THE DISTRIBUTED HOUSEHOLD: PLANT AND MOLLUSK REMAINS FROM K'AXOB, BELIZE

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ABSTRACT

MAIA DEDRICK: The Distributed Household: Plant and Mollusk Data from K'axob, Belize
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In the archaeological study of ancient Maya sites, scholars have considered structures of various sizes and configurations the material remains of households, social groups that made up the basic units of economic production. Archaeologists have used disparities in structure size and complexity to argue for political and ritual hierarchy among structures. This study presents faunal and botanical data from two structures at the site of K'axob, in northern Belize, which have been referred to as adjacent households. Using this biological as well as architectural evidence, I explore the relationship between the larger and smaller structure and developments in the organization of activity areas through time. I suggest that, by the Classic period, households were distributed across more than one structure. Complementary activities took place in adjoining areas, resulting in cooperation, rather than competition, across structures.

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CHAPTER 1:

INTRODUCTION

By the Late Classic period (550-850 CE), settlements of all sizes dotted the highly populated landscape of northern Belize. In urban centers and smaller towns people of different social status lived side-by-side. Various combinations of tribute, taxation, and reciprocity between and within communities figured into the complicated web of relationships that made up economic, social, and ritual identities (McAnany 2010:135). Elites materialized and maintained their authority through monumental architecture, ritual performances, and inherited and acquired luxury goods (McAnany 2010:159). Elites also forged their identities in part through the consumption of preferred foods that signified inherited wealth, ritual power, and political access. Widespread divisions in diet based on status have been identified using isotopic, paleoethnobotanical, and faunal evidence (Emery 2003; Lentz 1991; Metcalfe et al. 2009; Somerville et al. 2012). These studies have focused to a great extent on large, royal centers.

In recent decades archaeologists working in the Maya area have increasingly focused on non-royal and nonurban residential areas. Resulting studies have emphasized the hierarchy and complexity prevalent among small sites (Iannone and Connell 2003; Lohse and Valdez 2004). However, few scholars have used floral or faunal data to examine social and economic relationships within small communities (but see Goldstein and Hageman 2010). We do know that the residents of these communities maintained gardens, infields, and outfields that provided people with diverse diets (McAnany 1992, 1995; Pyburn 1998). On the other hand, plant and animal use differed within and between communities depending on social, environmental, economic, and ritual factors.

Previously, scholars have tried to understand regional and intrasite social and economic organization through the study of settlement patterns (Levi 1996, 2003; Lohse 2004). Research into site layout in northern Belize and elsewhere has illustrated the variety of structures present within non-urban sites. They range from compounds that shared basal platforms with courtyards and pyramidal eastern shrine structures, to "isolates," buildings without platforms some distance from other structures. Nearly all of these varied architectural forms have been interpreted as the material remains of separate households.

Based on this framework, some scholars have used the model of a corporate group to describe intrasite interactions within small settlements during the Late Classic period. The interpretation is based on a common architectural pattern present at small sites in which some structures, called "first-tier" due to their larger size and more complex configuration, endured longer and housed more elite occupants, while others ("second-tier," and even "third-tier") housed farmers (Hageman and Lohse 2003:113). In many cases, the structural isolates and smaller courtyard groups clustered around larger, more complex groups of structures. Scholars applying the corporate group model to sites in northwestern Belize have described the structural layout as indicative of intrasite hierarchy, suggesting that heads of houses made decisions about when to plant and also hosted religious ceremonies and feasts for the kin-based group (Goldstein and Hageman 2010; Hageman and Lohse 2003). Others have seen diversity among neighboring structures at small sites as indicative of household competition for ritual control (e.g., Blackmore 2011:174). This argument also characterizes intrasite interactions as hierarchical.

In this thesis I use food-related data to explore the concept of intrasite hierarchy as it relates to the site of K'axob, located adjacent to Pulltrouser Swamp in northern Belize (Figure 1). Patricia McAnany directed excavations at K'axob from 1990-1998 (McAnany 1993, 1995, 1997, 2004; McAnany and Berry 1999). As part of the project, Hope Henderson (2003) investigated intrasite hierarchy at K'axob through stable isotope signatures of burials interred within different types of structures. Assuming that each platform equaled the space of a household, she argued that people buried in larger and more complex platform groups would have had the opportunity to pursue a wider variety of subsistence strategies and thus consumed less maize (*Zea mays*) compared to people from smaller households. This suggestion is at odds with evidence that maize was consumed as a status food across the Maya area at this time (Coyston et al. 1999; Reed 1994; White et al. 1993; White, Pendergast, et al. 2001). However, northern Belize is a region in which maize seems to have been less associated with status than elsewhere, as overall maize consumption is lower than other regions based on isotope studies (Metcalfe et al. 2009; Reed 1998), and Altun Ha is the only site at which a strong correlation has been found between maize consumption and status (White 2005:368; White et al. 1993; White, Pendergast, et al. 2001). Henderson's use of maize consumption as a proxy for dietary diversity could be feasible.

Henderson's (2003) isotope values showed slight variations in the carbon signatures by residential group indicating that residents of more complex structures ate slightly less maize, particularly during the Formative or Preclassic period, suggesting more diverse diets. This matches with Laura Levi's (1996) finding at San Estevan, Belize, that larger structural compounds were positioned closer to more varied environmental niches than isolated structures within dispersed settlements. The use of diverse microenvironments could have been a risk reduction strategy available to households with larger labor pools. These studies have begun to delve into the advantages and labor implications of larger households—matters of interest to the research presented here.

The purpose of this study is to understand the nature of the basic social and economic unit at K'axob, particularly during the Classic period. This work interrogates the nature of the household, a basic economic unit that provides a vital foundation for how we understand larger issues in political economy and organization. I use botanical and faunal remains to re-examine concepts of the household, corporate group, and intrasite hierarchy. This study presents newly analyzed botanical samples from K'axob, dating predominantly to the Late Classic period (550-850 CE), which has been underrepresented among paleoethnobotanical studies conducted in the region (but see Cuddy 2000; Goldstein and Hageman 2010). I compare botanical and mollusk assemblages from excavations in two domestic areas located near one another in the northern part of K'axob. One excavation (Operation 14) was located within Structure 54, which is part of a basal platform group encompassing several mounds (Figure 3). The excavations revealed eight distinct construction sequences spanning the Late Formative through the Late Classic periods (around 200 BCE to 850 CE). The other excavation (Operation 15) was located within a smaller single mound, Structure 89, 50 m to the southeast (Figure 3). Excavators found three phases of construction dating only to the Late Classic period (550-850 CE).

I aim to understand the differences between the residential areas in order to reconsider economic and social relationships at K'axob, and how they developed in the Classic period. To do so, I probe for evidence of activities conducted in the two areas. The integrated study of plant and mollusk remains can enhance our ability to detect activity areas and their distribution across space. Is there evidence for redundant activities conducted within the two areas, corresponding to expectations of distinct households? Or did food production or ceremonial activities cluster more in one area than the other? I argue that we need to re-evaluate our assumptions about the organization of Classic period households to consider the possibility that they were distributed across structures. This thesis contributes to the literature on households by challenging the notion of competitive household hierarchies within small sites based on the adjacent positioning of diverse buildings. In this way it provides a new picture of the fundamental organization of Maya social and economic life.

In order to contribute to our understanding of households, in Chapter 2 I explore terms and concepts integral to the study of past social organization, including hierarchy and settlement diversity, identities, and corporate kin-based groups. Chapter 3 provides background information on the particular ecological and political landscapes of northern Belize during the Late Formative through Late Classic periods, with a specific focus on K'axob. This chapter includes a summary of archaeological research at the site of K'axob, emphasizing relevant findings and situating specific excavation units. In Chapter 4 I describe previous studies of faunal and botanical data from archaeological sites in northern and central Belize. While presenting prior scholarship, I stress the importance of interpreting plant and animal data in light of the specific contexts in which they were found. Research that does so can provide valuable information, not only on the plants and animals people used, but also on their value and meaning to past communities. Chapter 5 introduces new mollusk and plant data from Operations 14 and 15 at K'axob. The data presented allow for a re-evaluation of intrasite organization at K'axob in Chaper 6. In the discussion chapter I explore the idea that larger households extended across multiple structures and consider this perspective on Classic period social organization in light of related studies from other sites.

CHAPTER 2:

MAYA SOCIAL GROUPS AND IDENTITIES

This chapter critically examines the terminology of household archaeology in the Maya area. First I explore the nature of status and personhood among the Maya. The interpretation of power structures and identities based on past studies of Classic Maya sites provides a basis for discussion of important Maya social and economic groups and their material correlates. Through an examination of concepts including the house, household, houselot, and corporate group, I argue for increased attention to the material imprint of social groups across structures and sites. Also, I emphasize cooperation and heterarchical, rather than only hierarchical, relationships within sites.

Issues in Hierarchy

Recent archaeological discussions of small sites and households throughout the Maya area, but particularly in Belize, have keyed into the notion of “rural complexity.” Archaeologists use the term to better explain the diversity of production strategies and presence of monumental architecture in what have been called the “hinterlands.” In reality, many of these areas were densely populated with widespread settlements. The dichotomy between urban and rural is false because many places blur the boundaries between these categories, reflecting a spectrum of spaces from rural to urban (Iannone and Connell 2003:1; Creed and Ching 1997:15). Scholars studying rural complexity have challenged the belief that small sites consisted of commoners sharing a uniform identity. Instead, they argue that residents exhibited widespread social differentiation and household variation, and even hierarchy (Blackmore 2011). This is an important perspective that has changed our expectations of what have been considered rural places.

The possibility of mixed urban and rural landscapes is just one limitation of the use of such concepts. The imposition of the term "rural" in contrast to "urban" may actually say more about scholars' biases than life in the past (Levi 2003:83-85). Levi (2003:83) writes, "notions of the rural and the complex remain irrevocably tied to their binary opposites, the urban and the simple. Moreover, the entire suite of terms gains meaning only within the context of the evolutionism that emerged so prominently in nineteenth-century social theory and that persists to the present day." As Levi states, social evolutionary theory conflated the rural with the simple and the urban with the complex. In reaction, Maya scholars have predominantly argued for rural complexity using examples of intrasite hierarchy. Hierarchy is a structure composed of subordinate and superior, often ranked, elements (Crumley 1979:44, 1987:158).

On the other hand, several researchers have pointed out that complexity in the Maya area could be redefined to include heterarchical networks as well (Becker 2004; Crumley 2003; Hendon et al. 2009:2; Scarborough et al. 2003). Heterarchy results from coordinated horizontal power structures, working at various scales and through multiple networks (Hendon et al. 2009:11; Adams 1975:60-61). Elements arranged heterarchically can be unranked or flexible in how they are ranked, depending on context (Crumley 1987:158). Heterarchies can occur at regional and intrasite levels. Crumley (2003:138) explains that heterarchical polities make decisions based on popular consensus, often including contributions from disparate segments within the population. Decision-making takes more time than it would in hierarchical polities, where decisions are made quickly but not necessarily with widespread support. In reality, hierarchy and heterarchy often exist in dynamic tension, and both concepts can prove useful in describing past social systems. At the very least, it is better not to assume ranked order between sites or structures within sites without first considering the evidence.

Instead of imposing our problematic social models based on dichotomies of the urban and rural or elite and commoner onto the past, we should seek to understand ancient social groups through investigations of specific archaeological contexts at the site and regional level. Levi finds evidence using settlement pattern analysis that the sites of San Estevan, K'axob, and Kokeal shared a particular architecture of space distinct from surrounding areas (see Figures 1 and 2). To do this, Levi compares the ratios of structure types at varied distances from site centers. She argues that "the area delimited by Kokeal, K'axob, and the three San Estevan ridges constituted a single socioeconomic and political entity," (Levi 2003:91) distinct from other sites in the region. Through such means, researchers can attempt to identify political and economic relationships and affiliations in the past based on patterns arising from the data rather than our own conceptions.

As mentioned, scholars often propose hierarchies between and within sites, implying differences in acquired and attributed power and status. When considering structures of power, it is important to interrogate the meaning of status to the Maya and how it was gained and maintained. We know social positions varied within Maya societies. Elites materialized their social status through acquisition, construction, and performance, which naturalized their authority (McAnany 2010:160). Among the Classic Maya, in a manner particular to non-capitalist societies, economic practice was "entangled with political, social, and cosmological frames" (McAnany 2010:3). Masson (2003:129) has argued based on her study of two

Figure 1. Map of the Maya area showing the location of K'axob in relation to other sites in northern Belize (courtesy of Patricia A. McAnany).

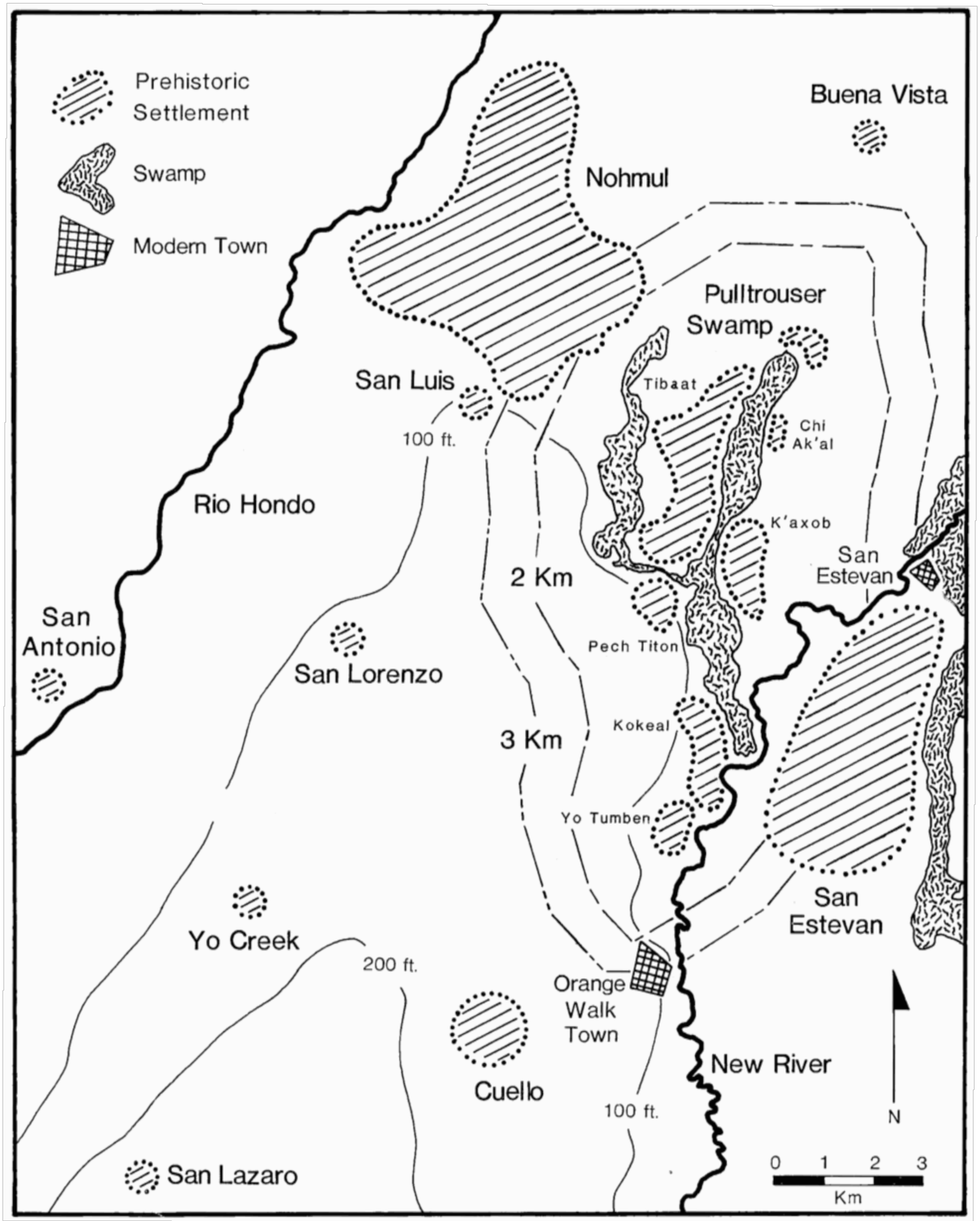

Figure 2. Map of northern Belize with an emphasis on the sites immediately neighboring K'axob (from McAnany 1992:199).

Postclassic communities in northern Belize that, at that time, “a community’s political rank was not closely tied to economic production or exchange privileges,” suggesting shifting relationships between important vectors of power through time. A recent study of Classic period pine wood distribution has shown that affiliation with certain monumental centers provided access to desired goods. Thus, in some ways the residents of small houses within these centers were richer than residents of similar houses elsewhere (Lentz et al. 2005). As it is today, status was a political and social as well as an economic matter. Religious authority was also intimately tied to social status among the Late Classic Maya. The nature of power in Maya society resists simplification into clear dichotomies or even ranked systems.

Personhood and Dwelling(s)

To further understand the character of status in ancient Maya society requires an examination of personhood. Scholars historically have imposed the Western notion of the individual onto ancient Maya communities in the study of mortuary ritual and political economy (Gillespie 2001:73). In many times and places, the notion of the bounded individual was not relevant. Instead, personhood extended beyond the individual to include relationships with larger social groups, ancestors, and objects (Gillespie 2001:75). Hutson (2010:2) refers to this as a sociocentric or “relational view of the self.” Relational personhood makes sense in Mesoamerican societies in particular due to their emphasis on corporate rights and collective forms of worship (Monaghan 1998:140). Through the lens of personhood, ideas of simple ranking of individuals within sites become less tenable.

Particularly relevant to this study, Gillespie (2001:73) states, “Maya corporate kin-based groups, known as ‘houses,’ were a major source of the social identities expressed in political action and represented in mortuary ritual and monumental imagery.” Within corporate groups, people became social beings by activating relationships with people, places, and things while engaging in daily activities within a particular landscape. This process has been referred to as "dwelling," a concept found in the work of philosopher Martin Heidegger (1993:350) that has been adapted by anthropologists (Hutson 2010:5; Ingold 1995; Thomas 2008:302). Dwelling is a condition characterized by equanimity and reciprocal relationships.

The term "dwelling," if employed as a noun, could usefully encapsulate the idea of a structure, group of structures, or other place in which people lived, performed identities, and developed as relational beings. This is how the term will be used here—as the material correlates of the social group called the household. The term dwelling has been used in contradictory ways among scholars, just as other terms relating to residential structures have been. However, when introducing studies that use dwelling differently from my definition, I will clarify the terminology used to make arguments.

Dwelling is also related to the concept of "taskscape," in which "[e]very task takes its meaning from its position within an ensemble of tasks, performed in series or in parallel, and usually by many people working together" (Ingold 1993:158). The taskscape can be useful in envisioning how people interacted within communities, and especially within corporate groups where residents mutually depended on each other for economic success. For example, Robin (2006) identified paths between structures that indicated walking, working, and cleaning spaces around houses and in fields. She used these data and information about activities conducted at Chan Nòohol to point out the close proximity of individuals working in domestic and agricultural pursuits and the absence of gendered workspaces in the community. These are the types of insights to be gained by employing relational perspectives to examine household interactions and economic affairs.

Across a taskscape, gender, status, age, and other identities are formed in relation to each other. Activities are divided accordingly, though boundaries could have been fluid. To understand gendered activities, scholars have drawn on ethnographic analogy, ethnohistoric documents, and depictions of women and men in Classic Maya iconography (e.g., Clark and Houston 1998; Hendon 1997, 2010:87-89; Joyce 1993, 1996). Iconographic evidence shows women engaged in food preparation, spinning, and weaving. Because subsistence production was mostly absent from these accounts, however, scholars have often depended on ethnography to understand gendered associations with agriculture and other activities. As a result, scholars often assume gender roles to have been complementary, with men engaged in crop production or more public activities outside of the dwelling (Devereaux 1987; Joyce 1992). Essentialized views of the division of labor should not be taken for granted, because domestic task affiliation and gender systems vary across time and space and include collaborative efforts (see, for example, Brumfiel and Robin 2008).

Identities are created and recreated through the act of dwelling that occurs within and between structures, including those examined in this thesis. Studies of personhood illustrate that the analysis of artifact assemblages and architectural arrangements can assist in the interpretation of relationships within and between social groups that led to identity formation and maintenance. In this study I utilize data from residential structures to understand the structure of activity areas and, beyond that, to suggest the implications for gender and status identities within a household's taskscape.

Defining Households and Other Social Groups

There has been confusion in naming and addressing important social units in the Maya area. House can refer to the corporate body defined by Lévi-Strauss, the "social house" (Gillespie 2007:35), or it can refer to the material remains of the social group called a household. Due to this confusion, I avoid using the term "house" to refer to residential structures in this thesis. The house society entails a "corporate body holding an estate made up of both material and immaterial wealth, which perpetuates itself through the transmission of its name, its goods, and its titles down a real or imaginary line" (Lévi-Strauss 1982:174). In terms of material correlates, Gillespie (2001:91) uses the term *house* to refer to the residents of a group of structures clustered around one or more patios. Several archaeologists have opted recently to explore Lévi-Strauss's house society model in the consideration of material from Mesoamerican sites, especially in relation to residential burial practices and ancestor veneration (Adams and King 2011; Gillespie 2001, 2011; see also Beck 2007). This model allows flexibility for fictive kinship and diverse house compositions. It opens space for the examination of heterarchical or horizontal networks (McAnany 2013:12).

The corporate group and house society models are compatible. The advantage of the term corporate group is that it does not bring to mind the presence of a single structure within which extended family and fictive kin lived. Also, the corporate group is a term better suited to the focus of this study due to its emphasis on joint economic and social activities across space. The house society model instead addresses the "transgenerational flow of resources" (McAnany 2004c:23), adaptability, and inter-house networks that, while useful, extend beyond the scope of the data presented here. Corporate groups have been defined as groups that jointly control property and resources, often in locations characterized by moderate land shortage (Goodenough 1951:30-31; Hayden and Cannon 1982). They can maintain a high degree of political autonomy, and support what has been called an intragroup administrative hierarchy (Hageman and Lohse 2003; Hayden and Cannon 1982). I would argue, however, that hierarchy within corporate groups has been overemphasized in studies of Maya archaeology.

The corporate group model has been applied to explain distinct patterns of smaller and larger (second-tier and first-tier) residential structures found to characterize Late Classic communities in northwestern Belize (Lohse 2004). Particularly in this region, scholars have interpreted clusters of a large mound with small groups or isolates as different households working together within corporate, lineage-based, and hierarchical groups (Hageman and Lohse 2003:113). The focus on separate structures rather than the larger entity may have hampered our ability to understand intrasite cooperation. As Hayden and Cannon (1982:135) note, residential corporate groups "exert a pervasive influence on all aspects of individuals' lives, including their marriage, their postmarital residence, their economic production, their feasting and celebrations, and their pastimes and pleasures." This study seeks to expand the notion of what corporate group and household life may have entailed at K'axob, while recognizing the significance of hierarchy and exclusion, which were also at play at large and small sites alike.

A household "is a social unit, specifically the group of people that shares in a maximum definable number of activities, including one or more of the following: production, consumption, pooling of resources, reproduction, coresidence, and shared ownership" (Ashmore and Wilk 1988:6). As mentioned, a household is a social group that lived in a dwelling consisting of one or more structures that could be called houses (e.g., Coleman

Goldstein 2008:40). How can a household be defined if not as a group of people residing in the same structure? Wilk (1997:35) suggests Hammel's (1980:251) definition of "the smallest [social] grouping with the maximum corporate function." He proposes using Venn diagrams to map how various domestic activities overlap (Wilk 1997:36). The area of maximum overlap denotes the household. This and other definitions of the household often correspond with descriptions of the corporate group.

In the Maya area, archaeologists have identified varied forms of architecture as the remains of past households. Laura Levi (1996, 2002) identified five classes of what she called household arrangements at San Estevan, Belize. These ranged from small isolates to large composite groups of six to thirteen structures with multiple courtyards and platforms (Levi 2002:126). Maya residences came in many different forms, and generally the greater the number of structures and construction phases, the more elite a household has been thought to be. In general, though, a house consisted of more than one structure and various activity areas. Classic period residences often contained a large eastern structure, pyramidal in form, within which select ancestors were interred, with elaborate burial goods. These sacred structures may have been the focal points of corporate groups, important to social identities of the Late Classic Maya.

Tourtellot (1988) and Haviland (1988) theorized the developmental cycle of Maya households through their work at Seibal and Tikal, respectively. They challenged the assumption that status determined household size. Instead, they argued that houses expanded as families grew. Haviland argues that people, rich and poor, lived together in extended families at Tikal. Extended families often live in a compound composed of individual structures for nuclear families. Within the compound, the head of the household occupies a special, and sometime more imposing location (Haviland 1988:122). Haviland describes a small group of structures at Tikal that grew over time, with a distinctive older structure. Residents renovated the group every generation or so. He connects this evidence with the extended family model, in which the death of the household head would trigger “musical hammocks” (Haviland 1988:123). The head’s successor would move out of his residential structure into a remodeled version of the previous head’s structure, and the next person would move into the house just vacated. Adults were buried with each subsequent construction phase, supporting his model. While in this chapter Haviland supports the idea that building isolates could represent early stage houses in his developmental cycle, Tourtellot finds otherwise.

Instead, Tourtellot (1988:113) found that single buildings often lacked adequate patio space and surrounding areas for future expansion. Included in Tourtellot’s (1988:101) study were eight structure isolates. Three of these had ceremonial uses, two had commercial uses, and three had only Preclassic dates. None of them provided evidence suggesting early stage houses. In addition, in his examination of patio groups with five or six buildings at Seibal, only one to four of these structures appeared to be places where people slept. Tourtellot discusses a variety of ancillary structures present as well, specifying the typical architecture for storage terraces, kitchens, oratories, and altars. As families grew, they rarely added more than four buildings to any single patio (Tourtellot 1988:114). House residents could build separate buildings on a different patio, which he argued was common at Seibal, or they could subdivide structures or expand laterally. The research of Tourtellot and Haviland, while useful to my study of the relationship between households and their material correlates, has a couple of major weaknesses. One, they argue that family growth best explains variability in patio units, when multiple factors could simultaneously influence house formation. Two, they attribute household development solely to internal dynamics rather than to forces such as political centralization or fluctuations in socio-economic status (LeCount et al. 2011:20).

Henderson (2003) also addressed the development of corporate households through time, based on her work at K'axob. She aimed to explain the shift asking the following questions: "Did larger corporate households, which began forming during the fourth century B.C., pool labor and follow a diverse productive pattern? Did smaller households follow a simple productive pattern and mainly cultivate maize?" (Henderson 2003:470). Examining these factors, she sought to understand intrasite wealth differentiation. This study complements the earlier work of Haviland and Tourtellot because it considers why extended family residences might have been advantageous. Henderson (2003:472) tentatively links the development of larger basal platforms, with two to six structures around a central patio, to the intensification of agrarian activities, which included hoeing and weeding as well as constructing raised field plots. She argues that more involved agricultural techniques would require larger households "capable of mobilizing larger labor pools" (Henderson 2003:472).

To test this notion, Henderson employed stable bone isotope analysis on a sample of 25 adults from what she considered 21 different households ranging the entire occupational span of K'axob. Generally, she found that K'axob residents depended on a wide range of plant and animal foods. When she compared consumption of C3 plants based on carbon apatite data, she found that adults from basal platform groups consumed slightly less maize (a 6 percent average difference) than adults from structure isolates. However, there were no significant differences in carbon from collagen or nitrogen isotope values between adults based on household. Still, she argues these data signify that larger households could pool their labor and produce a wider variety of foods for consumption, thus providing a rationale for household expansion.

Many scholars have wielded ethnographic, ethnohistoric, and ethnoarchaeological approaches to explore the physical layout of the Mesoamerican house, or of the houselot, which includes patios, gardens, and refuse areas around structures (Arnold 1990; Hayden and Cannon 1983; Hutson and Stanton 2007; Hutson et al. 2007; Killion 1990; Robin and Rothschild 2002). Houselots have become an important focus due to the perceived role of households as the basic units of production, "the level at which social groups articulate directly with economic and ecological processes" (Wilk and Rathje 1982:618). Hayden and Cannon (1983) famously studied refuse disposal behavior among households in the Maya Highlands and diagrammed the model layout of a houselot. In this model, a patio connected cooking and sleeping structures, around which many disposal and gardening activities took place. Other scholars have since tested additional causes and patterns of discard using ethnoarchaeological methods (Arnold 1990, Hutson and Stanton 2007, Hutson et al. 2007).

These household studies have profoundly improved our understanding of archaeological deposits. In particular, they have encouraged us to focus on areas outside of buildings, to examine their organization, and to draw other analogies from the ethnographic record. However, in some ways, the model of the individual houselot has impeded our consideration of larger entities, including corporate groups and extended families. It has promoted the identification of single structures and their related outdoor spaces over the consideration of larger site layout and the ways in which various structures would have related and interacted, especially at small sites. We have created expectations for the structure of activity areas within houselots based on ethnoarchaeological studies of structural arrangements and related artifact classes and distributions. However, ethnographic examples of social groups, their material correlates, and their relationships to larger political structures today may not easily correspond to those of the past. The next step is to think beyond buildings and patios to consider what evidence could support intrasite cooperation and larger pooled labor groups across households within and even between communities.

CHAPTER 3:

ENVIRONMENTAL AND ARCHAEOLOGICAL CONTEXTS

Residents of sites in northern Belize shared some aspects of diet, resource availability, and political organization due to the landscape. It is important to contextualize K'axob politically and economically within the larger region in order to interpret intrasite interactions. Households interact with larger political and economic spheres on many levels, and archaeological remains can reflect such relationships via artifact patterning. The environment too plays a role in the choices people make about how to structure social arrangements and invest resources. After situating K'axob within its landscape, this chapter describes the site and previous research relevant to the questions of the present study.

In terms of regional politics, the New River that flowed east of K'axob would have linked the site to a number of neighboring communities. The rulers of the large site of Lamanai, located about 50 km up the New River from K'axob at the river's source (Figure 1), constructed one of the largest pyramids built during the Late Formative. They may have enjoyed political hegemony over the residents of K'axob and other sites in the area (McAnany 2004b:12). The location of Lamanai near the New River Lagoon would have allowed residents to oversee river traffic and overland portage from the Belize River valley. Another large site, Cerros, sat at the mouth of the New River (Figure 1). It also hosted Late Formative pyramid construction and may have been a close ally of Lamanai. Colha was a large and important site southeast of K'axob that produced stone tools and traded with most other places in northern Belize, but probably existed mainly within a political sphere headed by Altun Ha to the south (McAnany 2004b:12).

Sites near K'axob, between the Río Hondo and Freshwater Creek include the large site of Nohmul, and the intermediate-sized Cuello and San Estevan (Figure 2). Nohmul residents, probably with the help of surrounding communities, constructed a massive Late Formative platform. K'axob was one of several smaller communities in the New River valley, including Kokeal, Yo Tumben, Tibaat, Pech Titon, and Chi Ak'al (McAnany 2004b:12). Though K'axob was occupied from the Middle Formative, the settlement's residents did not begin monumental pyramidal construction until the Early Classic. Hence it would seem K'axob was just a village in the Late Formative, when many large adjacent sites expanded rapidly. Though eventually K'axob would grow to contain two pyramid complexes, it never hosted the ballcourts or stelae that would be expected of a major center in this and other regions. This study seeks to understand K'axob as an exemplar of minor sites in northern Belize.

Environment of K'axob

An overview of the environment surrounding K'axob provides not just information about local plant diversity but also a rationale for some of the common subsistence strategies practiced in the area. Located in northern Belize, K'axob is situated amid diverse microenvironments. These include coastal, riverine, and wetland habitats conducive to plant and animal diversity. Geologically, northern Belize is part of a low-lying shelf of Cenozoic limestone (Bartlett et al. 2000:100). A fault system in the region runs northeast-southwest from the Chetumal Bay to the Maya Mountains and caused a series of scarps and swales between the Río Hondo and the Río Nuevo (Johnson 1983:17). Variations in salinity and elevation result in the complex array of localized ecosystems mentioned above that provide diverse opportunities for human, animal, and plant habitation. Hammond and Miksicek (1981:262), in characterizing the site of Cuello in northern Belize, described the five main plant communities of the area: (1) uplands of well-drained cohune palm (*Attalea cohune*) forest; (2) monsoon forests—seasonally deciduous forests with many economic tree species; (3) high marsh forests found near *bajos* and rivers; (4) herbaceous swamps characterized by grasses, sedges, rushes, and cattail (*Typha latifolia*); and (5) pine (*Pinus caribaea*) savanna, in which calabash (*Crescentia cujete*), nance (*Byrsonima crassifolia*), and oak trees (*Quercus* sp.) grow.

What did this mean for daily life in the area? Upland regions supported the cultivation of maize and beans (*Phaseolus* sp.). The interface between marsh forest and herbaceous swamp facilitated the development of drainage channels and raised fields (Hammond and Miksicek 1981:263). Deer could be found in the savannas, along with pine and chert. Maya communities made use of these diverse microenvironments through field scattering and other economic strategies (Levi 1996; Henderson 2012). Field scattering is a technique in which farmers cultivate field plots dispersed across microenvironments. Though travel and transport can reduce net yields, harvests from scattered fields buffer farmers from unpredictable production shortfalls (Goland 1993). This technique works particularly well in areas with diverse and highly localized environments, such as northern Belize.

K'axob residents had access to many resources, though hard stone had to be imported. Low-lying limestone hills surround the southern arm of Pulltrouser Swamp (K'axob is located on the eastern side; Figure 2). The limestone locally available to residents of K'axob was unsuitable for stone building blocks or vaulted roofs. K'axob residents acquired material for grinding stones and other tools through trade networks from distant regions such as the Maya Mountains of southern Belize (McAnany 2004b:11-12). Trade also supplied materials for pottery and precious items such as marine shells. The rivers of the area, and particularly the gentle and consistent New River adjacent to K'axob, provided transportation corridors, while the wetlands offered resources including hardwood, palms, and, most obviously, fresh water. Pulltrouser Swamp itself was a place rich with plants, aquatic and terrestrial animals, and birds. People residing nearby hunted, fished, collected mollusks, and conducted agriculture throughout the wetlands, fields, and forest (Masson 2004a:104).

