UNIVERSITY OF CALIFORNIA, SAN DIEGO

Companion Burials in the Kingdom of the Avocado: Indirect Evidence of Human Sacrifice in Late and Terminal Classic Maya Society

A Thesis submitted in partial satisfaction of the
Requirements for the degree Master of Arts

in

Anthropology

by

Megan R. Pitcavage

Committee in Charge:

Professor Geoffrey E. Braswell, Chair
Professor Paul S. Goldstein
Professor Guillermo Algaze

2008

The Thesis of Megan R. Pitcavage is approved and it is acceptable in quality and form for publication on microfilm:

Chair

University of California, San Diego

2008

TABLE OF CONTENTS

ABSTRACT OF THE THESIS

Companion Burials in the Kingdom of the Avocado:
Indirect Evidence of Human Sacrifice in Late and Terminal Classic Maya Society

by

Megan R. Pitcavage

Master of Arts in Anthropology

University of California, San Diego, 2008

Professor Geoffrey E. Braswell, Chair

In this paper I demonstrate the validity of indirect methods of identifying human sacrificial victims within companion burial contexts in the absence of anthropogenic cut marks on bone. My argument is supported by the preliminary investigation of the funerary assemblage from the site of Pusilhá, Toledo District Belize, which includes two companion burials involving an elite principal individual accompanied by the partial remains of one or more companion individuals. Using comparative caries frequency as an indicator of the relative quality of diet, and additionally as a proxy for hierarchical access to food resources, in combination with supplemental evidence from general health markers and biocultural practices, I demonstrate a bimodal distribution between principal and companion individuals. This cumulative data reveals that lifestyle differences are

reflected in the companion burials at Pusilhá supporting the hypothesis that the ritual offerings of companion remains represent sacrificial victims ceremonially offered to the principal individuals rather than their revered ancestors.

INTRODUCTION

One of the most salient debates in Maya bioarchaeology and mortuary archaeology involves the identification of the relationship expressed in single-deposition, multiple-individual interments, hereafter called "companion burials." Two possible relationships are posited for such mortuary contexts: (1) companion sacrifice, and (2) funerary rituals associated with ancestor veneration. Evidence based on ethnographic and ethnohistoric texts, interpretations of hieroglyphic inscriptions, and archaeological analyses of material culture confirm the existence of both patterns of funerary treatments in the Maya area (Boone 1984; Chase 1992; Chase and Chase 1996; McAnany 1995; Tozzer 1941; Weiss-Krejci 2003). Additionally, these relationships have been proposed to explain similar mortuary treatments as practiced by the Sumerians (Pollack 1991) and the Natufians (Kuijt 1996) in Mesopotamia, the Nazca (Browne et al 1993; Conlee 2007; DeLeonardis 2000) and the Moche (Verano 1997) of South America, and the Shang Dynasty in China (Shelah 1996). Common to each of these cases is the link between differential mortuary practices and social complexity. The widespread practice of companion funerary rituals indicates broader implications about the role of mortuary activities in the enactment of social differentiation and the performance of rulership.

Distinguishing mortuary practices associated with ancestor veneration from those associated with sacrifice directly from ancient Maya human remains has proven problematic. It is difficult to identify anthropogenic marks on bones indicating violent death because, in part, of the poor preservation of human remains in the Maya region. In the absence of evidence for perimortem trauma, researchers have relied mainly on

indirect demographic and contextual evidence to identify sacrificial victims in the archaeological record. For this reason, sacrifices have been inferred from indications such as irregular body positioning, disarticulation of the skeleton, arrangement of multiple interments around one central individual, the accompaniment of singular skeletal elements or otherwise incomplete remains with a complete skeleton, skewed age and sex profiles within multiple burials, and the scarcity or complete lack of associated grave furnishings (Cucina and Tiesler 2006; Schele 1984; Welsh 1988). A recent trend emphasizing the importance of ancestors in the study of funerary practices has challenged previous determinations of sacrificial behavior and reinterpreted them as instances of ancestor veneration (McAnany 1995:62-63; Weiss-Krejci 2001:778-779, 2003:376).

Ancestor veneration is a key component of Maya religious and political ideology. In particular, the practice of ancestor worship by the elite classes is supported by an abundance of evidence in the material culture, hieroglyphic inscriptions, and iconography found at Classic Maya centers. As explained by Schele and Miller (1986:14), "records of parents and ancestors transferring power to their children consume a large part of Maya pictorial imagery and writing." The practice of ancestor worship in Maya society served two purposes: (1) the legitimation of resource rights; and (2) the creation and maintenance of asymmetrical relationships between elites and subelites allowing for the institutionalization of social differentiation (McAnany 1995:8-9). Although commoners also practiced ancestor worship, "the rituals surrounding the treatment of the dead are not extended equally to all members of society; rather, they are employed preferentially when particularly important and influential members of a lineage die" (McAnany 1995:11). Special funerary treatments were afforded to these individuals, which involved the taking

of certain elements of the skeleton—particularly the long bones and the crania—as tokens of the ancestral line and symbols of inherited power. These were often kept on display or interred as ritual caches in important or sacred places on the landscape. The remains of the ancestral dead, therefore, were subject to extended funerary rituals, which very often did not end with the placement of the complete skeleton at the ultimate gravesite (McAnany 1995:60).

Incomplete human remains have also been interpreted as representing sacrificed individuals. Welsh (1988:171), for example, considers "multiple interments consisting of an apparently complete skeleton accompanied by an incomplete skeleton" as evidence for human sacrifice. Indeed, ritual human sacrifice was employed throughout the Maya area and was utilized by elite personages to legitimate their political authority, to maintain the subservience of their subjects, and to communicate their prestige and domination to neighboring polities as a type of external propaganda. Thus, at the death of an important elite figure it is conceivable that sacrifices would be interred with the deceased as attendant figures to help them during their journey through the underworld.

This paper tackles this ongoing debate and addresses concerns regarding the validity of indirect methods of identifying the nature of companion burial contexts in the absence of anthropogenic cut marks on bone. I suggest that the relationship between principal individuals and their funerary companions is accessible through bioarchaeological studies that emphasize the life histories of the individuals in combination with the aforementioned traditional forms of archaeological inquiry. Using comparative caries frequency as an indicator of the relative quality of diet, and as a proxy for hierarchical access to food resources, I demonstrate a bimodal distribution between

principal and companion individuals. This allows for a greater understanding of the relationship between the two groups. My argument is supported by the investigation of the funerary assemblage at the Late and Terminal Classic center of Pusilhá, Toledo District, Belize that includes three multiple burials, two of which involve an elite principal individual who is accompanied by the partial remains of one or more companion individuals. The incomplete nature and lack of body arrangement of the companions in combination with evidence that they were interred with the principal individual in one depositional event suggests that they are ritual offerings rather than carefully buried individuals within a funerary context.

Among the individuals comprising the mortuary assemblage there is no indication of perimortem trauma consistent with decapitation or heart sacrifice. Nor are there signs of postmortem treatments often associated with sacrifice, such as defleshing or the preparation of trophy heads for display as masks or costume regalia. In the absence of direct indicators of violent death, indirect methods of bioarchaeological evaluation are employed in order to answer the following question: Among the assemblage of human remains from the ancient Maya center of Pusilhá, what is the nature of the relationship between the principal individuals and their funerary companions in the multiple burials? Four hypotheses are tested here: (1) the companions are the revered ancestors of the principal individuals; (2) the companions are sacrificial offerings to the principal individuals; (3) the population of companion individuals may be comprised of both ritual sacrificial offerings and revered ancestors; and (4) the companions represent neither revered ancestors nor sacrifices.

Biological markers in the skeleton provide descriptive information about the types of foods ancient peoples consumed and the kinds of diseases to which they were exposed, as well as clues to broader cultural patterns. The study of human remains in archaeological research has moved beyond simple, descriptive demography to playing a focal role in interpretive analyses. A significant contribution to the ongoing development of an interpretive bioarchaeology is Saul's (1972, 1976) "osteobiographic" approach. Following this framework, the life histories of ancient individuals can be "read" in their skeletons and the information derived from these life stories can be used to make projections about the lifeways of the entire population (Saul and Saul 1989).

In order to evaluate the hypotheses outlined above it is necessary to consider the identity of the companion individuals. Early colonial records indicate that most victims of sacrificial rituals were members of peripheral subgroups of society or were foreigners (Chase 1992:121; Cucina and Tiesler 2006:103; Schele 1984; Tozzer 1941:54, 123). Sacrificial victims included slaves, orphans, delinquents, and captives taken in war. In contrast, as members of the same kin or lineage group as the principal individuals, revered ancestors would have shared the identity and lifestyle of their descendants. Taking this assumption into account, I test the hypotheses through an osteological and paleopathological investigation to determine differences in the lifestyles of principal and companion individuals.

Evidence related to diet and dental health, as well as supplemental evidence from general health markers and biocultural practices, inform my analysis. Conclusions about these relationships are made based on three hypothetical patterns. First, differential lifestyles of principal and companion individuals are indicated by a clearly divergent

pattern in caries rates, the presence of cultural modifications, the presence of general bone pathology and indications of trauma, and the amounts of dental calculus representative of each of the two populations. These results would suggest that the companion individuals are sacrificial offerings to the principal individuals. Second, similarities in the above mentioned indicators would imply that no lifestyle differences existed between the principal and companion individuals and, consequently, that the latter represent the revered ancestors of the former. Although it is possible that this scenario could also suggest that the companion individuals are sacrificed elite peers, it would be more likely that elite sacrifices would come from neighboring, rival polities rather than from within the local elite community. In this case, subtle lifestyle differences would be manifest indicating geographic and cultural differences between neighboring polities. Finally, the lack of a clear pattern in status markers as they appear in the skeleton would indicate that either both relationships are present in the multiple-burial mortuary population or that neither interpretation is a suitable explanation.

