga Peón." In *University of Oregon Anthropological Papers,* No. 27.

Dunmire, William W. 2004. *Gardens of New Spain: How Mediterranean Plants and Foods Changed America*. Austin: University of Texas Press.

Dunning, Nicholas P., Robert E. Griffin, John G. Jones, Richard E. Terry, Zachary Larsen, and Christopher Carr. 2015. "Life on the Edge: Tikal in a Bajo Landscape." In *Tikal: Paleoecology of an Ancient Maya City*, edited by David L. Lentz, Nicholas P. Dunning and Vernon L Scarborough, 95-123. New York: Cambridge University Press.

Ellis, Frank. 2000. *Rural Livelihoods and Diversity in Developing Countries*. Oxford: Oxford University Press.

Emery, Kitty F. 1999. "Continuity and Variability in Postclassic and Colonial Animal Use at Lamanai and Tipu, Belize." In *Reconstructing Ancient Maya Diet*, 61-82. Salt Lake City: University of Utah Press.

———. 1990. "Postclassic and Colonial Period Subsistence Strategies in the Southern Maya Lowlands: Faunal Analyses from Lamanai and Tipu Belize." Unpublished M.A. thesis, Department of Anthropology, University of Toronto.

Espinosa Córtes, Luz María, Fabiola Rueda Arroniz, and Rosa María Andrade García. 1987. *Cronología de hambrunas en México 40,000 a.C. - 1985 d.C.*. México, D.F.: Instituto Nacional de la Nutrición "Salvador Zubiran".

Estrada-Medina, Héctor, Francisco Bautista, Juan José María Jiménez-Osornio, José Antonio González-Iturbe, and Wilian de Jesús Aguilar Cordero. 2013. "Maya and WRB Soil Classification in Yucatan, Mexico: Differences and Similarities." *ISRN Soil Science* 2013:9634260 (1-10).

Farriss, Nancy M. 1984. *Maya Society Under Colonial Rule: The Collective Enterprise of Survival*. Princeton: Princeton University Press.

———. 1980. "Propiedades territoriales en Yucatán en la época colonial: Algunas observaciones acerca de la pobreza española y la autonomía indígena." *Historia Mexicana* 30 (2):153-208.

Faust, Betty B. 1998. *Mexican Rural Development and the Plumed Serpent: Technology and Maya Cosmology in the Tropical Forest of Campeche, Mexico*. Westport, CT: Bergin & Garvey.

Faust, Betty B., and Richard Bilsborrow. 2000. "Maya Culture, Population, and the Environment in the Yucatan Peninsula." In *Population, Development, and Environment on the Yucatán Peninsula: From Ancient Maya to 2030*, edited by Wolfgang Lutz, Leonel Prieto and Warren Sanderson, 73-107. Laxenburg, Austria: International Institute for Applied Systems Analysis.

Fedick, Scott L. 2020. "Maya Cornucopia: Indigenous Food Plants of the Maya Lowlands." In *The Real Business of Ancient Maya Economies: From Farmers' Fields to Rulers' Realms*, edited by Marilyn A. Masson, David A. Freidel and Arthur A. Demarest, in press. Gainesville: University Press of Florida.

———. 2017. "Plant-Food Commodities of the Maya Lowlands." In *The Value of Things: Prehistoric to Contemporary Commodities in the Maya Region*, edited by Jennifer P. Mathews and Thomas H. Guderjan, 163-72. Tucson: The University of Arizona Press.

———. 2014. "A Reassessment of Water and Soil Resources in the Flatlands of the Northern Maya Lowlands." *Archeological Papers of the American Anthropological Association* 24:72–83.

———. 1996. "Landscape Approaches to the Study of Ancient Maya Agriculture and Resource Use." In *The Managed Mosaic: Ancient Maya Agriculture and Resource Use*, edited by Scott L. Fedick, 335-47. Salt Lake City: University of Utah Press.

Fedick, Scott L., Maria de Lourdes Flores Delgadillo, Sergey Sedov, Elizabeth Solleiro Rebolledo, and Sergio Palacios Mayorga. 2008. "Adaptation of Maya Homegardens by "Container Gardening" in Limestone Bedrock Cavities." *Journal of Ethnobiology* 28 (2):290-304.

Fedick, Scott L., Bethany A. Morrison, Bente Juhl Andersen, Sylviane Boucher, Jorge Ceja Acosta, and Jennifer P. Mathews. 2000. "Wetland Manipulation in the Yalahau Region of the Northern Maya Lowlands." *Journal of Field Archaeology* 27 (2):131-52.

Feinman, Gary M., and Linda M. Nicholas. 2007. "Craft Production in Classic Period Oaxaca: Implications for Monte Albán's Political Economy." In *Craft Production in Complex Societies: Multicraft and Producer Perspectives*, edited by Izumi Shimada, 97-119. Salt Lake City: University of Utah Press.

Fernández Souza, Lilia. 2015. "Grinding and Cooking: An Approach to Mayan Culinary Technology." In *Cooking Technology: Transformations in Culinary Practice in Mexico and Latin America*, edited by Steffan Igor Ayora-Diaz, 15-27. New York: Bloomsbury Publishing.

———. 2010. "Grupos domésticos y espacios habitacionales en las Tierras Bajas Mayas durante el Período Clásico." Unpublished Ph.D. dissertation, Hamburg University.

Fernández Tejedo, Isabel. 1990. *La comunidad indígena Maya de Yucatán: Siglos XVI y XVII*. México: Instituto Nacional de Antropología e Historia.

Ferrand, Ezgi Akpinar, Nicholas P. Dunning, David L. Lentz, and John G. Jones. 2012. "Use of Aguadas as Water Management Sources in Two Southern Maya Lowland Sites." *Ancient Mesoamerica* 23 (1):85-101.

Fisher, Chelsea. 2014. "The Role of Infield Agriculture in Maya Cities." *Journal of Anthropological Archaeology* 36:196-210.

Flores-Delgadillo, Lourdes, Scott L. Fedick, Elizabeth Solleiro-Rebolledo, Sergio Palacios-Mayorga, Pilar Ortega-Larrocea, Sergey Sedov, and Esteban Osuna-Ceja. 2011. "A Sustainable System of a Traditional Precision Agriculture in a Maya Homegarden: Soil Quality Aspects." *Soil & Tillage Research* 113:112-20.

Florida Museum of Natural History (FLMNH). 2019. "Digital Ceramic Type Collection." https://www.floridamuseum.ufl.edu/histarch/ceramic-types/.

Florida Museum of Natural History (FLMNH). 2016. "Environmental Archaeology Image Search: Digital Resource." https://www.floridamuseum.ufl.edu/envarch-gallery/.

Ford, Anabel, and Ronald Nigh. 2015. *The Maya Forest Garden: Eight Millennia of Sustainable Cultivation of the Tropical Woodlands*. Walnut Creek, CA: Left Coast Press.

Fowler, Chris. 2013. *The Emergent Past: A Relational Realist Archaeology of Early Bronze Age Mortuary Practices*. Oxford, UK: Oxford University Press.

Freiwald, Carolyn, and Timothy W. Pugh. 2018. "The Origins of Early Colonial Cows at San Bernabé, Guatemala: Strontium Isotope Values at an Early Spanish Mission in the Petén Lakes Region of Northern Guatemala." *Environmental Archaeology* 23 (1):80-96.

Gallareta Negrón, Tomás, Anthony P. Andrews, and Peter J. Schmidt. 1990. "A 16th Century Church at Xlacah, Panaba, Yucatan." *Mexicon* 12 (2):33-6.

Galtung, Johan. 1969. "Violence, Peace, and Peace Research." *Journal of Peace Research* 6:167-91.

García Bernal, Manuela Cristina. 2006. *Desarrollo agrario en el Yucatán colonial: Repercusiones económicas y sociales*. Mérida, Yucatán, México: Universidad Autónoma de Yucatán.

———. 2005. *Economía, política y sociedad en el Yucatán colonial*. Mérida, Yucatán, México: Ediciones de la Universidad Autónoma de Yucatán.

———. 1978. *Población y encomienda en Yucatán bajo los Austrias*. Sevilla, España: Escuela de Estudios Hispano Americanos.

García Targa, Juan. 2000. "Análisis Histórico y Arqueológico del Asentamiento Colonial de Tecoh (Estado de Yucatán, México), Siglo XVI." *Ancient Mesoamerica* 11:231-43.

Gasco, Janine. 1992. "Material Culture and Colonial Indian Society in Southern Mesoamerica: The View from Coastal Chiapas, Mexico." *Historical Archaeology* 26 (1):67-74.

Gerhard, Peter. 1993. *The Southeast Frontier of New Spain*. 2nd ed. Princeton: Princeton University Press.

Gibbons, Euell. 1962. *Stalking the Wild Asparagus*. New York: David McKay Company.

Glover, Jeffrey B. 2012. "The Yalahau Region: A Study of Ancient Maya Sociopolitical Organization." *Ancient Mesoamerica* 23:271-95.