There has been controversy surrounding the use of wetland fields in Belize. Some scholars argue that their use pre-dated the Classic and may not have continued into this later period (Pohl and Bloom 1996; Pohl et al. 1990; Pohl et al. 1996; Pope et al. 1996). These same researchers believe that wetland field manipulations consisted of minor modifications rather than the creation of raised planting beds and extensive canal systems (Pohl et al. 1996). Their evidence was a program of excavation and coring within Pulltrouser, Cob, Pat, and Douglas Swamps in northern Belize, with a focus on what appeared from aerial photographs to be ancient canals. The project collected data about early agricultural activities in the area, and also showed that many posited canals were natural hummocks, though they found a well-developed canal system along the Hondo River ("Rio Hondo," Figure 2; Pohl et al. 1996:369). One possible reason this study did not find evidence for planting platforms in the wetlands was that it did not focus on modifications associated with any particular known archaeological site.

More recently, Berry and McAnany (2007) published compelling evidence for wetland agriculture at K'axob dating from the Formative to the Late Classic periods. Throughout their excavations, they found long temporal sequences of raised field and canal construction and renovation. Based on diverse formation processes and artifact inventories, Berry and McAnany (2007:159) argue that wetland fields at K'axob were not formed through centralized control but were most likely organized by kin groups. According to a study of pollen, people developed island gardens for the growth of specific cultigens (Berry and McAnany 2007:158). Plants represented through pollen finds included maize, manioc, squash, and cotton (Jones 1999). Artifacts included agricultural tools such as obsidian blade fragments found at a distance from the mainland, worked shell artifacts recovered from island field excavations (but not the empty space between residence and field), and a spear tip that was intact and practically unused. The marine shell and spear tip provide evidence for ritual caching in agricultural fields, also reported ethnographically (Vogt 1976:55-59). This evidence demonstrates the importance of wetlands in the life of K'axob residents.

Prior Research at K'axob

K'axob, an elongated site of 84 hectares, consists of more than 100 residential mounds on a patch of high ground between the southern arm of Pulltrouser Swamp and the New River of Belize (Figure 3). People resided at K'axob from at least the Middle Formative through the Late Classic period, and continued conducting ritual activities at the site during the Postclassic. The site surrounds two major pyramidal complexes (McAnany and López Varela 1999:147). The northern plaza contains a 13-m-tall pyramid constructed during the Late Classic period (Figure 3, "Plaza A"), while the southern plaza includes four pyramidal structures and platforms dating back to the Middle Formative (ca. 800 BCE) but added to throughout the occupation of the site (Figure 3, “Plaza B”). For that reason, researchers consider the southern part of K’axob the heart of the Formative period settlement (McAnany 2004b:13).

The Pulltrouser Swamp Project began extensive survey, mapping, and test excavations at K’axob in 1981 (McAnany 1987). Working under investigators Peter D. Harrison and B.L. Turner II, McAnany encountered substantial early Middle Formative deposits (McAnany 1997). Beginning in 1990, McAnany, as principal investigator, directed the first major excavations at K’axob. Research initially focused on illuminating the Formative period foundations of the site. This study inspired a National Science Foundation funded project for further work on ancestor veneration as well as the topical book *Living with the Ancestors* (McAnany 1995). Research into the Formative period at K’axob continued with National Science Foundation support in 1992 and 1993. McAnany edited a volume presenting results from the first three field seasons, entitled *K’axob: Ritual, Work, and Family in an Ancient Maya Village* (2004).

During each field season, large excavation trenches, called “operations,” were placed on platforms and structures and excavated to depths ranging from 1.5 m to 3.5 m. The 1990-1993 field seasons produced Operations 1 through 13 (Figure 3). Excavators controlled horizontal and vertical locations through the use of unique zone numbers for cultural contexts. They used a modified Harris matrix (Harris 1989) to interpret zones and group them into construction phases.

Sandra L. López Varela (1996) created a pottery classification system based on excavations at K’axob and relevant larger ceramic spheres (Table 1; McAnany 2004b:16; McAnany and López Varela 1999:150). Within this thesis when discussing site contexts, I

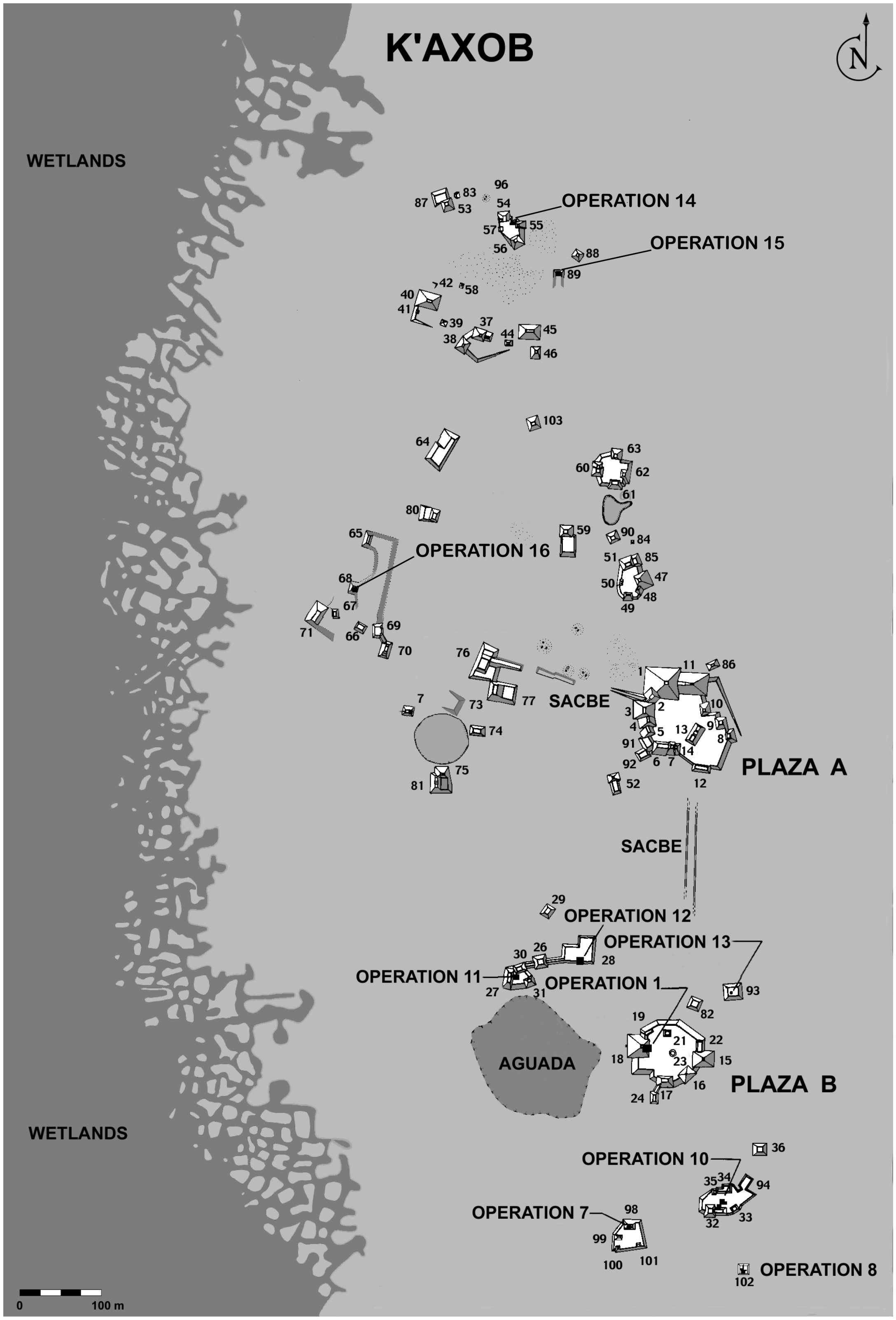

Figure 3. Map of K'axob excavations, with Operations 14 and 15 in the northern portion of the site (courtesy of Patricia A. McAnany).

Table 1. Ceramic complexes of K'axob aligned with major chronological periods (recreated from McAnany 2004b:16).

<table>
<tr><th>TIME</th><th>MAJOR PERIODS</th><th>CERAMIC COMPLEXES</th></tr>
<tr><td>1200</td><td>LATE POSTCLASSIC</td><td rowspan="4">Kimilk'ax</td></tr>
<tr><td>1100</td><td rowspan="3">EARLY POSTCLASSIC</td></tr>
<tr><td>1000</td></tr>
<tr><td>900</td></tr>
<tr><td>800</td><td>TERMINAL CLASSIC</td><td rowspan="3">Witsk'ax</td></tr>
<tr><td>700</td><td rowspan="2">LATE CLASSIC</td></tr>
<tr><td>600</td></tr>
<tr><td>500</td><td rowspan="5">EARLY CLASSIC</td><td rowspan="3">Nohalk'ax</td></tr>
<tr><td>400</td></tr>
<tr><td>300</td></tr>
<tr><td>200</td><td rowspan="2">Terminal Facet</td></tr>
<tr><td>100</td></tr>
<tr><td>C.E.</td><td rowspan="2">PROTOCLASSIC</td><td rowspan="3">K'atabche'k'ax
Late Facet</td></tr>
<tr><td>B.C.E.
100</td></tr>
<tr><td>200</td><td rowspan="4">LATE FORMATIVE</td></tr>
<tr><td>300</td><td rowspan="2">Early Facet</td></tr>
<tr><td>400</td></tr>
<tr><td>500</td><td rowspan="2">Late Facet</td></tr>
<tr><td>600</td><td rowspan="5">MIDDLE FORMATIVE</td></tr>
<tr><td>700</td><td rowspan="2">Chaakk'ax
Early Facet</td></tr>
<tr><td>800</td></tr>
<tr><td>900</td><td rowspan="2"></td></tr>
<tr><td>1000</td></tr>
</table>

will use both the name of the major period from which the information dates as well as the ceramic complex specific to K'axob. This will make the data more easily interpretable by scholars making comparisons with other sites. The complexes provide a chronology tailored to the site's development and occupation phases.

The key issues addressed through investigations of Formative K'axob included when the site was founded, how authority was structured, and the role of ancestors in everyday life. McAnany and colleagues (e.g., Bartlett 2004a; López Varela 2004; McAnany 2004d; McAnany and Ebersole 2004; McAnany and Peterson 2004) also investigated artisan traditions and the availability of local and regional procurement networks to residents of K'axob. The Late Formative was a time of agricultural intensification within the community that coincided with the construction of large basal platforms topped with perishable structures. Elaborate mortuary rituals also began. However, as noted earlier, K'axob residents built no pyramids at this time. They acquired hard stone from far and wide through trade networks in the Middle Formative, but by the Late Formative trade emphasized more localized networks (McAnany 2004a:7). For example, Bartlett and colleagues (2000) found through petrographic and neutron activation analysis that K'axob residents utilized more immediate clay resources at this time. Also, K'axob potters employed distinct decorative motifs when compared with those from neighboring sites in the Late Formative (McAnany 2004e:416). Furthermore, at this time burial contexts at K'axob contained only a limited amount of exotic stone, such as jadeite (Bartlett 2004b:364). All of these lines of evidence support the notion that networks of trade contracted by the end of the Formative period.

Early excavations at K'axob illustrated that Formative through Early Classic period dwellings (from 600 BCE to 400 CE) were built, maintained, and renovated over centuries

(McAnany 2004c:24). They housed economic and ritual activities including ancestor veneration and offerings to nourish the animus of lived space (Harrison-Buck 2004). Characteristics of dwellings at K'axob resonate with discussions of the house society model of Lévi-Strauss, described earlier. Most of the structures consisted of low platforms or building foundations less than 20 cm in height, and apsidal in shape. Buildings primarily rested on platforms of either 24 m^2 or 32 m^2, indicating larger and smaller variants among basic structure types (McAnany 2004c:59). Domestic features included middens and sherd-lined pits containing pottery, chipped stone, ground stone, and faunal remains. Cache deposits and burial interments could be found interspersed with pits, hearths, and middens. Mortuary features varied through time and space. For example, cross motifs and the inclusion of golden chert debitage characterized burials in Operation 1. Multiple interments of adults and children were more common in this excavation unit than others as well. Seated burials began at different times in separate excavation units (McAnany 2004c:61). Residential burial practices reflect patterns in K'axob's development.

Rebecca Storey (2004) analyzed the skeletal remains of ninety-eight individuals from Formative K'axob as well as nine from the Early Classic. Health indicators suggested only slight manifestations of chronic health problems. Porotic hyperostosis showed up rarely. Storey (2004:138) most commonly detected linear enamel hypoplasia and infection, though the latter in slightly lower percentages. The health patterns found among burials at K'axob resembled those from Cuello (Saul and Saul 1997). While Storey identified skeletal indicators of stress at K'axob, the overall assessment indicated that residents of K'axob and Cuello showed less stress than populations from other Maya sites, especially during the Classic period. Low incidences of porotic hyperostosis indicate sufficient dietary iron and low levels of parasites (Storey 2004:138). Residents of the village of K'axob stayed relatively healthy. Saul and Saul (1997:49), in their comments on Cuello, attribute this trend to the diverse and fairly healthy diets of community members who farmed, gardened, and collected wild plants from a mosaic of environments.

Three additional field seasons (in 1995, 1997, and 1998) centered on Classic period constructions and the adjacent wetlands at K'axob. Studies of the data collected during these seasons continue (though see, for example, Berry and McAnany 1998; Henderson 1998; McAnany 1997; McAnany 1998; McAnany and Berry 1999). Excavations conducted during the 1995 field season form the basis for the research presented here. In this season, excavators targeted Classic period contexts, and particularly six residential platforms near Plaza A (Figure 3) and in the northern portion of the site (McAnany 1997). Two operations tested basal platform mounds, while four sampled single mounds. Henderson, field director in 1995, referred to each structure tested in that season as a household, a notion that I refute in this thesis.

Of particular interest to this study are Operations 14 and 15, the northernmost residential areas excavated at K'axob, located approximately 200 m east of Pulltrouser Swamp (Figure 3). The deposits of Operation 14 indicate construction activity from the Late Formative through the Late Classic period. John Schulz directed excavations at Operation 14. The excavation unit sampled Structure 54, a residential group sharing a basal platform approximately 20 m by 30 m and elevated about 2 m above the ground surface (Schulz 1997). Numerous low-lying single platforms surround Structure 54. Among these is Structure 89, located about 50 m to the south, within which Operation 15 was placed (see Figure 3). K'axob residents constructed and utilized Structure 89 solely during the Late Classic period (associated with the Witsk'ax ceramic complex). Data from Operations 14 and 15, and particularly flotation samples from these two units, serve as the basis for the research presented in this thesis. The following section describes excavation finds within Operations 14 and 15 in some detail, with an emphasis on contexts sampled for botanical analysis. In the following descriptions, I specifically reference the names of the zones sampled for flotation in parentheses.

Operation 14

Operation 14 began as a 4x4 meter unit, but was expanded an additional two meters to the south to accommodate complete burial excavation. The earliest construction phases (Phases I and II), date to the Late Formative and Protoclassic periods, or around 200 BCE to 100 CE (associated with the K'atabche'k'ax ceramic complex, Late Facet). During Phase I, K'axob residents removed the original soil and dug pits into bedrock. Afterwards, they filled the pits and built a platform made up of midden deposits transported to the area as a single event or added to incrementally through time (Zone 44). Excavators found a fragment of plaster floor on the surface of the platform, along with a rock-lined posthole dug into the surface. Construction Phase II (Figure 4) included two well-preserved plaster (or packed marl) floors, hearths, pits, several postholes, and three child burials (Zones 47, 51, and 57). One small, 20x23 cm hearth (Zone 46) contained burnt limestone rocks.

Construction Phase III dates to the Early Classic period, or around 100 to 250 CE (Terminal Facet of the K'atabche'k'ax complex). Excavators did not collect flotation samples from this phase, which included two plaster floors, a hearth, and a pit. Construction Phases IV and V dated to the Early Classic period (Nohalk'ax complex), or 250 to 550 CE. No samples were collected from Phase IV, which contained a plaster floor, two postholes, and a

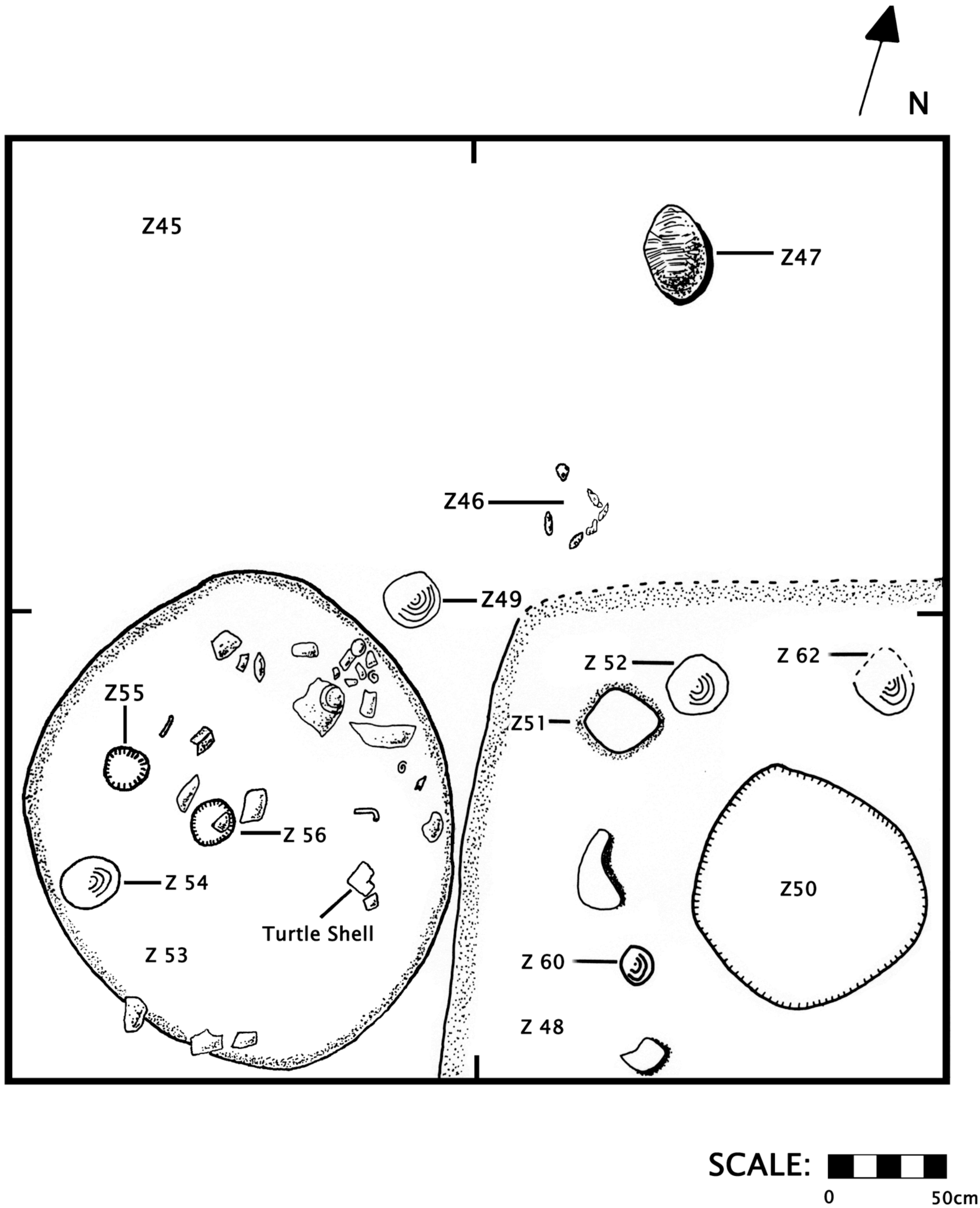

Figure 4. Operation 14, Construction Phase II (from Schulz 1997:21).

hearth. Phase V was the first construction phase in which a single plaster floor covered the entire unit, and it was the best-preserved floor encountered in Operation 14. The phase included an adult burial placed in an intrusive pit with vessels (Zone 35c), and two large limestone rocks suggesting a wall alignment along the southern edge of the unit.

Construction Phases VI through VIII at Operation 14 date to the Late to Terminal Classic, or about 550 to 850 CE (Witsk'ax complex). In Phase VIa another plaster floor was discovered with a pit dug into it that could have been used for cooking (Zone 32). The pit measured 40x42 cm and contained animal bones and sherds (burned and unburned). Above these contexts, in Phase VIb (Figure 5), were two burials (one of which was Zone 22), a midden, another plaster floor, a variety of postholes, and a pit (Zone 18). Zone 18 measured 62x70x30 cm and contained just a few pieces of shell and a couple of sherds. Phase VII (Figure 6) included plaster floors, a small midden, several postholes, two walls, a cache, and a burial (Zone 14) containing a middle-aged adult (Rebecca Storey, personal communication 2013). Excavators encountered two additional burials but they were not excavated. The final construction phase, Phase VIII, included a plaster floor, three adult burials, and a large hearth (Zone 3) with charcoal and a few ceramic sherds. The hearth intruded into one of the burials (Zone 5).

In the 1995 interim report, Schulz (1997:42) concluded that these eight construction phases within Operation 14 represented the expansion of a residential space into a large, multi-room structure occupied by an important family group within the K'axob community. He supported his claim by pointing to the quality of the architectural features within the operation as well as the presence of burials placed within stone-lined cists and accompanied by vessels, suggesting ancestor veneration.

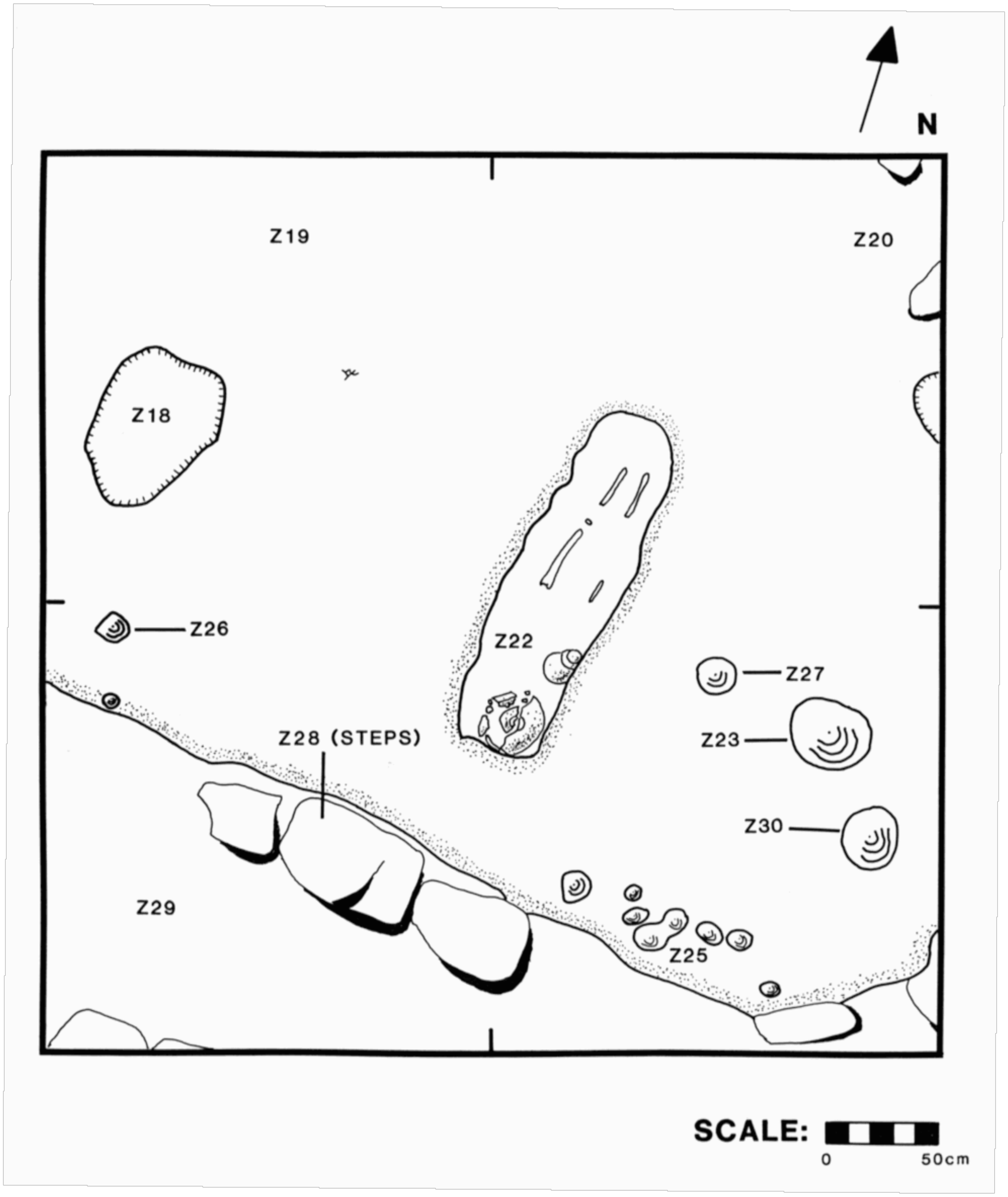

Figure 5. Operation 14, Construction Phase VIb (from Schulz 1997:32).

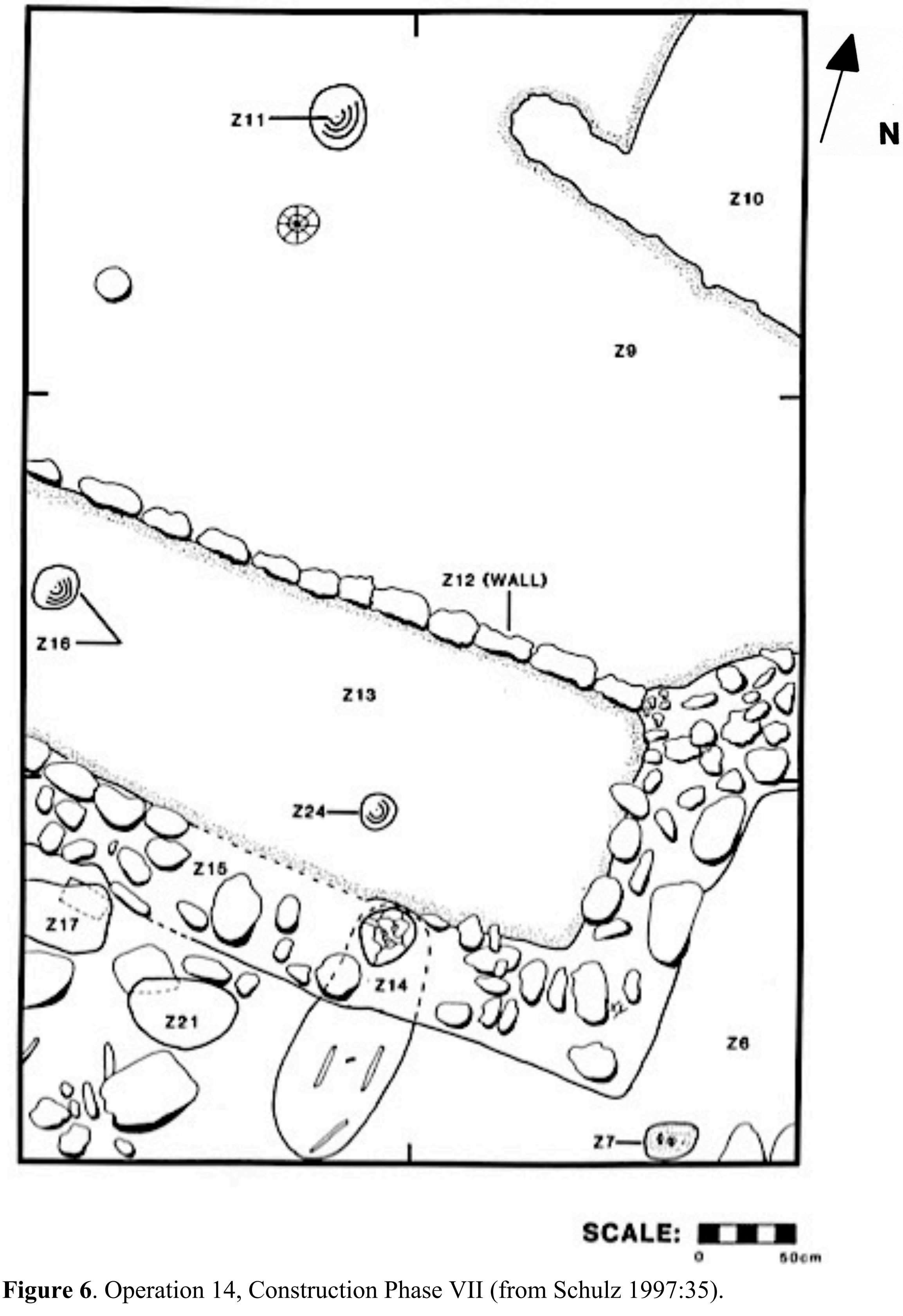

Figure 6. Operation 14, Construction Phase VII (from Schulz 1997:35).

Operation 15

Kimberly Berry directed excavations at Operation 15. The unit consisted of an initial 4x4 m unit, eventually expanded to include three additional 2x2 m units that allowed for further exposure of unusual bedrock features (Berry 1997:44). Construction Phase I of Operation 15 (Figure 7) dates to the Late Classic period (550-750 CE; early Witsk'ax complex). It included a series of pits intruded into a bedrock ridge that may have been used as a downdraft kiln (López Varela et al. 2001). Within the pits, excavators discovered amorphous lumps of fired clay, a diverse assemblage of sherds including shaped-sherd tools, figurine fragments, and powdery blocks that may have served as raw material for tempering pottery clay (Berry 1997:45; López Varela et al. 2001:185). A bedrock pit (Zone 44) could have functioned as a storage feature. Excavators also found the only posthole within Operation 15 (Zone 34). In the fill of another pit, excavators encountered two disarticulated burials (Zone 26). Most recently, Rebecca Storey (personal communication 2013) reports that one burial (15-1) was a young to middle-aged adult and the other (15-2) was a child.

Construction Phase II (Figure 8) also dates to the Late Classic period (early Witsk'ax complex). K'axob residents filled in the kiln features and constructed walls along the southern section of the excavation unit. What seems to have been a patio space to the southwest included a hearth (Zone 16) dug into bedrock and ringed by a hard packed-marl rim. The deposit extended higher than the rim, which suggested to the excavators that use of the hearth may have extended into construction Phase III. In the northern part of the unit occupants dug pits (including Zone 35, in which refuse was dumped). Construction Phase III likely dates to the Terminal Classic period (ca. 750-850 CE; Witsk'ax complex) based on the presence of Tepeu 3 ceramics. In Phase III, residents resurfaced the area (with an earthen

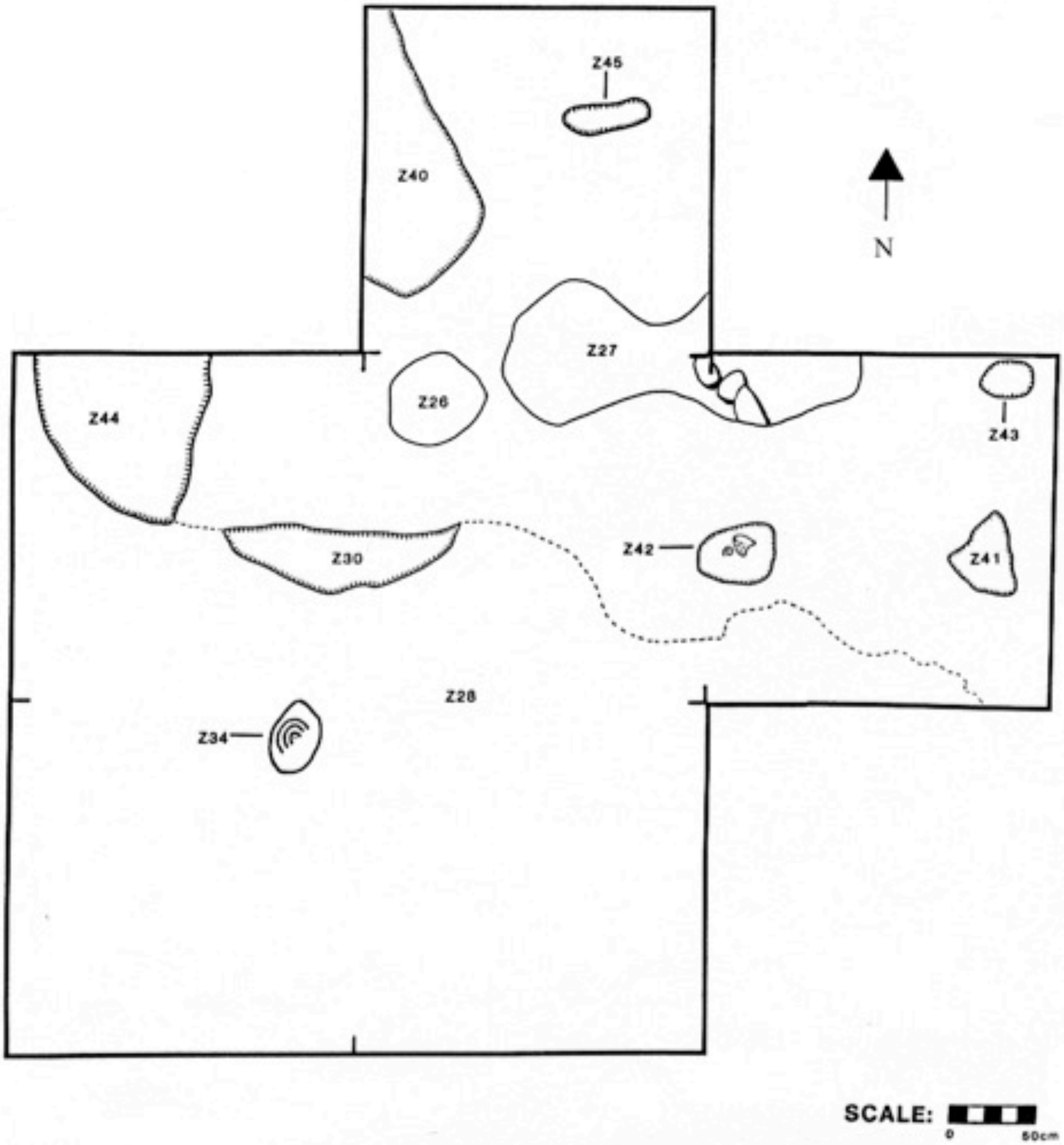

Figure 7. Operation 15, Construction Phase I (from Berry 1997:46).