BIOARCHAEOLOGY IN THE MAYA AREA

Bioarchaeological studies provide information on many basic issues of concern to Maya archeologists. For instance, they have been utilized in order to investigate the circumstances surrounding the Maya collapse. Hypotheses concerning the role of subsistence failure in the collapse have been tested through isotopic methods (White 1997; Whittington and Reed 1997; Wright 1997; 2006), odontological studies focusing on ancient Maya diet (Danforth 1997; Whittington 1999), and the analysis of osteological indicators of nutritional deprivation (Danforth 1999; Saul 1972: 72-73; Storey 1999; Whittington and Reed 1997). Moreover, research has been conducted with the goal of understanding the relationships and interactions between ancient Maya polities. Such investigations include chemical analyses using strontium and oxygen stable isotopes employed in the examination of migration patterns (Hodell et al. 2004; Price et al. 2007; Wright 2005) and biodistance studies based on the analysis of DNA (Merriwhether et al. 1997) and genetic variations in dental morphology and odontometrics (Jacobi 1997; Scherer 2007).

Finally, and most relevant to the current study, investigations have been made into the recognition of social differentiation through status indicators encoded in skeletal human remains. This issue has been approached through macroscopic analyses of bones and teeth as well as through chemical methods. Isotopic and dental studies of Maya paleodiet (Gerry 1997; Reed 1999; White et al. 1993; 2001; Whittington 1999) have determined that differences between the diets of the elite and commoner classes exist based on unequal access to resources–high-status individuals typically had greater access

to more nourishing foods or socially valued foods, such as maize. Patterns of differential general health status between low- and high-ranking groups have been identified based on odontological studies (Cucina and Tiesler 2003; White 1994) and paleopathological surveys (Whittington and Reed 1997). Evidence supporting differential rates in the presence of general health indicators suggest that the recognition of social classes based on general health markers is possible. These include rates of developmental arrest resulting from episodes of malnutrition or acute infectious disease, height based on stature reconstructions (Haviland 1967), and skeletal lesions indicating general disease, as well as more specific conditions such as iron-deficiency anemia. Other factors closely associated with the notion of social status are gender (White et al. 2005) and ethnicity. The latter may be identified through distinct biocultural practices (Tiesler Blos 2001, 2004; Williams and White 2006).

Colonial documents provide many descriptions of ancient Maya biocultural practices (see Tiesler Blos 2001:13). Although many of the forms of intentional physical manipulation of the body practiced by the ancient Maya involve the soft tissues, two—dental and cranial modification—are preserved in the archaeological record because of their manifestation in the skeleton. There is no consistent pattern of association between social status and the mere presence or absence of the practice of dental and cranial modification among the Maya (Havill et al. 1997:90; Romero 1970; Tiesler Blos 2002:195; Williams and White 2006:146), although Tiesler (2001:84) suggests that some particular forms may correlate with the upper classes. On the whole, studies have suggested that the cultural meaning of the custom is linked to a more complex notion of

identity that includes ethnicity, kinship, political affiliation, gender and social status (Tiesler Blos 2001; Williams and White 2006:148).

An Osteobiographic Approach: Demography, Health Status, and Biocultural Practices

This bioarchaeological study was conducted within the framework of Saul's (1972:8; 1976; Saul and Saul 1989) osteobiographic approach and Buikstra's (2004) more recent incarnation of it, the life-history approach. Influenced by Angel's (1946) notion of "social biology" and his own experience in forensic anthropology, Saul's perspective follows the assumption that culture interacts with human biology resulting in subtle variations in the functional morphology and chemistry of individual human skeletons (Saul 1976; Saul and Saul 1989). A record of an individual's life history—including the types of foods he consumed, the routine physical movements involved in his particular economic specialization, and the types of diseases to which he was exposed—is preserved in the physical body through observable, non-congenital skeletal and dental pathologies and biocultural markers. Bioarchaeologists are able to reconstruct ancient cultural behavior by synthesizing the information from a collection of individual life histories. Thus, the individual life histories recorded in the skeletal remains of those interred in the ruins of ancient Maya cities can be used to form wider interpretations about Maya social organization, religious traditions, subsistence practices, and political strategies.

In order to evaluate the proposed hypotheses outlined at the onset of this paper, I have focused on the identification of relative lifestyle differences between principal and companion individuals within the multiple burials of Pusilhá based on the average

expressed by the entire population. I argue that these differences are due to individual membership in distinct subgroups of the population. The lifestyles of particular subgroups are affected by varied social factors. Social status is an significant component in examining differences based on group affiliation, but it is important to note that individual lifestyle differences are also sensitive to such factors as sex, ethnic affiliation, kinship structure, and participation in particular craft specializations.

Social status is expressed in the archaeological record mainly through differential utilization of and access to resources. Food, as a resource consumed by people across all social strata, gives researchers the unique opportunity to evaluate particular lifestyles through the specific relationship of each stratum with particular types of foods. One of the main ways this relationship can be studied is the analysis of human teeth. White explains:

> dental pathology (patterns of disease in teeth) is one of the most sensitive of the indirect indicators of diet. Teeth are our primary food processing units, and anything we consume must pass over them before being used by the rest of the body. Dental pathology is, therefore, a function of diet, and provides good indirect evidence of food consumption (White 1994:281).

Caries, for example, are indicative of a diet rich in carbohydrates, especially sugars like those found in maize (Larsen 1997:65).

Osteological studies also can identify differences in nutrition by detecting diseases associated with specific nutritional deficiencies, dental pathologies associated with certain categories of foods, and markers of growth retardation and interruption. Diet is closely linked to disease because malnutrition and disease are often synergistic and one can leave an individual more susceptible to the other (Danforth 1999:2-3; Larsen 2000:43). The compound effect of these two factors is skeletal indications of growth

disruption. Moreover, the presence of lesions on bone indicates nutritional deficiency and infectious disease. Nevertheless, there are limitations to paleopathological analyses of skeletal material because it is often difficult to diagnose the exact cause of pathologies due to the limited response of bone to stress (Danforth 1999:3; Stuart-Macadam 1989:201). Despite this challenge, there are certain nutrition deficiency diseases that do leave diagnostic markers on bone. For the purpose of this study, high social status is assumed for individuals whose remains exhibit a nutritious diet marked by dietary diversity. A scarcity of paleopathological indicators on the skeleton also is viewed as indicating high status. Although there are instances in which, due to the social value placed on certain foods, an elite diet contains items that can cause dental and skeletal pathologies, the Pusilhá elite mortuary population does not follow this pattern.

PUSILHÁ

During the Late and Terminal Classic periods (A.D. 600-850), Pusilhá developed into the capital of the regional polity of *Un* (Avocado) in the valley that runs between the Pusilhá and the Poité rivers in the Toledo District of southern Belize (Braswell et al 2005:63; Braswell and Gibbs 2006:257; Figure 1). Located in the village of San Benito Poité, the site is situated approximately one kilometer east of the border with Guatemala. The ancient settlement is clustered both around the riverbanks and, taking advantage of the natural topography, on elevated ridges above the annually flooding, low-lying valley floors. Geographically, the site is centered on the Stela Plaza, though the most prominent area of Pusilhá is its dynastic palace and administrative complex, known as the Gateway Hill Acropolis, which is situated at the southeastern extension of the site (Figure 2). Constructed atop a natural hill rising 79 meters above the bank of the Pusilhá River, this palace complex, comprised of a series of terraces, platforms and pyramid structures, is accessed from the site center by means of a unique Maya bridge (Figure 2).

Thus far, settlement survey has mapped approximately 1.7 km^2 of the site, although the community most likely extends beyond this area to approximately 6 km^2 (Braswell et al. 2005:72). Within this surveyed area more than 500 residential structures and platforms have been mapped. Recent investigations into the demography of the site based on settlement density reveal an estimated population density of 1,100 persons/km^2 with a projected population total of 6,600 inhabitants (Volta 2007:39). Thus, Pusilhá was the largest and most populous city of the southern Belize region during the Late and Terminal Classic periods.

Pusilhá has been subject to archaeological investigation since the late 1920s when the site was rediscovered and explored by the British Museum Expedition to British Honduras (Gruning 1930, 1931; Joyce 1929; Joyce et al. 1927, 1928; Thompson 1928). During research conducted from 1927 through 1930, the project was responsible for limited survey and excavation at the main groups of the site as well as the transportation of many inscribed stelae to the British Museum in London. The resulting analyses of the hieroglyphic inscriptions by Morley (1938) and the examination of the ceramics and other recovered material culture (Joyce et al. 1928) indicate that the occupation of Pusilhá dates to the very end of the Early Classic and the Late Classic periods (Braswell 2002; Joyce et al. 1928).

Despite early interest in this major center, Pusilhá saw only brief and sporadic investigations in the following 70 years. In 1970, Hammond (1975) excavated two caves at the site, including Pottery Cave, as a brief extension of the Lubaantun project. From his study of the ceramic assemblages of both Pusilhá and Lubaantun, he concluded that Pusilhá functioned as the regional capital until the late eighth century, at which time it was abandoned and succeeded by Lubaantun (Hammond 1975:104, 133).

In 1979 and 1980 Pusilhá was included in Leventhal's (1990, 1992) Southern Belize Archaeological Project. The two primary aims of this investigation were site survey and limited excavations of the Stela Plaza, two ballcourts within the site, the Machaca Plaza, and other smaller groups. The most important product of this research was the creation of a pace-and-compass map, the first usable settlement map of the site, which includes the main architectural groups as well as many of the smaller residential groups (Leventhal 1990:131; Figure 8.1). Like all pace-and-compass maps, it is not

perfectly accurate, nonetheless, it does provide insight into the spatial relationships within and between architectural groups.

Gary Rex Walters was the next to explore Pusilhá in a series of brief reconnaissance expeditions undertaken from 1989 to 1991, during which several large outlying groups were discovered (Braswell 2002). But it was not until 2001 that extensive research was once again initiated at the site under the Pusilhá Archaeological Project (PUSAP) led by Geoffrey E. Braswell. This research was stimulated by the perceived political and economic connections between Pusilhá and different regions in the southeastern periphery of Mesoamerica, specifically with Copán and Quiriguá (Braswell et al. 2004). Following this interpretation, Pusilhá's strategic location along the main trade route between the central Maya lowlands and the southeastern periphery allowed it to ultimately become incorporated into the political sphere of Copán.

Research conducted from 2001 to 2007 was undertaken with the goal of testing competing models of ancient Maya political development through uncovering the nature of the unique political history of Pusilhá and its sociopolitical and economic interactions with important polities in the southeastern extension of the Maya area. The results of the PUSAP investigations indicate that despite the initial suggestion that the development of the site was directed under the political influence of Copán, Pusilhá may have always been an autonomous polity that shared only limited cultural and economic ties with the southeastern periphery (Braswell et al. 2005). Instead, Pusilhá was involved in a dynamic network that at times linked it to the southeastern periphery, the Rio Pasión and Petexbatun regions, and western Belize (Braswell et al. 2004:333). Furthermore,

evidence suggests that within this network, Pusilhá was most strongly connected with the southern Petén region rather than the southeastern periphery (Braswell et al. 2005).