Glover, Jeffrey B., and Travis W. Stanton. 2010. "Assessing the Role of Preclassic Traditions in the Formation of Early Classic Yucatec Cultures, México." *Journal of Field Archaeology* 35 (1):58-77.

Goggin, John M. 1968. *Spanish Majolica in the New World: Types of the Sixteenth to Eighteenth Centuries*. Publications in Anthropology, no. 72. New Haven, CT: Yale University.

Gómez-Pompa, Arturo. 1987. "On Maya Silviculture." *Estudios Mexicanos* 3:1-17.

Gómez-Pompa, Arturo, José Salvador Flores, and Mario Aliphat Fernández. 1990. "The Sacred Cacao Groves of the Maya." *Latin American Antiquity* 1 (3):247-57.

González-Cruz, Gabriela, Eduardo García-Frapolli, and Alejandra Casas. 2015. "Responding to Disturbances: Lessons from a Mayan Socio-Ecological System." *International Journal of the Commons* 9 (2):831-50.

González de la Mata, Rocío. 2006. "Agua, agricultura y mitos: El caso de tres rejolladas de Chichen Itza." In *XIX Simposio de Investigaciones Arqueológicas en Guatemala, 2005*, edited by Juan Pedro Laporte, Bárbara Arroyo and Héctor E. Mejía, 305-18. Guatemala: Museo Nacional de Arqueología y Etnología, Guatemala.

Graham, Elizabeth. 2011. *Maya Christians and Their Churches in Sixteenth-Century Belize*. Gainesville: University Press of Florida.

———. 1987. "Terminal Classic to Early Historic Period Vessels Forms from Belize." In *Maya Ceramics: Papers from the 1985 Maya Ceramic Conference*, edited by

Prudence M. Rice and Robert J. Sharer, 73-98. Oxford, UK: BAR International Series.

Graham, Elizabeth, David M. Pendergast, and Grant D. Jones. 1989. "On the Fringes of Conquest: Maya-Spanish Contact in Colonial Belize." *Science* 246:1254-9.

Grauer, Kacey C. 2019. "Active Environments: Relational Ontologies of Landscape at the Ancient Maya City of Aventura, Belize." *Journal of Social Archaeology* 19 (4):1-21.

Hall, Frank Gregory. 1936. "Physical and chemical survey of cenotes of Yucatán." In *The Cenotes of Yucatán: A Zoological and Hydrographic Survey*, edited by A. S. Pearse, Edwin P. Creaser and Frank Gregory Hall, 5-16. Washington, DC: Carnegie Institute of Washington.

Hanks, William F. 2010. *Converting Words: Maya in the Age of the Cross*. Berkeley: University of California Press.

———. 1990. *Referential Practice: Language and Lived Space among the Maya*. Chicago: The University of Chicago Press.

Hanson, Craig A. 2008. "The Late Mesoamerican Village." Unpublished Ph.D. dissertation, Department of Anthropology, Tulane University.

———. 2002. "In Praise of Garbage: Historical Archaeology, Households, and the Maya Political Economy." In *Ancient Maya Political Economies*, edited by Marilyn A. Masson and David A. Freidel, 365-97. Walnut Creek, CA: AltaMira Press.

Hare, Timothy S., Marilyn A. Masson, and Carlos Peraza Lope. 2014. "The Urban Cityscape." In *Kukulkan's Realm: Urban Life at Ancient Mayapán*, edited by Marilyn A. Masson and Carlos Peraza Lope, 149-92. Boulder: University Press of Colorado.

Harrison-Buck, Eleanor, and Julia A. Hendon. 2018. "An Introduction to Relational Personhood and Other-than-Human Agency in Archaeology." In *Relational Identities and Other-than-Human Agency in Archaeology*, edited by Eleanor Harrison-Buck and Julia A. Hendon, 3-28. Boulder: University Press of Colorado.

Hart, Siobhan M., Maxine Oland, and Liam Frink. 2012. "Finding Transitions: Global Pathways to Decolonizing Indigenous Histories in Archaeology." In *Decolonizing Indigenous Histories: Exploring Prehistoric/Colonial Transitions in Archaeology*, edited by Maxine Oland, Siobhan M. Hart and Liam Frink, 1-15. Tucson: The University of Arizona Press.

Hayden, Brian, and Aubrey Cannon. 1983. "Where the Garbage Goes: Refuse Disposal in the Maya Highlands." *Journal of Anthropological Archaeology* 2:117-63.

Healy, Paul F., John D.H. Lambert, J.T. Arnason, and Richard J. Hebda. 1983. "Caracol, Belize: Evidence of Ancient Maya Agricultural Terraces." *Journal of Field Archaeology* 10:397-410.

Hernández, Christine, and Victoria R. Bricker. 2004. "The Inauguration of Planting in the Borgia and Madrid Codices." In *The Madrid Codex: New Approaches to Understanding an Ancient Maya Manuscript*, edited by Gabrielle Vail and Anthony Aveni, 277-320. Boulder: University Press of Colorado.

Hernández Álvarez, Héctor, and Mario Zimmermann (editors). 2016. *Sendas del Henequén: Un estudio arqueológico de la hacienda San Pedro Cholul, Yucatán*. Mérida, Yucatán, México: Ediciones de la Universidad Autónoma de Yucatán.

Hernández Hernández, Concepción. 2005. "La cerámica del periodo preclásico tardío (300 aC-350 dC) en el norte de la peninsula de Yucatán." In *La producción alfarera en el México antiguo*, edited by Beatriz Leonor Merino Carrión and Ángel García Cook, 753–79. México, D.F.: Instituto Nacional de Antropología e Historia.

Hildebrand, Alan R., Glen T. Penfield, David A. Kring, Mark Pilkington, Antonio Camargo Z., Stein B. Jacobsen, and William V. Boynton. 1991. "Chicxulub Crater: A possible Cretaceous/Tertiary boundary impact crater on the Yucatán Peninsula, Mexico." *Geology* 19:867-71.

Hirth, Kenneth. 2009. "Craft Production, Household Diversification, and Domestic Economy in Prehispanic Mesoamerica." *Archeological Papers of the American Anthropological Association* 19 (1):13-32.

Hodell, David A., Mark Brenner, and Jason H. Curtis. 2007. "Climate and Cultural History of the Northeastern Yucatan Peninsula, Quintana Roo, Mexico." *Climatic Change* 83:215-40.

———. 2005. "Terminal Classic Drought in the Northern Maya Lowlands Inferred from Multiple Sediment Cores in Lake Chichancanab (Mexico)." *Quaternary Science Reviews* 24 (12):1413-27.

Hodell, David A., Mark Brenner, Jason H. Curtis, and T. Guilderson. 2001. "Solar Forcing of Drought Frequency in the Maya Lowlands." *Science* 292:1367–9.

Hodell, David A., Jason H. Curtis, and Mark Brenner. 1995. "Possible Role of Climate in the Collapse of Classic Maya Civilization." *Nature* 375:391-4.

Hoggarth, Julie A., Sebastian F. M. Breitenbach, Brendan J. Culleton, Claire E. Ebert, Marilyn A. Masson, and Douglas J. Kennett. 2016. "The Political Collapse of Chichén Itzá in Climatic and Cultural Context." *Global and Planetary Change* 138:25-42.

Hoggarth, Julie A., Matthew Restall, James W. Wood, and Douglas J. Kennett. 2017. "Drought and Its Demographic Effects in the Maya Lowlands." *Current Anthropology* 58 (1):82-113.

Houck, Charles W., Jr. 2006. "Cenotes, Wetlands, and Hinterland Settlement." In *Lifeways in the Northern Maya Lowlands: New Approaches to Archaeology in the Yucatán Peninsula*, edited by Jennifer P. Mathews and Bethany A. Morrison, 56-76. Tucson: The University of Arizona Press.

———. 2004. "The Rural Survey of Ek Balam, Yucatán, Mexico." Unpublished Ph.D. dissertation, Department of Anthropology, Tulane University.

Houston, Stephen D. 2010. "Living Waters and Wondrous Beasts." In *Fiery Pool: The Maya and the Mythic Sea*, edited by Daniel Finamore and Stephen D. Houston, 66-79. New Haven, CT: Yale University Press.

Hubbs, Carl L. 1936. "Fishes of the Yucatan Peninsula." In *The Cenotes of Yucatan: A Zoological adn Hydrographic Survey*, edited by A. S. Pearse, Edwin P. Creaser and Frank Gregory Hall, 157-287. Washington, DC: Carnegie Institution of Washington.

Hunt, Marta Espejo-Ponce. 1974. "Colonial Yucatán: Town and Region in the Seventeenth Century." Unpublished Ph.D. dissertation, Department of History, University of California, Los Angeles.

Hutson, Scott R. 2014. "Urbanism, Architecture, and Internationalism in the Northern Lowlands during the Early Classic." In *The Ancient Maya of Mexico: Reinterpreting the Past of the Northern Maya Lowlands*, edited by Geoffrey E. Braswell, 117-40. New York: Routledge.

———. 2010. *Dwelling, Identity, and the Maya: Relational Archaeology at Chunchucmil*. New York: AltaMira Press.