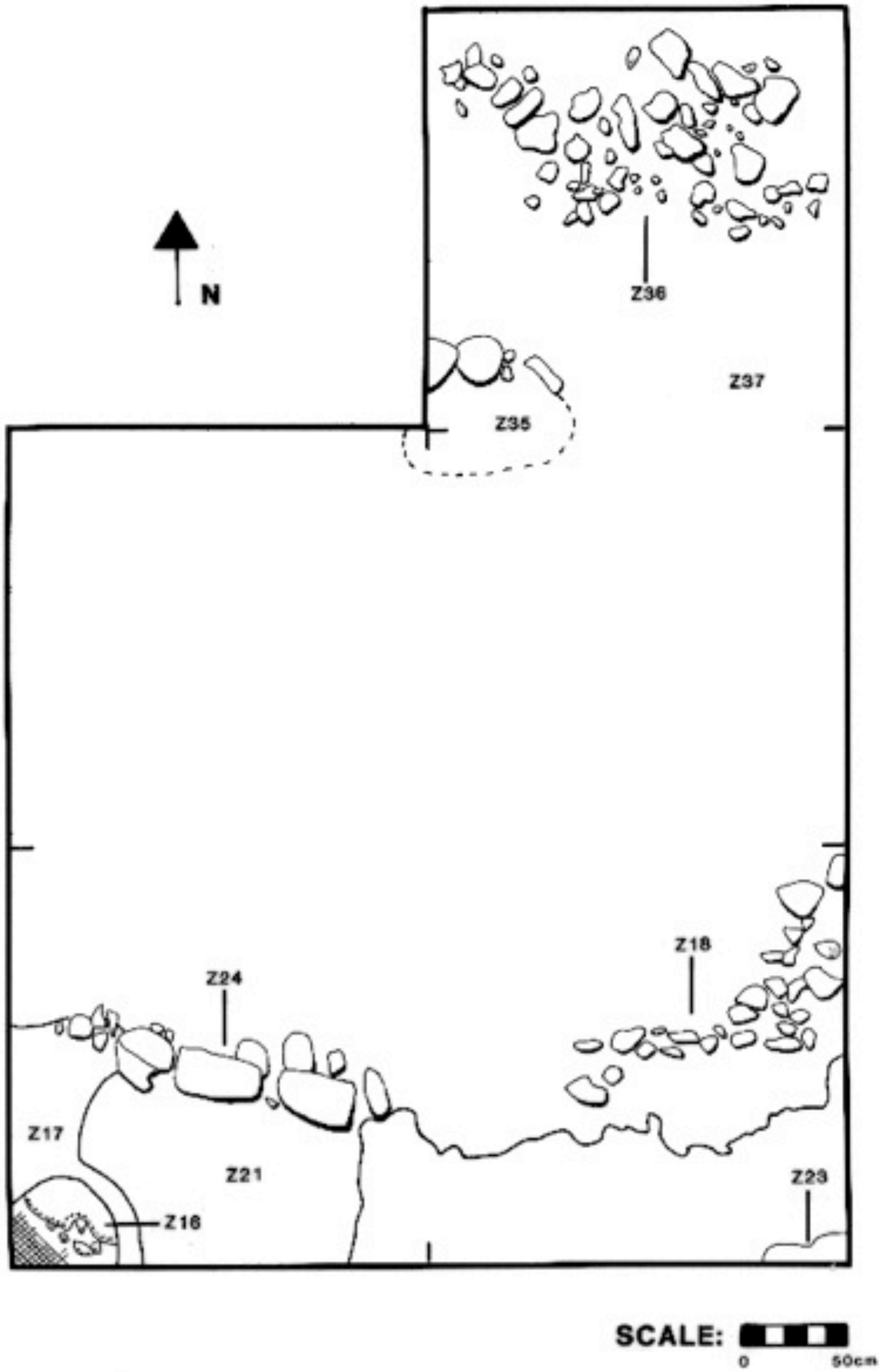

Figure 8. Operation 15, Construction Phase II (from Berry 1997:56).

floor) and constructed a new wall. They placed a marl cap over the Zone 16 hearth at this time. Outside of the rock boundary, excavators found two cooking surfaces (Zones 8 and 9), on top of which sat dense scatters of apple snails (*Pomacea flagellata*; Zones 3 and 4). Immediately below the topsoil, excavators detected a final resurfacing event.

The entire sequence of construction found within Operation 15 occurred during the Late Classic period. Based on the walls and hearths, Berry (1997:63) concluded that through time K'axob residents transformed the area from a production space into a residential and domestic site. She argued, however, that the later residential function did not preclude the continuity of pottery production in the area. Excavators encountered fewer (two) burials within the unit when compared to Operation 14 (which contained eleven). The burials at Operation 15 were disarticulated and found within a bedrock pit, while burials from Operation 14 were interred as articulated primary burials within constructed cists and accompanied by burial goods during the Late Classic. Operation 15 contained earthen floors rather than the packed-marl floors seen in Operation 14. All in all, the features apparent in Operation 15 did not require the same amount of labor to construct as features from the larger structure viewed through the lens of Operation 14.

Botanical Samples

Excavators collected flotation samples from a variety of contexts within Operations 14 and 15. Table 2 shows a list of the contexts and zones from which samples were taken for each operation, along with the corresponding construction phases, sample numbers, and wood weights. While the original sample volumes are not available for each sample, sample sizes varied from small collections from vessels and crania, which were less than 1 L, to around 30 L. Flotation occurred at the field site using a tank made from a 50-gallon steel

Table 2. Flotation samples from Operations 14 and 15 by zone, indicating phase, context, unique sample number, and wood weight.

Op.	Zone	Ceramic Complex	Construction Phase	Context	Sample #	Wood Weight (g)
14	3	Early Witsk'ax	Phase VIII	Hearth 3	532	3.56
		Early Witsk'ax	Phase VIII	Hearth 3	539	5.29
	5	Early Witsk'ax	Phase VIII	Burial	531	0.03
		Early Witsk'ax	Phase VIII	Burial	537	0
	14	Early Witsk'ax	Phase VII	Burial	583	0
	18	Early Witsk'ax	Phase VIb	Pit	575	0
		Early Witsk'ax	Phase VIb	Pit	598	0
	22	Early Witsk'ax	Phase VIb	Burial	607	0
	32	Early Witsk'ax	Phase VIa	Hearth 2	614	0
	35c	Nohalk'ax	Phase V	Burial	627	0.17
		Nohalk'ax	Phase V	Burial	630	0
		Nohalk'ax	Phase V	Burial	631	0.01
		Nohalk'ax	Phase V	Burial	637	0.01
	44	K'atabche'k'ax	Phase I	Midden	680	0.46
		K'atabche'k'ax	Phase I	Midden	681	0.16
		K'atabche'k'ax	Phase I	Midden	691	2.94
	46	K'atabche'k'ax	Phase II	Hearth 1	673	0
	47	K'atabche'k'ax	Phase II	Burial	674	0.07
		K'atabche'k'ax	Phase II	Burial	736	0.02
	51	K'atabche'k'ax	Phase II	Burial	708	0
	57	K'atabche'k'ax	Phase II	Burial	720	0.03
15	3	Witsk'ax	Phase III	Hearth 2	36	0.18
	4	Witsk'ax	Phase III	Hearth 2	42	0.1
	8	Witsk'ax	Phase III	Hearth 2	60	0.21
	9	Witsk'ax	Phase III	Hearth 2	62	0.79
	16	Early Witsk'ax	Phase II	Hearth 1	76	7.99
		Early Witsk'ax	Phase II	Hearth 1	90	0.64
	26	Early Witsk'ax	Phase I	Burial	118	0.01
		Early Witsk'ax	Phase I	Burial	196	0
	34	Early Witsk'ax	Phase I	Posthole	167	0
	35	Early Witsk'ax	Phase II	Midden	157	0.01
		Early Witsk'ax	Phase II	Midden	161	0.02
		Early Witsk'ax	Phase II	Midden	178	0
	44	Early Witsk'ax	Phase I	Pit	206	0

drum with water sent from the bottom towards an opening at the top. A 1/16-inch screen was suspended within the tank, allowing soil to fall through the mesh to the bottom, while botanicals floated to the top and were caught in net bags as light fractions. Heavy fractions included artifacts and rocks remaining on the screen after the sample had been floated. For this study, I only examined light fractions. Heavy fractions were sorted in the field laboratory.

CHAPTER 4:

PLANT AND ANIMAL USE IN ANCIENT NORTHERN BELIZE

This section introduces previous research on faunal and botanical data from sites in northern Belize, including K'axob. After a wider overview of faunal studies in northern Belize, I present previous studies of apple snails (*Pomacea flagellata*) from earlier excavation seasons at the site, which I will supplement with additional data in the next chapter. Because this study introduces new plant remains from K'axob, I explore botanical studies from other sites in northern and central Belize in order to tease out the significance of various plants in the environmental and cultural history of the area. Based on this review of the literature, it becomes clear that more work to interpret botanical remains according to their specific contexts rather than their general presence or absence at sites will assist in answering the research questions pursued in this thesis. Through plant remains, scholars can access not only broad environmental changes but also information relevant to social topics such as ritual, work, and identities in the past (see also Morehart and Morell-Hart 2013).

Faunal Remains

Studies of human-environmental interactions in northern Belize have focused mostly on the Preclassic, also known as the Formative period. Scholars have been particularly interested in examining the earliest occupations of sites. Several well-preserved, sealed contexts date to the Formative period. Carr and Fradkin (2008) provided a comparison of environmental use at Cuello, Colha, and K'axob during the Middle Formative based on faunal analysis, though they also inferred framing practices. The three sites shared similar terrestrial habitats, but varied in the freshwater features locally available (Carr and Fradkin 2008:150). Colha and K'axob sat next to large low-lying freshwater wetlands. As a result, residents of Colha and K'axob utilized fish and other freshwater resources to a greater extent. Cuello, on the other hand, had better access to well-drained uplands for rainy season cultivation. Consequently, residents of the site coordinated hunting, fishing, and collecting with wet season swidden farming in the uplands and dry season farming on wetland edges (Carr and Fradkin 2008:151). Colha would have used resources similarly, but with year-round fishing and an emphasis on white-tailed deer among hunted mammals. At K'axob, residents may have used more intensive farming methods (wetland edge and maybe riverine bank farming) early on, while conducting year-round fishing and catching small to medium mammals. There were fewer white-tailed deer found at K'axob, however. This might be explained by year-round wetland field farming, which would have altered the mosaic of habitats available locally.

Masson's (2004b:396) findings from Formative period K'axob showed that residents depended on fish, turtles, and mammals "that easily adjust to agrarian conditions, including deer, peccary, armadillo, agouti, small rodents, and canids." Catfish was the most common fish, while marine fish were not identified at the site (Masson 2004b:388). It seems that K'axob residents exploited small mammals regularly, but rarely utilized large-game resources, such as tapir (Masson 2004a:105). The lack of large mammals and marine fish at K'axob could signify residents' relatively limited economic power to access these resources. There may have been restricted hunting allotments for large animals such as deer and peccary (Carr 1996; Shaw 1999). People may also have engaged in trade for large mammals, as they did for marine fishes, which researchers found at the larger sites of Cuello and Colha (Carr and Fradkin 2008:151).

Despite limited recovery of particular animal resources, Masson (2004b:396) detected variations in the proportions of diverse species through time. For example, exploitation of turtle increased tremendously from the Late Formative through the Protoclassic periods. She argues that residents thoroughly understood local environments and engaged in flexible procurement strategies based on fluctuating availability (Masson 2004b:396). Due to sustainable management practices, small sites around Pulltrouser Swamp maintained access to aquatic and terrestrial game through time (Masson 2004a:98).

Additionally, Masson (2004b) identified fauna found in ritual contexts at K'axob, including frog and fish bones as well as fetal deer teeth found in a cache from the Late Formative. These finds, deposited in a quadripartite arrangement of ceramic vessels, may have related to Cha-Chac rain rituals, as practiced in the region today, or other animistic practices (Masson 2004a:106). Samuel Sheehan (2002) wrote his honors thesis on an analysis of fauna unearthed during the 1995 field season at K'axob, including Operations 14 and 15. Excavators had found the greatest amount of faunal material in Zone 44 of Operation 14, a Late Formative (K'atabche'k'ax complex) midden rich also in botanical remains. Included in the diverse assemblage were the only crocodile bones found at the site. Crocodiles were not consumed in significant quantities until the Postclassic period (Masson 2004a). Before this time, they were most likely reserved for ritual activities.

Though sparse, Classic period fauna from K'axob parallel Formative period assemblages, suggesting that the ecology of Pulltrouser Swamp remained relatively stable (Masson 2004a:106; Sheehan 2002). Turtle remained a significant component of the diet

(Masson 2004a:107). Residents consumed fish at a higher level in Formative period contexts. Throughout the Classic period, the use of mammals, including previously absent tapir, increased. This may signify a return to a high forest environment during the Late Classic period (Sheehan 2002:13). This would be the first example of reforestation at this time. Masson concluded that K'axob residents' diets were diverse and people exploited Pulltrouser Swamp sustainably (Masson 2004b).

Apple snails (*Pomacea flagellata*) are amphibious gastropods that reside near the shore and can survive in warm shallow water or bury themselves in mud during dry spells (Covich 1983:124). Apple snails do not move much in a lifetime, which for them lasts only a year (Harrigan 2004:400). Initially, Nations (1979) cast doubt on the use of apple snails as a food source based on present-day avoidance of the species among the Lacandon Maya. Since that time, however, scholars have argued for the exploitation and even cultivation of this commonly encountered resource (Cook 1997; Cuddy 2000:196; Miksicek 1991; Pyburn 1989). Apart from use of the snails as food, the shells may also have been used to make lime for processing maize (Nations 1979). Apple snails also played an important role in ritual, for excavators encountered at least 46 apple snail shells within a single human burial at K'axob. In ritual activities, shells symbolized fertility and regeneration (Harrigan 2004:404; Aizpurúa and McAnany 1999). In general, apple snail shells are likely to be preserved, and thus their significance for diet and other uses could be exaggerated in comparison to other faunal remains (Hammond and Miksicek 1981).

Research from Formative-period K'axob showed that higher densities of apple snails occurred within middens and pits than in construction fill, supporting their use as food (Harrigan 2004:402). Apple snails were found in many Formative period sherd-lined pits intruded into prepared surfaces or yard areas. The pits were likely used to cook these mollusks in the Formative period.

There were other possible uses for sherd-lined pits as well, including lime soaking maize, maintaining a fire, and depositing trash (Bobo 2004). A bimodal size distribution characterized sherd-lined pits, indicating two size classes possibly for different purposes. Bobo (2004:104) suggests changing functions through time, perhaps related to maize processing. She notes, “Just as large striated jars suitable for maize soaking become common at K’axob, sherd-lined pits disappear as a domestic facility” (Bobo 2004:104). The construction and use of sherd-lined pits declined and finally disappeared in the Classic period, indicating widespread changes in food preparation.

Botanical Remains

Formative Period

Studies of botanical remains augment our understanding of changing habitats in Formative period northern Belize. Most of these studies consist of lists of plants found at a site by broad time period. This research can help us to learn about broad-scale environmental and cultural changes. At Cuello, in the first millennium BCE and possibly earlier, only small areas of the forest were cleared for fields, or milpa (Hammond and Miksicek 1981:265). At least three types of maize were grown at Cuello at this time. Pine was collected from stands at least 6 km away for torches and probably construction. In the next construction phase, avocado (*Persea americana*) and nance (*Byrsonima crassifolia*) trees were in use. Hogplum (*Spondias purpurea*) shows up slightly later in the archaeological record, perhaps due to differential preservation (Hammond and Miksicek 1981:266). Land became more widely cultivated later in the Formative, when Cuello residents had access to squash (*Cucurbita* *moschata*), allspice (*Pimenta dioica*), and hackberry (*Celtis* sp.). Slightly after that, chile peppers (*Capsicum annuum*) were grown.

A variety of species were found from rich Late Formative period contexts at the sites of Cuello and Cerros (Crane 1996; Cliff and Crane 1989; Miksicek 1991). Based on macrobotanical evidence, utilized crops included maize, chile peppers, tubers, squash, and cotton (*Gossypium hirsutum*). Small, wild legumes were found from these contexts, but not the cultivated common bean (*Phaseolus vulgaris*). In addition, tree species present included nance, avocado, coyol palm (*Acrocomia aculeata*), mamey (*Pouteria sapota*), guava (*Psidium* sp.), ziricote (*Cordia dodecandra*), and persimmon (*Diospyros* sp.). Pollen was found from copal (*Protium copal*), papaya (*Carica papaya*), bottle gourd (*Lagenaria* sp.), and cattail (Crane 1996). Tree pollen included avocado, mamey, and caimito (*Chrysophyllum* sp.).

Crane (1996) argued that the consumption of tree fruits increased dramatically through time, from 275 BCE to 50 BCE. It is intriguing to consider the idea that people began cultivating fruit trees when an elite class emerged at Cerros. Orchards are symbols of wealth related to heritable land ownership (McAnany and Murata 2006). Crane's argument is supported by a simultaneous increase in the consumption of turtle, dog, deer, and peccary, also associated with high status. Unfortunately, it is unclear from her publications whether orchard species were found particularly within certain types of contexts, such as high status residences. An analysis of the differential use of plants within varying spaces at the site could strengthen her correlation between fruit tree cultivation and the emergence of wealth disparities.

Classic Period

Paleoethnobotanical studies have been conducted at the Classic period sites of Chau Hiix, Guijarral, and Blue Creek in northern and northwestern Belize (Bozarth and Guderjan 2004; Cuddy 2000; Goldstein and Hageman 2010). At Chau Hiix, Cuddy (2000) found a variety of seeds including geranium (*Geranium* sp.) and wild grape (*Vitis* sp.) in raised fields. He also found calabash rind, gourd rind (*Cucurbita* sp.), and palm fruits. In terms of wood, Cuddy found that early on residents of Chau Hiix used mostly pine for fuel. Through time, however, the primary fuel they used changed. After pine, they depended primarily on hardwood, and finally palm. However, pollen evidence showed increased availability of pine through time, so Cuddy argued that these shifts represented social and economic changes rather than overuse of the resource. Pine may have been bought and sold as a commodity. Nonetheless, "pine charcoal was recovered from nearly 90% of all contexts excavated," so it was never completely absent from the site (Cuddy 2000:179). This could be partially explained by the proximity of pine savanna to the site of Chau Hiix (Cuddy 2000:183). This study presents another example of a paleoethnobotanical investigation that focuses primarily on large-scale changes through time. In many cases, and in this study in particular, botanical sample sizes from Maya sites are quite small as a result of poor preservation. This challenge makes finer-grade analyses more difficult. However, Cuddy still manages to make suggestions about the values of different wood types and their possible roles in larger economic systems.

At the small site of Guijarral in northwestern Belize, Goldstein and Hageman (2010) compared plants purportedly used for Late Classic lineage-based feasting versus those for daily consumption. In order to do so, they studied evidence from two distinct midden contexts, one associated with an ancestor shrine, and the other with a residential structure. They found remains from plants that grow in successional forest stands, such as guava (*Psidium* sp.) and cohune palm (*Attalea cohune*), associated with terraces and check dams (Goldstein and Hageman 2010:434). The authors argue that the triumvirate of maize, beans, and squash has been overemphasized among scholars, and that other foodstuffs will better enable the study of intrasite social inequality (Goldstein and Hageman 2010:422). Specifically, Goldstein and Hageman found that distinct sets of plants delimited ritual and domestic deposits. Further studies into social relationships using food hold great potential.

Bozarth and Guderjan (2004) conducted at Blue Creek one of the few analyses of biosilicates, including phytoliths, from the area. Samples for the study came from vessels from dedicatory caches ranging in time from Late Preclassic to Late Classic periods. The dedicatory caches derived from contexts such as public buildings and dwellings of Blue Creek's elite, as well as residential structures of commoners at Blue Creek and nearby at Chan Cahal. For example, cache 43 from the non-elite community of Chan Cahal contained maize and squash phytoliths. Sponge spicules indicated that marine sponges were placed in all of the vessels from the core and elite areas. Red ochre was found in four of the vessels. Food was placed in many of the vessels, including maize, squash, fruits of palm and other unclassified plants, dicot seeds, and agave. Each cache included elements of both land and sea (Bozarth and Guderjan 2004:213). The domed lids of the caches are interpreted as the Sky of the Creation. The authors argued that components of the creation story were re-enacted in the placement of caches (Bozarth and Guderjan 2004:206). Significantly, these religious practices transcended social strata. This fascinating study resulted from detailed attention to small and varied ritual contexts.

Caves, Ritual, and Status in the Classic Period

To expand our understanding of Maya ritual practice during the Classic period, Christopher Morehart studied plants from the caves of central Belize (Morehart and Butler 2010; Morehart 2005, 2011). Caves were liminal spaces for ritual events throughout Maya history. They were seen as transitional spaces between the earth and the underworld, night and day, and life and death (Morehart 2011:16). They were also thought to be places of fecundity where the rain deity dwelled (Thompson 1970:251). According to Classic Maya iconography and archaeological remains, cave rituals almost always included the burning of food and substances such as wood, pine resin, and copal incense, which allowed ritual practitioners to feed and communicate with ancestors and deities (Houston and Taube 2000:267; Morehart 2011:14). Other non-edible plants used in cave ceremonies included flowers, found in pollen samples from Gordon's Cave III (Rue et al. 1989:399) and tobacco (*Nicotiana* sp.; Robicsek 1978).

Tobacco was used in rituals, and appears in sculptures and vase paintings as cigars smoked by elite lords (Robicsek 1978). The smoke of the cigars was represented in a fashion similar to breath, aroma, and wind (Houston et al. 2006:114; Morehart 2011:14). In the Late Classic period, miniature ceramic bottles generally about 5 cm tall were used as tobacco snuff flasks. Hieroglyphs painted or incised on these vessels indicate their use as tobacco powder containers. Recently, one such vessel was tested using gas and liquid chromatography mass spectrometry; nicotine alkaloids were detected, demonstrating that the flask did indeed hold a tobacco compound (Zagorevski and Loughmiller-Newman 2012:413).

There was a miniature flask found at K'axob, in Operation 16, within construction fill on a packed-marl surface dating to the Late Classic period (Figure 9). It is a jar with a vertical neck, 4.7 cm tall and 3 cm in rim diameter (López Varela 1997:224). The vessel had two handles, although one is missing. This vessel probably held tobacco, because, though lacking hieroglyphs, its shape closely resembles those of vessels designated for tobacco use, including the one found to have a tobacco compound (Zagorevski and Loughmiller-Newman 2012:Figure 1).

Figure 9. Miniature flask from Operation 16, Zone 8, found during the 1995 K'axob field season (from Terranova et al. 1996).

Research in Chiapas, Mexico, reveals the ongoing importance of tobacco as a sacred plant. Groark (2010:12) describes its use as a snuff slaked with lime and stored within small, highly polished gourd vessels. According to Groark's research, ceramic vessels would draw the juice out of the tobacco, and gourds are thus better for storing this valued product. In the Late Classic period, the presence of hieroglyphically identified ceramic tobacco vessels most likely reflects tobacco's increasing importance as a status plant and the formalization of its use.

Christopher Morehart (2005, 2011) found a variety of cultigens in Classic period cave contexts from the Belize River Valley, including maize, squash, beans, and chile peppers, some of which were wrapped in cotton textiles. The offerings were unprocessed domesticated crops. Crops were characteristically found in rural cave sites that were likely used for rituals dedicated to earth deities (Morehart 2011:123). These cultigens would have been offered as symbolic payments to the deities in exchange for agricultural productivity. All people, including lower status groups and farmers, could have participated in such practices to offer ritual payment to the earth deities. Still today, Tzotzil Maya peoples visit caves to communicate with and remunerate the Earth Lord for rain and fertility (Morehart 2005:174; Vogt 1969:457).

In Actun Nak Beh, a cave located near and connected by a causeway to the site Cahal Uitz Na, on Roaring Creek, a tributary of the Belize River, Morehart identified food remains including nance fruits and cohune palm nuts from a secondary burial. These orchard species could have symbolized the wealth and power of rulers from Cahal Uitz Na and may have been dedicated to an ancestral figure associated with the rising prosperity of the site's ruling family. Dominant groups at the site could conduct these rituals to provide "cosmological justification for the power of Cahal Uitz Na's rulers" (quote from Morehart 2005:177; see also Halperin 2002:125). Orchards are symbolic of wealth in the Maya area because they are an inherited resource requiring the development of a landscape over a long period of time. References to orchards as indicators of status include Landa's accounts of sixteenth-century Yucatec elites (Tozzer 1941:64). The iconography in the tomb of Pakal, the great ruler of

Palenque, showed his ancestors associated with fruit trees, including cacao, nance, and avocado (Robertson 1983:Figures 181-186).

Morehart (2011) found pine charcoal at all of the cave sites he examined. According to Morehart and colleagues (2005), burning of pine may have been an essential component of any valid ritual practice. Pine continues to be used in ceremonies today (Morehart 2011:107; Vogt 1976:6). Based on linguistic evidence, pine torches may have been the precursor to the currently prevalent use of candles in Maya rituals. On the other hand, pine torches would have provided light for people to see within caves, and thus pine served a practical purpose in these contexts.

David Lentz and colleagues (2005) have written about trade in pine, noting that pine charcoal was more abundant in contexts associated with higher status residences, independent of the locations of modern pine sources (see also Morehart and Helmke 2008). They argued that pine was not freely available in the marketplace but circulated through political alliances (Lentz et al. 2005). Within the sites of Xunantunich and San Lorenzo, pine use was relatively common in all households, without differentiation by status. However, when non-elite residences at Xunantunich were compared with those of a smaller site, Chan Nòohol, the farmers living at the rural site had much reduced access to pine, despite their similar status (Lentz et al. 2005:581). Thus, it is possible that the rulers of each polity controlled pine circulation within sites. Pine was thus a politically controlled good as well as a critical element of ritual, at least in central Belize. Also, because pine torches provided light at night, the presence or absence of pine would have had other implications for how people experienced life within their communities.

The studies described above, which surveyed plant remains in caves and residential contexts, illustrate the value in examining species present by context. By disaggregating site data, information becomes available about differential access to resources as well as more specific uses of particular plants. Morehart compared plant remains from different caves in the Belize River valley, and as a result he could discern the distinct roles caves could play for different segments of the ancient Maya population. Lentz and colleagues compared pine abundance within residences of diverse statuses at different sites. Consequently, they detected differences between structures of similar sizes that otherwise would have looked remarkably alike.

This literature review has demonstrated the value of archaeobotanical and faunal analyses for understanding past environments, including how they were changed and sustained. Use of diverse plants and animals contributed to the relatively good health of residents of many communities in northern Belize, including K'axob. Beyond that, it becomes clear that certain plants and animals were goods of high demand and value, accessed through markets or political networks. Others served particular purposes within ritual events. With continued investigation of faunal and botanical evidence by context rather than by entire site, their use for the discernment of different activities and meanings from archaeological sites will expand. Examples of this type of research along with information from previous studies of K'axob fauna has set the stage for the introduction of new faunal and archaeobotanical data from the site of K'axob.

CHAPTER 5:

CONTEXTUALIZED MOLLUSK AND PLANT INFORMATION

This study provides an example of the types of information available to scholars who examine the distribution of plant and, to a lesser extent, animal remains within a site. In order to understand the possible economic and social relationships between Structures 54 and 89, I search for clues about the activities undertaken within Operations 14 and 15 through time. New information on apple snails and plant remains from the excavations assists in this effort. Faunal and botanical data have underappreciated potential to help us parse out the tasks people performed to create various features found archaeologically. Particularly small faunal and botanical remains would likely remain unnoticed and *in situ* within features such as hearths, which people eventually covered in the process of new construction events. Within a hearth, then, archaeologists might more likely find small bones and charred seeds plausibly connected with particular activities than they would encounter large pottery sherds appropriate for form analysis or stone tools with use-wear evidence intact. Apart from assisting in the attempt to delineate more specific activity areas across the site, plant and animal remains can also provide a rich account of local environments, dietary preferences, and associated meanings.

The Apple Snail Shells from Operations 14 and 15

Cheryl Eckhardt (1995) analyzed apple snails collected from Operations 14 and 15 during the 1995 field season. Eckhardt measured valve and operculum lengths of 396 whole snail shells (Figure 10). She chose those measurements based upon an experimental study conducted by Norman Hammond (Hammond and Miksicek 1981:268), which concluded that larger snails were tough and lacked flavor while smaller and medium-sized snails were tender and delicious. At Cuello, Miksicek (1991:78) found that the distribution of apple snail shell sizes narrowed through time compared to wild populations, suggesting deliberate selection. In particular, the average apple snail valve length in one feature was 33.7±5.6 mm, with a range from 16 to 44 mm. In a second feature, the average valve length was 36.9±5.7 mm, with a range from 22 to 52 mm. Eckhardt sought to determine whether similar selectivity was used when people harvested the apple snails they later deposited in the areas of Operations 14 and 15. The data she recorded provided a meaningful pattern, although she did not note it at the time.

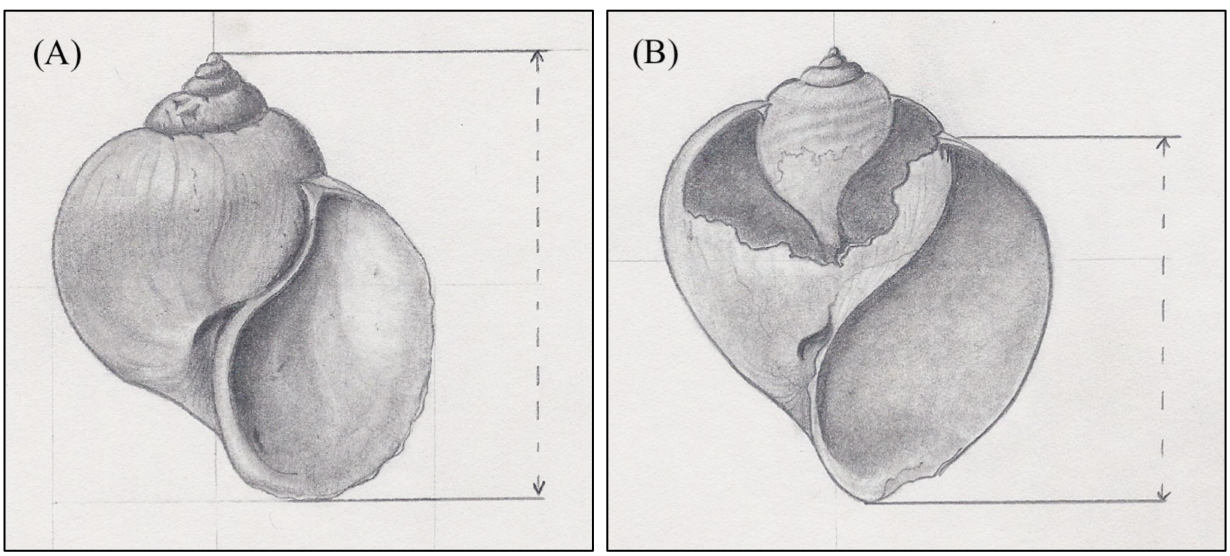

Figure 10. Drawings of apple snail (*Pomacea* sp.) shells, with (A) valve length, and (B) operculum length indicated. Illustrations by Astrid Runggaldier (from Eckhardt 1995:3).

Most of the apple snails found in Operation 14 came from midden and packed-marl floor contexts from the Late Formative and Protoclassic periods. Measurements yield a normal, or Gaussian distribution of snail size based on valve and operculum lengths (Figure 11). On the other hand, the contexts from Operation 15, and particularly the shell scatters and

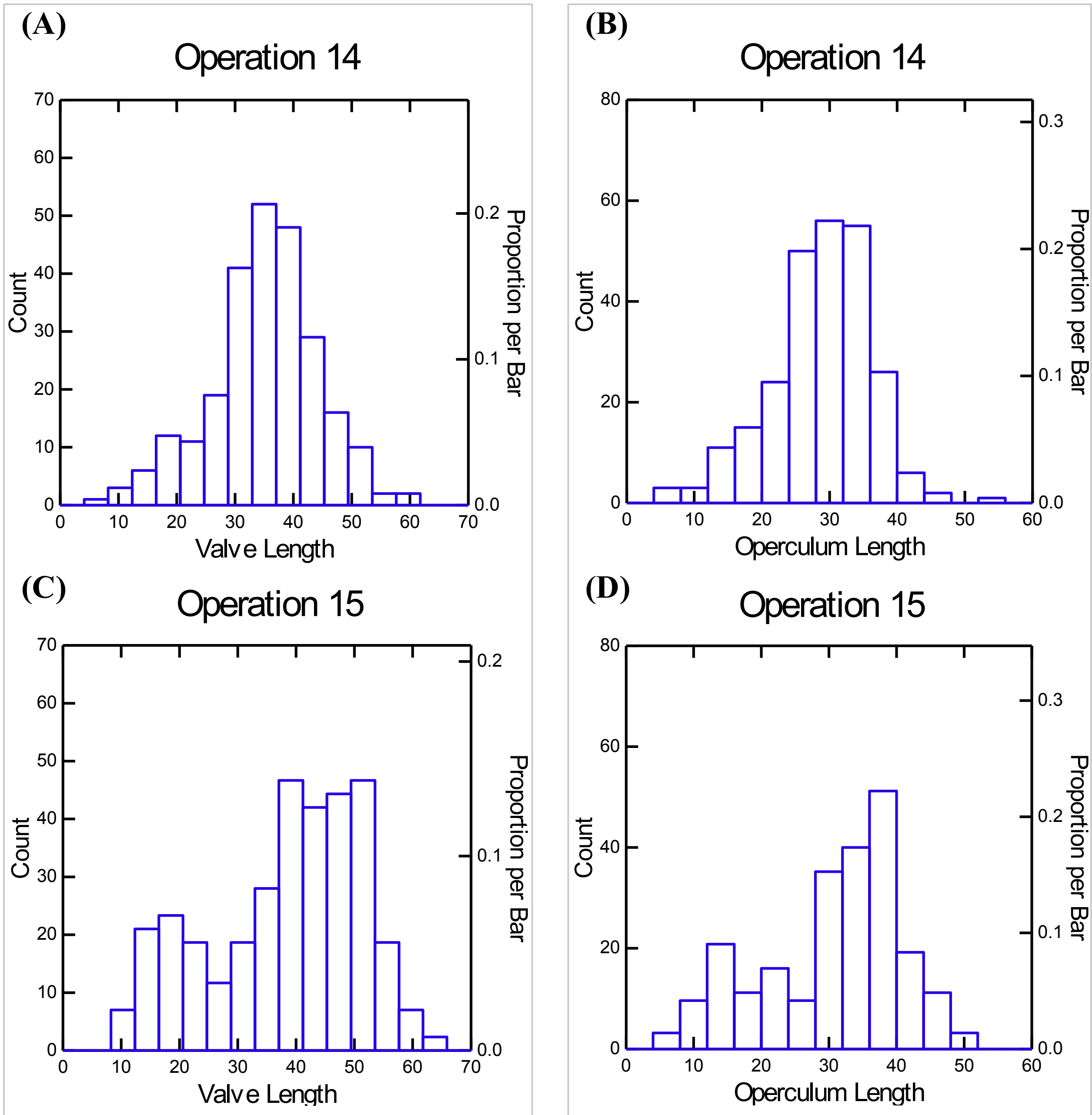

Figure 11A – 11D. Histograms of apple snail (A) valve length from Operation 14; (B) operculum length from Operation 14; (C) valve length from Operation 15; and (D) operculum length from Operation 15 (data from Eckhardt 1995).

surface contexts from packed earthen floors dating to the Late Classic period, show bimodal distributions in valve and operculum length. The modes of Operation 14 valve and operculum lengths are both 33.0 mm. The modes of the Operation 15 valve lengths are 17.0

mm and 41.0 mm. The modes of the Operation 15 operculum lengths are 14.0 mm and 39.0 mm.