Among the structures mapped at Pusilhá, some are grouped into *plazuela* (or patio) groups that are placed in more formal arrangement of structures situated around a central court, following Ashmore's (1981:48-49) basic classification of residential arrangements into informal patio groups. Volta (2007:36-37) has determined that there are 20 recognizable formal *plazuela* groups. According to Willey et al. (1965:572), the residents of *plazuela* groups enjoyed higher social status than those living in informal groups. Based on this hypothesis, the arrangement of Pusilhá settlement indicates spatially patterned status differentiation with high-status individuals occupying those areas in and around Stela Plaza and Gateway Hill.

Excavation of a total of eight structures was conducted by the Pusilhá Archaeological Project in the 2002, 2004, and 2006 field seasons. These excavations include salvage operations in the "Bulldozed Mound" and smaller structures along Stela Plaza (not located in Figure 2); four structures on the Gateway Hill Acropolis (Structures 3, 4, 8, and 9; Figure 2); and three structures (Structures 5, 6, and 7; Figure 2) within Lower Group I, an elite residential complex southwest of Gateway Hill Acropolis. I assume, following Willey et al. (1965), that individuals buried in formal graves within the *plazuela* groups and on Gateway Hill are buried in elite contexts.

METHODS

Bone preservation can vary tremendously because of its sensitivity to its depositional environment. In the Maya lowlands human skeletal preservation is generally poor to fair because of environmental factors such as soil conditions, water leaching, insect and faunal activity, and the disturbance of burial contexts by tree roots and modern human activities. Accordingly, the condition of the assemblage of human remains from Pusilhá is highly fragmentary and eroded. Moreover, there is no instance in which an individual is represented by a complete skeleton. The small sample size of the Pusilhá burial assemblage precludes a detailed demographic reconstruction for the site as a whole. Nonetheless, age and sex assessments were determined for the many of the individuals and all elements were examined for pathologies as well as intentional and unintentional biocultural modifications.

Given the poor state of preservation of the remains, sexing and aging of the individuals proved somewhat problematic. Some age and sex determinations simply could not be made due to the lack of assessable elements. Furthermore, as characteristically male traits are only discernible in mature crania, sex appraisals were limited to the adult remains. The pelvic remains of the entire population were virtually absent, thus when adult skulls were present, tentative sex assignments were based solely on standard dimorphic cranial attributes (Bass 2005:81-82; White 2000:636-365), with the exception of one individual (Burial 3/1A) whose the cranial indicators were too ambiguous to assign a sex determination with certainty.

Poor bone preservation also hampered age determinations, so adult age-at-death estimates are based on dental attrition (Buikstra and Ubelaker 1994:Figures 25 and 26) and, when possible, the degree of cranial suture fusion (Buikstra and Ubelaker 1994:32-33). The presence of degenerative changes in the skeleton is also taken into account. Since these methods are generally less reliable than the analysis of diachronic changes in the pubic symphyses or auricular surfaces of the pelvis, the precision in adult age determination is relatively poor as compared to that achieved for the subadults in the assemblage. Age-at-death is most accurate for the subadult group due to the standard pattern of human dental eruption (assessments based on White 2000:343 Figure 17.1).

Because exact estimates of adult age-at-death imply greater precision than is possible given the state of preservation of the remains, I classified adult remains into three broad age groups: young adult (20-34 years), adult (35-49 years), and old adult (50+ years). Assignments to the young adult age category were based on the eruption of the third molar (when present) and the absence or expression of only a mild degree of dental attrition. An adult age range was determined according to the complete eruption of the permanent dentition and the lack of extreme wear and antemortem tooth loss with alveolar resorption. Finally, the old adult age range was assigned to those individuals who had experienced either of these dental conditions, possibly in combination with secondary indicators such as marked cranial suture closure or arthritic deterioration of the vertebrae.

In addition to osteological determination of age and sex, the human remains were subject to a paleopathological study and scored according to Buikstra and Ubelaker's (1994) standard methods. The actual cause of death is rarely evident in skeletal remains.

This is true for Pusilhá, where I have not been able to identify perimortem trauma in the existing mortuary assemblage. Additionally, skeletal pathologies indicate only that an individual survived an instance of ill health or suffered from a chronic condition sometime during his or her lifetime. The identifiable health problems noted in the Pusilhá sample include dental maladies (such as enamel hypoplasia, the accumulation of calculus, caries, antemortem tooth loss, and alveolar resorption) and skeletal pathologies (including porotic hyperostosis, periostitis, and arthritis). Finally, biocultural practices were noted for each individual. Instances of dental incrustations and filing in the Pusilhá mortuary assemblage were identified and categorized according to Romero's (1970:Figure 1) classification system while types of cranial modification were distinguished according to Imbelloni's typology as outlined in Romero (1970).

THE PUSILHÁ MORTUARY POPULATION: CONTEXT AND ANALYSIS

The Pusilhá mortuary population is a small and nonrandom sample comprised of 17 funerary contexts containing the remains of 22 individuals. Approximate age-at-death was assessable for twenty individuals. The range of ages-at-death extended from small children of four to five years of age to old adults of approximately 50 years of age or older. It was possible to assign sex determinations to ten individuals: three females and seven males. Twelve individuals were classified as sex indeterminate.

In general, many of the Pusilhá burials show evidence of high status due to the greater amount of labor investment necessary in the construction of entombments, the locations of the burials within the *plazuela* group structures representing the administrative palace complex of the site, the presence of wealthy grave goods, as well as epigraphic evidence supporting the inclusion of a specific ruler of the site, Ruler G, in the mortuary population. The following is a detailed description of the physical and contextual character of each set of human remains emphasizing age-at-death, sex, cultural modifications, and skeletal pathologies.

Burial 1/25/1

This deposit of human remains, dating to the Terminal Classic period, was discovered on the slope between the Acropolis and Lower Group I in a secondary deposit that likely washed down from the western extension of Gateway Hill (Figure 2; Braswell et al. 2004:51-53). An examination of the pattern of dental development confirms that the individual was a subadult of approximately seven to nine years of age at the time of

death. Sex of the child is indeterminate as is typical of subadult skeletal remains. Indications of ill health over the lifetime of the child are manifest only in the teeth. Linear enamel hypoplasias (LEH) are evident in the permanent dentition, suggesting that the individual suffered at least one episode of systemic stress either caused by a brief event of ill health or possibly by weaning.

Burial 2/1

Salvage excavations of the Bulldozed Mound uncovered a secondary interment, Burial 2/1, in the undisturbed fill of the western extension of the mound (Braswell et al. 2002:54). No burial goods were found in association with these remains. From the fragmentary cranial bones, it appears that the entire assemblage represents a male who survived until late adulthood. Upon reconstruction, some flattening of the occipital bone and slight lateral bulging of the parietals is observable, but poor preservation and the fragmentary nature of the cranial bones precludes a clear assessment of the presence of intentional cranial modification. In terms of skeletal health, the only pathologies observed are porotic lesions on the parietal bosses and occipital squama adjacent to the cranial sutures.

Burial 2/3/1 and Burial 2/4/1

Two Late Classic to Terminal Classic period single burials were discovered during salvage operations targeting looter's pits in the structures along the sacbe southeast of Stela Plaza (Braswell et al. 2002:54-55). As a result, information about possible grave furnishings associated with these burials is unavailable. Furthermore, the

taphonomic conditions of Burial 2/3/1 could not be determined, although the disarticulated nature of Burial 2/4/1 suggests secondary deposition. No cranial remains were recovered from either interment and, consequently, neither the sex of these individuals nor any indications of possible cultural modification can be determined. Additionally, the poor condition of the post-cranial skeletal remains prevents bone pathologies from being identified. Although Burial 2/3/1 lacks dentition, rendering an age determination impossible, Burial 2/4/1 does contain dental remains allowing for the age assessment of this individual as a young adult.

The only pathology noted for either burial is evident on the dentition recovered in Burial 2/4/1. Two carious lesions and three instances of linear enamel hypoplasia are observable. Additionally, the teeth exhibit slight to moderate amounts of calculus, with the heaviest concentration on the labial surfaces of the single-root teeth.

Burial 3/1, Burial 3/1A, and Burial 3/1B

Three burials were discovered atop the platform fill of Structure 3, a north-south oriented structure demarcating the eastern edge of the southeastern corner of the Gateway Hill acropolis (Figure 2). Specifically, they are located behind a cut stone feature running axially along the center of the top of the platform mound (Braswell et al. 2004:6-14). This architectural element allows for an area specifically devoted to ritual interments. The three burials are aligned along the north-south axis of the structure with Burial 3/1A toward the northern extension, Burial 3/1B to the south, and Burial 3/1 in the center. Polychrome vessels accompanied each burial as grave furnishing. Burial 3/1 contained a flaring-walled bowl or plate and Burials 3/1A and 3/1B each contained a set of two

paired funerary vessels including the same sort of flaring walled vessel as Burial 3/1. All three burials date to the eighth century.

Burial 3/1 is a triple interment consisting of the articulated remains of a principal individual as well as partial, secondary dental remains of two companion individuals. These were interred with the principal individual in one depositional event. Following the orientation of the structure, the principal individual was buried in a north-south orientation, with the head to the north, in extended, supine position. Two capstones covered the cranium allowing it to be classified as a head cyst burial (Welsh 1988:17).

Osteological analysis reveals that this individual is a male within the young adult age range. Signs of dental pathology include five large carious lesions on the mandibular molars as well as mild to moderate amounts of calculus, which is principally concentrated on the upper and lower incisors. Additionally, the upper left central incisor exhibits filing of the mesial corner of the occlusal surface consistent with type B4 (Romero 1970). Instances of skeletal pathology include abnormal bone formation on the anterior aspect of the proximal third of the left femur and evidence of healing periosteal bone formation in relation to an instance of trauma suffered on the proximal right femur.