Hutson, Scott R., Iliana Ancona Aragón, Miguel Covarrubias Reyna, Zachary Larsen, Katie Lukach, Shannon E. Plank, Richard E. Terry, and Willem Vanessendelft. 2016. "A Historical Processual Approach to Continuity and Change in Classic and Postclassic Yucatan." In *Beyond Collapse: Archaeological Perspectives on Resilience, Revitalization, and Transformation in Complex Societies*, edited by Ronald K. Faulseit, 124-146. Center for Archaeological Investigations, Occasional Paper No. 42. Carbondale: Southern Illinois University.

Hutson, Scott R., Aline Magnoni, Daniel E. Mazeau, and Travis W. Stanton. 2006. "The Archaeology of Urban Houselots at Chunchucmil, Yucatán." In *Lifeways in the Northern Maya Lowlands: New Approaches to Archaeology in the Yucatán Peninsula*, edited by Jennifer P. Mathews and Bethany A. Morrison, 77-92. Tucson: University of Arizona Press.

Hutson, Scott R., and Travis W. Stanton. 2007. "Cultural Logic and Practical Reason: the Structure of Discard in Ancient Maya Houselots." *Cambridge Archaeological Journal* 17 (2):123-44.

Hutson, Scott R., Travis W. Stanton, Aline Magnoni, Richard Terry, and Jason Craner. 2007. "Beyond the Buildings: Formation Processes of Ancient Maya Houselots and Methods for the Study of Non-Architectural Space." *Journal of Anthropological Archaeology* 26:442-73.

Ingold, Timothy. 2011. *Being Alive: Essays on Movement, Knowledge and Description*. London and New York: Routledge.

———. 1993. "The Temporality of the Landscape." *World Archaeology* 25 (2):152-74.

Islebe, Gerald A., Nuria Torrescano-Valle, Alejandro A. Aragón-Moreno, and Alejandro A. Vela-Peláez. 2018. "The Paleoanthropocene of the Yucatán Peninsula: Palynological Evidence of Environmental Change." *Boletín de la Sociedad Geológica Mexicana* 70 (1):49-60.

Isphording, Wayne C. 1984. "The Clays of Yucatan, Mexico: A Contrast in Genesis." *Developments in Sedimentology* 37:59-73.

Johnson, Kristofer D., David R. Wright, and Richard E. Terry. 2007. "Application of Carbon Isotope Analysis to Ancient Maize Agriculture in the Petexbatún Region of Guatemala." *Geoarchaeology* 22 (3):313-36.

Johnston, Kevin J., and Nancy Gonlin. 1998. "What do Houses Mean? Approaches to the Analysis of Classic Maya Commoner Residences." In *Function and Meaning in Classic Maya Architecture*, edited by Stephen D. Houston, 141-86. Washington, DC: Dumbarton Oaks.

Jones, Grant D. 1989. *Maya Resistance to Spanish Rule: Time and Resistance on a Colonial Frontier*. Albuquerque: University of New Mexico Press.

Jones, John G. 2013. "Pollen and Phytolith Processing Protocols for ACS sediments." Manuscript on File, ACS, Ltd., Tempe, Arizona.

———. 1991. "Pollen Evidence for Agricultural Origins and Maya Subsistence Patterns in Northern Belize." Unpublished Ph.D. dissertation, Department of Anthropology, Texas A&M University.

Kaeding, Adam. 2013. "Negotiated Survival: An Archaeological and Documentary Investigation of Colonialism in Beneficios Altos, Yucatan, Mexico." Unpublished Ph.D. dissertation, Department of Archaeology, Boston University.

Kanxoc Kumul, José Miguel, and Maia Dedrick. 2016. "Interdisciplinary Views of Gardens Produced Through Ethnographic Research in Tahcabo, Yucatán, Mexico, as Part of a Collaborative Archaeological Project." Paper presented at the Annual Meeting of the American Anthropological Association, Minneapolis, MN.

Kapp, Ronald O., Owen K. Davis, and James E. King. 2000. *Pollen and Spores*. 2nd ed. College Station: American Association of Stratigraphic Palynologists Foundation, Texas A&M University.

Kennedy, Sarah A., Katherine L. Chiou, and Parker VanValkenburgh. 2019. "Inside the Reducción: Crafting Colonial Foodways at Carrizales and Mocupe Viejo, Zaña Valley, Peru (1570-1700)." *International Journal of Historical Archaeology*:1-31.

Kennett, Douglas J., Sebastian F. M. Breitenbach, Valorie V. Aquino, Yemane Asmerom, Jaime Awe, James U. L. Baldini, Patrick Bartlein, et al. 2012. "Development and Disintegration of Maya Political Systems in Response to Climate Change." *Science* 338:788-91.

Kennett, Douglas J., Marilyn A. Masson, Stanley Serafin, Brendan J. Culleton, and Carlos Peraza Lope. 2016. "War and Food Production at the Postclassic Maya City of Mayapán." In *The Archaeology of Food and Warfare*, edited by Amber VanDerwarker and Gregory Wilson, 161-92. Cham, Switzerland: Springer.

Kepecs, Susan. 2018. "The *Longue Durée*, from Salt to Sea Cucumbers: Kondratieff Waves in Chikinchel, on the Very Far Periphery." In *Colonial and Postcolonial Change in Mesoamerica: Archaeology as Historical Anthropology*, edited by Rani T. Alexander and Susan Kepecs, 283-333. Albuquerque: University of New Mexico Press.

———. 2005. "Mayas, Spaniards, and Salt: World Systems Shifts in Sixteenth-Century Yucatán." In *Postclassic to Spanish-Era Transition in Mesoamerica: Archaeological Perspectives*, edited by Susan Kepecs, Rani Alexander and Matthew Restall, 117-37. Albuquerque: University of New Mexico Press.

———. 1999. "The Political Economy of Chikinchel, Yucatan, Mexico: A Diachronic Analysis from the Prehispanic Era through the Age of Spanish Administration." Unpublished Ph.D. dissertation, Department of Anthropology, University of Wisconsin-Madison.

———. 1998. "Diachronic Ceramic Evidence and its Social Implications in the Chikinchel Region, Northeast Yucatan, Mexico." *Ancient Mesoamerica* 9:121-35.

Kepecs, Susan, and Sylviane Boucher. 1996. "The Pre-Hispanic Cultivation of *Rejolladas* and Stone-Lands: New Evidence from Northeast Yucatán." In *The Managed Mosaic: Ancient Maya Agriculture and Resource Use*, edited by Scott L. Fedick, 69-91. Salt Lake City: University of Utah Press.

Kepecs, Susan, Gary M. Feinman, and Sylviane Boucher. 1994. "Chichen Itza and Its Hinterland: A World-Systems Perspective." *Ancient Mesoamerica* 5 (2):141-58.

Killion, Thomas W. 1990. "Cultivation Intensity and Residential Site Structure: An Ethnoarchaeological Examination of Peasant Agriculture in the Sierra de los Tuxtlas, Veracruz, Mexico." *Latin American Antiquity* 1:191-215.

Koby, Peter. 2012. "Spatial Analysis of Ancient Maya Settlement Near Karst Sinkholes at Xuenkal, Yucatán, Mexico." Unpublished Honors thesis, Kent State University.

Krishnamurthy, Laksmi Reddiar, and Sumithra Krishnamurthy. 2016. "Family Agriculture for Bottom-Up Rural Development: A Case Study of the Indigenous Mayan Population in the Mexican Peninsula." *Future of Food: Journal on Food, Agriculture and Society* 4 (1):29-39.

Kurnick, Sarah. 2019. "Navigating the Past in the Aftermath of Dramatic Social Transformations: Postclassic Engagement with the Classic Period Past in the Northeast Yucatan Peninsula." *Journal of Anthropological Archaeology* 53:51-65.

Langlie, BrieAnna S. 2018. "Building Ecological Resistance: Late Intermediate Period Farming in the South-Central Highland Andes (CE 1100-1450)." *Journal of Anthropological Archaeology* 52:167–79.

Larsen, Zachary Scott. 2012. "Thin Soils and Sacbes: The Soil Resources of Uci, Yucatan, Mexico." Unpublished M.A. thesis, Brigham Young University.

Larson, Brooke, and Robert Wasserstrom. 1983. "Coerced Consumption in Colonial Bolivia and Guatemala." *Radical History Review* 27:49-78.

Latour, Bruno. 1999. *Pandora's Hope: Essays on the Reality of Science Studies*. Cambridge, MA: Harvard University Press.

Lavold, Lisa. 1997. "The Distribution of Pollen within a Cotton Field." Manuscript on file, Department of Anthropology, Arizona State University, Tempe.

Le Guen, Olivier. 2008. "Ubéel Pixan: El Camino de las Almas. Ancestros Familiares y Colectivos entre los Mayas Yucatecos." *Península* 3 (1):83-120.

Lemonnier, Eva, and Boris Vannière. 2013. "Agrarian Features, Farmsteads, and Homesteads in the Río Bec Nuclear Zone, Mexico." *Ancient Mesoamerica* 24:397–413.