There is a significant chronological gap between the shells described from each operation. However, a few shells were collected from Classic period plaster floor contexts at Operation 14. The measurements for each of these shells fell extremely close to the median valve and operculum lengths of the earlier contexts. Both the plaster floor and midden contexts from Operation 14, when graphed separately, show the same unimodal distribution. When the surface and scatter contexts from Operation 15 are graphed separately, they both demonstrate bimodal distributions. Operation 14 consistently contained shells at the preferable size for consumption, while Operation 15 had more of what could be considered the “leftovers.”

It is unlikely that this pattern resulted from an overutilization of apple snails in the Late Classic period. Apple snails were ubiquitous in the wetlands, had annual lifecycles, and may have been bred. The more likely possibility is that Structure 89, tested by Operation 15, served as a processing site for apple snails, which were consumed elsewhere, such as in the more elaborate living spaces of Structure 54 (as seen through the window of Operation 14). This would explain the distributions of shells at both operations. Whole shells are more likely to have been discarded, while broken ones unavailable for measurement were more likely processed and perhaps ideal for eating. Eckhardt noted that the Operation 14 surfaces contained many fewer whole shells than the exterior surfaces at Operation 15, indicating shell processing and discard in outside contexts. Due to the relative lack of broken mollusks in Operation 15, it seems unlikely that lower-status residents were eating the less desirable mollusks. Residents of various structures may have come together to process apple snails at Structure 89 (sampled by Operation 15) due to the number and distribution of whole shells.

Patterns in Plant Remains from K'axob, Operations 14 and 15

The light fractions of floated soil samples from the 1995 excavations in Operations 14 and 15 at K'axob were analyzed in the Archaeobotany Lab of the University of North Carolina-Chapel Hill. In the laboratory, the samples were weighed and sifted through geological sieves prior to analysis with a binocular dissecting microscope. Charred botanical remains such as 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 archaeobotany labs at the University of North Carolina and Georgia State University. Table 3 summarizes the plant taxa represented in the K'axob samples.

Charcoal was examined from selected samples that contained richer burned wood components. I separated charcoal into gymnosperms (pine in this area), monocots (probably palm) and dicots (hardwoods). These plants have entirely different structures that can be used for identification when viewed in cross-section. Dicot trees, or hardwoods in the area are diverse, and the lack of definitive seasons in tropical areas makes identification of their wood particularly challenging without high-level microscopy. The predominant charcoal finds at K'axob consisted of hardwood, which were not identified to genus or species due to equipment and time limitation.

The next portion of the paper presents archaeobotanical finds from K'axob through tables as well as a discussion of notable finds and their related contexts in chronological order from earliest to latest. For each context from which there was sufficient wood charcoal

Table 3. Plants from which charred seeds were found within K'axob samples, organized by function or habitat.

Scientific Name	Family	Common Name(s)	Uses[a]
Tree Fruits			
Attalea cohune	Arecaceae	Cohune palm	Food, fuel, medicine, oil, beverage, construction, fiber
Byrsonima sp.	Malpighiaceae	Nance, crabboe	Food, fuel, medicine, construction, beverage, tannin, dye
Spondias sp.	Anacardiaceae	Hogplum, jocote	Food, fuel, beverage, medicine, construction
Plants of Wet to Dry Forests, Secondary Growth, and Thickets			
Acalypha sp.	Euphorbiaceae	Copperleaf	Medicine, construction, fiber, digging sticks
Bulbostylis sp.	Cyperaceae	Hairsedge	Medicine
Cecropia peltata	Cecropiaceae	Trumpet tree	Food, medicine, construction, smoking substance
Cissus verticillata	Vitaceae	Seasonvine	Medicine, cordage, soap
Hyeronima alchorneoides	Euphorbiaceae	Suradan	Construction, tannin
Leucaena leucocephala	Fabaceae	Acacia, acacia pallida	Fuel, fodder, soil fertility, erosion control
Passiflora sp.	Passifloraceae	Passionfruit	Food, beverage, medicine
Phytolacca sp.	Phytolaccaceae	Pokeweed	Food, beverage, medicine, dye, soap
Solanum sp.	Solanaceae	Nightshade	Food, medicine
Vitis tiliifolia	Vitaceae	Water vine	Food, beverage, vinegar, medicine, cordage
Species Abundant in Fields and Gardens			
Amaranthus sp.	Amaranthaceae	Amaranth, bledo	Food, medicine
Chenopodium sp.	Chenopodiaceae	Chenopod, goosefoot	Food, medicine
Phaseolus vulgaris	Fabaceae	Common bean	Food
Physalis sp.	Solanaceae	Tomatillo	Food, medicine, spice
Zea mays	Poaceae	Maize, corn	Food, fuel, beverage
Wetland Herb			
Scirpus sp.	Cyperaceae	Bullrush	None
Ritual Plant			
Nicotiana tabacum	Solanaceae	Tobacco	Drug, ritual, medicine

[a] Uses from Balick et al. 2001; Lentz and Dickau 2005.

for analysis, a discussion of charcoal composition concludes the presentation of plant data from charred seeds. The account below begins with Late Formative through Early Classic finds at Operation 14, followed by the earliest finds from Operation 15 (associated with Tepeu 1 pottery). Next, I describe finds associated with Tepeu 2 pottery from Operations 14 and 15, and finally the latest occupation (found with Tepeu 3 pottery) at Operation 15. I then discuss the possibility that seeds of certain species entered the archaeological record naturally and finish with observations on trends in plant distribution.

Late Formative and Protoclassic Periods (Late K'atabche'k'ax Complex)

Operation 14 Midden. Excavators collected the earliest flotation samples from K'axob within Zone 44 in Operation 14. Schulz (1997:19) described Zone 44 as a midden, 60 to 70 cm thick, rich with artifacts and probably laid out as construction fill for the house's basal platform. Operation 14 was subdivided into four 2x2 meter squares for horizontal control, and Zone 44 was vertically subdivided as well. Excavators took three soil samples for flotation from different subzones. Zone 44 comprised many artifacts including pottery sherds, beads, and fish net sinkers; chipped stone debitage and tools including obsidian; and faunal remains including worked bone tools and worked shell (Schulz 1997:19).

The Operation 14 midden flotation samples contained rich botanical assemblages (Table 4). Most notably, amaranth (*Amaranthus* sp.) was found carbonized, including 32 seeds identified as either *Amaranthus* sp. or the more ambiguous "cheno-am," a designation that accounts for the difficulty of identifying damaged specimens of chenopod and amaranth seeds due to their similar morphologies (Figure 12). A few of them appeared to be partially uncarbonized and looked somewhat different from the clearly carbonized seeds (Figure 13). However, all of the seeds were in poor condition. Maize was also present, with more than 50

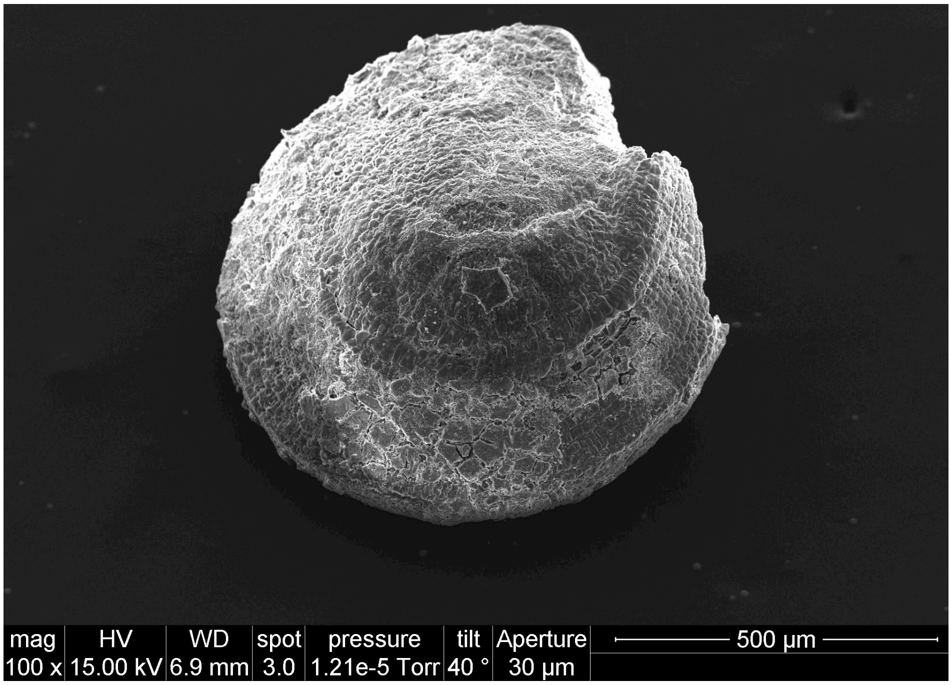

Figure 12. Image of cheno-am from Operation 14 midden using Scanning Electron Microscope.

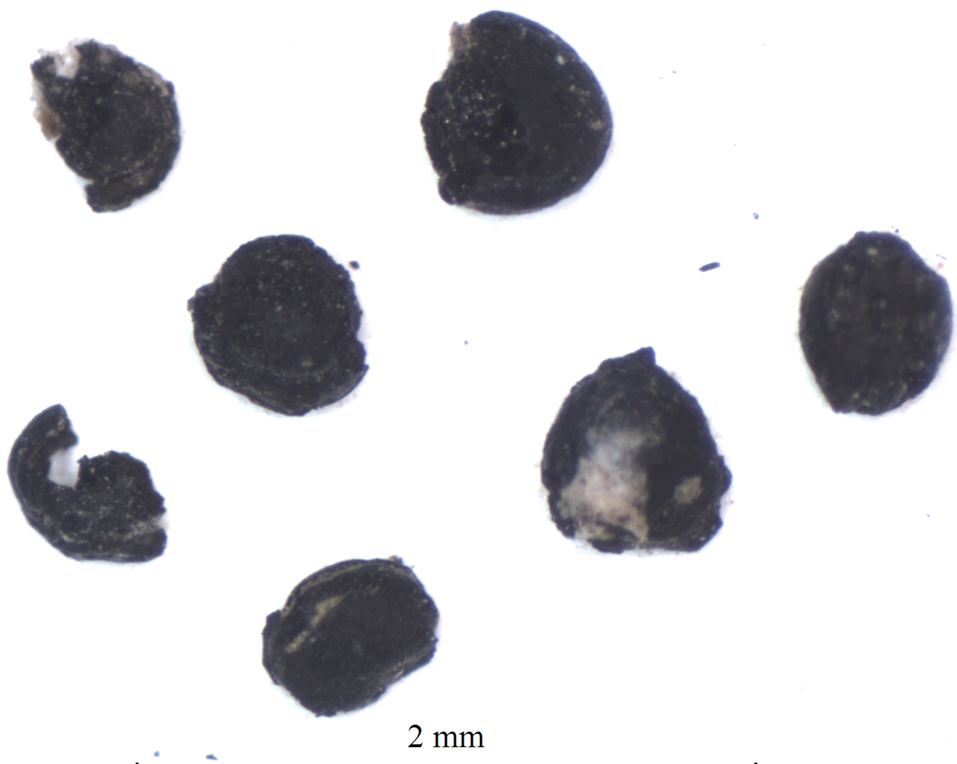

Figure 13. Examples of thoroughly carbonized cheno-am seeds from Operation 14 midden.

Table 4. Plant taxa found within richest contexts at Operations 14 and 15. Taxa highlighted in gray were found both charred and uncharred and may have entered the archaeological record naturally. They were left out of total seed and taxa counts.

	LATE FORMATIVE		LATE CLASSIC[a]				TERMINAL CLASSIC	
	Operation 14, Midden		**Operation 14, Hearth 3**		**Operation 15, Hearth 1**		**Operation 15, Hearth 2**	
Plant Taxon	count[b]	#/wt[c]	count	#/wt	count	#/wt	count	#/wt
Tree Fruits								
Cohune palm	0	0	0	0	2	0.23	0	0
Hairy Tom palmetto	0	0	0	0	8	0.93	0	0
Hogplum	0	0	1	0.11	0	0	0	0
Nance	0	0	0	0	30+	3.48+	1	0.78
Plants of Wet to Dry Forests, Secondary Growth, and Thickets								
Acacia	0	0	0	0	4	0.46	0	0
Copperleaf	2	0.56	0	0	0	0	1	0.78
Hairsedge	0	0	0	0	4	0.46	0	0
Passionfruit	0	0	1	0.11	5	0.58	0	0
Pokeweed	0	0	7	0.79	5	0.58	4	3.13
Seasonvine	0	0	0	0	2	0.23	0	0
Suradan	1	0.28	0	0	0	0	0	0
Trumpet tree	0	0	3	0.34	7	0.81	1	0.78
Water vine	0	0	0	0	9	1.04	0	0
cf. *Setaria* sp.	0	0	0	0	3	0.35	0	0
Asteraceae	40+	11.24+	2	0.23	1	0.12	1	0.78
Euphorbiaceae	0	0	15+	1.69+	20+	2.32+	20+	15.63+
Malvaceae	1	0.28	1	0.11	5	0.58	1	0.78
Poaceae	5	1.40	0	0	0	0	0	0
Solanaceae	0	0	3	0.34	8	0.93	1	0.78
Species Abundant in Fields and Gardens								
Amaranth/Cheno-am	32	8.99	2	0.23	1	0.12	1	0.78
Legumes	2	0.56	1	0.11	30	3.48	0	0
Maize cupule	50+	14.04+	0	0	3	0.35	0	0
Maize kernel fragment	4	1.12	0	0	9	1.04	0	0
Maize rachis flap	1	0.28	0	0	0	0	0	0
Wetland Herb								
Bullrush	0	0	0	0	1	0.12	0	0
Ritual Plant								
Tobacco	0	0	1	0.11	0	0	0	0

	LATE FORMATIVE		LATE CLASSIC[a]				TERMINAL CLASSIC	
	Operation 14, Midden		**Operation 14, Hearth 3**		**Operation 15, Hearth 1**		**Operation 15, Hearth 2**	
Plant Taxon	count[b]	#/wt[c]	count	#/wt	count	#/wt	count	#/wt
Unknown Taxa								
Unknown seeds	21	5.90	19	2.15	51	5.91	10	7.81
Unknown seed types[d]	16	4.49	12	1.36	43	4.98	10	7.81
Possible fiber	2	0.56	0	0	0	0	0	0
Total Seed Count	68	19.10	29	3.28	169	19.58	15	11.72
Number of Taxa	23	6.46	19	2.15	60	6.95	15	11.72

[a] Early Classic under-represented stratigraphically in Operation 14.
[b] Refers to the number of seeds found.
[c] Refers to the number of seeds or taxa found over wood weight (g); Wood weights (g) for Op. 14 Midden, Op. 14 Hearth 3, Op. 15 Hearth 1, and Op. 15 Hearth 2 are 3.56, 8.85, 8.63, and 1.28, respectively.
[d] Refers to number of species or of similar-looking unknown seeds.

cupules found. Two miniscule charred fragments appear to be preserved spun fibers (Figure 14). Their small size implies the use of cotton (*Gossypium hirsutum*), known for its fine threads, at the site. Of the 60 pieces of wood charcoal examined from this context, 47 pieces were hardwood (angiosperm dicot), and 13 were too small to discern further information.

Figure 14. Fiber fragment from Operation 14 midden.

Operation 14, Formative and Protoclassic Period Burials. Events that created construction Phase II at Operation 14 also took place in association with the Late K'atabche'k'ax ceramic complex. All of the flotation samples from Phase II came from burials. The plants identified from these burials can be found listed in Table 5. Zone 57 consisted of a seated infant burial with sixteen shell beads. The three pieces of wood charcoal from this context were all hardwood (angiosperm dicot). Zone 51 was a seated child 4-5 years old in a burial pit capped by limestone. Zone 47 comprised a large and striated tortoise-shaped vessel containing the skeletal remains of a child 1-2 years of age (Schulz 1997:22; Rebecca Storey, personal communication 2013). The fill of this vessel contained maize cupules and kernel fragments (Table 5). Of the six pieces of wood charcoal found in this sample, five pieces were hardwood (angiosperm dicot), and one was unidentifiable. Whether or not the legumes, maize, and amaranth found in these samples resulted from intentional deposition should be considered. It would have been possible for charred remains to be incorporated into burial fill when soil was moved from other contexts. There was surprisingly little wood in these contexts to suggest ritual activity involving burning upon placement of the bodies.

Early Classic Period (Late Nohalk'ax Complex)

Operation 14, Early Classic Period Burial. The only samples in this study from the Early Classic, associated with the Late Nohalk'ax complex, came from Zone 35c from Operation 14 (Table 5). Contexts from this time period are noticeably scarce throughout the Maya area, as it was a period of population contraction with limited local construction activity. Zone 35c contained an extended burial of a middle to young adult male and the remains of a reed mat in a cist-style pit with a plaster cap. There was very little wood charcoal present in the samples from this zone.

Table 5. Counts of carbonized seeds and maize cupules found within burial contexts from Operation 14. Taxa highlighted in gray were found both charred and uncharred within these contexts and may have entered the archaeological record naturally. They were left out of total seed and taxa counts.

	LATE FORMATIVE			EARLY CLASSIC	LATE CLASSIC	
Plant Taxon	**Z 57**	**Z 51**	**Z 47**	**Z 35c**	**Z 14**	**Z 5**
Plants of Wet to Dry Forests, Secondary Growth, and Thickets						
Copperleaf	0	0	0	0	0	5
Pokeweed	0	0	0	0	0	4
Trumpet tree	0	0	0	0	0	8
cf. *Setaria* sp.	0	0	0	0	0	3
Asteraceae	0	0	10+	3+	0	1
Euphorbiaceae	0	0	0	2+	0	8
Malvaceae	0	0	0	0	0	1
Solanaceae	0	0	0	1	0	1
Species Abundant in Fields and Gardens						
Amaranth or Cheno-am	1	0	1	0	0	3
Legumes	3	0	0	0	0	0
Maize cupule	0	0	6+	10+	0	0
Maize kernel fragment	0	0	3	0	0	0
Unknown Taxa						
Unknown seeds	0	1	3	2	3	6
Unknown seed types	0	1	2	2	3	6
Total Seed Count	4	1	7	3	3	16
Number of Taxa	2	1	4	4	3	10

Late Classic and Terminal Classic Periods (Witsk'ax Complex)

First Construction at Operation 15 (Tepeu 1). Construction Phase I at Operation 15 began in the Late Classic period. Very little botanical material was encountered within the samples from this phase, which are not included in the larger reference table. Finds included a charred cheno-am seed and a carbonized pokeweed seed (*Phytolacca* sp.). The first was from an intrusive pit cut into bedrock (Zone 44), while the latter came from a disarticulated burial (Zone 26). Samples were collected from another disarticulated burial and posthole but I found no plant remains in them.

Late Classic Period Activity at Operation 14 (Tepeu 2). Most of the samples I analyzed from both Operations 14 and 15 came from contexts associated with the Tepeu 2 ceramic complex. To organize this section, the samples from Operation 14 are presented first, followed by those from Operation 15.

In Phase VI at Operation 14, a carbonized pokeweed seed was found in association with a small pit possibly used for cooking (Hearth 2; Table 2) that contained numerous faunal remains and sherds. Another pit (Zone 18; Table 2) contained a seed from the nightshade family and three other unidentified seed types. After these sparse finds, the Phase VIII samples contained many more botanical remains. Excavators collected samples from a large hearth, here called Operation 14, Hearth 3 (Table 4), with the dimensions 52x44x34 cm. This hearth intruded into an extended burial (Zone 5, Table 5) in a pit cut into a floor. The hearth contained a variety of charred seeds. Most notably, a charred hogplum (*Spondias* sp.) seed was found, as well as a tobacco (*Nicotiana tabacum*) seed (Figures 15 and 16). Of the charcoal analyzed, there were 17 pieces of hardwood (angiosperm dicot), two pieces of palm charcoal, and one unidentifiable fragment.

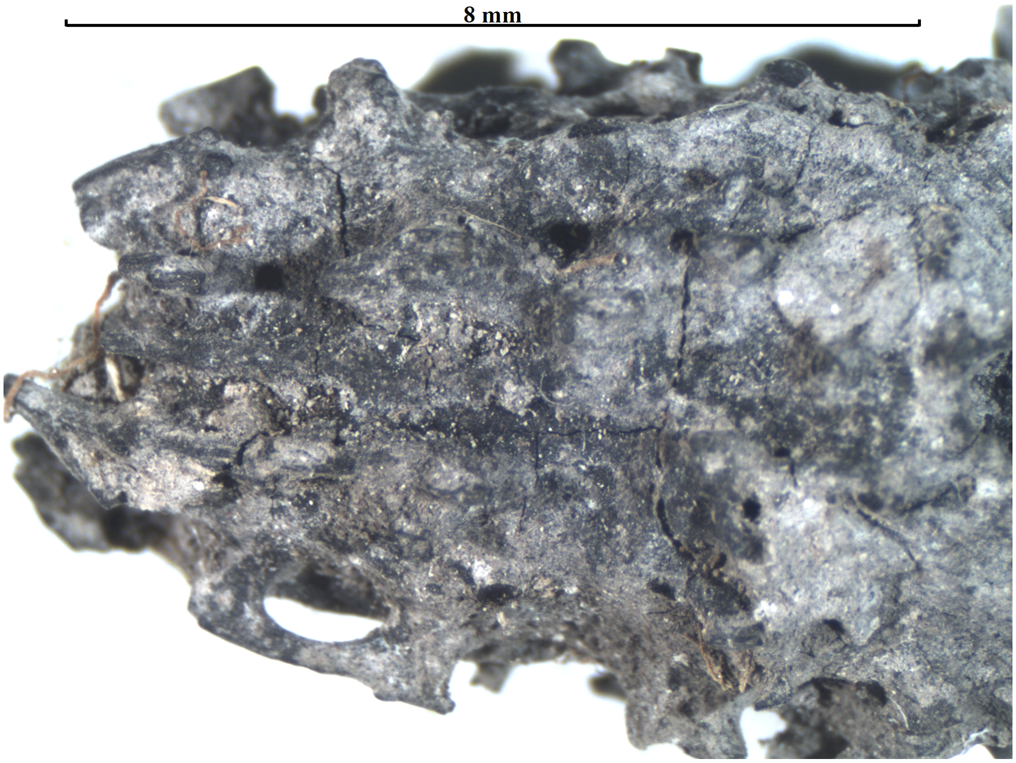

Figure 15. Hogplum pit from Operation 14, Hearth 2.

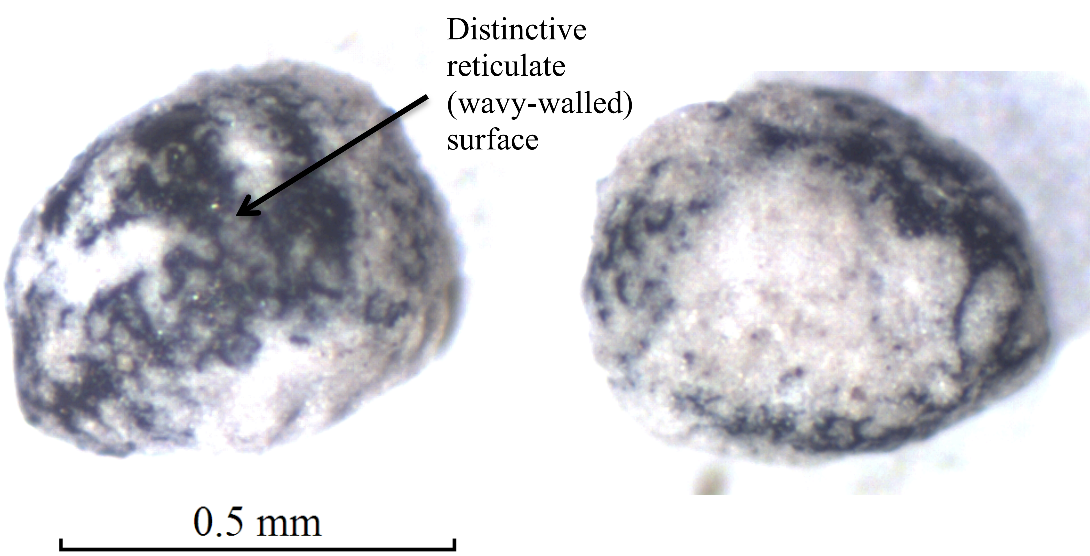

Figure 16. Tobacco seed from Operation 14, Hearth 2, indicating identification criteria.

Late Classic Period Activity at Operation 15 (Tepeu 2). Phase II construction at Operation 15 was roughly contemporary with the activity at Operation 14 just described.

Zone 16 was a 25 cm deep hearth (Operation 15, Hearth 1). The hearth contained wood charcoal, faunal remains, chipped stone debitage, and ceramics (Berry 1997). A wide array of plant species were represented (Table 4), including those found in other contexts but also nance (*Byrsonima* sp.), palm nuts (*Attalea cohune*), several types of legumes, and two species from the grape family (*Vitis tiliifolia* and *Cissus verticillata*; Figure 17A-17B). Among the various legumes were found two cultivated varieties, the common bean (*Phaseolus vulgaris*) and the sieva bean (*Phaseolus lunatus*). There were also three types of wild legumes present. Of the 36 charcoal pieces examined from this context, 32 were hardwood (angiosperm dicot), while four pieces appeared to be palm (angiosperm monocot). In the Late Classic midden at Operation 15 (Zone 35; Table 2) there were only three seeds of the ubiquitous Asteraceae family and one grass seed.

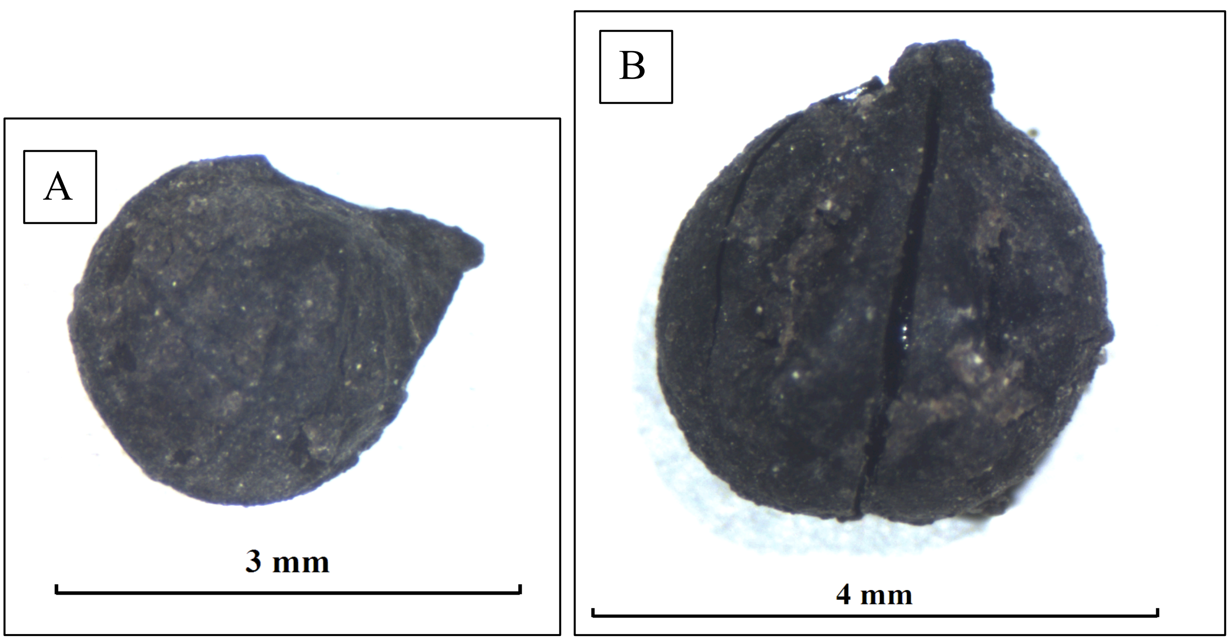

Figure 17A-17B. Seeds from the grape family (Vitaceae): (A) *Cissus verticillata*, and (B) *Vitis tiliifolia*.

Terminal Classic Activity at Operation 15 (Tepeu 3). The final samples represent the last phase of construction at Operation 15. Excavators collected Zones 8 and 9 in their entirety for flotation. The zones consisted of dense concentrations of burnt sascab (decomposed limestone), with rocks, pottery, and chipped stone debitage scattered throughout (Berry 1997:61). Apple snail shell scatters constituted Zones 3 and 4, from which excavators also took flotation samples. Because these zones sat next to one another and seem to have served the same function (food preparation), I have grouped the samples as Operation 15, Hearth 2. Seeds from various plants were found in mostly low quantities (Table 4). This context was near the surface, with a greater risk of contamination. Of the 37 pieces of charcoal examined, all of them were hardwood (angiosperm dicot). All but a couple of the pieces appeared to be of the same species.

Intrusive or Naturally Occurring Species

In studies of Maya botanical remains, scholars have considered the natural and cultural processes affecting the archaeological record and interpreted them in different ways. Some have chosen to ignore any seeds that were not carbonized, arguing that seeds could not survive for such lengths of time in the tropics if not charred. Exceptions to this rule have included waterlogged remains, and some plant materials from caves, though even then, interpreters expressed some apprehension. For example, Morehart (2011) in his analysis of samples from caves points out the possibility that certain uncharred fruit seeds were deposited through bat *guano* and other non-cultural processes. In presenting my data, I indicated in gray shading on Tables 4 and 5 those species that were found both carbonized and uncarbonized, and I have included their total counts within the tables. However, there were three instances in which I found one or two partially charred seeds in association with several charred seeds of the same species that appear to be ancient. These were cheno-am in the Operation 14 midden, and water vine and nance in Operation 15, Hearth 1 (Table 4). I interpreted all of these seeds to be ancient, deducing that the partially charred seeds happened to survive due to unusual preservation circumstances, such as the unique marl-lined and capped feature of Operation 15, Hearth 1.

The other species found charred and uncharred require special consideration. These seeds were scattered throughout most samples, from one or two to hundreds. They may have entered the archaeological contexts naturally. Paul Minnis (1981:147) notes that in studies of modern soil, there are usually thousands of seeds due to modern seed rain but none of them are charred. Because of this, it is unlikely that charred seeds in the archaeological record came from modern seed rain. It is possible, however, that seeds from plants growing on the site when it was occupied may have entered contexts such as hearths in courtyard patios and become charred. This can provide information about ambient vegetation at the site. Among seeds found, the species of Asteraceae that occurs widely has also been found in many contexts at San Estevan (Seinfeld 2011), where few human-manipulated plant seeds survived. In general, I believe these seeds represent ancient seed rain at the site. The situation is similar with a ubiquitous species of Euphorbiaceae. Asteraceae seeds were found in higher quantities within contexts from the Formative period, while Euphorbiaceae seeds were found only in contexts from the Early and Late Classic periods. This may suggest a slight shift in the background vegetation at K'axob through time, though it is difficult to suggest any specific changes without identification of the seeds to species or at least genus. On the other hand, charred seeds that appear to be *Setaria* sp. were found in only a few Late to Terminal

Classic contexts that were near the surface, and only in the presence of identical uncharred seeds. For these reasons they are considered modern intrusions.

Spatial Distribution of Plant Remains

Figure 18 shows the ubiquity of plants found at K'axob. In other words, each bar represents the number of contexts in which the plant was found. Throughout the previous tables and descriptions, plants have been referred to using the most specific identification possible based on the evidence. Some plant seeds were only identifiable to family, while others were assigned to species. For example, the bar for Solanaceae in Figure 18 refers to plants of at least two species in the nightshade family, while water vine refers only to the species *Vitis tiliifolia*. These differences should be kept in mind when interpreting the chart. In general, it can be said that the field and garden plants (cheno-am, maize, and legumes) were found in several contexts each, while a wider diversity of species were found in only one or two contexts sampled. Many of the plant species found in contexts ranging from the Late Formative through the Late Classic period at K'axob would have been procured from forests, thickets, and disturbed areas. The variety of species found in these samples conforms to a model in which people made use of gardens, infields, and outfields; cultivated and wild spaces.