The companion individuals are represented by two distinct sets of dentition, excluding the possibility that they correspond to one individual. These individuals are also determined to be within the age range of young adults, although sex determinations could not be made due to the lack of assessable skeletal elements. The first set of dental remains, representing Companion #1, was found within a flaring-walled redware vessel located near the pelvis of the primary individual. Three molars exhibit small caries and

calculus is very mild except on the lower central incisors, which bare heavy deposits on their lingual surfaces.

Companion #2 is represented as a set of loose dentition placed near the head of the principal individual. Dental inlays of pyrite as well as large drilled holes with missing inlays are observable on the upper left central and lateral incisors, upper left and right canines, and the lower right lateral incisors. This type of dental modification is consistent with type E1 (Romero 1970). Two carious lesions are also observable in the dentition, although one most likely formed as a result of enamel weakening from the dental modification. Calculus is present in very small amounts on both buccal and lingual surfaces of the dentition.

Directly to the north of this triple interment is Burial 3/1A consisting of the remains of a single young adult of indeterminate sex. This individual was placed in flexed position in a simple cist grave (Welsh 1988:16-17) with a large capstone covering the distal portion of the body. Prior to interment the individual was positioned on his or her left side facing east and oriented in a north-south direction with the head to the north. The associated grave goods include a set of paired funerary vessels, a plate and a drinking vessel. Noted dental pathologies include six teeth with carious lesions and moderate amounts of calculus with the highest concentration on the mandibular single root teeth. Accompanying these dental pathologies is marked lipping of the buccal side mandibular alveolar bone indicating periodontal disease affecting the right side molars, premolars, and canine. Additionally, there is evidence of a small abscess forming around the rightside maxillary second and third molars. Skeletal pathologies include marked porosity of the outer tables of the parietal and occipital bones both adjacent to the sutures

and in the squamous portions as well as on the interior surface of the frontal bone. Additionally, periostitic lesions are evident on the anterior aspect of the right tibia along with an ossified gluteal line (connective tissue) of the right femur. Finally, there is marked compression of both the frontal and occipital bones, creating parietal bulging, indicating the intentional manipulation of the cranium consistent with the tabular erect form (Romero 1970:65-67).

The southernmost interment in this triad, Burial 3/1B, contains the remains of a female who survived into late adulthood. Interred in a simple crypt (Welsh 1979:17-18), this individual was oriented along a north-south axis in extended position with the head to the north in a manner similar to the other two burials atop Structure 3. As with Burial 3/1A, a pair of polychrome funerary vessels was discovered in association with the human remains. These are a large cylinder vase and a flaring-walled plate that covered the head of the individual. Additionally, a single jade bead was located in proximity to the burial. The assessment of dental health reveals seven teeth with carious lesions as well as the presence of mild to moderate deposits of calculus on the maxillary dentition and more severe amounts of calculus concentrated on the mandibular single-root dentition. Antemortem tooth loss of the left molars and second premolar is also apparent in the mandible along with evidence of an abscess associated with these teeth. The practice of intentional dental modification is apparent from the presence of a single filed tooth, the lower left lateral incisor, which exhibits Romero's type B3 modification (1970). Lastly, skeletal pathology is evident by the presence of porotic lesions on the squama of the occipital bone.

Burial 3/2

An additional interment, Burial 3/2, was discovered in association with Structure 3 (Figure 2). Located near the central axis of the structure at the base of the stairs and intruding into the level of the plaza floor was a simple crypt formed by limestone uprights and capstones (Braswell et al. 2004:12). Within the crypt are the remains of two male individuals who died in late adulthood. The principal individual was arranged in an extended, supine position and oriented north-south with his head to the north. The companion individual was placed in a flexed position at the feet of the principal individual. A deliberate funerary offering was found in association with the human remains and contained the following items that indicate that the burial dates to the Terminal Classic period: (1) a large Belize Red plate and a carved pyriform shaped cup placed at the head of the principal individual; and (2) a fine redware plate with molded, ball-shaped supports and a filleted basal flange, found near the feet of the principal individual.

The principal individual exhibits no skeletal pathologies, although the dentition contains five teeth with caries and mild to moderate deposits of calculus. Although the occiput and posterior portion of the parietals were the only cranial elements present, it is apparent that this individual displays the annular oblique form of cranial modification. The presence of this form is a unique occurrence in this mortuary population. Other evidence of biocultural practices includes dental modification consistent with type E1 (Romero 1970) displayed on the maxillary lateral incisors and canines. The left side incisor and canine still retain the jade inlay while the right side teeth exhibit only the

drilled hole prepared for the incrustation. Additionally, the left side canine exhibits filing on the distal corner. Filing was not observed on the right side canine, probably because extreme attrition rendered this type of modification unobservable.

Unlike the principal individual, the companion exhibits much skeletal pathology, which is concentrated on his distal appendages. Specifically, woven bone is apparent on the right and left femurs, the left tibia, and the left fibula. These indicate a periosteal reaction possibly related to trauma or a localized infection. Only six teeth were recovered from this individual, none of which suffer from caries. Deposits of calculus are mild to moderate. The only pathology observable is a linear enamel hypoplasia on the upper left central incisor indicating an episode of systemic stress during childhood. No cultural modifications are noted for this individual.

Burial 4/1

Structure 4 is a north facing, east-west oriented structure that defines the southern edge of the plaza group near the southern end of the Gateway Hill Acropolis. Burial 4/1 (Figure 2), which probably dates to the Terminal Classic period, was found atop the plaza floor in front of this structure. A stone slab was placed over the head of the individual (Braswell et al. 2004:16). The only grave good recovered was a very poorly preserved vessel. As typical of surface funerary placements, the skeletal remains were fragmentary and poorly preserved. The discovery of scattered arm bones a few meters away from the cranium supports taphonomic disturbance in the form of animal activity. Despite the poor preservation of the remains, enough cranial and dental elements are present to determine that the individual is a female within the middle adult age-range. Seven out of

the 29 teeth present exhibit carious lesions, four of which suffer from multiple lesions. Additionally, calculus deposits are moderate to severe. No evidence of dental modification is present, but the cranium is shaped according to the tabular oblique form (Romero 1970:65-67).

Burial 5/1 and Burial 5/2

Excavations in Structure 5 on the eastern end of Lower Group I, a large group southwest of the Acropolis, yielded the remains of two individuals interred in separate burials dating to the Late Classic period (Figure 2). Burial 5/1 was placed in a break in a north-south oriented platform wall near the western edge and on the principal axis of the structure (Braswell et al. 2004:39). The only associated grave good is a small shell necklace. The recovered remains are very fragmentary and represent a young child, which may account for the poor preservation of the skeletal remains. Analysis of the dental development reveals that the child died between four and five years of age. Furthermore, the dentition reveals the cultural modification of the deciduous right and left upper lateral incisors. The distal corners of the teeth were filed and each was outfitted with jade inlays, though the left side inlay has since fallen out. This form of modification follows Romero's (1970) type G10. To date, this occurrence of dental inlays in deciduous dentition is unique in the Maya area, although instances of filing have been recorded for subadults at Jaina (Mayer 1983) and Comalcalco (Tiesler Blos 2001:35). According to Lopez Olivares (1997:114), it is not possible to employ dental modification techniques on very young individuals because of the extent of the pulp cavity. Additionally, deciduous tooth enamel is extremely thin and does not easily

withstand the drilling process. For these reasons, it is probable that the teeth were modified postmortem.

The second Structure 5 burial was discovered eroding out of the collapsing platform fill just south of the northwest corner of the structure (Braswell et al. 2004:41-42). Designated Burial 5/2, this disturbed collection of bones was found without any associated grave furnishings. The assemblage of bones represents a juvenile between the ages of ten to 11.5 years based on the analysis of dental development. The only pathology of note is the presence of periosteal woven bone on the medial aspect of the proximal third of the right tibia indicating a possible infection or healing fracture. The cranium was fragmentary and only a small number of teeth were recovered precluding a clear assessment of the presence of possible cultural modifications.

Burial 6/1 and Burial 6/2

Two very fragmentary and poorly preserved Late Classic burials were found in Structure 6, located at the southern end of Lower Group I (Figure 2). The remains of an individual of indeterminate sex, designated Burial 6/1, were found interred in an elaborate crypt centered in the middle of the structure that contained many grave offerings. They include hematite sequins, four vessels, one jade bead, two shell ornaments, one *Spondylus* shell, a slate paddle, a limestone baton, and several pyrite mirror stones (Braswell et al. 2004:46-49). The analysis of the attrition patterns on the recovered teeth support an age designation of young adult. Additionally, the dentition exhibits cultural modifications including filing and inlays. The upper central incisors are filed on the distal corners (type B4; Romero 1970) and the upper lateral incisors and

canines are drilled for the insertion of jade inlays. Only one preserved inlay was observed located in the upper left canine. No carious lesions afflict the dentition, although calculus is present in mild amounts on the maxillary teeth and mandibular dentition exhibit extreme amounts concentrated on the labial and lingual portions of the lower incisors. No skeletal pathologies or evidence of cranial modification are observable.

An additional simple cist burial, Burial 6/2, was discovered in the platform fill two meters south of Burial 6/1 (Braswell et al. 2004:49). In contrast to the rich grave furnishings accompanying the individual interred in Burial 6/1, the middle-aged adult of indeterminate sex encountered in Burial 6/2 had no burial goods. Additionally, no skeletal pathology is noted for this individual nor are any marked dental pathologies except very mild amounts of calculus. This individual exhibits no cultural modifications.

Burial 8/1 and Burial 8/2

Burials 8/1 and 8/2 are two of the four Terminal Classic sets of human remains associated with Structure 8 of the Gateway Hill Acropolis, the highest structure at the site (Figure 2). These individuals were discovered on the surface near the southernmost extension of the platform. Burial 8/1 was found resting atop the lowest terrace and Burial 8/2 was discovered in a Terminal Classic room on the plaza level south of this terrace (Braswell et al. 2006:4). No grave goods were recovered associated with Burial 8/2. Although a pyrite mirror stone was found with Burial 8/1, it is unclear if the artifact was originally placed with this individual.

Burial 8/1 consists solely of the cranium and elements of the upper portion of the skeleton. This individual, a male in middle adulthood, contains evidence of dental pathology and biocultural practices, but no indication of skeletal pathology. Five teeth with carious lesions were identified and calculus concentrations range from mild to moderate with only the lower lateral incisors exhibiting severe amounts. Filing is evident on the mesial corners of both of the upper central incisors following type B2 (Romero 1970). Furthermore, the cranium is shaped according to the tabular erect form.