Lentz, David L., and Ruth Dickau. 2005. *Seeds of Central America and Southern Mexico: The Economic Species*. New York: New York Botanical Garden.

Lentz, David L., Elizabeth Graham, Xochitl Vinaja, Venicia Slotten, and Rupal Jain. 2016. "Agroforestry and Ritual at the Ancient Maya Center of Lamanai." *Journal of Archaeological Science: Reports* 8:284-94.

Lerner, Amy M., Hallie Eakin, and Stuart Sweeney. 2013. "Understanding Peri-Urban Maize Production through an Examination of Household Livelihoods in the Toluca Metrpolitan Area, Mexico." *Journal of Rural Studies* 30:52-63.

Lesser, Juan M., and Alfred E. Weidie. 1988. "Region 25, Yucatan Peninsula." In *Hydrogeology*, edited by William Back, Joseph S. Rosenshein and Paul R. Seaber, 237-41. Boulder, CO: The Geological Society of America, Inc.

Leyden, Barbara W. 2002. "Pollen Evidence for Climatic Variability and Cultural Disturbance in the Maya Lowlands." *Ancient Mesoamerica* 13:85-101.

Leyden, Barbara W., Mark Brenner, and Bruce H. Dahlin. 1998. "Cultural and Climatic History of Cobá, a Lowland Maya City in Quintana Roo, Mexico." *Quaternary Research* 49:111-22.

Liebmann, Matthew, and Melissa S. Murphy. 2010. "Rethinking the Archaeology of 'Rebels, Backsliders, and Idolaters'." In *Enduring Conquests: Rethinking the Archaeology of Resistance to Spanish Colonialism in the Americas*, edited by Matthew Liebmann and Melissa S. Murphy, 3-18. Santa Fe: School for Advanced Research Press.

Lister, Florence C., and Robert H. Lister. 1982. *Sixteenth Century Maiolica Pottery in the Valley of Mexico*. Anthropological Papers of the University of Arizona no. 39. Tucson: The University of Arizona Press.

Logan, Amanda L. 2016. "“Why Can't People Feed Themselves?”: Archaeology as Alternative Archive of Food Security in Banda, Ghana." *American Anthropologist* 118 (3):508-24.

Lohse, Jon C. 2010. "Archaic Origins of the Lowland Maya." *Latin American Antiquity* 21:312-52.

López Cogolludo, Diego. 1957 [1688]. *Historia de Yucatán*. México, D.F.: Academia Literaria.

Lorenzen, Karl James. 2003. "Miniature Masonry Shrines of the Yucatan Peninsula: Ancestor Deification in Late Postclassic Maya Ritual and Religion." Unpublished Ph.D. dissertation, Department of Anthropology, University of California, Riverside.

Lucero, Lisa J., and Sherry A. Gibbs. 2007. "The Creation and Sacrifice of Witches in Classic Maya Society." In *New Perspectives on Human Sacrifice and Ritual Body Treatments in Ancient Maya Society*, edited by Vera Tiesler and Andrea Cucina, 45-73. New York: Springer.

MacLeod, Murdo J. 1973. *Spanish Central America: A Socioeconomic History, 1520-1720*. Berkeley: University of California Press.

Manahan, T. Kam, Traci Ardren, and Alejandra Alonso Olvera. 2012. "Household Organization and the Dynamics of State Expansion: The Late Classic–Terminal Classic Transformation at Xuenkal, Yucatan, Mexico." *Ancient Mesoamerica* 23 (02):345-64.

Mansell, Eugenia Brown, Robert H. Tykot, David A. Freidel, Bruce H. Dahlin, and Traci Ardren. 2006. "Early to Terminal Classic Maya Diet in the Northern Lowlands of the Yucatán (Mexico)." In *Histories of Maize: Multidisciplinary Approaches to the Prehistory, Linguistics, Biogeography, Domestication, and Evolution of Maize*, edited by John E. Staller, Robert Tykot and Bruce Benz, 173-85. New York: Academic Press.

Manzanilla, Linda R., and Luis Barba. 1990. "The Study of Activities in Classic Households: Two Case Studies from Coba and Teotihuacan." *Ancient Mesoamerica* 1:41-9.

Marcus, Joyce. 1982. "The Plant World of the Sixteenth- and Seventeenth-Century Lowland Maya." In *Maya Subsistence: Studies in Memory of Dennis E. Puleston*, edited by Kent V. Flannery, 131-56. New York: Academic Press.

Marken, Mitchell W. 1994. *Pottery from Spanish Shipwrecks, 1500-1800*. Gainesville: University Press of Florida.

Martin, Alexander C., and William D. Barkley. 1961. *Seed Identification Manual*. Berkeley: University of California Press.

Martos López, Luis Alberto. 2008. "Underwater Archaeological Exploration of the Mayan Cenotes." *Museum International* 60 (4):100-10.

Masson, Marilyn A. 2020. "Urban Carnivores, Rural Vegetarians? Differential Access to Faunal Foods over Time and Space in the Mayapán Vicinity." In *Social Uses of Food in the Maya Area*, edited by Traci Ardren, in press. Austin: University of Texas Press.

———. 2004. "Fauna Exploitation from the Preclassic to the Postclassic Periods at Four Maya Settlements in Northern Belize." In *Maya Zooarchaeology: New Directions in Method and Theory*, edited by Kitty F. Emery, 97-122. Los Angeles: University of California Press.

———. 2002. "Community Economy and the Mercantile Transformation in Postclassic Northeastern Belize." In *Ancient Maya Political Economies*, edited by Marilyn A. Masson and David A. Freidel, 335-64. Walnut Creek, CA: Altamira Press.

———. 2000. *In the Realm of Nachan Kan: Postclassic Maya Archaeology at Laguna de On, Belize*. Boulder: University of Colorado Press.

Masson, Marilyn A., and David A. Freidel. 2012. "An Argument for Classic Era Maya Market Exchange." *Journal of Anthropological Archaeology* 31:455-84.

Masson, Marilyn A., Timothy S. Hare, Carlos Peraza Lope, Bárbara C. Escamilla Ojeda, Elizabeth H. Paris, Betsy Kohut, Bradley W. Russell, and Wilberth Cruz Alvarado. 2016. "Household Craft Production in the Prehispanic Urban Setting of Mayapán, Yucatan, Mexico." *Journal of Archaeological Research* 24:229-74.

Masson, Marilyn, and Carlos Peraza Lope. 2014. *Kukulcan's Realm: Urban Life at Ancient Mayapán*. Boulder: University Press of Colorado.

———. 2008. "Animal use at the Postclassic Maya center of Mayapán." *Quaternary International* 191 (1):170-83.

Mathews, Jennifer P. 1998. "The Ties that Bind: The Ancient Maya Interaction Spheres of the Late Preclassic and Early Classic Periods in the Northern Yucatán Peninsula." Unpublished Ph.D. dissertation, Department of Anthropology, University of California, Riverside.

Mathews, Jennifer P., and Rubén Maldonado Cárdenas. 2006. "Late Formative and Early Classic Interaction Spheres Reflected in the Megalithic Style." In *Lifeways in the Northern Maya Lowlands: New Approaches to Archaeology in the Yucatán Peninsula*, edited by Jennifer P. Mathews and Bethany Morrison, 95-118. Tucson: The University of Arizona Press.

McAnany, Patricia A. 2013. *Living with the Ancestors: Kinship and Kingship in Ancient Maya Society*. Revised ed. New York: Cambridge University Press.

McCourt, Desmond. 1955. "Infield and Outfield in Ireland." *The Economic History Review* 7 (3):369-76.

Medina-Elizalde, Martín, Stephen J. Burns, David W. Lea, Yemane Asmerom, Lucien von Gunten, Victor Polyak, Mathias Vuille, and Ambarish Karmalkar. 2010. "High Resolution Stalagmite Climate Record from the Yucatán Peninsula Spanning the Maya Terminal Classic Period." *Earth and Planetary Science Letters* 298:255-62.

Meissner, Nathan J. 2018. "Small Projectile Points of Petén: Resources, Production, and Interpolity Variability." In *Historical and Archaeological Perspectives on the Itzas of Petén, Guatemala*, edited by Prudence M. Rice and Donald S. Rice, 252-74. Boulder: University Press of Colorado.

Metcalfe, Sarah E. 1995. "Holocene Environmental Change in the Zacapu Basin: A Diatom-Based Record." *The Holocene* 5:196-208.

Meyers, Allan D. 2012. *Outside the Hacienda Walls: The Archaeology of Plantation Peonage in Nineteenth-Century Yucatán*. Tucson: The University of Arizona Press.

Miksicek, Charles H., Elizabeth S. Wing, and Sylvia J. Scudder. 1991. "The Ecology and Economy of Cuello." In *Cuello: An Early Maya Community in Belize*, edited by Norman Hammond, 70-97. Cambridge: Cambridge University Press.

Millet Cámara, Luis, Heber Ojeda M., and Vicente Suárez A. 1993. "Tecoh, Izamal: Nobleza Indigena y Conquista Española." *Latin American Antiquity* 4 (1):48-58.