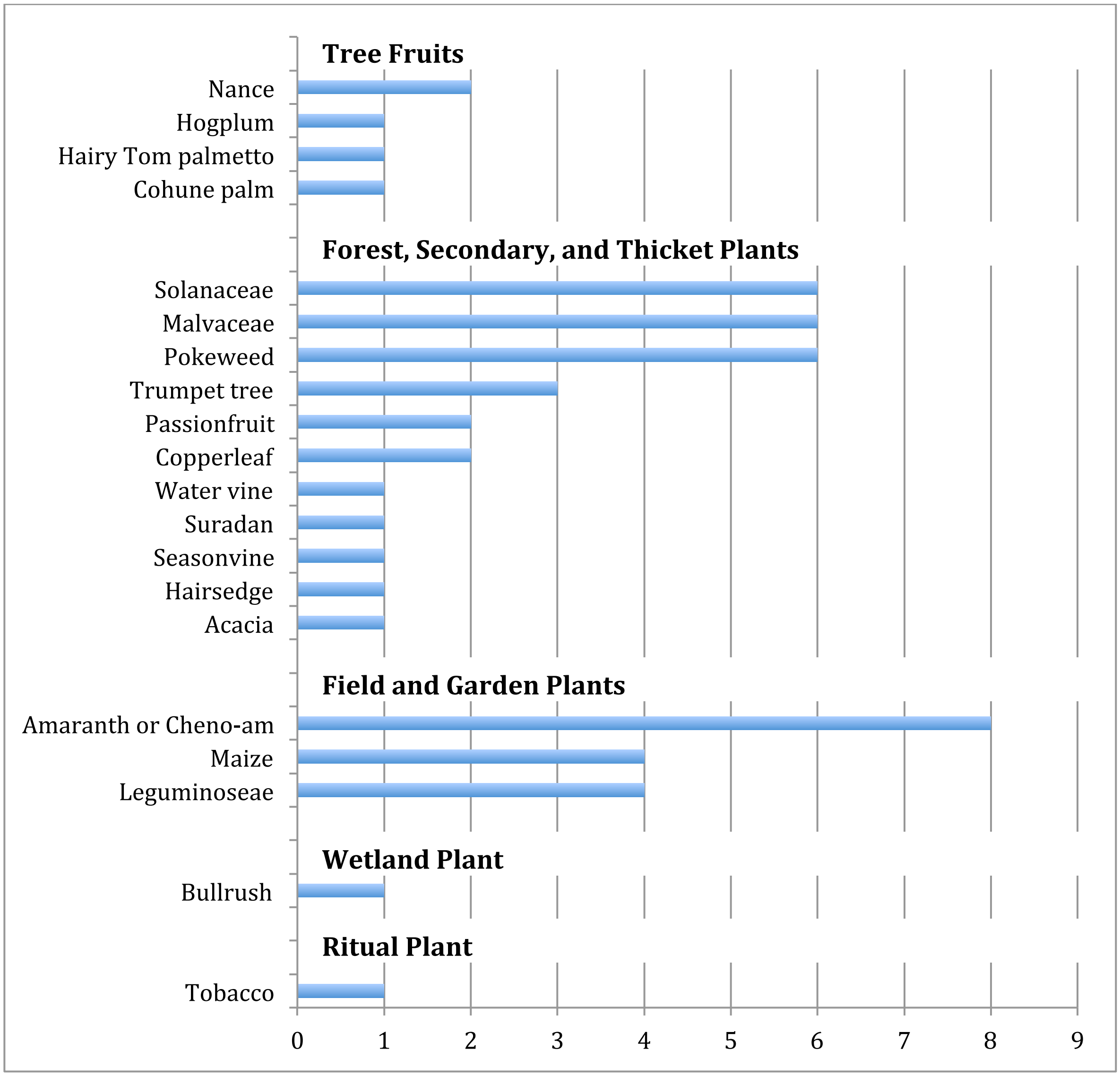

Figure 18. Ubiquity (out of 14 total contexts) of the main paleoethnobotanical finds from K'axob, omitting those that appear to have entered the record naturally. In order to maintain clarity, the x-axis represents counts of major contexts in which the species were found, rather than the standard measure calculated as percentage of total contexts.

The midden from Operation 14 and Hearth 1 from Operation 15 contained similar numbers of seeds when compared to wood weight (19.10 and 19.58, respectively). Hearth 2 from Operation 15 contained fewer seeds by wood weight (11.72) when possibly natural seeds are removed from the calculation. This is probably due to the location of the context near topsoil, resulting in more seeds introduced naturally and fewer old seeds preserved. On the other hand, Hearth 3 from Operation 14 contained only 3.28 seeds per gram of charred wood. The same hearth contained very few seeds of field or garden plants but instead included a hogplum seed and a tobacco seed, neither of which were found in other contexts. Because the wood weights were nearly the same from Operation 14's Hearth 3 and Operation 15's Hearth 1, and they were contemporaneous, they can be compared fruitfully.

To summarize, within Operation 14, the early midden primarily contained evidence of plants that grew in fields and gardens. Though characterized by a high ratio of seed counts to wood weight, the plant assemblage lacked diversity. The Late Classic period hearth found in the same excavation unit contained a low ratio of seeds to wood weight, characterized by finds unique to the context. Within Operation 15, more wild plant species were encountered. Hearth 1, with a high ratio of seeds by count to wood weight, included a wide range of plants including domesticates. Hearth 2, on the other hand, contained few domesticates and fewer seeds by wood weight, though this assemblage suffered degradation due to its location near the surface.

Seeds and charcoal provide evidence for the utilization of palm for food and fuel in the Late Classic, but not from earlier contexts at K'axob. Though it is unwise to assert trends within small datasets such as the one presented here, it seems more generally that people in the Maya area increasingly utilized palm for food and fuel in the Late Classic period. This is reflected in Cuddy's (2000) find regarding wood and increased use of palm at Chau Hiix. In addition, almost all cohune palm remains have been found within Classic-period contexts, from sites including Dos Pilas, Guijarral, Pulltrouser Swamp, Kichpanha, Tiger Mound, and Wild Cane Cay (Scott Cummings and Magennis 1997:217; Goldstein and Hageman

2010:454; Lentz 1999:Table 1.1). Cohune fruits are rich in calories, carbohydrates, vitamins, and protein (McKillop 1996:280).

In terms of wood use, no pine charcoal could be securely identified from the K'axob samples. The charcoal fragments present in samples other than the biggest hearths were quite small (between 2-4 mm), and microscopic power was limited, making it difficult to see the details of wood structure. None of the larger pieces of charcoal was pine (they were instead hardwoods, or angiosperm dicots, and a few pieces of palm). It was difficult to discern vessels characteristic of hardwoods in many of the small pieces of charcoal, yet obvious pine characteristics were absent. Thus, it seems there was no pine in the samples examined from K'axob. This lack of pine is striking in contrast with the pine found at San Estevan (the only wood found at the site), a site that probably held sway over residents of K'axob (Levi 2003; Seinfeld 2011). K'axob was not located near pine stands and may not have had the political connections necessary to access pine and other preferable wood species. Without pine torches, K'axob residents would have lacked an important source of light during the night, though some other material might have been used for torches. Access to pine could also have had important implications for ritual, power, and regional politics.

CHAPTER 6:

THE DISTRIBUTED HOUSEHOLD

Formative Period: Ritual and Diet

In this chapter I consider the significance of newly presented botanical remains and other evidence associated with the two residential contexts from northern K'axob. Discussion of the data will proceed in chronological order, beginning with Formative period contexts but focusing on comparisons between operations in the Late Classic period. Operation 14 included a longer stratigraphic chronology dating back to the Late Formative period, while Operation 15 consisted of contexts laid down during the Late Classic period. Thus, the Formative contexts from Operation 14 will first be described, followed by a comparative analysis of Classic period contexts from the excavation units within adjacent structures. Based on the Classic period data, I argue for a new model for Maya households, in which households expanded functionally and were distributed across space, encompassing multiple structures.

The main sample available from the Late Formative period came from the midden laid down in the construction of the original platform (Operation 14, Zone 44). The midden provided construction fill for the basal platform on which sat structures, which then were renovated over hundreds of years. The construction of the platform probably coincided with the interment of ancestors and other dedication rituals (McAnany 2011; Schulz 1997). Zone 44 contained the richest faunal assemblage, including armadillo, bird, dog, catfish and other fish, crab, crocodile, iguana, peccary, rabbit, rodent, shark, snake, squirrel, and turtle

(Sheehan 2002). As seen in Chapter 5, it also contained complete apple snail shells with a distribution particularly high in those sizes most desired for consumption.

The presence of crocodile bone in the platform fill is particularly notable. Crocodile is rarely found outside of ritual contexts from the Formative to Classic periods in this region. Based on extant iconography from the Formative period across the Maya area, crocodiles symbolized the Earth Monster during this time period (Thurston 2011:103). Crocodiles also appear bound and speared within the cosmic flood myth, representing the crocodile Itzam Kab Ayin, sacrificed to create the world (Taube 2010:204). Though crocodiles were abundant and could have been a nutritious resource for Maya people who lived near lagoons, wetlands, and rivers, such as those near K'axob, evidence is scarce for the routine consumption of this animal. Instead, crocodile is found in limited, mostly ritual contexts, and especially during the Classic period there may have been a taboo on killing the animal for everyday subsistence needs. The site of Lamanai, with a name meaning "submerged crocodile," had the largest zooarchaeological assemblage of crocodiles and may have influenced such restrictions (Thurston 2011:178). Crocodile bones signal the midden as an unusual context probably ritual in nature.

The initial context at K'axob possibly consisted of the remains of a ceremonial feasting event or a midden that was in long-standing use by the community. Though characterized by highly diverse animal remains, the Operation 14 midden samples contained the least diverse plant assemblage. Maize and amaranth dominated the samples. As noted earlier, maize was an important status food. It also was used ritually (Carrasco 2010:623; Guderjan 2000; LeCount 2010:346; Morehart 2005:175; Redfield and Villa Rojas 1967:128; Taube 1989, 1996). The amaranth seeds found in the Operation 14 midden constitute the largest collection to have been found in the Maya area (32 *Amaranthus* sp. or "cheno-am" seeds were identified in this context). The comparative lack of diversity within the context could plausibly result from generally small sample sizes. On the other hand, if this context represents trash deposited from a feast, it is possible that residents focused on fewer plant species in greater abundance for consumption, even while diversifying their meat intake.

Based on the data presented here, amaranth and possibly chenopod contributed to the diet of K'axob residents, at least during the Late Formative period. Amaranth has also been found at a few other sites in northern Belize in recent studies, though the counts have been low (Goldstein and Hageman 2010; Magennis 1999; Seinfeld 2011). Only two amaranth seeds were found within abundant samples from sites in northern Honduras, and amaranth has not been found elsewhere in the Maya area, so Morell-Hart (2011:118) argues it was likely not a staple in this or other regions. One chenopod seed has previously been found from the Pre-Classic period at Copán (Lentz 1991), and a few others were found in northern Honduras from the Classic period (Morell-Hart 2011:221). No single "cheno-am" seed from K'axob could be securely identified as chenopod, though several of the seeds present were clearly amaranth. Due to the rarity of both chenopod and amaranth seeds among paleoethnobotanical assemblages, the presence of amaranth in this deposit makes it more likely that all cheno-am seeds present in the sample are amaranth.

The cheno-am seeds found at K'axob exhibited diversity in shape and size, a characteristic typical of charred amaranth seeds. Some of the seeds were popped, as they can pop under heat and be ground into flour. Fritz (2007) has written of the importance of amaranth as a grain in North America, noting the unwillingness of many scholars to acknowledge the seed as an important component of ancient diets, perhaps due to our own biases towards maize and larger domesticates. The grain was also famously important to peoples of highland Mexico. Though small, amaranth seeds are high in lysine (Plotkin 1988) and protein (MacVean and Pöll 2002:218). Amaranth greens contain protein, carbohydrates, fiber, calcium, phosphorous, iron, vitamin A, vitamin B2, niacin, and vitamin C, among other nutrients (MacVean and Pöll 2002:219). Amaranth grains and greens convey important nutritional benefits to those who eat them. It is an important discovery that K'axob residents seem to have eaten amaranth, since little evidence for consumption of this plant has been found previously in the Maya area.

Another consideration regarding amaranth is that it is a C4 carbon fixing plant (White, Pohl, et al. 2001:94). In the interpretation of carbon ratios, C4 values are often attributed to maize consumption. However, if amaranth were shown to be a significant part of the diet, it could have increased C4 content in bone isotope ratios. This would make it appear that K'axob residents ate more maize than they did. Carbon isotope ratios from K'axob showed that residents of the site already ate fewer C4 plants than occupants of many other Maya sites. In general, people in northern Belize tended to eat less maize than those in other regions, and much of this variation has been attributed to microenvironment diversity (Henderson 2012:283; White 2005:368). If amaranth was a more important part of the diet than previously understood, then the amount of maize residents of K'axob were eating might have been even less than current interpretations suggest. In addition, recent research has shown that the C-13 values of C4 plants can overlap with CAM pathway plants, and that even C3 plants can have enriched carbon values (Warinner et al. 2012). These factors complicate the use of carbon isotopes in determining amounts of maize in the diet and demonstrate the importance of examining diet and dietary change through more than one type of evidence.

After the placement of this initial deposit in the Late Formative period, Structure 54 (sampled by Operation 14) was used as a residence and a place of important daily activities including food preparation. Excavators found animal bones in several Formative and Early Classic contexts from Operation 14 (Zones 53, 41, 39). In these contexts, faunal remains were found in conjunction with apple snail shells, jar rims, large sherds and a *mano* fragment (Schulz 1997). The excavator interpreted the contexts as hearths and cooking areas. Though plant remains did not survive from these contexts (not all of them were sampled), it seems clear that during these two earlier periods, food preparation including the cooking of faunal resources occurred at Structure 54 (as seen through Operation 14).

Classic Period: Household Organization and Intrasite Dynamics

This study has implications for understanding how people interacted with others across residences within larger social groups. We must broaden our gaze from the structure or basal platform to various clusters of structures and how they worked together in the creation of a taskscape. Based on botanical and mollusk remains, I argue that during the Classic period the structure sampled by Operation 14 functioned primarily as a place of ritual and ancestor veneration, while the structure and patio sampled by Operation 15 operated as a place of plant processing and food preparation. Then I consider other lines of evidence from northern K'axob to strengthen my argument for the distributed household model.

There are a couple of difficulties in the comparison between Operations 14 and 15 based on the current botanical samples. First, there are just two hearths, one from each operation, that coincide temporally. Though both are situated on mounds, the excavation at

Operation 14 included postholes and other indications of indoor, residential space, while Operation 15 contained evidence suggestive of patio and outdoor space. The sample sizes are small and not representative of all contexts within each excavation unit. Finds from the Late Classic Operation 14 hearth included just one tobacco seed and one hogplum pit. This is an extremely small sample, and it is clear that more work is needed to support the interpretations that I suggest. Even with a small sample, I choose not to ignore the seeds that are present and to suggest what they may mean. The small sample sizes allow for some comparison through time and space, but not with the certainty one might desire.

To review, Operation 14 sampled a basal platform group—a collection of structures built on top of a single platform oriented around a shared patio space, including Structure 54. Structure 89, sampled by Operation 15, on the other hand, consisted of a single mound about 50 m to the south of the larger complex but also near another low mound some ten meters to the northeast (Figure 3). Operation 14, located within Structure 54, demonstrated occupation over a longer time span, and contained the burials of eleven individuals. From the Formative period through the Late Classic period it was used as a residence. Structure 89 was constructed during the Late Classic period, and contained packed earthen floors within which two people were interred. The earliest use of Structure 89 seems to have been as a kiln (López Varela et al. 2001). There was also evidence in later levels for continued use of the area for pottery production (for example, wasters). Structure 89 was an important space for processing and production within the northern area of K'axob.

The Late Classic period hearths from Operations 14 and 15 reinforce these distinctions in spatial use. As mentioned earlier, the ratios of seed counts to wood weight were markedly different between the contemporaneous hearths at Operations 14 and 15

(Table 4). Such a measure can account for differences in preservation between samples and suggest variations in use across time and space (Miller 1988:75). The density for Operation 14, Hearth 3, was only 3.28 seeds/wood weight (g), while Operation 15, Hearth 1 had a density of 19.58 seeds/wood weight (g). These numbers support the conclusion that many more plants were being processed at the Operation 15 hearth, while the Operation 14 hearth contained a greater proportion of fuel than food or craft plants. The presence of burnt wood with minimal seeds in the Operation 14 hearth could align with ceremonial use. The lack of seeds may also represent the use of the area for consumption rather than preparation of food items.

In order to further develop my argument, I discuss the specific plants found in each context and their uses to define activity areas. Both hearths contain amaranth, trumpet tree, legumes, pokeweed, passionfruit, and nightshade, illustrating similarities in local environment and plant availability. Apart from this, there are distinct types of plants at each operation.

Tobacco and hogplum were found in the hearth of Operation 14. As mentioned earlier, excavators found a ceramic tobacco flask at K'axob in the style of others encountered throughout the area in Classic times, suggesting use of tobacco as a snuff. Tobacco is a plant with continued importance among Maya peoples for ritual and medicinal purposes (e.g., Groark 2010). Tobacco plants are often tended and their flowers snipped before the plant can seed in order to maintain the quality of the leaves. This may help to explain the lack of tobacco seeds at Maya archaeological sites. Indeed, only one other paleoethnobotanical study in the Maya area has located tobacco seeds, from sites in northern Honduras (Morell-Hart 2011). The seeds are extremely small (approximately 0.5 mm in length) and can elude detection by screening. Hogplum pits have been found at various sites across the Maya area (Lentz 1999:Table 1.1). Morehart (2011:94) found charred hogplum pits within a hearth feature in a cave, associated with other carbonized fruit remains. Hogplum trees could have been found in orchards, which were related to inherited wealth, as discussed earlier. Both tobacco and hogplum were plants associated with status and religious practices.

The finds specific to Operation 14 represent species of plants that would have required minimal processing prior to their consumption and also have strong associations with religious behavior. This fits with the location of the hearth from Operation 14 immediately adjacent to a burial within a large residential structure. The lack of processing may relate to the presence of the hearth within an active, covered residential space rather than in a patio area where more intensive processing may have occurred. The presence of tobacco and hogplum likely relate to the role of residents of Structure 54 in terms of their authority within the corporate group and site. Members of the larger corporate group or household could have brought prepared foods to residents in Structure 54, either due to their status within a lineage or their religious role within the community. Residents of the corporate group may also have joined in on the ritual activities that took place at Structure 54 in ways beyond preparing and providing supplies.

The plant species represented by seeds found within Operation 15 included cohune palm, nance, two different species from the grape family, a variety of legumes, and maize. Thus, Operation 15's Hearth 1 contained cultigens, as expected from a residential hearth. It is likely that these would have been important components of the diet for all residents of K'axob, and that the preparation of these cultigens represented a daily task that took place in this patio hearth. Nance is a tree with an edible fruit that grows in moist thickets or open forests, but also is cultivated within orchards. Because the nance seeds found from the site were only 4 mm long (about half the minimum size of cultivated nance seeds known today) it is possible that these were collected from forest stands, though some shrinkage also occurred during carbonization. More than 30 nance seeds were found from this context. These fruits could have been collected for food, beverage, or dye. Palm nuts could also have formed a regular part of diets at K'axob. Palm wood was used for fuel in both hearths. The two species from the grape family grow in similar environments and could have been collected together. The seeds of water vine (*Vitis tiliifolia*) came from fruits that could be used as a food, beverage, or vinegar. If people collected water vine stems as well, they could have been used for cordage. Lentz (1991:277) also recovered water vine from a Classic-period low-status platform surface from Copan, in Honduras. The leaves of seasonvine (*Cissus verticillata*) could have been used to make soap. Together, water vine and seasonvine could be used for medicine or cordage. The wild and cultivated plants found in the hearth could have been processed for a variety of uses.

From the Late Formative to Late Classic periods, as the basal platform and structures within and around Operation 14 grew, residents seem to have transitioned from conducting basic tasks in a central location to conducting more specialized consumptive, possibly commensal, and ritual activities in structures distributed across space. People continued to live in the structure sampled by Operation 14. Changes in the use of space may have resulted from a growing family and an increase in the status of kin group or house, in the sense of Lévi-Strauss's (1982) model. As population increased, space was likely organized more strictly to facilitate specialized activities. Household members distributed activities among several structures by the Late Classic.

In all, it appears that the patio hearth at Operation 15 was a space for the preparation not only of dietary staples including corn, beans, palm fruit, and nance, but also of important products such as fiber, dye, medicine, and beverages. Cooking and other processing activities would have taken place outside in the patio, and it is likely based on ethnographic and iconographic depictions of grinding, spinning, and weaving that these activities were done by women. In contrast, ethnographic and epigraphic information suggest that the tobacco use that took place at Structure 54 was possibly a men's activity (Groark 2010; Robicsek 1978), though scholars have shown in other areas of Mesoamerica that women also used hallucinogenic plants (Patel 2012:58), possibly including tobacco. Structure 89, sampled by Operation 15, was far enough away from Structure 54 that people could have shouted to each other, but in general the smoke and noises of Structure 89 would have been muted for people at the larger compound. The location of the hearth on the north side of Structure 89 would have allowed those present to view Structure 54 and vice versa.

This assessment is consistent with the apple snail data presented earlier. Shell sizes were distributed normally around ideal edible sizes within Operation 14, whereas mostly large and small shells were found in Operation 15, located within Structure 89, a likely center for processing. In terms of other fauna, Formative period Operation 14 contained the possible feasting debris mentioned earlier, including a great quantity and diversity of animal species in the early midden. In the Formative there were also animal bones found left on plaster floors (turtle, fish, armadillo, deer, dog) and in a burial (turtle, fish, unidentified mammal). The comparative lack of faunal remains found in Late Classic contexts within Operation 14 is clear. No analysis has been conducted on the small number of animal bones collected from Late Classic contexts at Operation 14. However, the excavation report (Schulz 1997) made note of animal bones in four Late Classic contexts, two of which also contained sherds (Zones 32 and 2), and two of which included human bone, sherds, and other artifacts (Zones 20 and 10). The contents of these contexts suggest their placement related to consumption or ritual interment for ancestor veneration rather than to food preparation.

Within Operation 15, a small amount of bone was scattered among surfaces and within Hearth 1, including a turtle bone and mammal long bone fragments. Food could have been prepared at Hearth 1, as well as other hearths in mounds around the larger compound, and served to many residents of the corporate group. Before the construction of Structure 89, Structure 54 may also have functioned as a building associated with rituals due to the variety of animals found in the midden, which suggests feasting. It may also have served as a processing site for animals and other foods, due to finds of animal bones on plaster surfaces. Later on in its history, though, Structure 54 as viewed through Operation 14 seems to have become more specialized as a place of food consumption and ancestor veneration.

These data support the idea of an extended household utilizing multiple buildings in the northern portion of K'axob during the Late Classic. Residents of the household, or at least corporate group, could have utilized the space sampled by Operation 15 as a production center somewhat removed from the house. This would allow for additional room and a separation of tasks from the main structural center. A couple of household members may too have resided on the adjacent mound and within other miscellaneous structures. This would have been a bustling workspace. On the other hand, the use of plants at Structure 89 should not be viewed as entirely mundane. Though ritual activity may predominantly have occurred on and around the basal platform sampled by Operation 14, the plants identified at Operation 15 could have been prepared for rituals and commensality at Structure 54. That is, Structure

89 could have been a center of production for a wider corporate group. The operations should not be viewed as disconnected. In addition, cultivated plants eaten daily such as maize and beans and the fruits of palm and nance are also found in ritual contexts (Morehart 2011). Although I have suggested a separation of work and sacred space, these categories of life would not have been so distinct in practice.

Synthesis of Burial Data from Northern K'axob

Newly synthesized burial data further support the idea of a larger, integrated household utilizing multiple structures in the northern segment of K'axob. Specifically, people with differing identities who could have lived as part of the same household were buried in distinct structures. While males who may have qualified as lineage heads or at least ancestors to be venerated along with burial accouterments could be found in Operation 14, more multiple burials, females, and those without burial goods could be found in Operation 16, located approximately 400 m south of Operation 14 (Meyer 2013; Figure 3). In this way people from the same household, when deceased, were distributed among structures. This supports the notion of specialized and complementary functions among structures utilized by households.

Meyer (2013) compiled burial data from Operation 14 and compared the trends he found to those within other excavation units at K'axob as well as the sites of Cuello and Tikal. In particular, he noted changes in burial practices through time. Meyer found that early on, in the Late Formative, burials consisted primarily of children laid in simple graves. There was no consistent orientation of bodies at this time. Meyer (2013:44) posited the connection between burials and new construction phases in the Late Formative. As evidence, Burial 11 was cut into a packed marl surface adjacent to a posthole. It may have served as a dedication for the building event. The Late Formative burials from Operation 14 do not suggest a standardized practice of ancestor interment and veneration. This evidence conforms to the notion that areas of houses had not yet become distributed according to specialized functions.

From the Early Classic onwards, all burials within Operation 14 consisted of adults. The two burials for which sex information was available were male. Other burial practices became more standardized as well, especially by the Late Classic. Extended burials characterize this time period, mostly laid within crypt-style or simple graves. While previously individuals had faced different directions, by the Late Classic period almost all burials were oriented with their heads to the north (18 degrees off true north) and feet to the south (Meyer 2013:45). Each burial included a vessel placed over the head. Still, people cut burials into existing packed marl floor surfaces. Clearly, burial practices within Operation 14 became more regular through time. They also seemed to become exclusive to adults—and males, in at least two instances—and contained grave goods such as marine shells indicating a particular status or ritual role within society. Meyer (2013:61) argues that the people buried within Operation 14 by the Late Classic may have been household heads venerated as ancestors that legitimized land claims.

Classic period burials from Operation 14 show marked differences from those of another structure represented by Operation 16 (Figure 3; Meyer 2013). Operation 16 sampled a structure located on the northwestern side of K'axob, not immediately adjacent to Operation 14 and 15 examined in this thesis. Though burial practices also became standardized throughout the Classic period, the results were slightly different. Bodies were oriented southwest to northeast, and graves consisted of simple pits. Though most graves contained ceramic vessels, some held no grave goods. Burials contained two individuals in several cases, including two adults or an adult with a child. Mostly sex was indeterminate, but one adult individual was identified as female. It is possible that Structure 68, in which Operation 16 was placed, became a location by the Late Classic within which a wide variety of people could be buried, in contrast with Operation 14. The differences in burial practices at Operations 14 and 16 indicate distinct treatments of the dead based on identity categories including status or ritual role, age, and gender. As people interred their dead in diverse residential or specialized mounds, members of household groups became distributed across structures at the site.

Reconsidering Isotopic Evidence

It is useful here to revisit some of the data from stable bone isotope analyses that Henderson (2003) published. Henderson assumed that Operations 14 and 15 at K'axob represented different households. Why would she have found isotopic differences between people buried within structures of different sizes if they did not represent households with differential labor pools? First, it may not be correct to assume that people were buried in the structures where they lived. This is a common conjecture, but if people were cooperating among various structures it would be more likely for people to have been buried in any one of the structures within which they worked and dwelled. Differences in burial data could represent distinct identities among the people buried in specific structures rather than all the members of a particular household. Second, it is useful to separate Formative from Classic period burial data. When I decouple isotopic evidence from burials by time period, many of the dietary distinctions between burials from larger and smaller structures disappear during the Classic period.

Henderson selected a stratified sample of 25 adults from different structures. Many of her bone collagen samples had to be eliminated due to poor preservation. The carbon apatite samples from bone carbonate worked better, with 23 successful samples (Henderson 2003:480). One main finding was that the average adult diet at K'axob consisted of a mix of plants, with less than half of plant food coming from maize. This is low when compared to Maya populations in other regions. Because all people at the site maintained a relatively diverse diet, her argument that higher status individuals would have experienced even greater dietary diversity may not hold true. This is especially the case because maize was often considered a plant important to status and ritual. However, she does find that the mean carbon apatite value for "smaller households" is -9.1±0.193, while the mean for "larger corporate households" is -10.05±0.849, which is a significant difference (Henderson 2003:480). She examined adult burials from isolated and small structures from the Middle Formative through Classic and compared them to adult burials from larger structures that encompass more than one building from the Late Formative through Classic.

Henderson (2003) asked how diets may have differed between single isolates and structures on basal platform mounds, which she believed were corporate groups. I take her argument one step further to argue that all of these structures were engaged in the activities of a larger corporate group or household during the Late Classic period. As a result, I would expect people buried in structures of various sizes to have eaten roughly similar diets, with some variation based on identity (dependent on, for example, gendered eating patterns). This helps to explain why in the Classic period the carbon apatite signatures of people buried within basal platform groups represented a subset of the carbon apatite signatures of people buried within isolates (the latter consisting of a larger sample; Henderson 2003:480). The correlation Henderson used to make her argument would have been stronger if she had calculated significance based solely on Formative period data. In the Late Classic, like never before, people worked in larger social groups to produce and distribute food.

Ceramic Evidence

The size and shape of pottery vessels at K'axob also provide clues about changing diet and social groups during the Formative to Classic period transition. Common cooking vessels began to increase in size at this time. Only by the Late Formative or Protoclassic periods (Late K'atabche'k'ax complex) were striated wares introduced at K'axob. At this same time, the size and frequency of jars began to increase (McAnany and López Varela 1999:166). During the Late Formative and Protoclassic periods, sherd-lined pits occurred as isolated features, after which they were phased out entirely. Serving vessels associated with the Terminal K'atabche'k'ax complex also became larger, and new vessel forms, such as spouted jars and large serving bowls, became available. These vessel types could have played a role in commensal ritual activities such as feasting. It also seems possible that these changes in vessel forms would have allowed for cooking and serving larger batches of food necessary for a growing household. The transition period to larger, distributed households seems to have occurred after the introduction of new and larger ceramic types.

This study challenges the notion that Structures 54 and 89 (represented by Operations 14 and 15, respectively) were discrete households. Instead, I suggest that the longer-occupied Structure 54 expanded through time to allow for additional task space and to accommodate a growing, distributed household. In addition to plant and animal evidence, other data including burial remains and isotopic studies support the idea that the structures represented by Operations 14 and 15 were bound together as part of a social and economic network.

CHAPTER 7:

COMPARATIVE DISCUSSION

Do data from other sites in northern Belize support my argument for distributed households during the Late Classic period? One factor that makes this question difficult to answer is that most studies of small households in northern Belize have relied primarily on site survey and test pitting. To analyze activity area distribution, one must study evidence collected through the horizontal exposure of structures of various sizes, particularly those in close proximity to one another. This paper has begun to illustrate why this is the case. The main goal of digging test pits has been to collect pottery sherds that will assist in dating stratigraphic layers. When an excavator encounters features, they may be labeled as "middens" or "hearths," based on factors such as the presence of dense artifact deposits or charcoal, respectively. We would expect both of these types of features to occur within residential contexts. However, the classification of a feature as a hearth, for example, does not necessarily provide information about the specific household activity that occurred in that locale. To access this kind of information would require additional study of the artifacts, including the ceramic forms as well as plant and animal remains present in each feature. With some luck, this kind of analysis could distinguish between those fires over which food was cooked versus those kindled for other purposes. The lack of this sort of attention directed at Late Classic period residential structures in northern Belize has made it difficult to track different types of activity areas across sites or structures in order to explore economic and social arrangements.

In order to decide whether or not other evidence supports the idea that households utilized multiple structures in the Late Classic period, I examine two lines of evidence: (1) horizontal excavations of adjacent residential structures within small sites across the Maya area; and (2) settlement surveys that took place in northern Belize. The first allows for an examination of data presently unavailable in northern Belize but crucial to my argument, while the second provides comparative information relevant to the present study region.

Excavation of Residential Structures within Small Sites

What evidence would support the distributed household model within excavations of residential structures? Characteristics of the distributed household include shared labor across structures. Consequently, one piece of evidence in support of larger household sizes would be the occurrence of complementary specialized activity areas dispersed across several structures in relatively close proximity. In large excavation units, many artifact types could be mobilized to identify production and consumption within residential areas, including ceramics, stone tools, greenstone, groundstone, and plant and animal remains. Particular mounds would contain more burials than others, or the distribution of burials could have been divided according to demographic differences within the population. Some mounds would have hosted more obvious ritual events, while others may have contained more numerous fire pit features.

Another expectation is that small isolated structures would have been incorporated into larger structures in some way. Isolates may represent places in which specialized activities occurred for the larger social group, though people may have slept in buildings within and around which specialized activities took place. The key is that even so, residents would have participated in economic activities in and around other household structures on a daily basis. It would be difficult to identify an isolated mound as part of a larger group unless there was evidence for a specific activity taking place. Otherwise, one would need to consider the spatial relationships of isolates to larger structures in the immediate area.

Chan

Chan, located in the upper Belize River valley, is a site where archaeologists have directed significant attention to horizontal exposures of small residences (Robin 1999, 2002, 2012). Recently, excavations have taken place at the Northeast Group of Chan, which Blackmore (2012:173) considers "one of several 'neighborhoods' that make up the Chan community." Blackmore's study, like this one, examines intrasite dynamics, and the diversity present within commoner, farming populations. The Northeast Group includes six mound groups and two isolated mounds (Figure 19), and Blackmore considers each of these eight varied arrangements distinct households.

Blackmore argued that at least two of the groups, NE-1 and NE-3, "engaged in practices and behaviors that distinguished them socially and physically from their neighbors" (Blackmore 2012:188). Blackmore identified a variety of specialized activity areas distributed across the Northeast Group. A paired platform structure, NE-3, contained a particularly high number of densely clustered burials, as well as a midden and hearth indicating food consumption and possibly feasting. NE-3 contained most of the unworked and worked marine shell identified in the Northeast Group (Blackmore 2011:169). Though not the earliest founded structure, NE-3 seems to have become a place in which ancestor veneration including public ritual displays occurred. The oldest group, NE-1, consisted of a loose collection of mounds including at least two different platforms. It was located near extensive terracing and contained an especially high concentration of slate and obsidian tools in its midden, providing evidence for agricultural activities and plant processing in this location (Blackmore 2012:184).