Burial 8/2 consists of the partial, postcranial remains of either a gracile adult or an adolescent, but the scant elements preserved in the archaeological record preclude a clear assessment of age or sex. It is clear, however, because of the presence of duplicate elements that these remains do not belong to the individual interred in Burial 8/1 nor are they consistent with the remains found in Burial 4/1 placed a few meters away on the plaza floor. No dental remains were recovered for this individual nor are any skeletal pathologies observable.

Burial 8/3

Burial 8/3 was discovered cut into the plaza floor along the western side of the structure in front of the staircase (Figure 2). The Terminal Classic remains of three individuals were discovered entombed in this simple crypt burial sealed with three capstones (Braswell et al. 2006:11-12). In contrast to Burials 3/1 and 3/2, which appear to have included multiple individuals interred in one depositional event, it is apparent that this multiple burial involved multiple depositional events. Individual #1 was placed in an extended, supine position oriented north-south with the cranium to the north and a

capstone covering his head. Individual #2 was discovered in flexed position on her right side north of the cranium of Individual #1. And, the remains of Individual #3 were scattered throughout the crypt. Individual #3 died as a small child of at least five years of age. Associated grave goods include an orange-slipped, cream paste, incised vessel dating to the Terminal Classic period and one fragmentary jade bead. The burial is interpreted as one containing a nuclear family.

Analysis of the skeletal remains of Individual #1 reveals that the individual was a male who survived until middle adulthood. The dentition present suffered no carious lesions and calculus deposits are mild to moderate. Furthermore, no dental modification is apparent in the available elements. Skeletal pathology includes evidence of porotic hyperostosis on the squamous portion of the occipital bone as well as a bony torus on the posterior aspect of the left mandible adjacent to the molars. The practice of biocultural modification is not evident in this individual.

Individual #2 is a female whose age of death is estimated to be within the late adult age range due to the high degree of dental attrition, suture closure, and the presence of degenerative disease in the skeleton. Dental disease includes eight teeth with large carious lesions and very mild concentrations of calculus. Additionally, the mandible indicates that all four lower incisors were lost antemortem. This individual exhibits evidence of premortem dental modification with the filing of the distal corner of the upper left central incisor (type B5; Romero 1970) as well as the tabular oblique form of cranial modification (Romero 1970:65-67).

Skeletal pathology is apparent affecting the cranial and postcranial remains. Porotic lesions are evident on both the occipital and right parietal bones. A thick deposit

of woven bone on the medial surface of the proximal diaphysis of the left tibia suggests a healed break. Finally, degenerative bone disease is manifest in two of the cervical vertebrae. One exhibits slight lipping noticeable on the anterior aspect of the centra while the other shows evidence of collapse and severe osteophyte formation.

I conjecture that Burial 8/3 contains the remains of a nuclear family. The scattered remains of the child, Individual #3, suggest he was interred first and later disturbed as the crypt was expanded to accommodate the remains of the other two individuals. Individual #1, perhaps the father of Individual #3, was interred next. Finally, Individual #2, who died later in life, was interred last. I speculate that this may have been the wife of Individual #1 and the mother of Individual #3.

Burial 8/4

An elaborate tomb, designated Burial 8/4 (Figure 2), was discovered at the summit of Structure 8 oriented north-south along the center axis of the building (Braswell et al. 2006:9-11). This tomb contained the fragmentary remains of a single individual and rich grave furnishings including: four eccentrics of chert and obsidian, thirteen fine serving vessels, a crude basin holding jadeite offerings, 197 jadeite and other greenstone artifacts (including three jadeite diadems forming a *saj hunal* headdress), 761 obsidian tools and debitage, one large drilled pearl, four pyrite mirror stones, two complete *Spondylus* shells and seventeen other shells and fragments, and four carved *Spondylus* mosaic pieces. Together, the location of the tomb, the elaborate nature of the grave furnishings, the presence of the *saj hunal* headdress, and the age of the ceramics support

the identification of this tomb as the royal burial place of Ruler G, who died between A.D. 731 and A.D. 751 (Braswell et al 2006:18).

Analysis of the skeletal remains is also consistent with this interpretation. The individual is identified as a male who lived into late adulthood, which coincides with the lifespan projected for Ruler G based on the epigraphic evidence. Carious lesions are visible on four teeth and the entire dentition exhibits mild amounts of calculus. All four upper incisors are filed on both the front and back of the teeth creating a sharp ridge running mesiodistally along the midline of the tooth. This form is consistent with type A4 (Romero 1970). Nevertheless, no cranial modification is evident. Arthritic lipping on two cervical vertebrae is observable by the presence of osteophytes around the circumference of both the superior and inferior aspects of the centra.

DISCUSSION

The hypotheses outlined at the onset of this paper are evaluated through the analysis of the osteological and paleopathological markers on the principal and companion individuals in Burials 3/1 and 3/2 as compared to those of the entire skeletal assemblage of Pusilhá. Although the mortuary population of Pusilhá includes three multiple burials, Burial 8/3 is omitted from the companion burial subgroup due to its contextual and depositional uniqueness. Family burials are another Maya mortuary pattern, but they do not involve ancestor worship or sacrifice, thus Burial 8/3 has been excluded from consideration as a companion burial. Despite the exclusion of this burial from the companion burial subgroup, the adult remains of Burial 8/3 are included in the average health status of the Pusilhá mortuary assemblage.

Dental Health of the Pusilhá Mortuary Population

Certain patterns of general health and diet of the principal and companion individuals in the multiple burials at Pusilhá are apparent when compared to the average health status of the entire mortuary population. First, dental pathologies within the mortuary assemblage indicate dietary differences between the companion burial subgroups. The average caries rate for the principal individuals is approximately twice that of the companion individuals. Additionally, it is higher than both the total caries rate for the entire population as well as that calculated for the male subpopulation. Moreover, the principal individuals exhibit a slightly lower average calculus score than the companion individuals, although it is higher than the average for the entire adult

population (Table 1). These patterns suggest an overall difference in the consumption of cariogenic foods, such as maize, between principal and companion individuals. Overall, the diet of the principal individuals consisted of a greater proportion of cariogenic foods than the diet of the companion individuals. Chi-square analysis of caries rates between the principal individual and companion population subgroups confirms this correlation (Table 2). This analysis also confirms that there are marked sex-based differences in dental health suggesting that males consumed greater amounts of cariogenic foods, but virtually no temporally-based difference exists (Table 2 and Table 3).

Similar results are reported for isotopic studies conducted at Pacbitun (White el al. 1993). This study concluded that the high ranked individuals had greater access to maize than the low ranked individuals. Consistent with the Pacbitun results, it can be concluded that the principal individuals interred in the multiple burials at Pusilhá enjoyed higher status than their companions. For this population, high status is marked by the consumption of greater amounts of maize, an ideologically valued foodstuff in Maya society. The elevated consumption of maize among the high status individuals at Pusilhá may be due to feasting activities limited to the elite classes of society. Moreover, these results are mirrored in the skeletal remains of a confirmed ruler, Ruler G interred in Burial 8/4 (Table 1), further validating this conclusion.

Despite the findings, when the scores for the companions are considered separately, clearly defined differences in dental health between the principal and companion individuals are less visible (Table 5). For instance, the companion individual of Burial 3/2 appears to be an outlier due to its caries rate of 0.0% and high calculus score of 1.67 (Table 3), however, these scores may be skewed due to the fact that only six teeth

were available for evaluation, all of which are single root teeth. Therefore, the absence of caries in this individual may be more due to the absence of molars, the teeth more likely to develop caries (Caselitz 1998:214-215). Additionally, the high calculus scores may be due to the advanced age of the individual because calculus continues to accumulate over a lifetime. Additionally, the dental health of Companion #1 of Burial 3/1 is consistent with that of the principal individuals, but Companion #2 within this burial diverges from this pattern.

Caries has been highly correlated with maize consumption and comparative Maya skeletal samples correspond to this data (see Table 4). The high rate of caries at Kichpanha (Magennis 1997:135) and Lamanai (White 1994:291), Belize can be traced to their high consumption of maize. By contrast, the Maya of Ambergris Caye, who inhabited an island and therefore had an array of marine resources available to them for consumption, exhibit relatively low rates of caries (Glassman and Garber 1999:124-125). Additionally, the low-status sample from Copán, Honduras (Whittington 1999:160) is consistent with the lower consumption of maize suggested by the Pusilhá companion individual caries rate.

Skeletal Analysis

The small sample size of the Pusilhá mortuary population precludes a statistically significant analysis of the presence of skeletal pathologies and biocultural practices within the multiple burials. Nonetheless, the presence and absence of skeletal lesions, cranial modification, and dental modification provides supplemental evidence of difference between principal and companion individuals (Table 5). The lack of skeletal

remains for the companion individuals interred in Burial 3/1 prevents an assessment of pathological differences for this burial, but clear differences between subgroups are apparent in Burial 3/2. Overall, the principal individual enjoyed better health than the companion individual who suffered from growth disruptions, as indicated by linear enamel hypoplasia, as well as periostitis on the majority of the distal longbones.

Both principal individuals under study exhibit dental modification. Only one of the three companion figures has dental modification. The most common dental modification type is E1, although no interpretations based on differences between principal and companion individuals can be made based on type of modification due to the presence of type E1 in both multiple burial subgroups. Only three of the crania from the companion burial subgroup could be reconstructed in order to assess the presence and type of cranial modification (Burial 3/1 principal individual, Burial 3/2 principal individual, and Burial 3/2 companion individual). Of these individuals, the principal individual of Burial 3/1 and the companion individual of Burial 3/2 did not exhibit any signs of cranial modification. The cranium of the principal individual in Burial 3/2, however, shows modification consistent with the annular oblique form. According to the regional study of cranial modification conducted by Tiesler (2001:176-177), annular forms of cranial modification are expressed most often in the Late and Terminal Classic periods in the Southern Maya Lowlands and coastal Northern Maya Lowlands. This instance is unique within the Pusilhá population where the most common form is tabular (Table 5).