Mixter, David W. 2016. "Surviving Collapse: Collective Memory and Political Reorganization at Actuncan, Belize." Unpublished Ph.D. dissertation, Department of Anthropology, Washington University in St. Louis.

Morandi, Steven J. 2010. "Xibun Maya: The Archaeology of an Early Spanish Colonial Frontier in Southeastern Yucatán." Unpublished Ph.D. dissertation, Department of Archaeology, Boston University.

Morehart, Christopher T. 2003. "Paleoethnobotany at Avila." In *Belize Postclassic Project 2002: Investigation of the Shore Settlements of Progresso Lagoon, and San Estevan*, edited by Josalyn M. Ferguson, Maxine H. Oland and Marilyn A. Masson, 126-44. Report to the Department of Archaeology, Belmopan, Belize. Institute of Mesoamerican Studies Occasional Paper No. 9. Department of Anthropology, The University at Albany - SUNY.

Morell-Hart, Shanti, Rosemary A. Joyce, John S. Henderson, and Rachel Cane. 2019. "Ethnoecology in Pre-Hispanic Central America: Foodways and Human-Plant Interfaces." *Ancient Mesoamerica* First View:1-19. doi: 10.1017/S0956536119000014.

Morgan-Smith, Mary Margaret. 2019. "*Caciques* and Community: Historical Maya Archaeology at Rancho Kiuic, Yucatán, México." Unpublished Ph.D. dissertation, Department of Anthropology. University of North Carolina at Chapel Hill.

Morrison, Bethany A. 2006. "From Swidden to Swamps: The Study of Ancient Maya Agriculture." In *Lifeways in the Northern Maya Lowlands: New Approaches to Archaeology in the Yucatán Peninsula*, edited by Jennifer P. Mathews and Bethany A. Morrison, 41-55. Tucson: The University of Arizona Press.

Morrison, Bethany A., and Roberto Cozátl-Manzano. 2003. "Initial Evidence for Use of Periphyton as an Agricultural Fertilizer by the Ancient Maya Associated with the El Edén Wetland, Northern Quintana Roo, Mexico." In *The Lowland Maya Area: Three Millennia at the Human-Wildland Interface*, edited by Arturo Gómez-Pompa, Michael F. Allen, Scott L. Fedick and Juan J. Jiménez-Osornio, 401-13. Binghamton, NY: The Haworth Press, Inc.

Morrison, Kathleen D. 1994. "The Intensification of Production: Archaeological Approaches." *Journal of Archaeological Method and Theory* 1 (2):111-59.

Munro-Stasiuk, Mandy J., T. Kam Manahan, Trent Stockton, and Traci Ardren. 2014. "Spatial and Physical Characteristics of *Rejolladas* in Northern Yucatán, Mexico: Implications for Ancient Maya Agriculture and Settlement Patterns." *Geoarchaeology* 29:156-72.

Nations, James D., and Ronald B. Nigh. 1980. "The Evolutionary Potential of Lacandon Maya Sustained-Yield Tropical Forest Agriculture." *Journal of Anthropological Research* 36 (1):1-30.

Nelson, Ben A. 1991. "Ceramic frequency and use-life: A highland Mayan case in cross-cultural perspective." In *Ceramic Ethnoarchaeology*, edited by William A. Longacre, 162-81. Tucson: University of Arizona Press.

Netting, Robert McC. 1993. *Smallholders, Householders: Farm Families and the Ecology of Intensive Sustainable Agriculture*. Palo Alto, CA: Stanford University Press.

Neulinger, Korinna, Christian R. Vogl, and José A. Alayón-Gamboa. 2013. "Plant Species and Their Uses in Homegardens of Migrant Maya and *Mestizo* Smallholder Farmers in Calakmul, Campeche, Mexico." *Journal of Ethnobiology* 33 (1):105-24.

Nigh, Ronald, and Stewart A. W. Diemont. 2013. "The Maya Milpa: Fire adn the Legacy of Living Soil." *Frontiers in Ecology and the Environment* 11 (1):e45-e54.

Nixon, Rob. 2011. *Slow Violence and the Environmentalism of the Poor*. Cambridge, MA: Harvard University Press.

Ochoa Rodríguez, José Manuel. 2004. "La secuencia cerámica de Xcaret, Quintana Roo, México." Tesis de licenciatura, Universidad Autónoma de Yucatán, Mérida.

Oland, Maxine. 2016. "Chetumul Bay in the Fifteenth to Seventeenth Centuries." In *Perspectives on the Ancient Maya of Chetumal Bay*, edited by Debra S. Walker, 107-24. Gainesville: University Press of Florida.

———. 2014. "'With the Gifts and Good Treatment That He Gave Them': Elite Maya Adoption of Spanish Material Culture at Progresso Lagoon, Belize." *International Journal of Historical Archaeology* 18:643–67.

———. 2012. "Lost among the Colonial Maya: Engaging Indigenous Maya History at Progresso Lagoon, Belize." In *Decolonizing Indigenous Histories: Exploring Prehistoric/Colonial Transitions in Archaeology*, edited by Maxine Oland and Siobhan Hart, 178-200. Tucson: University of Arizona Press.

———. 2009. "Long-Term Indigenous History on a Colonial Frontier: Archaeology at a 15th-17th Century Maya Village, Progresso Lagoon, Belize." Unpublished Ph.D. dissertation, Northwestern University.

Oland, Maxine, and Joel W. Palka. 2016. "The Perduring Maya: New Archaeology on Early Colonial Transitions." *Antiquity* 90 (350):472–86.

Olsen, Stanley J. 1982. *An osteology of some Maya mammals*. Vol. 73, *Papers of the Peabody Museum of Archaeology and Ethnology*. Cambridge, MA: Peabody Museum of Archaeology and Ethnology, Harvard University.

———. 1968. *Fish, Amphibian and Reptile Remains from Archaeological Sites; Southeastern and Southwestern United States*. Vol. 56, *Papers of the Peabody Museum of Archaeology and Ethnology*. Cambridge, MA: Peabody Museum of Archaeology and Ethnology, Harvard University.

Ortega-Muñoz, Allan, Andrea Cucina, Vera Tiesler, and Thelma N. Sierra-Sosa. 2018. "Population and Demographic Shifts along the Coast of Yucatan from the Early to Late Classic: A View from Xcambo, Mexico." *Latin American Antiquity* 29 (3):591-609.

Overholtzer, Lisa. 2013. "Archaeological Interpretation and the Rewriting of History: Deimperializing and Decolonizing the Past at Xaltocan, Mexico." *American Anthropologist* 115 (3):481-95.

Pacheco Cruz, Santiago. 1934. *Estudio etnográfico de los mayas del ex-territorio de Quintana Roo*. Mérida, Yucatán, México: Imprenta Oriente.

Palka, Joel W. 2005. *Unconquered Lacandon Maya: Ethnohistory and Archaeology of Indigenous Culture Change*. Gainesville: University Press of Florida.

Paris, Elizabeth H. 2008. "Metallurgy, Mayapan, and the Postclassic Mesoamerican World System." *Ancient Mesoamerica* 19:43-66.

Paris, Elizabeth H., Carlos Peraza Lope, Marilyn A. Masson, Pedro C. Delgado Kú, and Bárbara C. Escamilla Ojeda. 2018. "The Organization of Stingless Beekeeping (Meliponiculture) at Mayapán, Yucatan, Mexico." *Journal of Anthropological Archaeology* 52:1-22.

Patch, Robert W. 1994. "Imperial Politics and Local Economy in Colonial Central America 1670-1770." *Past & Present* 143:77-107.

———. 1993. *Maya and Spaniard in Yucatan: 1648-1812*. Redwood City, CA: Stanford University Press.

Pearsall, Deborah. 2016. *Paleoethnobotany: A Handbook of Procedures*. 3rd ed. San Diego, CA: Academic Press.

Pech, Nakuk. 1969 [1562]. "The Chronicle of Chac Xulub Chen." In *The Maya Chronicles*, edited by Daniel G. Brinton, 187-259. New York: AMS Press.

Pendergast, David M. 1993. "World in Collision: The Maya/Spanish Encounter in Sixteenth and Seventeenth Century Belize." *Proceedings of the British Academy* 81:105-43.

Peniche Moreno, Paola. 2009. "Migración y sobrevivencia. Los Mayas ante las hambrunas en el Yucatán Colonial." In *Diásporas, migraciones y exilios en el mundo Maya*, edited by Mario Humberto Ruz, Juan García Targa and Andrés Ciudad Ruiz, 189-206. Mérida, Yucatán, México: Sociedad Española de Estudios Mayas, Universidad Nacional Autónoma de México.

Pezzarossi, Guido. 2015a. "Tribute, Antimarkets, and Consumption: An Archaeology of Capitalist Effects in Colonial Guatemala." In *Archaeology of Culture Contact and Colonialism in Spanish and Portuguese America*, edited by Pedro Paulo A. Funari and Maria Ximena Senatore, 79-102. New York: Springer.