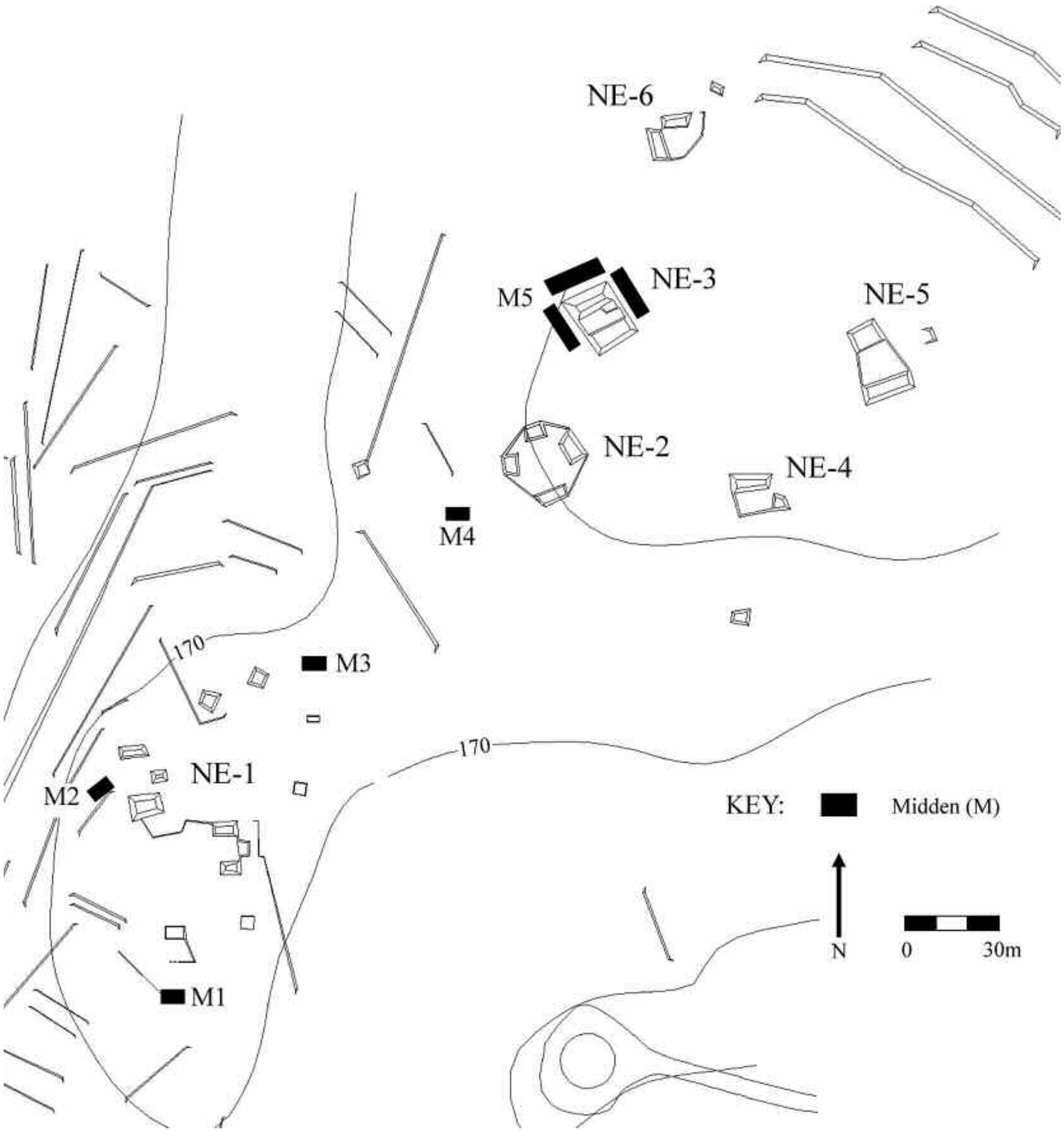

Figure 19. The Northeast Group from Chan (from Blackmore 2011:165).

Blackmore found a differential distribution of various artifact classes—including ceramics, slate, obsidian, jade, shell, and animal bone—across the neighborhood. Five of the seven pieces of jade and both pieces of *Spondylus* shell from excavations at the Northeast

Group came from NE-1 (Blackmore 2011:168). NE-1 and NE-3 both contained more serving dishes than the other groups. Of the ceramics found from excavations at NE-6, 45.2% consisted of unslipped jars, while there were "few fine ceramic wares or specialty forms… suggesting that cooking, storage, and food processing were the primary foci of its residents" (Blackmore 2012:182). Though NE-6 dates back to the Early Classic period, it only comprised three distinct construction episodes (Blackmore 2011:166). Ultimately, Blackmore can trace a number of particular activities across the cluster of residential structures.

Evidence from Chan supports the idea that people at the Northeast Group pooled their labor and conducted activities in a corporate manner distributed across space. Blackmore (2011, 2012) believes the structures in this area constituted a neighborhood. She draws from Bullard's (1964:281) archaeological definition of a neighborhood as a collection of households represented by a cluster of five to twelve structures (Bullard 1964:281). Also, she refers to waterhole groups of modern-day Zinacantan as examples of neighborhoods (Blackmore 2012:177; Vogt 1976). The latter seems like an inappropriate comparison to the Northeast Group, considering waterhole groups often consisted of multiple lineages including hundreds of people (Vogt 1976:99). A social group from the same study residing in structure groups more similar to those of the Northeast Group might be the SNA, a term that Vogt uses to refer to localized patrilineages that "vary in size from those containing one patrilineage, with only four houses and less than fifteen people, to very large ones with at least thirteen patrilineages and over one hundred and fifty people living in more than forty houses" (Vogt 1976:25).

Another ethnographic study useful to compare to the Northeast Group was that conducted by Wilk (1983) on Kekchi Maya community organization in southern Belize. In this study, Wilk defined household clusters as groups of up to five residential structures strung along trails or arranged around courtyards. They often consist of kinship groups, "which are tightly knit and cooperate frequently in production and consumption" (Wilk 1983:102). Within the cluster, men conduct agricultural work together, minimizing risk through the use of various crops located within different microenvironments (Wilk 1983:109). Junior members of the cluster stay nearby the head of the cluster in order to acquire access to land and inheritance rights. Wilk makes the point that structures within household clusters vary in size and elaboration according to the seniority of cluster residents and their relationship to the cluster's head. This is despite the fact that, throughout the community at large, "there is a fierce egalitarian ethos" (Wilk 1983:103).

Though in this publication, "for the sake of convenience," Wilk (1983:100) refers to a household as people living together under one roof, he acknowledges that Kekchi household clusters "*share* in production, consumption, and child care on a daily basis." In other publications he notes that a household can occupy several adjacent buildings, while acting as a single and social economic unit (Wilk 1981, 1988:138; Wilk and Rathje 1982). Wilk's (1983) study is one ethnographic example that seems to reflect the presence of distributed households functioning within a larger community, and his description bears a resemblance to the data available from the Northeast Group of Chan. It seems unlikely that the larger structures constituting the Northeast Group provided space only for activities but not for residents. People probably lived in most, if not all, of the mounds. However, this does not preclude the possibility that Northeast Group residents depended on each other for shared work on a daily basis. For example, the group could have consisted of an extended family household made up of nuclear families (as suggested in Haviland 1988).

Blackmore (2011) argues that her evidence reflects social differentiation and complexity among commoners. In this way, her argument focuses more on comparing competing households within a neighborhood rather than considering the level of cooperation suggested by evidence found within the Northeast Group. Blackmore considers there to have been eight households in the Northeast Group. However, two structures considered the remains of households are small isolates. The two isolates are spatially related to the other structures. They are within 30-40 m of other structures in the Northeast Group—a distance considerably smaller than the farthest spread of the dispersed collection of structures that make up NE-1. In addition, they appear to be smaller than most of the mounds that make up the larger structural groups. Therefore, these isolated structures (named NE-7 and NE-8) likely served specialized functions or housed individuals who participated in a larger production space. It seems likely that an extended household could make use of an area as large as the Northeast Group. The main difference between terms such as “distributed household” and “household cluster” when compared to a “neighborhood” is that the former emphasize collaboration to a much greater extent and stress the involvement of people utilizing multiple structures within a single social and economic unit. Using the distributed household model, one might gain new perspectives on the Northeast Group and emphasize interactions between residents differently.

Within the same site of Chan, Robin (2002, 2006) directed excavations at a neighborhood to the south of the site center, called Chan Nòohol (Figure 20). Robin (2002:251) describes Chan Nòohol as a cluster of seven farmsteads or residential structures, spaced 50-100 m apart and filled in by agricultural areas. Each structure or farmstead dates only to the Late Classic period, to a phase called Hats’ Chaak (AD 660-790). The farmsteads seem particularly discrete, with few isolated structures between them and a greater distance between structures than can be found at the Northeast Group.

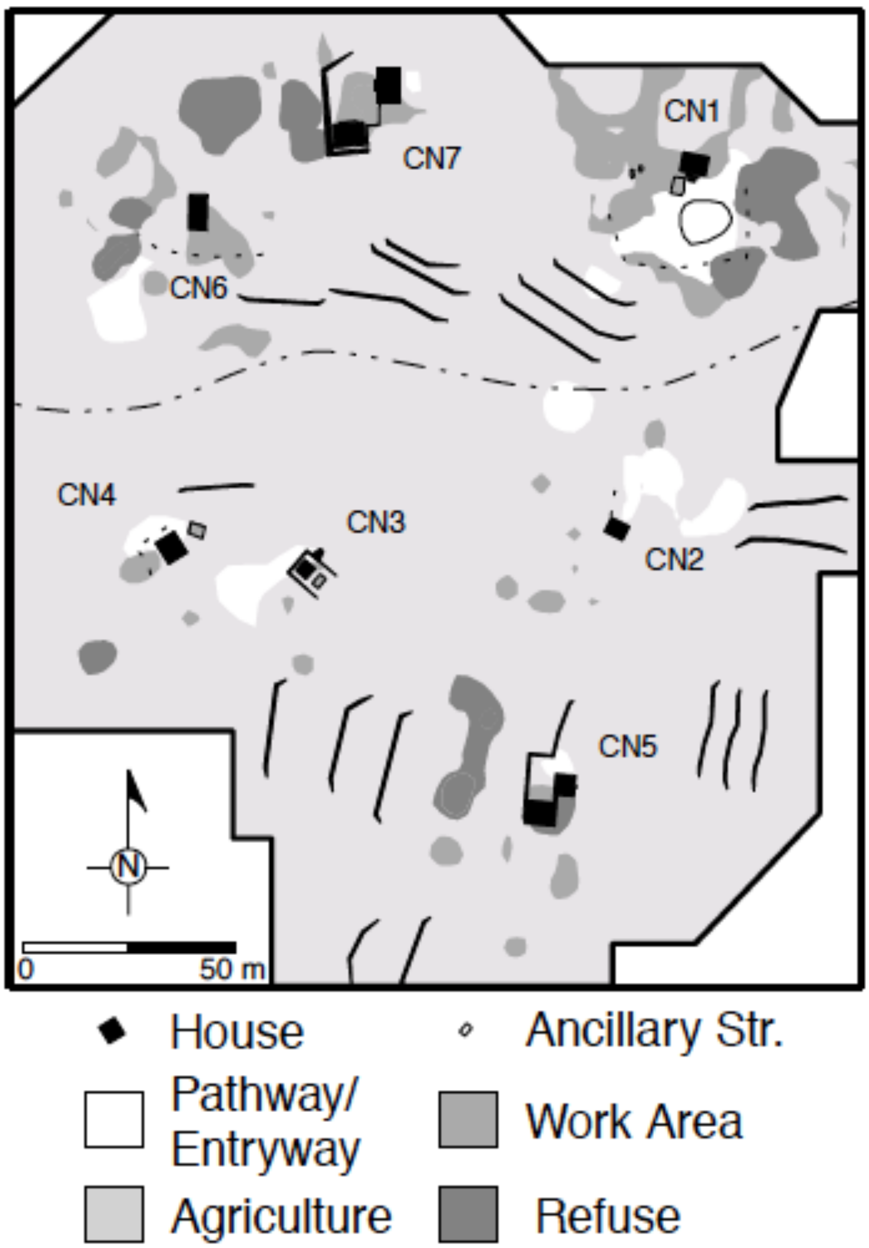

Figure 20. Map of Chan Nòohol (from Robin 2002:251).

The farmstead called CN1 contained an artificial reservoir and also the only evidence for small-scale ritual feasts. CN1 also included larger work areas and higher densities of refuse (Robin 2002:260). A stream ran within Chan Nòohol, separating three farmsteads to the north (including CN1) from four farmsteads to the south. All structures except for one (CN7) faced the stream, and the sloping terrain hosted numerous terraces. For these reasons, Robin argues for the importance of water in linking residents at Chan Nòohol. In this particular example, it is difficult to imagine that all of the structures constitute the remains of a single distributed household. For the most part, the structures are more spread out, with the exception of two south of the river that could easily have shared a workspace.

Robin (2002:256) found that residents of all the structures conducted tasks focused on food preparation and consumption, cloth and stone tool production, and farming. However, she also determined that one farmstead on each side of the stream (CN5 and CN7) "achieved enhanced socio-economic status, probably through their farmwork" (Robin 2002:259). It was only at these two structures that greenstone and marine shell were found. The structures themselves were renovated to become larger with cut limestone facing stones and stone basal platforms.

Through a re-examination of the Chan Nòohol map with ethnographic examples of household clusters (Wilk 1983) in mind, I would like to posit the idea of two distributed households: one north and one south of the stream. CN5 and CN7 appear to have contained artifacts related to ancestor veneration and other ritual activity. The terraces associated with each cluster do not appear to be spatially segregated by residence. Finally, CN1 could have served as a place for all of the farmsteads to come together. Overall, though, Chan Nòohol does not fit the distributed household model as well as other places discussed in this chapter, demonstrating variability in household arrangement. Fewer specialized activity areas and a lack of significant shared labor may relate to the short period in which these houses were occupied. In most areas of northern Belize, elaborated Late Classic structures sit on top of earlier Early Classic or even Late Formative platforms. Residential conglomerates such as these connected people to their ancestors and growing families through the centuries. The structures of Chan Nòohol, on the other hand, do not contain earlier substructures.

Chan is located in the upper Belize River valley, more than 100 km southwest of K'axob, the main site of interest for this paper. The two examples from Chan present evidence from horizontal excavations of small structures in close proximity. Because of the excavation and interpretive strategies taken by scholars at Chan, these residential areas provide case studies in the examination of household organization. What would be even more useful, however, would be comparative examples from northern Belize, or studies of structures including contextually-linked botanical analyses. As these types of study results become available, the distributed household model can be tested against even more pertinent examples.

Cerén

At a distance much farther from K'axob than Chan, Cerén is a small site in El Salvador with dwellings that have been thoroughly excavated. The Loma Caldera eruption covered the farming village around C.E. 600. Because of this, the preservation of the site including *in situ* artifacts and plant remains is incredible. Excavators of Cerén have detected household production and specialization at a more detailed level than has been possible at other sites. Cerén researchers have studied the relationships of households to the larger community and to specialized facilities (Sheets 2002:4). Excavators have unearthed various structures associated with each of four residential areas, which they call households (Figure 21).

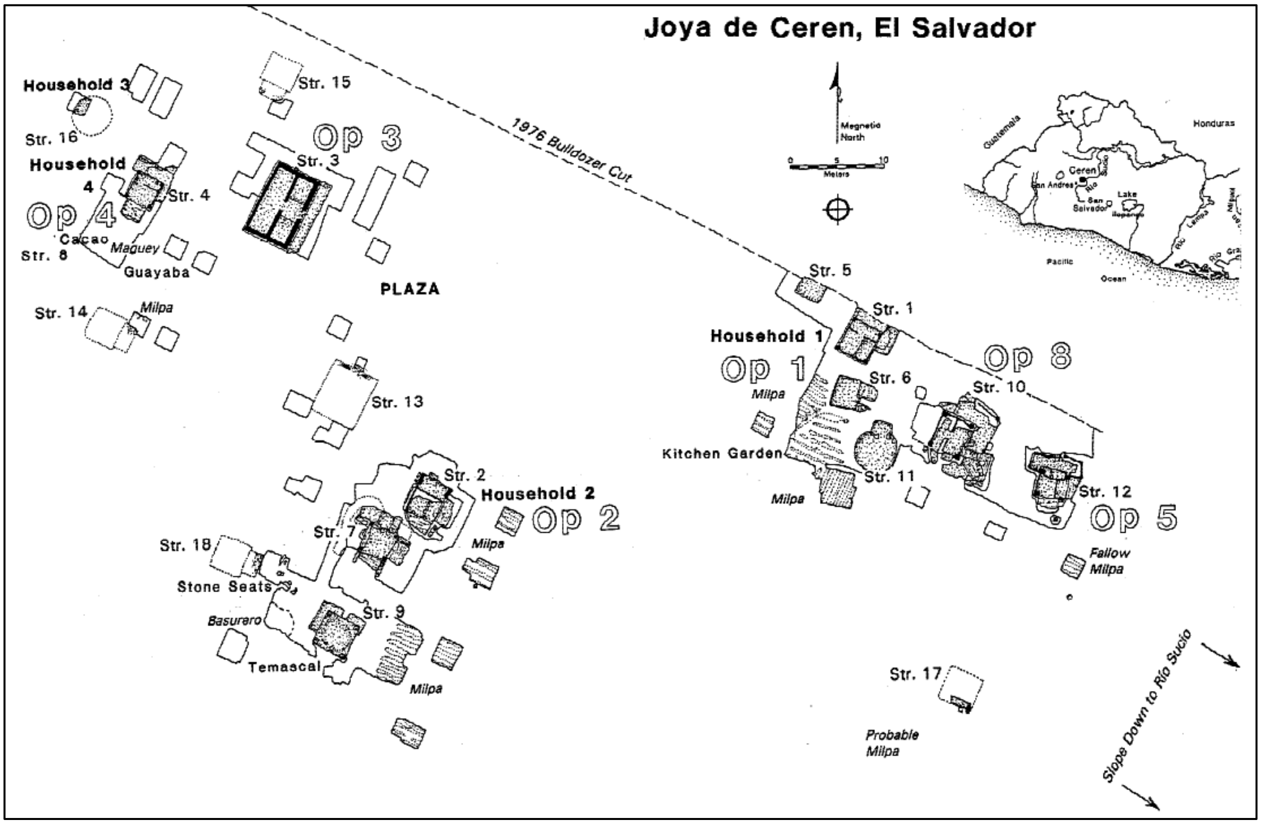

Figure 21. Map of Cerén Households (from Sheets 2000:218).

Several structures and additional outdoor features have been excavated in an area of Cerén that has been called Household 1. Structure 1 served as a place in which people slept, as it included an interior room with a raised bench (Beaudry-Corbett et al. 2002:45). Adjacent structures included a storeroom (Structure 6), a kitchen (Structure 11), and a low adobe platform with thatched roof that had been partially removed by a bulldozer in 1976 (Structure 5; Beaudry-Corbett et al. 2002:49). The household also seems to have made use of an additional building, Structure 10, associated with religious events (Beaudry-Corbett et al. 2002:56; Brown and Gerstle 2002). Also, additional structures could have occupied the space north of the bulldozer cut, which is now unavailable for study. The structures are not all oriented towards a central courtyard. Artifacts in each extant building could have been associated with general domestic activities such as fiber spinning, plant processing and food preparation, craft production, and storage. Nevertheless, excavators could determine based on architecture, features, and artifact distributions that each building served more specialized functions for Cerén residents.

The description of households at Cerén, including Household 1, seems distinct from other interpretations of ancient households in the Maya area. Cerén researchers argue that each household "built at least three structures: (1) a domicile, used for sleeping, eating, and various daytime activities; (2) a smaller building for storing food and artifacts; and (3) a kitchen" (Sheets 2000:223). The structures clustered together generally but did not share a basal platform or consist of a unified architectural style. The degree of craft specialization found among various structures at the small site was greater than expected (Sheets 2000:226). It is clear that households at Cerén were distributed across structures.

The Northeast Group of Chan and Cerén both provide examples of dwellings that align with the distributed household model. I suggest that the Northeast Group may have consisted of a few central structures, perhaps where people slept, within and around which specialized activities took place for the entire corporate entity. My explanation contrasts with Blackmore's, in which there would have been social and economic separation and perhaps a ranked hierarchy among structures of variable size and elaboration. The findings at Cerén provide strong evidence that each household made use of multiple structures consisting of a structure used for sleeping physically associated with a variety of task-specific buildings. The possibility of this residential pattern should be considered for other Maya sites. It is conceivable that archaeologists working at sites characterized by poorer conditions of preservation have lacked the detailed evidence necessary to understand the uses of structures that households employed. As household organization was highly variable through time and space, it is important for excavators to collect evidence from residential structures that can provide more information about this important aspect of everyday life.

Surveys of Northern Belize

While data from horizontal excavations in other areas provide intriguing glimpses into Maya household life, perhaps the most relevant dataset to this question comes from abundant settlement surveys conducted in northern Belize. This section compares structural configurations and test pit data from settlement studies to the distributed household model proposed for K'axob during the Late Classic period. I will consider whether site configuration supports or contradicts the idea that households extended beyond single structures or structural complexes.

In order to assess varied residential structure layouts and compare them to my data, I present here expectations for what settlement survey data would look like if the distributed household model were a good fit with the reality of ancient settlements. If households were distributed among various structures within sites, I would expect structures to be clustered rather than evenly spaced across large areas. Clustered structures might be connected by central courtyards, paths, or by means of building orientation. However, it should not be assumed that a single basal platform or even a central courtyard would unite all buildings utilized by a household. Within clusters, I would expect larger and smaller structures to sit side-by-side, exhibiting diversity in structure type within a small area. As mentioned earlier, this was a common site layout in northern Belize. Also, structures might reflect their functions through variations in size, arrangement, and outdoor activity spaces.

San Estevan

San Estevan is an important site for comparison with K'axob. It was a large neighboring settlement, and both sites grew in population particularly during the Late Classic. In contrast, nearby Nohmul experienced a decline in the Late Classic period followed by growth in the subsequent Terminal Classic, in a manner distinct from San Estevan or K'axob (Pyburn 1988). In the survey of San Estevan, Levi (1993, 2002, 2003) identified varied structure types, including isolated mounds, paired platform groups, basal platform groups, and large composite groups. San Estevan was settled in the Middle Preclassic, contained a significant occupation by the Early Classic, and had its greatest population boom and geographical extent during the Late Classic. Within this time span, Levi identified varying histories among the structure types present at San Estevan. Large, formal basal platform groups were founded early on until the end of the Late Preclassic, though their use extended beyond that time, as at K'axob. Slightly later on, isolates and paired platforms became more common. Over 80% of single and paired platforms had a Late Classic component (Levi 1993:123). Half of the structures with Late Classic artifacts began to be used in the Early Classic, while the other half were occupied solely during the Late Classic. Large composite groups, a third category consisting of an array of six to thirteen structures, arose and declined during the Late Classic (Levi 2003:88). Thus, clustered residences were an innovation of this later period at San Estevan.

Levi notes differences in settlement layout through space as well. "Areas dominated by basal platform groups never appeared farther than 0.5 km from any one of the site's three monumental precincts" (Levi 2003:88). Loci characterized by highly diverse residential structures occurred only within 0.75 km of these precincts. From 0.75 km to about 1.25 km from site centers, paired platforms and isolates became most frequent. Even farther away, large composite groups dominate all other residential forms. This pattern illustrates the value of survey to our understanding of larger patterns of social and political organization (see also Levi 2002:122). Levi's work shows the importance of a residential structure's spatial relationship to the site center in household organization and decision-making.

Similar to other scholars working at sites in northern Belize, Levi argues that structure isolates likely had a residential function. As evidence, excavation in some units yielded dedicatory caches similar to those from larger structures (Levi 2003:85). In addition, Levi found isolates most frequently in locations devoid of larger structures. Due to this settlement pattern, she argues that isolates "cannot readily be dismissed as mere adjuncts to larger, plaza-focused residential groups" (Levi 2003:85). Based on the data Levi presents, I would suggest that the structure isolates she identified far from larger structures probably served as field houses. On the other hand, isolates located in diverse structural areas near monumental precincts more likely served specialized functions in relation to the larger residential features.

An analysis of settlement variation at San Estevan through time and space seems to support the idea that distributed corporate households became common during the Late Classic. As stated above, within 0.5 km of monumental precincts, basal platform groups dominate the architectural landscape of San Estevan. The presence of basal platform groups, constructed through the Late Preclassic period, seems to represent the denser settlement of residents around site centers early on (see, for example, Robin et al. 2012:29). Also in this space and up to 0.75 km from site centers, areas were identified that were characterized by a high diversity of residential structures. In these places, early basal platform groups seem to have been built slightly further apart. Structure isolates and pairs were then interspersed with the basal platform groups. This development may have allowed households to spread out and organize diverse activity areas in a more structured way. As mentioned, large composite groups dated particularly to the Late Classic. This evidence could support the idea that a new kind of corporate unit thrived at that time. As the population grew beyond the capacity of the original basal platform groups, people constructed residential structures, slightly farther from site centers, in a new way that reflected changes in the use of space by households. It seems distributed households could have been maintained with or without an ancient core. Evidence from San Estevan might support household expansion during the Classic period, though additional excavation of or data analysis from residential architecture at the site must be considered to strengthen this argument.

Nohmul

Nohmul experienced population decline in the Late Classic period, making it a less appealing site for comparison to K'axob. In addition, Levi (2003:91-92) argues that residential patterns at San Estevan appear to resemble those at Kokeal and K'axob, but not those at Tibaat, located between the west and east arms of the wetland, or Nohmul, which is on the far west side of Pulltrouser Swamp. She suggests that they constituted separate communities. However, the differences in population trends at the various sites could certainly confuse direct settlement comparisons, so I would caution against too hasty an assertion of sociopolitical differences between these sets of sites. Because Nohmul was a large settlement near K'axob, it is still worthy of consideration in this comparative examination.

Anne Pyburn (1988) conducted an extensive survey and a test-pitting program at the site of Nohmul. She documented patterns in structural layout and examined changes in settlement from the Middle Formative through the Terminal Classic. For example, she found that the Late Preclassic structures at Nohmul were spread evenly across the site, while the Early Classic structures clustered into larger structural groups. Late Classic contexts often contained Early Classic ceramics though less frequently Early Classic floors (Pyburn 1988:216). When considering artifact distributions, Pyburn found that particularly within Late Classic period contexts, ceramic densities increased with distance from the site center. As at other sites, larger structures spread across the landscape rather than decreasing with distance from the site center. Pyburn acknowledges the work of other scholars (Adams and Smith 1981; Haviland 1981; Marcus 1983) who have argued that this pattern represents the social and political power of kinship groups.

The identification of perishable structures at Nohmul may strengthen the argument for larger corporate households beginning in the Early Classic. Pyburn also used test pits to identify floors located off of mounds ("nonplatform"). Because of the limited "window" afforded by test pit excavation, Pyburn often could not identify possible functions of the structures she located. She speculated about the use of non-mound features, which often have few to no associated artifacts and change location in relation to platforms through time. Pyburn suggests that "nonplatform structures" may have served different functions from mounded structures (Pyburn 1988:327). On the other hand, she notes the possibility that nonplatform structures without artifacts could have served as houses of lower status workers or as field houses. As these structures lack pottery, the latter two suggestions seem less likely.

It is possible that the nonmound floors Pyburn identified, if representing specialized activity areas, could support the distributed household model. The shift in settlement patterns from more spread out in the Late Preclassic to more clustered in the Early Classic, described above, could parallel the development of households distributed over larger areas proposed at K'axob. If Early Classic households depended on nonmounded structures for specialized activities, household growth could have gone undetected by scholars. Though ground surface occupations were common in the Early Classic, they were least common in the Late Classic. By the Late Classic, I suggest that specialized activity structures could have become more formalized, with a preference for mounded structures. If this statement could be supported through excavation data, Nohmul would provide evidence for household activities distributed among varied structures.

Cuello

Wilk and Wilhite (1991) conducted settlement survey at Cuello in order to analyze changes in household organization. They argue that most common people at Cuello lived in ground-level, perishable structures, often undetectable on the surface today. Consequently, we may have underestimated hierarchy, as well as population, within sites such as Cuello, where "it is quite possible that only substantial, property-owning or politically important households constructed houses on platforms, while landless classes of slaves, tenants, servants, and workers continued to live in pole-and-thatch houses built on the ground surface" (Wilk and Wilhite 1991:119). Wilk and Wilhite acknowledge Haviland's (1985) argument that perishable structures consisted of outbuildings such as kitchens. However, they argue against this idea, noting the large distances between structures in question (80 m apart in one case). Though data from Cuello "offer no conclusive answers," Wilk and Wilhite

(1991:125) argue that perishable structures were residences rather than outbuildings. As evidence, they found only one possible lithic workshop. In addition, they think few of the structures would have been kitchens, due not only to distances between buildings, but also to the presence of sherds from serving rather than cooking vessels within the remains of perishable structures. Based on their results, Wilk and Wilhite would argue against the distributed household model for Cuello, though they have no definitive evidence.

Cuello grew tremendously in size during the Formative period. By the end of the Formative period, Wilk and Wilhite detect social ranking based on platform variations. They argue that “some households lived on large plastered platforms which represented a considerable investment in labor, while most households continued to occupy perishable dwellings built directly on the ground surface” (Wilk and Wilhite 1991:129). Wilk and Wilhite propose that, by the Late Formative, powerful lineage heads regulated land holdings. In the Early Classic period, residents of Cuello built a ceremonial precinct, which suggests community-level ritual practice. Burial within dwelling floors, rather than within large complex platforms, became more common. Some structures contained more burials than others. At this time as well, Wilk and Wilhite (1991:130) believe a larger proportion of the population became settled property holders, as basal platform groups of various sizes became more common, suggesting “small-scale communal enterprises.” This strand of their argument for Cuello seems to parallel the Classic period transition I suggest for K’axob and San Estevan, and supports an argument for larger households. By the Late Classic period, there was a population decline at Cuello. Wilk and Wilhite (1991:133) argue that a larger proportion of the population at Cuello lived in perishable dwellings during the Late Classic when compared to the Early Classic. It seems as though the settlement trend at Cuello may have paralleled that at other sites in northern Belize until the Late Classic, when populations dwindled and the remaining residents of Cuello managed to live in whatever arrangements they could.

Population Estimates

Many settlement studies in northern Belize conclude with population estimates for their study sites. In particular, Pyburn (1988) and Wilk and Wilhite (1991) have suggested increased settlement densities at Nohmul and Cuello, respectively, due to the presence of non-mound residential structures. For example, Wilk and Wilhite (1991:131) emphasized the flaws in traditional population estimation methods for Cuello, "where only a fraction of the population ever lived on mounds." Instead, they proposed calculating inhabitants based on average total refuse areas from ethnoarchaeological work (Wilk 1983) in conjunction with structure counting and house redundancy estimation. According to Wilk's (1983) work, thin trash scatters around houses would have grown in density but not size through time. This updated approach vastly augmented population estimates. Their method applied to Tikal would expand Haviland's (1970) estimate of 39,000 occupants in the Late Classic to 156,000 or even 200,000 residents. Pyburn also calculated the Late Classic population at Nohmul using an estimate of nonplatform floors, in addition to all of the mounded structures. Clearly such strategies amplify population estimates and change our perspective on the nature of Maya sites and their development through time.

If corporate households used multiple structures distributed across space for daily activities, many estimates from northern Belize likely have miscalculated population densities. Though the concept of a distributed household does not discount the possibility that people slept in most mounded or even perishable structures available at the time, it does provide a greater possibility that some and perhaps many of these structures were reserved for specialized activities and housed fewer people at a time. A single structure might hold a smaller segment of each family or household rather than an extended family, lowering the number of occupants estimated in each location. Haviland (1985) addressed some of the difficulties scholars face in estimating population based on Maya settlement surveys. As he stated, population estimates often rely on three assumptions: "(1) that all small mounds at lowland Maya sites represent house ruins; (2) that small structures at a site were occupied at the same time; (3) that all small houses deteriorate to form visible mounds" (Haviland 1985:186). As apparent in this chapter, scholars have been grappling with the difficulties posed by non-platform, ephemeral residences and varying structure histories using more intensive test pitting strategies.

Like Haviland (1985), I encourage caution in assuming all small mounds to have accommodated complete households. Unfortunately, I offer no easy solution to correct population estimates based on the presence of more specialized structures located amidst other residential features. To create such an algorithm scholars will have to conduct additional research at sites in the area based on large, horizontal exposures as well as full utilization of available botanical and faunal analysis techniques. These strategies provide greater opportunities to understand activity areas, features, and space utilization by larger households in the service of economic and social aims.

Overall, excavation and survey information provides enticing possibilities for household organization strategies and their association with structures of various sizes and configurations. Some of the most important questions for future research will be: (1) Did people living in different structures function relatively independently, or did they rely on people living in proximate areas to conduct basic productive activities?; and (2) How did social groups of various sizes and configurations integrate in the practices of everyday life? In order to answer these questions, we will need to think more intensely about the types of evidence available. For example, it could be important to determine the purposes of any given hearth or midden. Within differing structures, scholars might try to determine if people burned wood or threw items away as they cooked food, venerated ancestors, hosted feasts, or conducted other activities.

As depicted in this chapter, scholars have stressed the importance of socioeconomic status in the consideration of intrasite organization and relationships among structures. According to a variety of studies, wealthy people with important community roles lived within large and complex structures, while poor individuals or families lived in single-building dwellings, sometimes on the ground surface in almost entirely perishable houses. On the other hand, many scholars argue that corporate groups shared resources and labor in Maya society. If large households functioned corporately across multiple structures, diverse members would have co-depended on the resources available to the group and would have worked within a complex network of cooperative tasks in order to succeed. The distributed household model, then, provides impetus for a new conceptualization of site complexity and intrasite relationships.

CHAPTER 8:

CONCLUSION

This thesis rejects the assumption that the presence of adjacent structures of varying size at K'axob and other small sites necessarily implies the existence of separate and competing households characterized by hierarchical relationships. Through the window of plant remains combined with other evidence from K'axob, I suggest that Late Classic interactions between multiple structures were complex and specialized. The basic economic group could have occurred at a level larger than the individual platform or even the compound residential structure. In many cases, structure isolates could have been loci for specialized economic and ritual activities. It is possible that people making up a household also lived in different structures, including isolates, but that they interacted economically and socially in a fundamental way. This arrangement would align with the definition of a household, set forth by Hammel (1980) and developed by Wilk (1997), as a social group with maximum corporate function.