Overall, no clear pattern indicating specific ethnic markers is present from the analysis of biocultural modifications based on the fact that no correlation exists between

principal or companion individuals and either absence or presence of modifications or a particular form of modification (see Table 5). Therefore, the preliminary hypothesis regarding the foreign identity of the companion sacrifices is not assessable given the small sample size and the methods available. Bone chemistry studies analyzing stable isotopes of strontium and oxygen would be a valuable course for future research in order to directly determine the location of origin for both the principal figures and companions. Such studies are planned and will be conducted at the University of California, San Diego in the near future.

CONCLUSION

Companion burials are the material reflections of important funerary rituals that served specific social and political functions in society at large. In order to identify the functions these rituals performed in complex societies, it is necessary to understand the relationship between the individuals interred in such burials. At the onset of this thesis, I proposed that the relationship between principal individuals and their funerary companions in companion burials in the Maya area is marked by the practice of companion sacrifice or ancestor veneration. Following the assumption that each of these practices is linked to specific lifestyle patterns, I argue that similarities with respect to diet, general health, and biocultural practices between the principal and companion individuals within companion burials indicates the practice of ancestor veneration. Conversely, I argue that differences in lifestyle, as expressed as clear patterns of disparity in diet, general health, and biocultural practices, indicate the practice of companion sacrifice.

These hypotheses were tested through a bioarchaeological analysis of the mortuary population from the site of Pusilhá, Belize. In the absence of direct indicators of human sacrifice, as manifested in the skeleton as cut marks on the cervical or thoracic vertebrae or ribs, special attention is paid to lifestyle differences as expressed in: (1) caries rates and calculus scores as proxies for diet; (2) non-specific skeletal lesions and dental markers of developmental arrest as indicators of general health; and (3) dental and cranial modification as the manifestations of biocultural practices. Following Saul's (1972, 1976) osteobiographic approach, individuals who live within specific, shared

social and economic parameters exhibit similar patterns of subtle skeletal changes. Thus, despite the limited mortuary sample afforded by the Pusilhá excavations, preliminary conclusions about the nature of the relationship between the individuals interred in the companion burials are compelling. There is marked difference in the frequency of caries between the principal individuals, whose average caries rate is 27.8%, and companion individuals, who exhibit caries at a rate of 13.6%. This supports the hypothesis that the companion individuals are sacrificial offerings to the principal individuals. Although at first glance Companion #1 in Burial 3/1 and Companion #1 in Burial 3/2 appear to be outliers in this overall pattern, I argue that these aberrations have more to do with the problems presented by the scant data set provided by the Pusilhá excavations than with the life histories of these individuals. I therefore reject the hypothesis that the companion individuals represent a mix of revered ancestors and sacrificed companions.

In sum, as investigated through bioarchaeological means, distinctive lifestyles are apparent within the companion burial subpopulation at Pusilhá and are marked by differences in both the consumption of different types and quantities of specific categories of foodstuffs as well as subtle differences in general health status. Higher caries rates and calculus scores among the principal individuals indicate that they enjoyed higher social status than their funerary companions. They generally exploited a broader range of food resources and also had privileged access to more cariogenic foods, such as maize, a socially and economically valued food in the Maya area. Additionally, skeletal pathologies further elucidate the differences identified in the dental data. This cumulative data reveals that lifestyle differences are reflected in the companion burials at Pusilhá supporting the hypothesis that the ritual offerings of companion remains at

Pusilhá represent sacrificial victims ceremonially offered to the principal individuals rather than their revered ancestors.

The identification of companion sacrifice in funerary contexts such as Gateway Hill at Pusilhá suggests broader social processes at work in Maya society. The political and ideological underpinnings of human sacrifice in Maya society most often encountered in iconographic and epigraphic investigations are supported here through bioarchaeological and mortuary data. The ritual inhumation of sacrificial remains with elite individuals suggests that this practice is related to the maintenance of social differentiation as well as the legitimation of rulership. As a public display of power, human sacrifice in the Maya world is a method of communication with both the living and the dead. The elite are able to convey their social and ritual advantage over subaltern groups through their position as the sole practitioners of human sacrifice. The practice creates social distance through the public display of privilege.

Sacrificial practices in the Maya world permeated both the realm of the living and of the dead. The letting of blood through sacrificial acts was also a means through which elites communicated with the spirit world. Maya iconography provides many examples of this practice, particularly with reference to elite autosacrifice in which the letting of blood opened the portal to the underworld so that rulers could communicate with their powerful ancestors (Schele and Friedel 1992:68-71). Thus, the inclusion of sacrificial remains in funerary contexts would have aided the deceased in the trials set up by the gods of the underworld as he traveled through the underworld. Maya human sacrifice and elite autosacrifice alike were powerful rituals that were used as strategies for domination as well as mechanisms for the maintenance of social differentiation.

The value of bioarchaeological studies in the Maya area has moved beyond mere descriptive analyses to interpretive analyses. Despite the challenges presented by the nature of human remains as an archaeological data set, I maintain that interpretations are possible when bioarchaeological data is placed within coherent and culturally consistent theoretical frameworks. Since the human skeleton records the routine lived experiences of individuals within a specific cultural context, the thoughtful organization of skeletal data can elucidate broader cultural processes.

APPENDIX

Figures

Figure 1. Southern Belize region, showing the location of Pusilhá (Volta 2007:Figure 1).

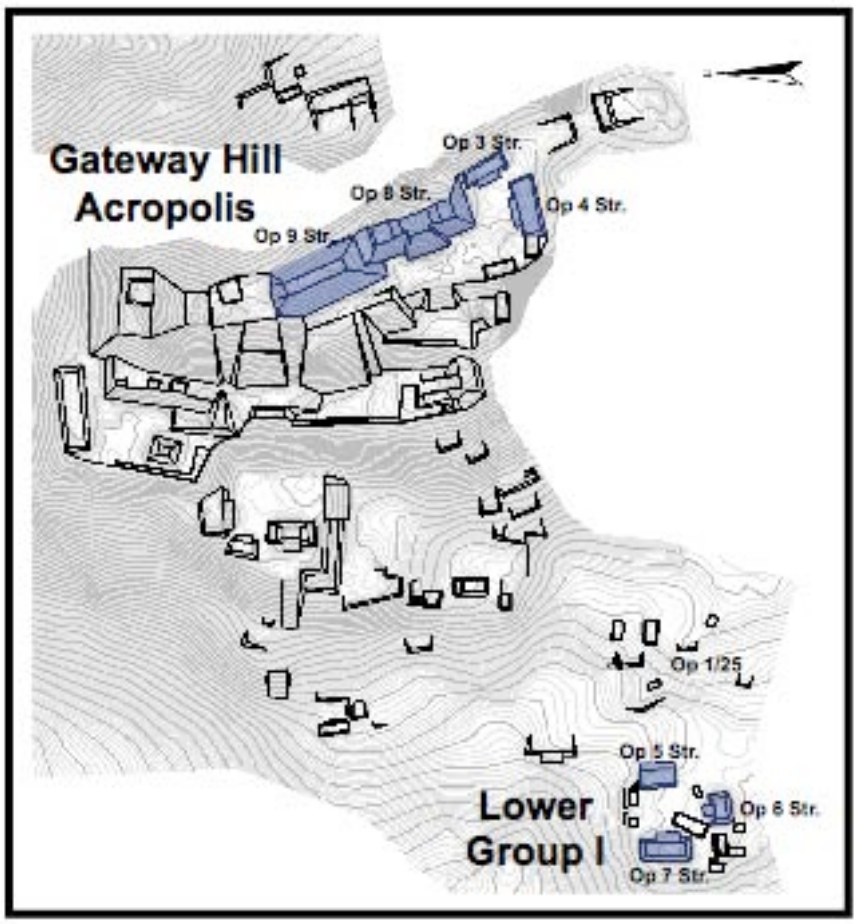

Figure 2. Location of excavated structures on Gateway Hill (after Braswell 2007:Figure 6).

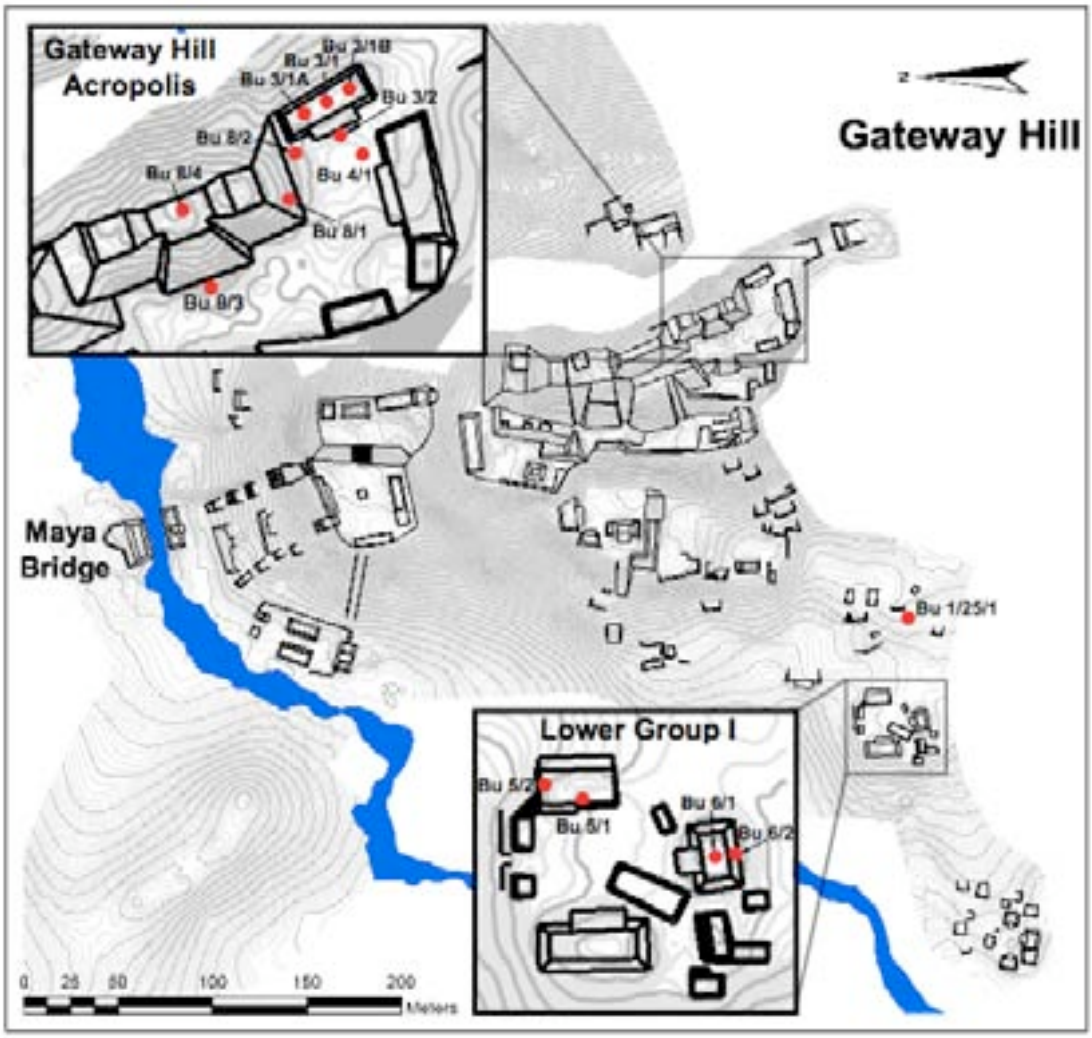

Figure 3. Locations of burials on Gateway Hill (after Braswell 2007:Figure 6).