———. 2015b. "A Spectral Haunting of Society: Longue Durèe Archaeologies of Capitalism and Antimarkets in Colonial Guatemala." In *Historical Archaeologies of Capitalism*, edited by Mark P. Leone and Jocelyn E. Knauf, 345-73. Cham, Switzerland: Springer International Publishing.

Pickersgill, Barbara. 2016. "Chile Peppers (*Capsicum* spp.)." In *Ethnobotany of Mexico: Interactions of People and Plants in Mesoamerica*, edited by Rafael Lira, Alejandro Casas and José Blancas, 417-37. New York: Springer Science+Business Media.

Poot-Pool, Wilbert Santiago, Hans van der Wal, Salvador Flores-Guido, Juan Manuel Pat-Fernández, and Ligia Esparza-Olguín. 2015. "Home Garden Agrobiodiversity Differentiates Along a Rural—Peri-Urban Gradient in Campeche, México." *Economic Botany* 69 (3):203-17.

———. 2012. "Economic Stratification Differentiates Home Gardens in the Maya Village of Pomuch, Mexico." *Economic Botany* 66 (3):264-75.

Pope, Kevin O., Adriana C. Ocampo, and Charles E. Duller. 1993. "Surficial Geology of the Chicxulub Impact Crater, Yucatan, Mexico." *Earth, Moon, and Planets* 63:93-104.

Pope, Kevin O., Adriana C. Ocampo, Gary L. Kinsland, and Randy Smith. 1996. "Surface Expression of the Chicxulub Crater." *Geology* 1996 (6):527–30.

Powis, Terry G. 2004. "Ancient Lowland Maya Utilization of Freshwater Pearly Mussels (*Nephronaias* spp.)." In *Maya Zooarchaeology: New Directions in Theory and Method*, edited by Kitty F. Emery, 125-40. Monograph 51, Cotsen Institute of Archaeology. University of California, Los Angeles.

Powis, Terry G., Norbert Stanchly, Christine D. White, Paul F. Healy, Jaime J. Awe, and Fred Longstaffe. 1999. "A Reconstruction of Middle Preclassic Maya Subsistence Economy at Cahal Pech, Belize." *Antiquity* 73:364-76.

Proskouriakoff, Tatiana. 1974. *Jades from the Cenote of Sacrifice, Chichen Itza, Yucatan*, *Memoirs of the Peabody Museum of Archaeology and Ethnology*. Cambridge, MA: Peabody Museum of Harvard University.

Prufer, Keith M. 2005. "Shamans, Caves, and the Roles of Ritual Specialists in Maya Society." In *In the Maw of the Earth Monster: Mesoamerican Ritual Cave Use*, edited by James E. Brady and Keith M. Prufer, 186-222. Austin: University of Texas Press.

Pugh, Timothy W. 2009a. "Contagion and Alterity: Kowoj Maya Appropriations of European Objects." *American Anthropologist* 111 (3):373-86.

Pugh, Timothy W. 2009b. "Residential and Domestic Contexts at Zacpetén." In *The Kowoj: Identity, Migration, and Politics in Late Postclassic Petén, Guatemala*, edited by Prudence M. Rice and Donald S. Rice, 173-91. Boulder: University Press of Colorado.

Pugh, Timothy W., Katherine Miller Wolf, Carolyn Freiwald, and Prudence M. Rice. 2016. "Technologies of Domination at Mission San Bernabé, Petén, Guatemala." *Ancient Mesoamerica* 27:49-70.

Pugh, Timothy W., José Rómulo Sánchez, and Yuko Shiratori. 2012. "Contact and Missionization at Tayasal, Petén, Guatemala." *Journal of Field Archaeology* 37 (1):3-19.

Puleston, Dennis E. 1978. "Terracing, Raised Fields, and Tree Cropping in the Maya Lowland: A New Perspective on the Geography of Power." In *Pre-Hispanic Maya Agriculture*, edited by Peter D. Harrison and B. L. Turner II, 225-46. Albuquerque: University of New Mexico Press.

Quezada, Sergio. 2014. *Maya Lords and Lordship: The Formation of Colonial Society in Yucatán, 1350-1600*. Norman: University of Oklahoma Press.

———. 2001a. "Tributos, limosnas, y mantas en Yucatán, siglo XVI." *Ancient Mesoamerica* 12 (1):73-8.

———. 2001b. *Breve historia de Yucatán*: Fondo De Cultura Economica.

———. 1997. *Los Pies de la República: Los Mayas Peninsulares, 1550-1750*. Tlalpan: Centro de Investigaciones y Estudios Superiores en Antropología Social (CIESAS).

———. 1993. *Pueblos y caciques Yucatecos, 1550-1580*. México, D.F.: El Colegio de México.

Rathje, William L. 1983. "To the Salt of the Earth: Some Comments on Household Archaeology among the Maya." In *Prehistoric Settlement Patterns: Essays in Honor of Gordon R. Willey*, edited by Evon Z. Vogt and Richard M. Leventhal, 23-34. Albuquerque: University of New Mexico Press.

Redfield, Robert, and Alfonso Villa Rojas. 1934. *Chan Kom: A Maya Village*. Chicago: The University of Chicago Press.

Reese-Taylor, Kathryn. 2017. "Founding Landscapes in the Central Karstic Uplands." In *Maya E Groups: Calendars, Astronomy, and Urbanism in the Early Lowlands*, edited by David A. Freidel, Arlen F. Chase, Anne S. Dowd and Jerry Murdock, 480-514. Gainesville: University Press of Florida.

Restall, Matthew. 2009. *The Black Middle: Africans, Mayas, and Spaniards in Colonial Yucatan*. Palo Alto, CA: Stanford University Press.

———. 1997. *The Maya World: Yucatec Culture and Society, 1550-1850*. Stanford, CA: Stanford University Press.

Rice, Prudence M., and Donald S. Rice (editors). 2018. *Historical and Archaeological Perspectives on the Itzas of Petén, Guatemala*. Boulder: University Press of Colorado.

———. 2009. *The Kowoj: Identity, Migration, and Geopolitics in Late Postclassic Petén, Guatemala*. Boulder: University Press of Colorado.

Richard, François G. 2018. *Reluctant Landscapes: Historical Anthropologies of Political Experience in Siin, Senegal*. Chicago: University of Chicago Press.

Rico-Gray, Victor, Jose G. Garcia-Franco, Alexandra Chemas, Armando Puch, and Paulino Sima. 1991. "Species Composition, Similarity, and Structure of Mayan Homegardens in Tixpeual and Tixcacaltuyub, Yucatan, Mexico." *Economic Botany* 44 (4):470-87.

Ringle, William M., George J. Bey, Tara Bond Freeman, Craig A. Hanson, Charles W. Houck, and J. Gregory Smith. 2004. "The Decline of the East: The Classic to Postclassic Transition at Ek Balam." In *The Terminal Classic in the Maya Lowlands: Collapse, Transition, and Transformation*, edited by Arthur A. Demarest, Prudence M. Rice and Don S. Rice, 485-516. Boulder: University Press of Colorado.

Robles Castellanos, Fernando. 1990. *La secuencia cerámica de la región de Cobá, Quintana Roo*. México, D.F.: Instituto Nacional de Antropología e Historia.

Robles Castellanos, Fernando, and Teresa Ceballos Gallareta. 2018. "The Genesis of Maya Complexity in the Northwestern Region of the Yucatan Peninsula." In *Pathways to Complexity: A View from the Maya Lowlands*, edited by M. Kathryn Brown and George J. Bey III, 223-51. Gainesville: University Press of Florida.

Robin, Cynthia. 2013. *Everyday Life Matters*. Gainesville: University Press of Florida.

Rodríguez-Alegría, Enrique. 2010. "Incumbents and Challengers: Indigenous Politics and the Adoption of Spanish Material Culture in Colonial Xaltocan, Mexico." *Historical Archaeology* 44 (2):51-71.

Rosenzweig, Melissa S., and John M. Marston. 2018. "Archaeologies of Empire and Environment." *Journal of Anthropological Archaeology* 52:87–102.

Roys, Ralph L. 1957. *The Political Geography of the Yucatan Maya*. Washington, DC: Carnegie Institution of Washington.

———. 1952. *Conquest Sites and the Subsequent Destruction of Maya Architecture in the Interior of Northern Yucatan*. Publication 596, *Contributions to American Anthropology and History*. Washington, DC: Carnegie Institution of Washington.

———. 1939. *The Titles of Ebtun*. Publication No. 505. Washington, DC: Carnegie Institution of Washington.

———. 1933. *The Book of Chilam Balam of Chumayel*. Washington, DC: Carnegie Institution of Washington.

Rugeley, Terry. 2009. *Rebellion Now and Forever: Mayas, Hispanics, and Caste War Violence in Yucatán, 1800-1880*. Palo Alto, CA: Stanford University Press.

Rushton, Elizabeth A.C., Sarah E. Metcalfe, and Bronwen S. Whitney. 2012. "A Late-Holocene Vegetation History from the Maya Lowlands, Lamanai, Northern Belize." *The Holocene* 23 (4):485-93.

Russell, Bradley W. 2016. "All the Gods of the World: Modern Maya Ritual in Yucatán, Mexico." *Ethnoarchaeology* 8 (1):4-29.