Households may have utilized many more specialized structures within small sites than we have previously recognized. Cerén illustrates a case in which each household made use of multiple structures, only one of which seems to have been used for sleeping. It is possible that the lack of such fine-grained evidence elsewhere has caused us to overlook a larger pattern. Additional insights can be gained regarding intrasite interactions at small sites with the continued collection of samples for animal and plant remains and their disaggregated interpretation by context. In particular, excavations that expose horizontal swaths of adjacent structures will most likely yield information useful to the study of potential distributed households. Additional research will allow us to consider cooperation between structures through evidence such as the presence of complementary activity areas.

The ethnoarchaeological study of households has taken us a long way in understanding how people organized activities and disposed of related garbage, but it has prevented us from interrogating the relationships at work between households, in part because the strongly corporate social form in evidence during the Late Classic period does not seem to exist in the same way today. It is not surprising that social networks have shifted in the Maya area over a thousand years, especially taking into consideration the deliberate breaking up of extended families that Spaniards attempted throughout the colonial period. Moreover, the corporate group in Late Classic times seems to have been a unique formation when compared to earlier settlement patterns in the area.

Households grew at K'axob even during the Formative period, but strong corporate relationships may not have been fully formed until later Classic times when population growth, land conscription, and kin-based land claims partitioned space (McAnany 1995). In part, they likely represented a response to economic risk. People may have depended on each other for subsistence and ritual nourishment while working together across structures and statuses in work groups separated by gender. While differential access to certain goods may have occurred, cooperation also existed within social groups at small communities. Small sites, which one could call rural, certainly exhibited complexity, but perhaps not in the way we have been discussing it. Rather than hierarchy between structures, complexity could be seen in rich heterarchical networks perpetuated through Classic times.

In addition, this dataset suggests the importance of understanding K'axob within its regional political and economic context. Residents of K'axob, along with those of other sites in northern Belize, were eating less maize overall than people in other regions, such as northern Honduras (Morell-Hart 2011; Reed 1998). They may even have been eating less maize than understood previously, due to the apparent presence of amaranth, another C4 plant, in the diet. The evidence presented in this thesis provides a small window into the plants that contributed to the diverse diet of the people who resided at K'axob. Though K'axob residents probably shared many characteristics of plant use with other sites in the area, there appear to have been some differences, such as lack of access to pine. This absence correlates with other classes of evidence that indicate the localness of resources used at K'axob (e.g., Bartlett et al. 2000). In these ways, the small dataset from K'axob examined here has begun to shed light on intrasite, and even intersite and interregional dynamics.

APPENDIX

Carbonized seeds and non-wood remains contained within each sample[a]

Op	Z	Sq	FCB #	Phase	Period	Taxon	Type	Count	Comment
15	3	B	36	III	Witsk'ax, Late	*Acalypha* sp.	seed	1	
15	3	B	36	III	Witsk'ax, Late	Asteraceae	seed	1	
15	3	B	36	III	Witsk'ax, Late	Cheno-am	seed	1	Degraded
15	3	B	36	III	Witsk'ax, Late	Euphorbiaceae	seed	10+	Type 1; some unc.
15	3	B	36	III	Witsk'ax, Late	Malvaceae	seed	1	Type 3 UNK
15	3	B	36	III	Witsk'ax, Late	Solanaceae	seed	1	
15	3	B	36	III	Witsk'ax, Late	Unidentified	seed	7	
15	4	C	42	III	Witsk'ax, Late	*Phytolacca* sp.	seed	2	
15	8	AB	60	III	Witsk'ax, Late	Euphorbiaceae	seed	5	Type 1 UNK
15	8	AB	60	III	Witsk'ax, Late	*Phytolacca* sp.	seed	1	
15	8	AB	60	III	Witsk'ax, Late	Type 34 UNK	seed/fruit	1	cf. *Byrsonima* sp.
15	8	AB	60	III	Witsk'ax, Late	Type 63 UNK	seed	1	
15	9	C	62	III	Witsk'ax, Late	*Byrsonima* sp.	seed	1	Type 32 UNK
15	9	C	62	III	Witsk'ax, Late	*Cecropia peltata*	seed	1	Type 60 UNK
15	9	C	62	III	Witsk'ax, Late	Euphorbiaceae	seed	3	Type 1 UNK
15	9	C	62	III	Witsk'ax, Late	*Phytolacca* sp.	seed	1	
15	9	C	62	III	Witsk'ax, Late	Type 53 UNK	seed	1	
15	16	C	76	IIa	Witsk'ax, Early	*Leucaena leucocephala*	seed	3	Type 31 UNK
15	16	C	76	IIa	Witsk'ax, Early	Type 33 UNK	seed	8	Arecaceae or fungus
15	16	C	76	IIa	Witsk'ax, Early	Asteraceae	seed	1	Type 2 UNK
15	16	C	76	IIa	Witsk'ax, Early	*Attalea cohune*	endocarp	2	Type 51 UNK
15	16	C	76	IIa	Witsk'ax, Early	cf. *Bulbostylis* sp.	seed	4	Type 45 UNK

Op	Z	Sq	FCB #	Phase	Period	Taxon	Type	Count	Comment
15	16	C	76	IIa	Witsk'ax, Early	*Byrsonima* sp.	seed	30	Type 32; some unc.
15	16	C	76	IIa	Witsk'ax, Early	*Cecropia peltata*	seed	7	
15	16	C	76	IIa	Witsk'ax, Early	cf. *Setaria* sp.	seed	3	Some unc.
15	16	C	76	IIa	Witsk'ax, Early	*Cissus verticillata*	seed	2	
15	16	C	76	IIa	Witsk'ax, Early	Euphorbiaceae	seed	10+	Type 1; Some unc.
15	16	C	76	IIa	Witsk'ax, Early	cf. *Erythrina resupinata*	cotyledon	4	Type 37, Legume 2
15	16	C	76	IIa	Witsk'ax, Early	Fabaceae	cotyledon	6	Type 38, Legume 3
15	16	C	76	IIa	Witsk'ax, Early	Fabaceae	cotyledon	4	Type 39, *P. lunatus*
15	16	C	76	IIa	Witsk'ax, Early	Fabaceae	seed	1	Type 49, Legume 5
15	16	C	76	IIa	Witsk'ax, Early	Malvaceae	seed	4	Type 17; *Abutilon*
15	16	C	76	IIa	Witsk'ax, Early	*Passiflora* sp.	seed	4	Type 9 UNK
15	16	C	76	IIa	Witsk'ax, Early	*Phaseolus vulgaris*	cotyledon	14	Type 36 UNK
15	16	C	76	IIa	Witsk'ax, Early	*Phytolacca rivinoides*	seed	4	
15	16	C	76	IIa	Witsk'ax, Early	*Scirpus* sp.	seed	1	Type 41 UNK
15	16	C	76	IIa	Witsk'ax, Early	Solanaceae	seed	7	Type 55; *Solanum*
15	16	C	76	IIa	Witsk'ax, Early	Type 10 UNK	seed	4	cf. *Ehretia tinifolia*
15	16	C	76	IIa	Witsk'ax, Early	Type 34 UNK	seed/fruit	3	Byrsonima?
15	16	C	76	IIa	Witsk'ax, Early	Type 35 UNK	cotyledon	2	Legume-like
15	16	C	76	IIa	Witsk'ax, Early	Type 40 UNK	seed	2	cf. *Phytolacca* sp.
15	16	C	76	IIa	Witsk'ax, Early	Type 42 UNK	seed	1	
15	16	C	76	IIa	Witsk'ax, Early	Type 43 UNK	seed	1	
15	16	C	76	IIa	Witsk'ax, Early	Type 44 UNK	seed	1	
15	16	C	76	IIa	Witsk'ax, Early	Type 46 UNK	seed	1	
15	16	C	76	IIa	Witsk'ax, Early	Type 47 UNK	seed	1	
15	16	C	76	IIa	Witsk'ax, Early	Type 48 UNK	seed	1	
15	16	C	76	IIa	Witsk'ax, Early	Type 50 UNK	seed	1	
15	16	C	76	IIa	Witsk'ax, Early	Type 52 UNK	seed	1	
15	16	C	76	IIa	Witsk'ax, Early	Type 53 UNK	seed	1	Solanaceae

Op	Z	Sq	FCB #	Phase	Period	Taxon	Type	Count	Comment
15	16	C	76	IIa	Witsk'ax, Early	Unidentified	seed	1	Unidentifiable
15	16	C	76	IIa	Witsk'ax, Early	Unidentified	seed	18	Unidentifiable?
15	16	C	76	IIa	Witsk'ax, Early	*Vitis tiliifolia*	seed	9	1 unc.
15	16	C	76	IIa	Witsk'ax, Early	*Zea mays*	cupule	3	
15	16	C	76	IIa	Witsk'ax, Early	*Zea mays*	kernel	8	
15	16	C	90	IIa	Witsk'ax, Early	*Leucaena leucocephala*	seed	1	Type 31 UNK
15	16	C	90	IIa	Witsk'ax, Early	*Amaranthus* sp.	seed	1	
15	16	C	90	IIa	Witsk'ax, Early	*Byrsonima* sp.	seed	1	Type 32; some unc.
15	16	C	90	IIa	Witsk'ax, Early	Euphorbiaceae	seed	10+	Type 1 UNK
15	16	C	90	IIa	Witsk'ax, Early	Malvaceae	embryo	1	Type 17 UNK
15	16	C	90	IIa	Witsk'ax, Early	*Passiflora* sp.	seed	1	Type 9 UNK
15	16	C	90	IIa	Witsk'ax, Early	cf. *Phaseolus lunatus*	cotyledon	1	Type 54 UNK
15	16	C	90	IIa	Witsk'ax, Early	*Phytolacca rivinoides*	seed	1	
15	16	C	90	IIa	Witsk'ax, Early	Solanaceae	seed	1	Type 55; *Solanum*
15	16	C	90	IIa	Witsk'ax, Early	Type 56 UNK	seed	1	
15	16	C	90	IIa	Witsk'ax, Early	Type 57 UNK	seed	1	cf. *Carex* sp.
15	16	C	90	IIa	Witsk'ax, Early	Type 58 UNK	seed	1	Compositaceae
15	16	C	90	IIa	Witsk'ax, Early	Type 59 UNK	seed	2	
15	16	C	90	IIa	Witsk'ax, Early	Unidentified	seed	8	Unidentifiable
15	16	C	90	IIa	Witsk'ax, Early	*Zea mays*	kernel	1	
15	26	B	118	I	Witsk'ax, Early	*Phytolacca rivinoides*	seed	1	
15	35		157	IIb	Witsk'ax, Early	Asteraceae	seed	1	Type 2 UNK
15	35	X	161	IIb	Witsk'ax, Early	Asteraceae	seed	1	Type 2 UNK
15	35	X	161	IIb	Witsk'ax, Early	Poaceae	seed	1	Type 64; Short grass

Op	Z	Sq	FCB #	Phase	Period	Taxon	Type	Count	Comment
15	35		178	IIb	Witsk'ax, Early	Asteraceae	seed	1	Type 2 UNK
15	44		206	I	Witsk'ax, Early	Cheno-am	seed	1	
14	5		531	VIII	Witsk'ax, Early	*Acalypha* sp.	seed	5	All unc.
14	5		531	VIII	Witsk'ax, Early	Cheno-am	seed	3	
14	5		531	VIII	Witsk'ax, Early	Euphorbiaceae	seed	6	Type 1; some unc.
14	5		531	VIII	Witsk'ax, Early	*Phytolacca rivinoides*	seed	2	All unc.
14	5		531	VIII	Witsk'ax, Early	cf. *Setaria* sp.	seed	1	All unc.
14	5		531	VIII	Witsk'ax, Early	Solanaceae	seed	1	Type 26 UNK
14	5		531	VIII	Witsk'ax, Early	Unidentified	seed?	4	Unidentifiable
14	3		532	VIII	Witsk'ax, Early	*Cecropia peltata*	seed	2	Some unc.
14	3		532	VIII	Witsk'ax, Early	Cheno-am	seed	1	Minute; not cultivated
14	3		532	VIII	Witsk'ax, Early	Euphorbiaceae	seed	10+	Type 1 UNK; unc.?
14	3		532	VIII	Witsk'ax, Early	Fabaceae	seed	1	Type 11 UNK
14	3		532	VIII	Witsk'ax, Early	*Passiflora* sp.	seed	1	Type 9 UNK
14	3		532	VIII	Witsk'ax, Early	*Phytolacca rivinoides*	seed	6	All unc.
14	3		532	VIII	Witsk'ax, Early	Solanaceae	seed	3	cf. *Solanum*
14	3		532	VIII	Witsk'ax, Early	*Spondias* sp.	pit/drupe	1	
14	3		532	VIII	Witsk'ax, Early	Type 10 UNK	seed	2	Myrsinaceae?
14	3		532	VIII	Witsk'ax, Early	Type 30 UNK	seed	4	
14	3		532	VIII	Witsk'ax, Early	Type 8 UNK	seed	1	
14	3		532	VIII	Witsk'ax, Early	Unidentified	seed	1	Broken
14	3		532	VIII	Witsk'ax, Early	Unidentified	seed	1	Unidentifiable?
14	3		532	VIII	Witsk'ax, Early	Unidentified	seed	1	Unidentifiable?

Op	Z	Sq	FCB #	Phase	Period	Taxon	Type	Count	Comment
14	5		537	VIII	Witsk'ax, Early	Asteraceae	seed	1	Type 27 UNK
14	5		537	VIII	Witsk'ax, Early	Euphorbiaceae	seed	2	Type 1 UNK
14	5		537	VIII	Witsk'ax, Early	Malvaceae	seed	1	Type 17 UNK
14	5		537	VIII	Witsk'ax, Early	*Phytolacca rivinoides*	seed	2	
14	5		537	VIII	Witsk'ax, Early	cf. *Setaria* sp.	seed	2	All unc.
14	5		537	VIII	Witsk'ax, Early	Type 30 UNK	seed	1	
14	5		537	VIII	Witsk'ax, Early	Unidentified	seed	1	Unidentifiable
14	3		539	VIII	Witsk'ax, Early	Asteraceae	seed	2	Type 27; 1 broken
14	3		539	VIII	Witsk'ax, Early	*Cecropia peltata*	seed	1	
14	3		539	VIII	Witsk'ax, Early	Cheno-am	seed	1	Puffy, concentric ring
14	3		539	VIII	Witsk'ax, Early	Euphorbiaceae	seed	3	Type 1 UNK
14	3		539	VIII	Witsk'ax, Early	Malvaceae	seed	1	Type 17 UNK
14	3		539	VIII	Witsk'ax, Early	*Nicotiana tabacum*	seed	1	
14	3		539	VIII	Witsk'ax, Early	*Phytolacca rivinoides*	seed	1	Unc.?
14	3		539	VIII	Witsk'ax, Early	Type 28 UNK	seed	1	
14	3		539	VIII	Witsk'ax, Early	Type 29 UNK	seed	1	Fabaceae?
14	3		539	VIII	Witsk'ax, Early	Type 30 UNK	seed	3	
14	3		539	VIII	Witsk'ax, Early	Unidentified	seed	1	Unidentifiable?
14	3		539	VIII	Witsk'ax, Early	Unidentified	seed	1	Unidentifiable?
14	3		539	VIII	Witsk'ax, Early	Unidentified	seed?	1	Unidentifiable?
14	3		539	VIII	Witsk'ax, Early	Unidentified	seed	1	Unidentifiable
14	18	F	575	VIb	Witsk'ax, Early	Euphorbiaceae	seed	1	Type 1 UNK
14	18	F	575	VIb	Witsk'ax, Early	Solanaceae	seed	1	
14	18	F	575	VIb	Witsk'ax, Early	Type 61 UNK	seed	7	Some unc.
14	18	F	575	VIb	Witsk'ax, Early	Unidentified	seed	1	Type 62 UNK; Broken

Op	Z	Sq	FCB #	Phase	Period	Taxon	Type	Count	Comment
14	14		583	VII	Witsk'ax, Early	Unidentified	seed	3	Unidentifiable
14	18		598	VIb	Witsk'ax, Early	Unidentified	seed	1	Unidentifiable
14	32		614	VIa	Witsk'ax, Early	*Phytolacca rivinoides*	seed	1	
14	35c		627	V	Nohalk'ax, Late	Asteraceae	seed	3+	Type 2 UNK
14	35c		627	V	Nohalk'ax, Late	Euphorbiaceae	seed	2+	Type 1 UNK
14	35c		627	V	Nohalk'ax, Late	Malvaceae	embryo	1	Type 17 UNK
14	35c		627	V	Nohalk'ax, Late	Solanaceae	seed	1	Type 65; *Physalis*
14	35c		627	V	Nohalk'ax, Late	Type 30 UNK	seed	1	
14	35c		627	V	Nohalk'ax, Late	Type 61 UNK	seed	1	
14	35c		627	V	Nohalk'ax, Late	*Zea mays*	cupule	8	
14	35c		637	V	Nohalk'ax, Late	*Zea mays*	cupule	2+	Mostly fragments
14	47		674	II	K'atabche'k'ax, Late	*Amaranthus* sp.	seed	1	
14	47		674	II	K'atabche'k'ax, Late	Asteraceae	seed	10+	Hundreds; Type 2
14	47		674	II	K'atabche'k'ax, Late	Type 5 UNK	seed	1	Should be identifiable
14	47		674	II	K'atabche'k'ax, Late	Type 6 UNK	seed	2	Should be identifiable
14	47		674	II	K'atabche'k'ax, Late	*Zea mays*	cupule	3+	fragmentary
14	44a	B	680	I	K'atabche'k'ax, Late	*Acalypha* sp.	seed	1	Damaged
14	44a	B	680	I	K'atabche'k'ax, Late	*Amaranthus*/Cheno-am	seed	12	Seed coat, 4 popped
14	44a	B	680	I	K'atabche'k'ax, Late	cf. *Celtis* sp.	seed	1	Uncarbonized
14	44a	B	680	I	K'atabche'k'ax, Late	Cheno-am	embryo	18	
14	44a	B	680	I	K'atabche'k'ax, Late	*Hyeronima alchorneoides*	seed	1	Type 15 UNK
14	44a	B	680	I	K'atabche'k'ax, Late	Fabaceae	cotyledon	2	cf. *Phaseolus vulgaris*

Op	Z	Sq	FCB #	Phase	Period	Taxon	Type	Count	Comment
14	44a	B	680	I	K'atabche'k'ax, Late	Malvaceae	seed	1	Type 17 UNK
14	44a	B	680	I	K'atabche'k'ax, Late	Poaceae	seed	2	Type 19 UNK
14	44a	B	680	I	K'atabche'k'ax, Late	Poaceae	seed	1	Type 20 UNK
14	44a	B	680	I	K'atabche'k'ax, Late	Type 16 UNK	seed	1	Possible legume
14	44a	B	680	I	K'atabche'k'ax, Late	Type 18 UNK	seed	1	Probably identifiable
14	44a	B	680	I	K'atabche'k'ax, Late	Type 21 UNK	seed	2	
14	44a	B	680	I	K'atabche'k'ax, Late	Type 22 UNK	seed	1	Long teardrop shape
14	44a	B	680	I	K'atabche'k'ax, Late	Type 23 UNK	seed	2	cf. Lamiaceae
14	44a	B	680	I	K'atabche'k'ax, Late	Type 24 UNK	seed	1	cf. Polygalaceae
14	44a	B	680	I	K'atabche'k'ax, Late	Type 25 UNK	seed	1	cf. Poaceae
14	44a	B	680	I	K'atabche'k'ax, Late	Unidentified	seed	1	Unidentifiable? Unc.?
14	44a	B	680	I	K'atabche'k'ax, Late	Unidentified	seed	1	Unidentifiable?
14	44a	B	680	I	K'atabche'k'ax, Late	Unidentified	seed	2	Unidentifiable
14	44a	B	680	I	K'atabche'k'ax, Late	Unidentified	seed	1	cf. *Vicia* sp.
14	44a	B	680	I	K'atabche'k'ax, Late	*Zea mays*	cupule	23+	Sorted >1.4 mm
14	44a	B	680	I	K'atabche'k'ax, Late	*Zea mays*	kernel	1	
14	44a	B	680	I	K'atabche'k'ax, Late	*Zea mays*	rachis	1	
14	44a	D	681	I	K'atabche'k'ax, Late	*Acalypha* sp.	seed	1	
14	44a	D	681	I	K'atabche'k'ax, Late	*Amaranthus* sp.	seed	2	
14	44a	D	681	I	K'atabche'k'ax, Late	Asteraceae	seed	10+	Type 2 UNK; unc.
14	44a	D	681	I	K'atabche'k'ax, Late	Type 14 UNK	seed	1	Unidentifiable?
14	44a	D	681	I	K'atabche'k'ax, Late	Unidentified	seed	1	Unidentifiable?
14	44a	D	681	I	K'atabche'k'ax, Late	Unidentified	seed coat	3	Unidentifiable?
14	44a	D	681	I	K'atabche'k'ax, Late	*Zea mays*	cupule	6+	
14	44b	C	691	I	K'atabche'k'ax, Late	Asteraceae	seed	30+	Type 2 UNK; unc.
14	44b	C	691	I	K'atabche'k'ax, Late	Euphorbiaceae	seed	1	Type 1 UNK; unc.

Op	Z	Sq	FCB #	Phase	Period	Taxon	Type	Count	Comment
14	44b	C	691	I	K'atabche'k'ax, Late	Poaceae	seed	2	Type 13; *Eragrostis*
14	44b	C	691	I	K'atabche'k'ax, Late	Type 12 UNK	seed	1	with hilum, broken
14	44b	C	691	I	K'atabche'k'ax, Late	Unidentified	seed	1	Broken in lab
14	44b	C	691	I	K'atabche'k'ax, Late	Unknown	fibers?	2	1 broken
14	44b	C	691	I	K'atabche'k'ax, Late	*Zea mays*	cupule	10	
14	44b	C	691	I	K'atabche'k'ax, Late	*Zea mays*	kernel	3	
14	51		708	II	K'atabche'k'ax, Late	Unidentified	seed	1	Unidentifiable
14	57		720	II	K'atabche'k'ax, Late	Cheno-am	seed	1	
14	57		720	II	K'atabche'k'ax, Late	Fabaceae	seed	3	cf. *Phaseolus vulgaris*
14	47		736	II	K'atabche'k'ax, Late	*Zea mays*	cupule	3	
14	47		736	II	K'atabche'k'ax, Late	*Zea mays*	kernel	3	

[a] Any uncarbonized seeds were noted in the comment section (“unc.").

WORKS CITED

Adams, Richard E.W. and W.D. Smith
1981 Feudal Models for Classic Maya Civilization. In *Lowland Maya Settlement Patterns*, edited by Wendy Ashmore, pp. 335–349. University of New Mexico Press, Albuquerque.

Adams, Richard N.
1975 *Energy and Structure: A Theory of Social Power*. University of Texas Press, Austin.

Adams, Ron L. and Stacie M. King, eds.
2011 Residential Burial: A Multiregional Exploration. *Archaeological Papers of the American Anthropological Association*, Special Issue, Volume 20. Wiley Subscription Services, Hoboken, NJ.

Aizpurúa, Ilean Isel Isaza and Patricia A. McAnany
1999 Adornment and Identity: Shell Ornaments from Formative K'axob. *Ancient Mesoamerica* 10(1):117–127.

Arnold, Phillip J.
1990 *Domestic Ceramic Production and Spatial Organization: A Mexican Case Study in Ethnoarchaeology*. Cambridge University Press, Cambridge.

Ashmore, Wendy, and Richard R. Wilk
1988 Introduction. In *Household and Community in the Mesoamerican Past*, edited by Richard R. Wilk and Wendy Ashmore, pp. 1–28. University of New Mexico Press, Albuquerque.

Balick, Michael J., Michael H. Nee, and Daniel E. Atha
2001 *Checklist of the Vascular Plants of Belize: With Common Names and Uses.* Memoirs of the New York Botanical Garden Volume 58. The New York Botanical Garden Press, New York.

Bartlett, Mary Lee
2004a The Potter's Choice of Clays and Crafting Technologies. In *K'axob: Ritual, Work, and Family in an Ancient Maya Village*, edited by Patricia McAnany, pp. 143–167. The Cotsen Institute of Archaeology, Monumenta Archaeologica 22. University of California Press, Los Angeles.
2004b Ornaments of Bone and Semiprecious Stone. In *K'axob: Ritual, Work, and Family in an Ancient Maya Village*, edited by Patricia McAnany, pp. 353–364. The Cotsen Institute of Archaeology, Monumenta Archaeologica 22. University of California Press, Los Angeles.

Bartlett, Mary Lee, Hector Neff, and Patricia A. McAnany
2000 Differentiation of Clay Resources on a Limestone Plain: The Analysis of Clay Utilization during the Maya Formative at K'axob, Belize. *Geoarchaeology* 15:95–133.

Beaudry-Corbett, Marilyn, Scott E. Simmons, and David B. Tucker
2002 Ancient Home and Garden: The View from Household 1 at Cerén. In *Before the Volcano Erupted: the Ancient Cerén Village in Central America*, edited by Payson Sheets, pp. 45–57. University of Texas Press, Austin.

Beck, Robin A., ed.
2007 *The Durable House: House Society Models in Archaeology*. Center for Archaeological Investigations, Occasional Paper No. 35. Southern Illinois University, Carbondale, IL.

Becker, Marshall J.
2004 Maya Heterarchy as Inferred from Classic Period Plaza Plans. *Ancient Mesoamerica* 15(1):127–138.

Berry, Kimberly A.
1997 Operation 15: Excavations at Structure 89. In K'axob Project: Interim Report of the 1995 Field Season, edited by Patricia A. McAnany, pp. 43–63. Manuscript prepared for and filed with the Department of Archaeology, Belmopan, Belize.

Berry, Kimberly A. 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, pp. 149–162. University of New Mexico Press, Albuquerque.

Blackmore, Chelsea
2012 Recognizing Difference in Small-Scale Settings: An Examination of Social Identity Formation at the Northeast Group, Chan. In *Chan: An Ancient Maya Farming Community*, edited by Cynthia Robin, pp. 173–191. University Press of Florida, Gainesville.
2011 Ritual among the Masses: Deconstructing Identity and Class in an Ancient Maya Neighborhood. *Latin American Antiquity* 22(2):159–177.

Bobo, Victoria L.
2004 Soaked and Steamed Sustenance: Evidence from Sherd-Lined Pits. In *K'axob: Ritual, Work, and Family in an Ancient Maya Village*, edited by Patricia McAnany, pp. 87–104. The Cotsen Institute of Archaeology, Monumenta Archaeologica 22. University of California Press, Los Angeles.

Bozarth, Steven R. and Thomas H. Guderjan
2004 Biosilicate Analysis of Residue in Maya Dedicatory Cache Vessels from Blue Creek, Belize. *Journal of Archaeological Science* 31:205–215.

Brown, Linda and Andrea I. Gerstle
2002 Structure 10: Feasting and Village Festivals. In *Before the Volcano Erupted: the Ancient Cerén Village in Central America*, edited by Payson Sheets, pp. 97–103. University of Texas Press, Austin.

Brumfield, Elizabeth M. and Cynthia Robin
2008 Gender, Households, and Society: An Introduction. In *Gender, Households, and Society: Unraveling the Threads of the Past and the Present*, edited by Cynthia Robin and Elizabeth M. Brumfiel, pp. 1–16. Archaeological Papers of the American Anthropological Association, Number 18, Wiley Subscription Services, Hoboken, NJ.

Bullard, William R., Jr.
1964 *Settlement Pattern and Social Structure in the Southern Maya Lowlands during the Classic Period*. XXXV Congreso Internacional de Americanistas 1:279–287.

Carr, H. Sorayya
1996 Precolumbian Maya Exploitation and Management of Deer Populations. In *The Managed Mosaic: Ancient Maya Agriculture and Resource Use*, edited by Scott L. Fedick, pp. 251–261. University of Utah Press, Salt Lake City.

Carr, H. Sorayya and Arlene Fradkin
2008 Animal Resource Use in Ecological and Economic Context at Formative Period Cuello, Belize. *Quaternary International* 191:144–153.

Carrasco, Michael D.
2010 From Field to Hearth: An Earthly Interpretation of Maya and Other Mesoamerican Creation Myths. In *Pre-Columbian Foodways: Interdisciplinary Approaches to Food, Culture, and Markets in Ancient Mesoamerica*, edited by John E. Staller and Michael D. Carrasco, pp. 601–634. Springer Science+Business Media LLC.

Clark, John E. and Stephen D. Houston
1998 Craft Specialization, Gender, and Personhood among the Postconquest Maya of Yucatan, Mexico. In *Craft and Social Identity*, edited by C.L. Costin and Rita P. Wright. Archaeological Papers oft he American Anthropological Association, Volume 8. American Anthropological Association, Arlington, VA.

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, pp. 295–324. Research in Economic Anthropology, Volume 4. JAI Press, Greenwich, CT.

Coleman Goldstein, Robin
2008 Hearths, Grinding Stone, and Households: Rethinking Domestic Economy in the Andes. In *Gender, Households, and Society: Unraveling the Threads of the Past and the Present*, edited by Cynthia Robin and Elizabeth M. Brumfiel, pp. 37–48. Archaeological Papers of the American Anthropological Association, Number 18, Wiley Subscription Services, Hoboken, NJ.

Cook, Patricia Maria

1997 Basal Platform Mounds at Chau Hiix, Belize: Evidence for Ancient Maya Social Structure and Cottage Industry Manufacturing. Unpublished Ph.D. dissertation, Department of Anthropology, University of Arizona. University Microfilms, Ann Arbor.

Covich, Alan P.
1983 Mollusca: A Contrast in Species Diversity from Aquatic and Terrestrial Habitats. In *Pulltrouser Swamp: Ancient Maya Habitat, Agriculture and Settlement in Northern Belize*, edited by B.L. Turner II and Peter D. Harrison, pp. 120–139. University of Texas Press, Austin.

Coyston, Shannon, Christine D. White and Henry P. Schwarcz
1999 Dietary Carbonate Analysis of Bone and Enamel for Two Sites in Belize, in *Reconstructing Ancient Maya Diet*, edited by Christine D. White, pp. 199–220. University of Utah Press, Salt Lake City.

Crane, Cathy J.
1996 Archaeobotanical and Palynological Research at a Late Preclassic Maya Community, Cerros, Belize. In *Managed Mosaic: Ancient Maya Agriculture and Resource Use*, edited by Scott L. Fedick, pp. 262–277. University of Utah Press, Salt Lake City.

Creed, Gerald W. and Barbara Ching
1997 Recognizing Rusticity: Identity and the Power of Place. In *Knowing Your Place: Rural Identity and Cultural Hierarchy*, edited by Barbara Ching and Gerald W. Creed, pp. 1–38. Routledge, London.

Cuddy, Thomas
2000 Socioeconomic Integration of the Classic Maya State: Political and Domestic Economies in a Residential Neighborhood. Unpublished Ph.D. dissertation, Department of Anthropology, Columbia University. University Microfilms, Ann Arbor.

Crumley, Carole L.
2003 Alternative Forms of Social Order. In *Heterarchy, Political Economy, and the Ancient Maya*, edited by Vernon L. Scarborough, Fred Valdez Jr., and Nicholas Dunning, pp. 136–145. The University of Arizona Press, Tucson.
1987 A Dialectical Critique of Hierarchy. In *Power Relations and State Formation*, edited by Thomas C. Patterson and Christine Ward Gailey, pp. 155–168. American Anthropological Association, Washington, DC.
1979 Three Locational Models: An Epistemological Assessment for Anthropology and Archaeology. In *Advances in Archaeological Method and Theory*, edited by Michael B. Schiffer, pp. 141–173. Academic Press, New York.

Devereaux, Leslie
1987 Gender Difference and the Relations of Inequality in Zinacantan. In *Dealing with Inequality*, edited by Marilyn Strathern, pp. 89–111. Cambridge University Press, Cambridge.

Eckhardt, Cheryl
1995 Pomacea: An Analysis of the Apple Snail at Operations 14 and 15. Manuscript on file, Department of Anthropology, University of North Carolina, Chapel Hill.

Emery, Kitty F.
2003 The Noble Beast: Status and Differential Access to Animals in the Maya World. *World Archaeology* 34(3):498–515.

Fritz, Gayle J.
2007 Pigweeds for the Ancestors: Cultural Identities and Archaeobotanical Identification Methods. In *The Archaeology of Food and Identity*, edited by Katheryn C. Twiss, pp. 288–307. Center for Archaeological Investigations, Occasional Paper No. 34, Southern Illinois University, Carbondale, IL.

Gillespie, Susan D.
2011 Inside and Outside: Residential Burial at Formative Period Chalcatzingo, Mexico. In *Residential Burial: a Multiregional Perspective*, edited by Adams, Ron L. and Stacie M. King, pp. 98–120. Archaeological Papers of the American Anthropological Association, Number 20, Wiley Subscription Services, Hoboken, NJ.
2007 When is a House? In *The Durable House: House Society Models in Archaeology*, edited by Robin A. Beck, Jr., pp. 25–50. Center for Archaeological Investigations, Occasional Paper No. 35. Southern Illinois University, Carbondale, IL.
2001 Personhood, Agency, and Mortuary Ritual: A Case Study from the Ancient Maya. *Journal of Anthropological Archaeology* 20(1):73–112.

Goland, Carol
1993 Field Scattering as Agricultural Risk Management: A Case Study from Cuyo Cuyo, Department of Puno, Peru. *Mountain Research and Development* 13(4):317–338.

Goldstein, David J. and Jon B. Hageman
2010 Power Plants: Paleobotanical Evidence of Rural Feasting in Late Classic Belize. In *Food and Feasting in Mesoamerican Civilization: Interdisciplinary Approaches to the Roles of Consumables and Ritual Performance*, edited by John E. Staller and Michael Carrasco, pp. 421–440. Springer, New York.

Gonlin, Nancy
2012 Production and Consumption in the Countryside: A Case Study from the Late Classic Maya Rural Commoner Households at Copán, Honduras. In *Ancient Households of the Americas*, edited by John G. Douglass and Nancy Gonlin, pp. 79–116. University Press of Colorado, Boulder.