Tables

Table 1. Dental Indicators of Diet and Oral Health at Pusilhá

	n **(Individuals)**	***n*** **(Teeth)**	**Caries Rate (%)***	**Average Calculus**
Males	6	125	15.7	1.20
Females	3	69	53.6	1.30
Young Adult	6	122	17.6	1.06
Middle Adult	4	90	13.3	1.35
Old Adult	5	104	34.3	1.01
Ruler G	1	31	26.9	0.45
Principals	2	42	27.8	1.16
Companions	3	45	13.6	1.21
Total Adult	15	316	22.0	1.12

*Caries rates based on total teeth

Table 2. Chi-square Analysis of Caries Rates by Companion Burial Subgroups

Caries Rate	χ^2	**p-value***
Males and Females	7.105	0.008
Principals and Companions	2.312	0.128
Terminal Classic and Late Classic	0.157	0.692

*p-values based on one degree of freedom

Table 3. Patterns in Caries Rate and Calculus Scores

	Caries Rate (%)	Average Calculus
Total Adult	22.0	1.12
Principal Individuals	27.8	1.16
Companion Individuals	13.6	1.21
Terminal Classic	22.61	1.08
Late Classic	20.31	1.03
Bu 3/1 Principal	33.0	1.13
Companion #1	25.0	0.95
Companion #2	15.8	1.00
Bu 3/2 Principal	22.2	1.19
Companion #1	0.0	1.67

Table 4. Intersite Patterns in Dental Caries by Status

Site	Status Group	Caries Rate (%)	*n* (Individuals)	*n* (Teeth)
Pusilhá, Belize	High (Total)	22.0	15	316
	Principal	27.8	2	42
	Companion	13.6	3	45
Copán, Honduras (Whittington 1999:160)	Low	17.9	85	1195
Northern Petén, Guatemala (Calakmul, Dzibanché, Kohunlich) (Cucina and Tiesler 2003:4)	High	4.0	30	502
	Low	6.0	19	328
Lamanai, Belize (White 1994:291)	High	20.1	111	--
Kichpanha, Belize (Magennis 1999:142)	High	28.5	13	179
Ambergris Cay, Belize (Glassman and Garber 1999:124-125)	--	4.9	25	324

Table 5. Late and Terminal Classic Period Human Remains at Pusilhá

Burial	Time Period[a]	Sex	Age[b]	Caries Rate (%)	Calculus Score	Linear Enamel Hypoplasia[c]	Porotic Hyper-ostosis[c]	Post-cranial pathology[c]	Cranial Mod.[cd]	Dental Mod.[c]
Bu 1/25/1	TC	-	7-9	0	0.40	P	-	-	-	np
Bu 2/1	TC	M	OA	-	-	-	P	np	np	-
Bu 2/3/1	LC-TC	-	-	-	-	-	-	-	-	-
Bu 2/4/1	LC-TC	-	YA	7.4	0.93	P	-	-	-	np
Bu 3/1: *Principal*	LC	M	YA	33.3	1.13	np	np	P	np	Filing, B4 (1)
Companion #1	LC	-	YA	25.0	0.95	np	-	-	-	np
Companion #2	LC	-	YA	15.8	1.00	np	-	-	-	Inlay, E1 (5)
Bu 3/1A	LC	-	YA	24.1	1.41	np	P	P	TE	np
Bu 3/1B	LC	F	OA	44.0	1.33	np	np	P	np	Filing, B3 (1)
Bu 3/2: *Principal*	TC	M	OA	22.2	1.19	np	np	np	AO	Inlay, E1 (4)
Companion	TC	M	OA	0	1.67	P	np	P	np	np
Bu 4/1	TC	F	A	41.3	2.17	-	np	-	TO	np

[a] LC = Late Classic TC = Terminal Classic
[b] SA = Subadult: < 20 YA = Young adult: 20-34 A = Middle adult: 35-49 OA = Old adult: 50+
[c] np = not present P = present
[d] TE = tabular erect TO = tabular oblique AO = annular oblique

Table 5. continued.

Burial	Time Period[a]	Sex	Age[b]	Caries Rate (%)	Calculus Score	Linear Enamel Hypoplasia[c]	Porotic Hyper-ostosis[c]	Post-cranial pathology[c]	Cranial Mod.[cd]	Dental Mod.[c]
Bu 5/1	LC	-	4-5	0	0	np	-	-	-	Filing/ Inlay G10 (2)
Bu 5/2	LC	-	SA	0	0	np	-	P	-	-
Bu 6/1	LC	-	YA	0	0.92	np	-	np	-	Filing, B4 (2) Inlay, E1 (4)
Bu 6/2	LC	-	A	0	0.47	np	-	np	-	np
Bu 8/1	TC?	M	A	12.0	1.35	np	np	np	TE	Filing, B2 (2)
Bu 8/2	TC	-	-	-	-	-	-	np	-	-
Bu 8/3:										
Individual #1	TC	M	A	0	1.40	np	P	np	-	np
Individual #2	TC	F	OA	78.5	0.40	np	P	P	TO	Filing, B5 (1)
Individual #3	TC	-	5+	0	0	-	-	-	-	-
Bu 8/4	LC	M	OA	26.9	0.45	np	-	-	-	Filing, E5 (4)

[a] LC = Late Classic TC = Terminal Classic
[b] SA = Subadult: < 20 YA = Young adult: 20-34 A = Middle adult: 35-49 OA = Old adult: 50+
[c] np = not present P = present
[d] TE = tabular erect TO = tabular oblique AO = annular oblique

REFERENCES CITED

Angel, J. Lawrence
1946 Social Biology of Greek Culture Growth. *American Anthropologist* 48:493-533.

Ashmore, Wendy
1981 Some Issues of Method and Theory in Lowland Maya Settlement Archaeology. In *Lowland Maya Settlement Patterns*, edited by Wendy Ashmore, pp. 37-69. University of New Mexico Press, Albuquerque.

Bass, William M.
2005 *Human Osteology: A Laboratory and Field Manual*. 5th ed. Missouri Archaeological Society, Inc., Columbia.

Berryman, C. A.
2007 Captive Sacrifice and Trophy Taking Among the Ancient Maya. In *The Taking and Displaying of Human Body Parts as Trophies by Amerindians*, edited by R. J. Chacon and D. H. Dye, pp. 377-399. Springer, New York.

Bill, Cassandra R., and Geoffrey E. Braswell
2005 Life at the Crossroads: New Data from Pusilhá, Belize. In *Archaeological Investigations in the Eastern Maya Lowlands: Papers of the 2004 Belize Archaeology Symposium. Research Reports in Belizean Archaeology*, Vol. 2, edited by Jaime Awe, John Morris, Sherilyne Jones, and Christophe Helmke, pp. 301-312. Institute of Archaeology, National Institute of Culture and History, Belmopan, Belize.

Boone, Elizabeth H. (editor)
1984 *Ritual Human Sacrifice in Mesoamerica*. Dumbarton Oaks Research Library and Collection, Washington, D.C.

Braswell, Geoffrey E.
2001 *Pusilhá Archaeological Project: 2001 Annual Report*. Manuscript on file, Institute of Archaeology, NICH, Belmopan, Belize.
2002 *Pusilhá Archaeological Project*. Report submitted to the Foundation for the Advancement of Mesoamerican Studies. Electronic document, http://www.famsi.org/reports/00029.

Braswell, Geoffrey E. and Sherry A. Gibbs
2006 In the Land of the Avocado: Recent Archaeological Investigations at Pusilha, Toledo District, Belize. In *Archaeological Investigations in the Eastern Maya Lowlands: Papers of the 2006 Belize Archaeology Symposium,* Vol.3, edited by John Morris, Sherilyne Jones, Jaime Awe and Christophe Helmke, pp. 257-268. Institute of Archaeology, National Institute of Culture and History, Belmopan, Belize.

Braswell, Geoffrey E., Christian M. Prager, Cassandra R. Bill, and Sonja A. Schwake
2004 Recent Archaeological and Epigraphic Research at Pusilhá, Belize: Report of the 2001 and 2002 Field Seasons. In *Archaeological Investigations in the Eastern Maya Lowlands: Papers of the 2003 Belize Archaeology Symposium*, Vol. 1, edited by Jaime Awe, John Morris, and Sherilyne Jones, pp. 333-345, Institute of Archaeology, National Institute of Culture and History, Belmopan, Belize.

Braswell, Geoffrey E., Christian Prager, and Cassandra R. Bill
2005 The Kingdom of the Avocado: Recent Investigations at Pusilhá, a Classic Maya City of Southern Belize. *Notebooks of the Slovene Anthropological Society*, XI:59-86.

Braswell, Geoffrey E., Christian M. Prager, Cassandra R. Bill, Sonja A. Schwake, and Jennifer B. Braswell
2004 The Rise of Secondary States in the Southeastern Periphery of the Maya World: A Report of Recent Archaeological and Epigraphic Research at Pusilhá, Belize. *Ancient Mesoamerica* 15:1-15.

Braswell, Geoffrey E., Sonja Schwake, and Cassandra Bill
2004 *Pusilhá Archaeological Project: 2004 Annual Report*. Manuscript on file, Institute of Archaeology, NICH, Belmopan, Belize.