———. 2013. "Fortress Mayapán: Defensive Features and Secondary Functions of a Postclassic Maya Fortification." *Ancient Mesoamerica* 24 (2):275-94.

Sabloff, Jeremy. 1975. *Excavations at Seibal: Ceramics*. 2 vols. Vol. 13, *Memoirs of the Peabody Museum*. Cambridge, MA: Peabody Museum.

Salazar, Carmen, Zizumbo-Villarreal, Stephen B. Brush, and Patricia Colunga-GarcíaMarín. 2012. "Earth Ovens (*Píib*) in the Maya Lowlands: Ethnobotanical Data Supporting Early Use." *Economic Botany* 66 (3):285-97.

Sánchez de Aguilar, Pedro. 1937 [1613]. *Informe contra idolorum cultores del obispado de Yucatán*. 3 ed. Mérida, Yucatán, México: E.G. Triay.

Sanders, William T., and Thomas W. Killion. 1992. "Factors Affecting Settlement Agriculture in the Ethnographic and Historic Record of Mesoamerica." In *Gardens of*

Prehistory: The Archaeology of Settlement Agriculture in Greater Mesoamerica, edited by Thomas W. Killion, 14-32. Tuscaloosa: The University of Alabama Press.

Santos-Fita, Dídac, Eduardo J. Naranjo, Erin I. J. Estrada, Ramón Mariaca, and Eduardo Bello. 2015. "Symbolism and Ritual Practices Related to Hunting in Maya Communities from Central Quintana Roo, Mexico." *Journal of Ethnobiology and Ethnomedicine* 11:1-13.

Scarry, C. Margaret. 1993. "Plant Production and Procurement in Apalachee Province." In *The Spanish Missions of La Florida*, edited by Bonnie G. McEwan, 357-75. Gainesville: University Press of Florida.

Schele, Linda, and Peter Mathews. 1998. *The Code of Kings: The Language of Seven Sacred Maya Temples and Tombs*. New York: Scribner.

Schmidt, Peter J., Péter Bíró, and Eduardo Pérez de Heredia. 2018. "El Templo de los Búhos de Chichén Itzá y su emplazamiento cronológico: una nueva propuesta." *Estudios de Cultura Maya* 52:11-49.

Scholes, France V., and Eleanor B. Adams (editors). 1938. *Don Diego Quijada: Alcalde Mayor de Yucatan, 1561-1565*. 2 vols. México: Antigua Librería Robredo de José Porrúa e Hijos.

Scholes, France V., Carlos T. Menéndez, J. Ignacio Rubio Mañé, and Eleanor B. Adams (editors). 1938. *Documentos para la Historia de Yucatán*. Vol. II: "La Iglesia en Yucatán." Mérida, Yucatán, México: Compañía Tipográfica Yucateca.

Scholes, France V., and Ralph L. Roys (editors). 1948. *The Maya Chontal Indians of Acalan-Tixchel: A Contribution to the History and Ethnography of the Yucatan Peninsula*. Washington, DC: Carnegie Institution of Washington.

Schwartz, Norman B. 1990. *Forest Society: A Social History of Petén, Guatemala*. Philadelphia: University of Pennsylvania Press.

Scoones, Ian. 2009. "Livelihood Perspectives and Rural Development." *The Journal of Peasant Studies* 36 (1):171-96.

———. 1998. "Sustainable Rural Livelihoods: A Framework for Analysis." *IDS working paper* 72. Brighton, UK: Institute of Development Studies.

Scott, James C. 1976. *The Moral Economy of the Peasant: Rebellion and Subsistence in Southeast Asia*. New Haven, CT: Yale University Press.

Serafin, Stanley, Carlos Peraza Lope, and Eunice Uc González. 2014. "Bioarchaeological Investigation of Ancient Maya Violence and Warfare in Inland Northwest Yucatan, Mexico." *American Journal of Physical Anthropology* 154:140-51.

Shaw, Leslie C. 1999. "Social and Ecological Aspects of Preclassic Maya Meat Consumption at Colha, Belize." In *Reconstructing Ancient Maya Diet*, edited by Christine D. White, 83-101. Salt Lake City: The University of Utah Press.

Shaw, Justine M. 2015 (editor). *The Maya of the Cochuah Region: Archaeological and Ethnographic Perspectives on the Northern Lowlands*. Albuquerque: University of New Mexico Press.

Shaw, Justine, and Dave Johnstone. 2006. "Classic Politics in the Northern Maya Lowlands." In *Lifeways in the Northern Maya Lowlands: New Approaches to Archaeology in the Yucatán Peninsula*, edited by Jennifer P. Mathews and Bethany Morrison, 142-54. Tucson: The University of Arizona Press.

Sheets, Payson, Christine Dixon, David L. Lentz, Rachel Egan, Alexandria Halmbacher, Venicia Slotten, Rocío Herrera, and Céline Lamb. 2015. "The Sociopolitical Economy of an Ancient Maya Village: Cerén and its Sacbe." *Latin American Antiquity* 26 (3):341-61.

Sheets, Payson, David L. Lentz, Dolores R. Piperno, John Jones, Christine Dixon, George Maloof, and Angela Hood. 2012. "Ancient Manioc Agriculture South of the Ceren Village, El Salvador." *Latin American Antiquity* 23 (3):259-81.

Sheptak, Russell N., Rosemary A. Joyce, and Kira Blaisdell-Sloan. 2010. "Pragmatic Choices, Colonial Lives: Resistance, Ambivalence, and Appropriation in Northern Honduras." In *Enduring Conquests: Rethinking the Archaeology of Resistance to Spanish Colonialism in the Americas*, edited by Matthew Liebmann and Melissa S. Murphy, 149-72. Santa Fe, NM: School for Advanced Research Press.

Sierra Sosa, Thelma N. 1999. "Xcambó: Codiciado enclave económico del Clásico Maya." *Arqueología Mexicana* 7 (37):40-7.

Simmons, Scott E. 1995. "Maya Resistance, Maya Resolve: The Tools of Autonomy from Tipu, Belize." *Ancient Mesoamerica* 6:135-46.

Simmons, Scott E., David M. Pendergast, and Elizabeth Graham. 2009. "The Context and Significance of Copper Artifacts in Postclassic and Early Historic Lamanai, Belize." *Journal of Field Archaeology* 34:57-75.

Simms, Stephanie Renee. 2013. "Prehispanic Maya Foodways: Archaeological and Microbotanical Evidence from Escalera al Cielo, Yucatán, Mexico." Unpublished Ph.D. dissertation, Department of Archaeology, Boston University.

Simms, Stephanie R., Francesco Berna, and George J. Bey III. 2013. "A Prehispanic Maya Pit Oven? Microanalysis of Fired Clay Balls from the Puuc Region, Yucatán, Mexico." *Journal of Archaeological Science* 40:1144-57.

Simms, Stephanie R., Evan Parker, George J. Bey, and Tomás Gallareta Negrón. 2012. "Evidence from Escalera al Cielo: Abandonment of a Terminal Classic Puuc Maya Hill Complex in Yucatán, Mexico." *Journal of Field Archaeology* 37 (4):270-88.

Simpson, Lesley Byrd. 1982. *The Encomienda in New Spain*. Reprint of 1966 ed. Berkeley: University of California Press.

Smith, Gregory J., William M. Ringle, and Tara M. Bond-Freeman. 2006. "Ichmul de Morley and Northern Maya Political Dynamics." In *Lifeways in the Northern Maya Lowlands: New Approaches to Archaeology in the Yucatán Peninsula*, edited by Jennifer P. Mathews and Bethany Morrison, 155-72. Tucson: The University of Arizona Press.

Smith, A. Ledyard. 1962. "Residential and Associated Structures at Mayapán." In *Mayapán Yucatan, Mexico*, edited by H. E. D. Pollock, Ralph L. Roys, Tatiana Proskouriakoff and A. Ledyard Smith, 165-320. Washington, DC: Carnegie Institution of Washington.

Smith, Marvin T., Elizabeth Graham, and David M. Pendergast. 1994. "European Beads from Spanish-Colonial Lamanai and Tipu, Belize." *BEADS: Journal of the Society of Bead Researchers* 6:21-47.

Smith, Robert E. 1971. *The Pottery of Mayapan*. Vol. 66. Cambridge, MA: Harvard University Press.

Smyth, Michael P., and Davíd Ortegón Zapata. 2006. "Foreign Lords and Early Classic Interaction at Chac II, Yucatan." In *Lifeways in the Northern Maya Lowlands: New Approaches to Archaeology in the Yucatán Peninsula*, edited by Jennifer P. Mathews and Bethany Morrison, 119-41. Tucson: The University of Arizona Press.

Smyth, Michael P., and Daniel Rogart. 2004. "A Teotihuacan Presence at Chac II, Yucatan, Mexico: Implications for Early Political Economy of the Puuc Region." *Ancient Mesoamerica* 15:17-47.

Solís Robleda, Gabriela. 2009. "El repartimiento de géneros y la sociedad indígena en Yucatán en al siglo XVII." *Estudios de Historia Novohispana* 22:13-48.