Goodenough, Ward
1951 *Property, Kin, and Community on Truk*. Yale University Publications in Anthropology, No. 46. Yale University Press, New Haven, CT.

Groark, Kevin

2010 The Angel in the Gourd: Ritual, Therapeutic, and Protective Uses of Tobacco (*Nicotiana tabacum*) among the Tzeltal and Tzotzil Maya of Chiapas, Mexico. *Journal of Ethnobiology* 30(1):5–30.

Guderjan, Thomas H.
2000 Sampling Botanical Remains at Blue Creek, Belize. Report submitted to the Foundation for the Advancement of Mesoamerican Studies, Inc., Crystal River, Florida.

Guderjan, Thomas H. and Samantha Krause
2011 Identifying the Extent of Ancient Maya Ditched Field Systems in the Río Hondo Valley of Belize and Mexico: A Pilot Study and Some of its Implications. *Research Reports in Belizean Archaeology* 8:127–136.

Hageman, Jon B. and Jon C. Lohse
2003 Heterarchy, Corporate Groups, and Late Classic Resource Management in Northwestern Belize. In *Heterarchy, Political Economy, and the Ancient Maya: The Three Rivers Region of the East-Central Yucatán Peninsula*, edited by Vernon L. Scarborough, Fred Valdez Jr., and Nicholas Dunning, pp. 109–121. The University of Arizona Press, Tucson.

Halperin, Christina T.
2002 *Caves, Ritual, and Power: Investigations at Actun Nak Beh, Cayo District, Belize*. Unpublished PhD Dissertation, Department of Anthropology, Florida State University. University Microfilms, Ann Arbor.

Hammel, Eugene A.
1980 Household Structure in Fourteenth-Century Macedonia. *Journal of Family History* 5:242–273.

Hammond, Norman and Charles H. Miksicek.
1981 Ecology and Economy of a Formative Maya Site at Cuello, Belize. *Journal of Field Archaeology* 8(3):259–269.

Harrigan, Ryan
2004 Mollusca of K'axob: For Supper and Soul. In *K'axob: Ritual, Work, and Family in an Ancient Maya Village*, edited by Patricia McAnany, pp. 399–412. The Cotsen Institute of Archaeology, Monumenta Archaeologica 22. University of California Press, Los Angeles.

Harris, Edward
1989 *Principles of Archaeological Stratigraphy.* Academic Press, London.

Harrison-Buck, Eleanor
2004 Nourishing the Animus of Lived Space through Ritual Caching. In *K'axob: Ritual, Work, and Family in an Ancient Maya Village*, edited by Patricia A. McAnany, pp. 65–85. The Cotsen Institute of Archaeology, Monumenta Archaeologica 22. University of California Press, Los Angeles.

Haviland, William A.
1988 Musical Hammocks at Tikal, Guatemala: Problems with Reconstructing Household Composition. In *Household and Community in the Mesoamerican Past*, edited by Richard R. Wilk and Wendy Ashmore, pp. 121-134. University of New Mexico Press, Albuquerque.
1985 *Excavations in Small Residential Groups of Tikal: Groups 4F-1 and 4F-2*. University Museum, University of Pennsylvania, Philadelphia.
1981 Dower Houses and Minor Centers at Tikal, Guatemala: An Investigation into the Identification of Valid Units in Settlement Hierarchies. In *Lowland Maya Settlement Patterns*, edited by Wendy Ashmore, pp. 89–117. University of New Mexico Press, Albuquerque.
1970 Tikal, Guatemala and Mesoamerican Urbanism. *World Archaeology* 2(2):186–198.

Hayden, Brian and Aubrey Cannon
1983 Where the Garbage Goes: Refuse Disposal in the Maya Highlands. *Journal of Anthropological Archaeology* 2:117–165.
1982 The Corporate Group as an Archaeological Unit. *Journal of Anthropological Archaeology* 1:132–158.

Heidegger, Martin
1993 Building, Dwelling, Thinking. In *Martin Heidegger: Basic Writings*, edited by David F. Krell, pp. 423-440. Routledge, London.

Henderson, H. Hope
2012 Understanding Households on Their Own Terms: Investigations on Household sizes, Production, and Longevity at K'axob, Belize. In *Ancient Households of the Americas*, edited by John G. Douglass and Nancy Gonlin, pp. 269–297. University Press of Colorado, Boulder.
2003 The Organization of Staple Crop Production at K'axob, Belize. *Latin American Antiquity* 14(4):469–496.
1998 The Organization of Staple Crop Production in Middle Formative, Late Formative, and Classic Period Farming Households at K'axob, Belize. Unpublished Ph.D. dissertation, Department of Anthropology, University of Pittsburgh. University Microfilms, Ann Arbor.

Hendon, Julia A.
2010 *Houses in a Landscape: Memory and Everyday Life in Mesoamerica.* Duke University Press, Durham, NC.
1997 Women's Work, Women's Space, and Women's Status among the Classic Period Maya Elite of the Copan Valley, Honduras. In *Women in Prehistory: North America and Mesoamerica*, edited by Cheryl Claassen and Rosemary Joyce, pp. 33–46. University of Pennsylvania Press, Philadelphia.

Hendon, Julia A., Rosemary A. Joyce, and Russell Sheptak
2009 Heterarchy as Complexity: Archaeology in Yoro, Honduras. Paper presented at the 58th Annual Meeting of the Society for American Archaeology, St. Louis, MO.

Houston, Stephen D., David Stuart, and Karl A. Taube
2006 *The Memory of Bones: Body, Being, and Experience among the Classic Maya*. University of Texas Press, Austin.

Houston, Stephen and Karl A. Taube
2000 An Archaeology of the Senses: Perception and Cultural Expression in Ancient Mesoamerica. *Cambridge Archaeological Journal* 10:261–294.

Hutson, Scott R.
2010 *Dwelling, Identity, and the Maya: Relational Archaeology at Chunchucmil*. Altamira Press, Lanham and New York.

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):123–144.

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(3):442–473.

Iannone, Gyles and Samuel V. Connell, editors
2003 *Perspectives on Ancient Maya Rural Complexity*. Cotsen Institute of Archaeology, University of California, Los Angeles.

Ingold, Tim
1995 Building, Dwelling, Living; How Animals and People Make Themselves at Home in the World. In *Shifting Contexts: Transformations in Anthropological Knowledge*, edited by Marilyn Strathern, pp. 57–80. Routledge, London.
1993 The Temporality of the Landscape. *World Archaeology* 25(2):152–174.

Johnson, William C.
1983 The Physical Setting: Northern Belize and Pulltrouser Swamp. In Pulltrouser Swamp: Ancient Maya Habitat, Agriculture, and Settlement in Northern Belize, edited by Billie Lee Turner & Peter Harrison, pp. 8–29. University of Texas Press, Austin.

Jones, John G.
1999 Analysis of Pollen from K'axob, Belize. In Where the Water Meets the Land: 1998 Excavations in Wetland Fields and along Transects at K'axob, Belize, edited by Patricia A. McAnany and Kimberly Berry, pp. 125–137. Manuscript prepared for and filed with the Department of Archaeology, Belmopan, Belize.

Joyce, Rosemary A.
1996 The Construction of Gender in Classic Maya Monuments. In *Gender and Archaeology*, edited by Rita P. Wright, pp. 167–195. University of Pennsylvania Press, Philadelphia.

1993 Women's Work: Images of Production and Reproduction in Prehispanic Southern Central America. *Current Anthropology* 34(3):255–274.
1992 Images of Gender and Labor Organization in Classic Maya Society. In *Exploring Gender through Archaeology: Selected Papers from the 1991 Boone Conference*, edited by Cheryl Claassen, pp. 63–70. Prehistory Press, Madison, WI.

Killion, Thomas
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.

LeCount, Lisa J.
2010 Ka'kaw Pots and Common Containers: Creating Histories and Collective Memories among the Classic Maya of Xunantunich, Belize. *Ancient Mesoamerica* 21(2):341–351.

LeCount, Lisa J., Angela Keller, and John Blitz
2011 Common House, Elite House, Council House: Report of the 2010 Field Season of the Actuncan Archaeological Project. *Research Reports in Belizean Archaeology* 8:19–30.

Lentz, David L.
1999 Plant Resources of the Ancient Maya: The Paleoethnobotanical Evidence. In *Reconstructing Ancient Maya Diet*, edited by Christine D. White, pp. 3–18. University of Utah Press, Salt Lake City.
1991 Maya Diets of the Rich and Poor: Paleoethnobotanical Evidence from Copán. *Latin American Antiquity* 2:269–285.

Lentz, David L. and Ruth Dickau
2005 *Seeds of the Central America and Southern Mexico: The Economic Species*. New York Botanical Garden, New York.

Lentz, David L., Jason Yaeger, Cynthia Robin, and Wendy Ashmore
2005 Pine, Prestige and Politics of the Late Classic Maya at Xunantunich, Belize. *Antiquity* 79:573–585.

Levi, Laura J.
2003 Space and the Limits to Community. In *Perspectives on Ancient Maya Rural Complexity*, edited by Gyles Iannone and Samuel V. Connell, pp. 82–93. The Cotsen Institute of Archaeology, University of California, Los Angeles.
2002 An Institutional Perspective on Prehispanic Maya Residential Variation: Settlement and Community at San Estevan, Belize. *Anthropological Archaeology* 21:120–141.
1996 Sustainable Production and Residential Variation: A Historical Perspective on Pre-Hispanic Domestic Economies in the Maya Lowlands. In *The Managed Mosaic: Ancient Maya Agriculture and Resource Use*, edited by Scott L. Fedick, pp. 92–106. University of Utah Press, Salt Lake City.
1993 Prehispanic Residence and Community at San Estevan, Belize. Unpublished Ph.D. dissertation, University of Arizona, Tucson.lei

Lévi-Strauss, Claude
1982 *The Way of the Masks*. Translated by S. Modelski. University of Washington Press, Seattle.

Lohse, Jon C.
2004 Intra-Site Settlement Signatures and Implications for Late Classic Maya Commoner Organization at Dos Hombres, Belize. In *Ancient Maya Commoners*, edited by Jon C. Lohse and Fred Valdez, Jr., pp. 117–146. University of Texas Press, Austin.

Lohse, Jon C. and Fred Valdez, Jr., eds.
2004 *Ancient Maya Commoners*. University of Texas Press, Austin.

López Varela, Sandra L.
2004 Ceramic History of K'axob:The Early Years. In *K'axob: Ritual, Work, and Family in an Ancient Maya Village*, edited by Patricia A. McAnany, pp. 169–192. The Cotsen Institute of Archaeology, Monumenta Archaeologica 22. University of California Press, Los Angeles.
1997 Pottery Classification Procedures and Documentation of Partially and Wholly Restorable Vessels. In K'axob Project: Interim Report of the 1995 Field Season, edited by Patricia A. McAnany, pp. 203–270. Manuscript prepared for and filed with the Department of Archaeology, Belmopan, Belize.
1996 The K'axob Formative Ceramics: The Search for Regional Integration through a Reappraisal of Ceramic Analysis and Classification in Northern Belize. Unpublished Ph.D. dissertation, University of London, London.

López Varela, Sandra L., Patricia A. McAnany, and Kimberly A. Berry
2001 Ceramics Technology at Late Classic K'axob, Belize. *Journal of Field Archaeology* 28(1-2):177–191.

MacVean, Ana Lucrecia de and Elfriede Pöll
2002 Ethnobotany. In *Tropical Tree Seed Manual*, edited by Jack A. Vozzo, pp. 215–219. United States Department of Agriculture, Forest Service, Washington, DC.

Magennis, Ann L.
1999 Dietary Change at the Lowland Maya Site of Kichpanha, Belize. In *Reconstructing Ancient Maya Diet*, edited by Christine D. White, pp. 133–150. University of Utah Press, Salt Lake City.

Marcus, Joyce
1983 On the Nature of the Mesoamerican City. In *Prehistoric Settlement Patterns*, edited by Richard M. Leventhal and Evon Z. Vogt, pp. 195–242. University of New Mexico Press and Peabody Museum, Harvard University, Cambridge.

Martin, Alexander C. and William D. Barkley
1961 *Seed Identification Manual*. University of California, Berkeley.

Masson, Marilyn A.

2004a 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, pp. 97–122. The Cotsen Institute of Archaeology, Monograph 51. University of California Press, Los Angeles.

2004b Contribution of Fishing and Hunting to Subsistence and Symbolic Expression. In *K'axob: Ritual, Work, and Family in an Ancient Maya Village*, edited by Patricia A. McAnany, pp. 382–397. The Cotsen Institute of Archaeology, Monumenta Archaeologica 22. University of California Press, Los Angeles.

2003 Laguna de On and Caye Coco: Postclassic Political and Economic Scales of Integration at Two Island Communities in Northern Belize. In *The Social Implications of Ancient Maya Rural Complexity*, edited by Gyles Iannone and Samuel V. Connell, pp. 119–130. Monograph 49. The Cotsen Institute of Archaeology, University of California, Los Angeles.

McAnany, Patricia A., ed.

2004 *K'axob: Ritual, Work, and Family in an Ancient Maya Village*. The Cotsen Institute of Archaeology, Monumenta Archaeologica 22. University of California Press, Los Angeles.

1997 K'axob Project: Interim Report of the 1995 Field Season. Manuscript prepared for and filed with the Department of Archaeology, Belmopan, Belize.

1995 K'axob Project: Interim Report, 1993 Field Season. Manuscript prepared for and filed with the Department of Archaeology, Belmopan, Belize.

1993 K'axob Project: Interim Report, 1992 Summer Field Season. Manuscript prepared for and filed with the Department of Archaeology, Belmopan, Belize.

McAnany, Patricia A.

2013 Introduction. *Living with the Ancestors: Kinship and Kingship in Ancient Maya Society*, 2nd edition. Cambridge University Press, New York.

2011 Practices of Place-Making, Ancestralizing, and Re-animation within Memory Communities. In *Residential Burial: a Multiregional Perspective*, edited by Adams, Ron L. and Stacie M. King, pp. 136–142. Archaeological Papers of the American Anthropological Association, Number 20, Wiley Subscription Services, Hoboken, NJ.

2010 *Ancestral Maya Economies in Archaeological Perspective*. Cambridge University Press, Cambridge.

2004a Situating K'axob within Formative Period Lowland Maya Archaeology. In *K'axob: Ritual, Work, and Family in an Ancient Maya Village*, edited by Patricia A. McAnany, pp. 1–10. The Cotsen Institute of Archaeology, Monumenta Archaeologica 22. University of California Press, Los Angeles.

2004b Landscapes of K'axob in Deep and Current Time. In *K'axob: Ritual, Work, and Family in an Ancient Maya Village*, edited by Patricia A. McAnany, pp. 11–17. The Cotsen Institute of Archaeology, Monumenta Archaeologica 22. University of California Press, Los Angeles.

2004c Domiciles and Construction Histories. In *K'axob: Ritual, Work, and Family in an Ancient Maya Village*, edited by Patricia A. McAnany, pp. 23–62. The Cotsen Institute of Archaeology, Monumenta Archaeologica 22. University of California Press, Los Angeles.

2004d Obsidian Blades and Source Areas. In *K'axob: Ritual, Work, and Family in an Ancient Maya Village*, edited by Patricia A. McAnany, pp. 307–316. The Cotsen Institute of Archaeology, Monumenta Archaeologica 22. University of California Press, Los Angeles.
2004e Denouement. In *K'axob: Ritual, Work, and Family in an Ancient Maya Village*, edited by Patricia A. McAnany, pp. 415–419. The Cotsen Institute of Archaeology, Monumenta Archaeologica 22. University of California Press, Los Angeles.
1997 K'axob, the 1995 Field Season. In K'axob Project: Interim Report of the 1995 Field Season, edited by Patricia A. McAnany, pp. 1–8. Manuscript prepared for and filed with the Department of Archaeology, Belmopan, Belize.
1995 *Living with the Ancestors: Kinship and Kingship in Ancient Maya Society*. University of Texas Press, Austin.
1992 Agricultural Tasks and Tools: Patterns of Stone Tool Discard Near Prehistoric Maya Residences Bordering Pulltrouser Swamp, Belize. In *Gardens of Prehistory: The Archaeology of Settlement Agriculture in Greater Mesoamerica*, edited by Thomas Killion, pp. 184–214. University of Alabama Press, Tuscaloosa.
1987 K'axob: A Formative and Classic Period Settlement at Pulltrouser Swamp, Belize. Manuscript on file, Department of Anthropology, University of North Carolina, Chapel Hill.

McAnany, Patricia A. and Kimberly Berry, eds.
1999 Where the Water Meets the Land: 1998 Excavations in Wetland Fields and along Transects at K'axob, Belize. Manuscript prepared for and filed with the Department of Archaeology, Belmopan, Belize.

McAnany, Patricia A. and Justin P. Ebersole
2004 Ground and Polished Stone Tools. In *K'axob: Ritual, Work, and Family in an Ancient Maya Village*, edited by Patricia A. McAnany, pp. 317–330. The Cotsen Institute of Archaeology, Monumenta Archaeologica 22. University of California Press, Los Angeles.

McAnany, Patricia A. and Sandra L. López Varela.
1999 Re-Creating the Formative Maya Village of K'axob. *Ancient Mesoamerica* 10(1):147–168.

McAnany, Patricia A. and Satoru Murata
2006 From Chocolate Pots to Maya Gold: Belizean Cacao Farmers through the Ages. In *Chocolate in Mesoamerica: A Cultural History of Cacao*, edited by Cameron L. McNeil, pp. 429–50. University Press of Florida, Gainesville.

McAnany, Patricia A. and Polly A. Peterson
2004 Tools of the Trade: Acquisition, Use, and Recycling of Chipped Stone. In *K'axob: Ritual, Work, and Family in an Ancient Maya Village*, edited by Patricia A. McAnany, pp. 279–306. The Cotsen Institute of Archaeology, Monumenta Archaeologica 22. University of California Press, Los Angeles.

McKillop, Heather

1996 Prehistoric Maya Use of Native Palms: Archaeobotanical and Ethnobotanical Evidence. In *The Managed Mosaic: Ancient Maya Agriculture and Resource Use*, edited by Scott L. Fedick, pp. 278–294. University of Utah Press, Salt Lake City.

Metcalfe, Jessica Z., Christine D. White, Fred J. Longstaffe, Gabriel Wrobel, Della Collins Cook, and K. Anne Pyburn

2009 Isotopic Evidence for Diet at Chau Hiix, Belize: Testing Regional Models of Hierarchy and Heterarchy. *Latin American Antiquity* 20(1):15–36.

Meyer, Anthony J.

2013 "Housed Within": A Museum Display Critique and Investigation of a Classic Maya Household at K'axob. Unpublished Honors Thesis, Department of Anthropology, University of North Carolina, Chapel Hill.

Miksicek, Charles H.

1991 The Natural and Cultural Landscape of Preclassic Cuello. In *Cuello: An Early Maya Community in Belize*, edited by Norman Hammond, pp. 70–84. Cambridge University Press, Cambridge.

1990. Early Wetland Agriculture in the Maya Lowlands: Clues from Preserved Plant Remains. In *Ancient Maya Wetland Agriculture: Excavations on Albion Island, Northern Belize*, edited by Mary Pohl, pp. 295–312. Westview Press, Boulder.

1986. Paleobotanical Identifications. In *The Archaeology of Santa Leticia and the Rise of Maya Civilization*, edited by Arthur A. Demarest, pp. 199–200. Tulane University Press, New Orleans.

1983 Macrofloral Remains in the Pulltrouser Area: Settlements and Fields. In *Pulltrouser Swamp: Ancient Maya Habitat, Agriculture and Settlement in Northern Belize*, edited by B.L. Turner II and Peter D. Harrison, pp. 94–104. University of Texas Press, Austin.

1981 Paleoecology and Subsistence at Pulltrouser Swamp: The View from the Float Tank. Manuscript on file, Department of Archaeology, Boston University, Boston.

Miller, Naomi

1988 Ratios in Paleoethnobotanical Analysis. In *Current Paleoethnobotany: Analytical Methods and Cultural Interpretations of Archaeological Plant Remains*, edited by Christine A. Hastorf and Virginia S. Popper, pp. 72–96. University of Chicago Press, Chicago.

Minnis, Paul E.

1981 Seeds in Archaeological Sites: Sources and Some Interpretive Problems. *American Antiquity* 46(1):143–152.

Monaghan, John

1998 The Person, Destiny, and the Construction of Difference in Mesoamerica. *Res: Anthropology and Aesthetics* 33:137–146.

Morehart, Christopher T.

2011 *Food, Fire, and Fragrance: A Paleoethnobotanical Perspective on Classic Maya Cave Rituals*. Archaeopress, Oxford, England.

2005 Plants and Caves in Ancient Maya Society. In *Stone Houses and Earth Lords: Maya Religion in the Cave Context*, edited by Keith M. Prufer and Jim E. Brady, pp. 167–186. University Press of Colorado, Boulder.

Morehart, Christopher T. and Noah Butler
2010 Ritual Exchange and the Fourth Obligation: Ancient Maya Food Offering and the Flexible Materiality of Ritual. *Journal of the Royal Anthropological Institute* 16:588–608.

Morehart, Christopher T. and Christophe G. B. Helmke
2008 Situating Power and Locating Knowledge: A Paleoethnobotanical Perspective on Late Classic Maya Gender and Social Relations. *Archeological Papers of the American Anthropological Association* 18:60–75.

Morehart, Christopher T., David L. Lentz, and Keith M. Prufer
2005 Wood of the Gods: The Ritual Use of Pine (*Pinus* spp.) by the Ancient Lowland Maya. *Latin American Antiquity* 16(3):255–274.

Morehart, Christopher T. and Shanti Morell-Hart
2013 Beyond the Ecofact: Toward a Social Paleoethnobotany in Mesoamerica. *Journal of Archaeological Method and Theory* (September 2013):1–29.

Morell-Hart, Shanti
2011 Paradigms and Syntagms of Ethnobotanical Practice in Pre-Hispanic Northwestern Honduras. Unpublished Ph.D. dissertation, Department of Anthropology, University of California, Berkeley.

Nations, James D
1979 Snail Shells and Maize Preparation: A Lacandon Maya Analogy. *American Antiquity* 44(3):568–571.

Patel, Shankari U.
2012 Journey to the East: Pilgrimage, Politics, and Gender in Postclassic Mexico. Unpublished Ph.D. dissertation, University of California, Riverside, Department of Anthropology. University Microfilms, Ann Arbor.

Plotkin, Mark J.
1988 *The Outlook for New Agricultural and Industrial Products from the Tropics*. Volume 106. National Academy Press, Washington, DC.

Pohl, Mary D. and Paul Bloom
1996 Prehistoric Maya Farming in the Wetlands of Northern Belize: More Data from Albion Island and Beyond. In *The Managed Mosaic: Ancient Maya Agriculture and Resource Use*, edited by Scott L. Fedick, pp. 145–164. University of Utah Press, Salt Lake City.

Pohl, Mary D., Paul Bloom, and Kevin O. Pope

1990 Interpretation of Wetland Farming in Northern Belize: Excavations at San Antonio Rio Hondo. In *Ancient Maya Wetland Agriculture: Excavations on Albion Island, Northern Belize*, edited by M.S. Pohl, pp. 187–278. Westview Press, Boulder.

Pohl, Mary D., Kevin O. Pope, John G. Jones, John S. Jacob, Dolores R. Piperno, Susan D. deFrance, David L. Lentz, John A. Gifford, Marie E. Danforth, and J. Kathryn Josserand
1996 Early Agriculture in the Maya Lowlands. *Latin American Antiquity* 7:355–372.

Pope, Kevin O., Mary D. Pohl, and John S. Jacob
1996 Formation of Ancient Maya Wetland Fields: Natural and Anthropogenic Processes. In *The Managed Mosaic: Ancient Maya Agriculture and Resource Use*, edited by Scott L. Fedick, pp. 165–176. University of Utah Press, Salt Lake City.

Pyburn, K. Anne
1998 Smallholders in the Maya Lowlands: Homage to a Garden Variety Ethnographer. *Human Ecology* 26(2):267–286.
1989 Maya Cuisine: Hearths and the Lowland Economy. In *Prehistoric Maya Economies of Belize*. Research in Economic Anthropology Supplement 4, pp. 325–344. JAI Press, Greenwich, CT.
1988 The Settlement of Nohmul: Development of a Prehispanic Maya Community in Northern Belize. Unpublished Ph.D. dissertation, University of Arizona, Department of Anthropology, University Microfilms, Ann Arbor.

Redfield, Robert and Alfonso Villa Rojas
1967 *Chan Kom: A Maya Village*. University of Chicago Press, Chicago and London.

Reed, David M.
1998 Ancient Maya Diet at Copán, Honduras. PhD dissertation, Department of Anthropology, Pennsylvania State University. University Microfilms, Ann Arbor.
1994 Ancient Maya Diet at Copán, Honduras, as Determined through the Analysis of Stable Carbon and Nitrogen Isotopes. In *Paleonutrition: The Diet and Health of Prehistoric Americans*, edited by K.D. Sobolik, pp. 210–221. Center for Archaeological Investigations, Occasional Paper No. 22. Southern Illinois University, Carbondale.

Robertson, Merle Greene
1983 *The Sculptures of Palenque, Volume 1: The Temple of the Inscriptions*. Princeton University Press, Princeton.

Robicsek, Francis
1978 *The Smoking Gods: Tobacco in Maya Art, History, and Religion*. University of Oklahoma Press, Norman, OK.

Robin, Cynthia, ed.
2012 *Chan: An Ancient Maya Farming Community*. University Press of Florida, Gainesville.

Robin, Cynthia

2006 Gender, Farming, and Long-Term Change: Maya Historical and Archaeological Perspectives. *Current Anthropology* 47(3):409–433.
2002 Outside of Houses: The Practices of Everyday Life at Chan Nòohol. *Journal of Social Archaeology* 2(2):245–268.
1999 Towards an Archaeology of Everyday Life: Maya Farmers of Chan Nòohol and Dos Chombitos Cik'in, Belize. Unpublished Ph.D. dissertation, University of Pennsylvania, Department of Anthropology. University Microfilms, Ann Arbor.

Robin, Cynthia and Nan A. Rothschild
2002 Archaeological Ethnographies: Social Dynamics of Outdoor Space. *Journal of Social Archaeology* 2(2):159–172.

Robin, Cynthia, Andrew R. Wyatt, Laura J. Kosakowsky, Santiago Juarez, Ethan Kalosky, and Elise Enterkin
2012 A Changing Cultural Landscape: Settlement Survey and GIS at Chan. In *Chan: An Ancient Maya Farming Community*, edited by Cynthia Robin, pp. 19–41. University Press of Florida, Gainesville.

Rue, David J., AnnCorinne Freter, and Diane A. Ballinger
1989 The Caverns of Copán Revisited: Preclassic Sites in the Sesesmil River Valley, Copán, Honduras. *Journal of Field Archaeology* 16(4):395–404.

Saul, Julie M. and Frank P. Saul
1997 The Preclassic Skeletons from Cuello. In *Bones of the Maya*, edited by Scott L. Whittington and David M. Reed, pp. 28–50. Smithsonian Institution Press, Washington, DC.

Scarborough, Vernon L., Fred Valdez, Jr., and Nicholas Dunning, eds.
2003 *Heterarchy, Political Economy, and the Ancient Maya: The Three Rivers Region of the East-Central Yucatán Peninsula*. The University of Arizona Press, Tucson.

Schulz, John
1997 Operation 14: Excavations at Structure 54. In K'axob Project: Interim Report of the 1995 Field Season, edited by Patricia A. McAnany, pp. 17–42. Manuscript prepared for and filed with the Department of Archaeology, Belmopan, Belize.

Scott Cummings, Linda and Ann Magennis
1997 A Phytolith and Starch Record of Food and Grit in Mayan Human Tooth Tartar. In *Primer Encuentro Europeo sobre el Estudio de Fitolitos*, edited by A. Pinilla, J. Juan-Tresserras, and M. J. Machado, pp. 211–218. Gráficas Fersán, Madrid.

Seinfeld, Daniel M.
2011 Agricultural Consumption Patterns and Formative Period Sociopolitical Developments at the Maya Site of San Estevan, Belize. Unpublished Ph.D. dissertation, Florida State University, Department of Anthropology. University Microfilms, Ann Arbor.

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, pp. 83–100. University of Utah Press, Salt Lake City.

Sheehan, Samuel L.
2002 Faunal Analysis of the K'axob Site: Using Diet to Interpret the Maya Lowland Environment. Unpublished Honors Thesis, Department of Anthropology, State University of New York at Albany.

Sheets, Payson
2002 Introduction. In *Before the Volcano Erupted: the Ancient Cerén Village in Central America*, edited by Payson Sheets, pp. 1–8. University of Texas Press, Austin.
2000 Provisioning the Ceren Household: The Vertical Economy, Village Economy, and Household Economy in the Southeastern Maya Periphery. *Ancient Mesoamerica* 11:217–230.

Somerville, Andrew D., Mikael Fauvelle, and Andrew W. Froehle
2012 Applying New Approaches to Modeling Diet and Status: Isotopic Evidence for Commoner Resiliency and Elite Variability in the Classic Maya Lowlands. *Journal of Archaeological Science*, Available online 9 November 2012. (http://www.sciencedirect.com/science/article/pii/S0305440312004803?v=s5)

Storey, Rebecca
2004 Ancestors: Bioarchaeology of the Human Remains of K'axob. In *K'axob: Ritual, Work, and Family in an Ancient Maya Village*, edited by Patricia A. McAnany, pp. 109–138. The Cotsen Institute of Archaeology, Monumenta Archaeologica 22. University of California Press, Los Angeles.

Taube, Karl A.
2010 Where Earth and Sky Meet: The Sea and Sky in Ancient and Contemporary Maya Cosmology. In *Fiery Pool: The Maya and the Mythic Sea*, edited by Daniel Finamore and Stephen D. Houston, pp. 202–219. Yale University Press, New Haven, CT.
1996 The Olmec Maize God: The Face of Corn in Formative Mesoamerica. *RES: Anthropology and Aesthetics* 29/30:39–81.
1989 The Maize Tamale in Classic Maya Diet, Epigraphy, and Art. *American Antiquity* 54(1):31–51.

Terranova, Pia, Patricia A. McAnany, and Sandra L. López Varela
1996 *K'axob: Formative and Classic Period Vessels Stored in Belmopan, Belize (from 1992-1995 Field Seasons*. Manscript on file, University of North Carolina, Chapel Hill.

Thomas, Julian
2008 Archaeology, Landscape, and Dwelling. In *Handbook of Landscape Archaeology*, edited by Bruno David and Julian Thomas, pp. 300–306. Left Coast Press, Walnut Creek, CA.

Thompson, J. Eric S.
1970. *Maya History and Religion*. University of Oklahoma Press, Norman.

Thurston, Elizabeth B.
2011 Crocodiles and the Ancient Maya: An Examination of the Iconographic and Zooarchaeological Evidence. Unpublished Master's Thesis, Trent University, Peterborough, Ontario, Canada. University Microfilms, Ann Arbor.

Tourtellot, Gair III
1988 Developmental Cycles of Households and Houses at Seibal. In *Household and Community in the Mesoamerican Past*, edited by Richard R. Wilk and Wendy Ashmore, pp. 97-120. University of New Mexico Press, Albuquerque.

Tozzer, Alfred M.
1941 *Landa's Relación de las Cosas de Yucatan.* Papers of the Peabody Museum of American Archaeology and Ethnology, Volume 18. Harvard University, Cambridge.

Vogt, Evon Z.
1976 *Tortillas for the Gods: A Symbolic Analysis of Zinacantan Rituals*. Harvard University Press, Cambridge.
1969 *Zinacantan: A Maya Community in the Highlands of Chiapas*. The Belknap Press of Harvard University, Cambridge.

Warinner, Christina, Nelly Robles Garcia, and Noreen Tuross
2012 Maize, Beans and the Floral Isotopic Diversity of Highland Oaxaca, Mexico. *Journal of Archaeological Science* 40:868–873.

White, Christine D.
2005 Gendered Food Behavior among the Maya: Time, Place, Status and Ritual. *Journal of Social Archaeology* 5(3):356–382.

White, Christine D., Paul F. Healy, and Henry P. Schwarcz.
1993 Intensive Agriculture, Social Status, and Maya Diet at Pacbitun, Belize. *Journal of Anthropological Research* 49(4): 347–375.

White, Christine D., David M. Pendergast, Fred J. Longstaffe, and Kimberley R. Law
2001 Social Complexity and Food Systems at Altun Ha, Belize: The Isotopic Evidence. *Latin American Antiquity* 12(4):371–393.

White, C.D., M.D. Pohl, H.P. Schwarcz and F.J. Longstaffe
2001 Isotopic Evidence for Maya Patterns of Deer and Dog Use at Preclassic Colha. *Journal of Archaeological Science* 28:89–107.

Wilk, Richard R.

1997 *Household Ecology, Economic Change and Domestic Life among the Kekchi Maya in Belize*. Northern Illinois University Press, DeKalb, IL.
1988 Maya Household Organization: Evidence and Analogies. In *Household and Community in the Mesoamerican Past*, edited by Richard R. Wilk and Wendy Ashmore, pp. 135–151. University of New Mexico Press, Albuquerque.
1983 Little House in the Jungle: The Causes of Variation in House Size among Modern Kekchi Maya. *Journal of Anthropological Archaeology* 2:99–116.
1981 Households in Process: Agriculture and Domestic Organization among the Kekchi Maya. Paper presented at Wenner-Gren Foundation symposium, Households: Changing Form and Function.

Wilk, Richard R. and William L. Rathje
1982 Archaeology of the Household: Building a Prehistory of Domestic Life. *American Behavioral Scientist* 25(6):611–724.

Wilk, Richard R. and Harold L. Wilhite, Jr.
1991 The Community of Cuello: Patterns of Household and Settlement Change. In *Cuello: An Early Maya Community in Belize*, edited by Norman Hammond. Cambridge University Press, Cambridge.

Zagorevski, Dmitri V. and Jennifer A. Loughmiller-Newman
2012 The Detection of Nicotine in a Late Mayan Period Flask by Gas Chromatography and Liquid Chromatography Mass Spectrometry Methods. *Rapid Communications in Mass Spectrometry* 26(4):403–411.