Stanton, Travis W. 2005. "Taluds, Tripods, and Teotihuacanos: A Critique of Central Mexican Influence in Classic Period Yucatan." *Mayab* 18:17-35.

Stringfield, V. T., and H. E. LeGrand. 1976. "Karst Hydrology of Northern Yucatan Peninsula, Mexico." In *Carbonate Rocks and Hydrogeology of the Yucatan Peninsula, Mexico*, edited by A. Ward and W. Weidie, 192-210. New Orleans: New Orleans Geological Society.

Sweetwood, Ryan V., Richard E. Terry, Timothy Beach, Bruce H. Dahlin, and David Hixson. 2009. "The Maya Footprint: Soil Resources of Chunchucmil, Yucatán, México." *Soil Science Society of America Journal* 73 (4):1209-20.

Sweitz, Sam R. 2012. *On the Periphery of the Periphery: Household Archaeology at Hacienda San Juna Bautista Tabi, Yucatán, Mexico*. New York: Springer Science+Business Media.

Talavera Barnard, Elena. 1979. "Las salinas de la Cuenca de México y la cerámica de impresión textil." Tesis de licenciatura, Escuela Nacional de Antropología e Historia.

Tani, Masakazu. 1994. "Why should more pots break in larger households? Mechanisms underlying population estimates from ceramics." In *Kalinga Ethnoarchaeology: Expanding Archaeological Method and Theory*, edited by William A. Longacre and James M. Skibo, 51-70. Washington, DC: Smithsonian Institution Press.

Tankersley, Kenneth Barnett, Denis G. Conover, David L. Lentz, Alexia Callihan, Jacob Weakley, Isabel Hassett, Elaine Platt, Audrey Laiveling, and Emma Bradford. 2019. "The impact of maize (*Zea mays*) on the stable carbon isotope values of archaeological soil organic matter." *Journal of Archaeological Science* 24:324-9.

Taube, Karl A. 1995. "The Monumental Architecture of the Yalahau Region and the Megalithic Style of the Northern Maya Lowlands." In *The View from Yalahau: 1993 Archaeological Investigations in Northern Quintana Roo, Mexico*, 23-58. Riverside: University of California Press.

Tedlock, Dennis. 1985. *Popol Vuh: The Definitive Edition of the Mayan Book of the Dawn of Life and the Glories of Gods and Kings*. New York: Simon & Schuster.

Terán, Silvia, and Christian H. Rasmussen. 2009. *La milpa de los Mayas: La agricultura de los Mayas prehispánicos y actuales en el noreste de Yucatán*. Second ed. México, D.F.: Universidad Autónoma de México.

———. 1995. "Genetic Diversity and Agricultural Strategy in 16th Century and Present-Day Yucatecan Milpa Agriculture." *Biodiversity and Conservation* 4:363-81.

Terán, Silvia, Christian Rasmussen, and Olivio May Cauich. 1998. *Las plantas de la milpa entre los Mayas*. Mérida, Yucatán, México: Fundación Tun Ben Kin.

Thompson, Philip C. 1999. *Tekanto, A Maya Town in Colonial Yucatán*. New Orleans, LA: Middle American Research Institute, Tulane University.

Tozzer, Alfred M. 1957. *Chichen Itza and Its Cenote of Sacrifice: A Comparative Study of Contemporaneous Maya and Toltec*. Cambridge: Peabody Museum, Harvard University.

———. 1941. *Landa's Relación de las Cosas de Yucatán*. Papers of the Peabody Museum of Archaeology and Ethnology. Cambridge, MA: Peabody Museum of Archaeology and Ethnology, Harvard University.

Tsing, Anna Lowenhaupt. 2015. *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins*. Princeton, NJ: Princeton University Press.

Turner, B. L. II, and Peter D. Harrison (editors). 1983. *Pulltrouser Swamp: Ancient Maya Habitat, Agriculture and Settlement in Northern Belize*. Austin: University of Texas Press.

Tuz Chi, Lázaro Hilario. 2009. "Así es nuestro pensamiento. Cosmovisión e identidad en los rituales agrícolas de los mayas peninsulares." Unpublished Ph.D. dissertation, Universidad de Salamanca.

VanDerwarker, Amber M. 2006. *Farming, Hunting, and Fishing in the Olmec World*. Austin: University of Texas Press.

VanDerwarker, Amber M., Jon B. Marcoux, and Kandace D. Hollenbach. 2013. "Farming and Foraging at the Crossroads: The Consequences of Cherokee and European Interaction through the Late Eighteenth Century." *American Antiquity* 78 (1):68-88.

Varien, Mark D., and Barbara J. Mills. 1997. "Accumulations Research: Problems and Prospects for Estimating Site Occupation Span." *Journal of Archaeological Method and Theory* 4 (2):141-91.

Vela-Peláez, Alejandro A., Nuria Torrescano-Valle, Gerald A. Islebe, J.F. Mas, and Holger Weissenberger. 2018. "Holocene Precipitation Changes in the Maya Forest, Yucatán Peninsula, Mexico." *Palaeogeography, Palaeoclimatology, Palaeoecology* 505:42-52.

Vogt, Evon Z. 1969. *Zinacantan: A Maya Community in the Highlands of Chiapas*. Cambridge, MA: Belknap Press of Harvard University Press.

Vogt, Evon Z., and David Stuart. 2005. "Some Notes on Ritual Caves among the Ancient and Modern Maya." In *In the Maw of the Earth Monster: Mesoamerican Ritual Cave Use*, edited by James E. Brady and Keith M. Prufer, 155-85. Austin: University of Texas Press.

Von den Driesch, Angela. 1976. *A guide to the measurement of animal bones from archaeological sites: as developed by the Institut für Palaeoanatomie, Domestikationsforschung und Geschichte der Tiermedizin of the University of Munich*, *Peabody Museum Bulletins*. Cambridge, MA: Peabody Museum of Archaeology and Ethnology, Harvard University.

Wallace, Geoffrey H. 2019. "The Geography and History of Beeswax Extraction in the Northern Maya Lowlands, 1540-1700." Unpublished Ph.D. dissertation, Department of History, McGill University.

Webb, Elizabeth, Henry P. Schwarcz, and Paul F. Healy. 2004. "Detection of Ancient Maize in Lowland Maya Soils Using Stable Carbon Isotopes: Evidence from Caracol, Belize." *Journal of Archaeological Science* 31:1039-52.

Webb, Elizabeth, Henry P. Schwarcz, Christopher T. Jensen, Richard E. Terry, Matthew D. Moriarty, and Kitty F. Emery. 2007. "Stable Carbon Isotope Signature of Ancient Maize Agriculture in the Soils of Motul De San José, Guatemala." *Geoarchaeology* 22 (3):291-312.

Weisbach, Carina, Holm Tiessen, and Juan J. Jimenez-Osornio. 2002. "Soil fertility during shifting cultivation in the tropical Karst soils of Yucatan." *Agronomie* 22:253-63.

Wiewall, Darcy Lynn. 2009. "Identifying the Impact of the Spanish Colonial Regime on Maya Household Production at Lamanai, Belize, during the Terminal Postclassic to Early Colonial Transition." Unpublished Ph.D. dissertation, Department of Anthropology, University of California Riverside.

Wilk, Richard R. 1997. *Household Ecology: Economic Change and Domestic Life among the Kekchi Maya in Belize*. DeKalb: Northern Illinois University Press.

Wilk, Richard R., and Wendy Ashmore (editors). 1988. *Household and Community in the Mesoamerican Past*. Albuquerque: University of New Mexico Press.

Wilk, Richard R., and William L. Rathje. 1982. "Household Archaeology." *American Behavioral Scientist* 6:617-39.

Wing, Elizabeth S., and Sylvia J. Scudder. 1991. "The Exploitation of Animals." In *Cuello: An Early Maya Community in Belize*, edited by Norman Hammond, 84-97. Cambridge: Cambridge University Press.

Wright, David R., Richard E. Terry, and Markus Eberl. 2009. "Soil Properties and Stable Carbon Isotope Analysis of Landscape Features in the Petexbatún Region of Guatemala." *Geoarchaeology* 24 (4):466-91.

Wolf, Eric R. 1982. *Europe and the People without History*. Berkeley: University of California Press.

Wollwage, Lance, Scott Fedick, Sergey Sedov, and Elizabeth Solleiro-Rebolledo. 2012. "The Deposition and Chronology of Cenote T'isil: A Multiproxy Study of Human/Environment Interaction in the Northern Maya Lowlands of Southeast Mexico." *Geoarchaeology* 27:441-56.

Young, Helen J., and Maureen L. Stanton. 1990. "Influences of Floral Variation on Pollen Removal and Seed Production in Wild Radish." *Ecology* 71 (2):536-47.

Zrałka, Jarosław, Christophe Helmke, Laura Sotelo, and Koszkul Wiesław. 2018. "The Discovery of a Beehive and the Identification of Apiaries among the Ancient Maya." *Latin American Antiquity* 29 (3):514-31.