Braswell, Geoffrey E., Beniamino P. Volta, and Sherry A. Gibbs
2006 *Pusilhá Archaeological Project: 2005-2006 Annual Report*. Manuscript on file, Institute of Archaeology, NICH, Belmopan, Belize.

Browne, David M., Helaine Silverman, and Rubén García
1993 A Cache of 48 Nasca Trophy Heads from Cerro Carapo, Peru. *Latin American Antiquity* 4:274-294.

Buikstra, Jane E., T. Douglas Price, Lori E. Wright and James A. Burton
2004 Tombs from the Copan Acropolis: A Life History Approach. In *Understanding Early Classic Copan*, edited by E. E. Bell, M. A. Canuto and R. Sharer. Museum of Archaeology and Anthropology, University of Pennsylvania, Philadelphia.

Buikstra, Jane E. and Douglas H. Ubelaker (editors)
1994 *Standards for Data Collection from Human Skeletal Remains*. Arkansas Archaeological Survey Research Series No. 44, Arkansas Archaeological Survey, Fayetteville.

Caselitz, Peter
1998 Caries – Ancient Plague of Humankind. In *Dental Anthropology: Fundamentals, Limits, and Prospects*, edited by Kurt W. Alt, Friedrich W. Rösing, and Maria Teschler-Nicola, pp. 203-226. Springer-Verlag/Wien, Austria.

Chase, Diane Z
1992 Postclassic Maya Elites: Ethnohistory and Archaeology, In *Mesoamerican Elites: An Archaeological Assessment*, edited by Diane Z. Chase and Arlen F. Chase, pp. 118-134. University of Oklahoma Press, Norman.

Chase, Diane Z. and Arlen F. Chase
1996 Maya Multiples: Individuals, Entries, and Tombs in Structure A34 of Caracol, Belize. *Latin American Antiquity* 7:61-79.

Conlee, Christina A.
2007 Decapitation and Rebirth: A Headless Burial from Nasca, Peru. *Current Anthropology* 48:438-445.

Cucina, Andrea and Vera Tiesler
2003 Dental Caries and Antemortem Tooth Loss in the Northern Peten Area, Mexico: A Biocultural Perspective on Social Status Differences among the Classic Maya. *American Journal of Physical Anthropology* 122:1-10.
2006 The Companions of Janaab' Pakal and the "Red Queen" from Palenque, Chiapas: Meanings of Human Companion Sacrifice in Classic Maya Society. In *Janaab' Pakal of Palenque: Reconstructing the Life and Death of a Maya Ruler*, edited by Vera Tiesler and Andrea Cucina, pp. 102-125. University of Arizona Press, Tucson.

Danforth, Marie Elaine
1997 Late Classic Maya Health Patterns: Evidence from Enamel Microdefects. In *Bones of the Maya: Studies of Ancient Skeletons*, edited by Stephen L. Whittington and David M. Reed, pp. 127-137. Smithsonian Institution Press, Washington D.C.
1999 Coming Up Short: Stature and Nutrition among the Ancient Maya of the Southern Lowlands. In *Reconstructing Ancient Maya Diet*, edited by Christine D. White, pp. 103-118. The University of Utah Press, Salt Lake City.

DeLeonardis, Lisa
2000 The Body Context: Interpreting Early Nasca Decapitated Burials. *Latin American Antiquity* 11:363-386.

Gerry, John P.
1997 Bone Isotope Ratios and their Bearing on Elite Privilege among the Classic Maya. *Geoarchaeology* 12:41-69.

Glassman, David M. and James F. Garber
1999 Land Use, Diet, and Their Effects on the Biology of the Prehistoric Maya of Northern Amergris Cay, Belize. In *Reconstructing Ancient Maya Diet*, edited by Christine D. White, pp 119-132. The University of Utah Press, Salt Lake City.

Gruning, E. L.
1930 Report on the British Museum Expedition to British Honduras, 1930. *The Journal of the Royal Anthropological Institute* 60:477-483.
1931 Excavations for the British Museum. *Man* 31:26.

Haviland, W.A.
1967 Stature at Tikal: Ancient Maya Demography and Social Organization. *American Antiquity* 32:316-25.

Hammond, Norman
1975 *Lubaantun: A Classic Maya Realm*. Monographs of the Peabody Museum, No. 2. Harvard University Press, Cambridge.

Havill, Lorena M., Diane M. Warren, Keith P. Jacobi, Karen D. Gettelman, Della Collins Cook, and K. Anne Pyburn
1997 Late Postclassic Tooth Filing at Chau Hiix and Tipu, Belize. In *Bones of the Maya: Studies of Ancient Skeletons*, edited by Stephen L. Whittington and David M. Reed, pp. 78-88. Smithsonian Institution Press, Washington, D.C.

Healy, Paul F., Jaime J. Awe, and Hermann Helmuth
1998 An Ancient Maya Multiple Burial at Caledonia, Cayo District, Belize. *Journal of Field Archaeology* 25:261-274.

Hodell, David A., Rhonda L. Quinn, Mark Brenner, and George Kamenov
2004 Spatial Variation of Strontium Isotopes ($^{87}Sr/^{86}Sr$) in the Maya Region: A Tool for Tracking Ancient Human Migration. *Journal of Archaeological Science* 31:585-601.

Jacobi, Keith P.
1997 Dental Genetic Structuring of a Colonial Maya Cemetery, Tipu, Belize. In *Bones of the Maya: Studies of Ancient Skeletons*, edited by Stephen L. Whittington and David M. Reed, pp. 138-156. Smithsonian Institution Press, Washington, D.C.

Joyce, Thomas A.
1929 Report on the British Museum Expedition to British Honduras, 1929. *The Journal of the Royal Anthropological Institute* 59:439-459.

Joyce, Thomas A., J. Cooper Clark, and J. Eric S. Thompson
1927 Report on the British Museum Expedition to British Honduras, 1927. *The Journal of the Royal Anthropological Institute* 57:295-323.

Joyce, Thomas A., Thomas Gann, E.L. Gruning, and R.C.E Long
1928 Report on the British Museum Expedition to British Honduras, 1928. *The Journal of the Royal Anthropological Institute* 58:323-350.

Kuijt, Ian
1996 Negotiating Equality through Ritual: A Consideration of Late Natufian and Prepottery Neolithic A Period Mortuary Practices. *Journal of Anthropological Archaeology* 15:313-336.

Larsen, Clark Spencer
1997 *Bioarchaeology: Interpreting Behavior from the Human Skeleton*. Cambridge University Press, New York.
2000 *Skeletons in Our Closet: Revealing Our Past through Bioarchaeology*. Princeton University Press, Princeton.

Leventhal, Richard M.
1990 Southern Belize: An Ancient Maya Region. In *Vision and Revision in Maya Studies*, edited by Flora S. Clancy and Peter D. Harrison, pp. 125-142. University of New Mexico Press, Albuquerque.
1992 The Development of a Regional Tradition in Southern Belize. In *New Theories on the Ancient Maya,* edited by E.C. Danien and R.J. Sharer, pp. 145-153. University Museum Symposium, Vol. 3. The University Museum, University of Pennsylvania, Philadelphia.

López Olivares, Nora M.
1997 Cultural Odontology: Dental Alterations from Petén, Guatemala. In *Bones of the Maya: Studies of Ancient Skeletons*, edited by Stephen L. Whittington and David. M Reed, pp. 105-115. Smithsonian Institution Press, Washington D.C.

Magennis, Ann I.
1997 Dietary Change at the Lowland Maya Site of Kichpanha, Belize. In *Reconstructing Ancient Maya Diet*, edited by Christine D. White, pp 133-150. The University of Utah Press, Salt Lake City.

Mayer, Karl Herbert
1983 Dental Decoration among the Pre-Columbian Maya. *Organorama* 20:15-20.

McAnany, Patricia A.
1995 *Living with the Ancestors: Kinship and Kingship in Ancient Maya Society*. University of Texas Press, Austin.

Merriwether, D. Andrew, David M. Reed, and Robert E. Ferrell
1997 Ancient and Contemporary Mitochondrial DNA variation in the Maya. In *Bones of the Maya: Studies of Ancient Skeletons*, edited by Stephen L. Whittington and David M. Reed, pp. 208-220. Smithsonian Institution Press, Washington, D.C.

Morley, Sylvanus G.
1938 *The Inscriptions of Peten*, Vol. IV, No. 347. Carnegie Institute of Washington, Washington, D.C.

Pollack, Susan
1991 Of Priestesses, Princes and Poor Relations: The Dead in the Royal Cemetary of Ur. *Cambridge Archaeological Journal* 1:171-189.

Price, T. Douglas, James H. Burton, Lori E. Wright, Christine D. White, and Fred Longstaffe
2007 Victims of Sacrifice: Isotopic Evidence for Place of Origin. In *New Perspectives on Human Sacrifice and Ritual Body Treatment in Ancient Maya Society*, edited by Vera Tiesler and Andrea Cucina, pp. 263-292. Springer, New York.

Reed, David Millard
1999 Cuisine from Hun-Nal-Ye. In *Reconstructing Ancient Maya Diet*, edited by Christine D. White, pp. 183-196. The University of Utah Press, Salt Lake City.

Romero Molina, Javier
1970 Dental Mutilation, Trephination, and Cranial Deformation. In *Handbook of Middle American Indians*, Vol. 9, pp. 50-67. University of Texas, Austin.

Saul, Frank P.
1972 *The Human Skeletal Remains of Altar de Sacrificios: An Osteobiographic Analysis.* Memoirs of the Peabody Museum of Archaeology and Ethnology, Vol. 63, No. 2. Harvard University, Cambridge, Massachusetts.
1976 Osteobiography: Life History Recorded in Bone. In *The Measures of Man: Methodologies in Biological Anthropology*, edited by Eugene Giles and Jonathan S. Friedlaender, pp. 372-382. Peabody Museum Press, Cambridge, Massachusetts.

Saul, Frank P., and Julie M. Saul
1989 Osteobiography: A Maya Example. In *Reconstruction of Life from the Skeleton*, edited by M. Y. Iscan and K.A.R. Kennedy, pp. 287-302. Liss, New York.

Schele, Linda
1984 Human Sacrifice among the Classic Maya. In *Ritual Human Sacrifice in Mesoamerica*, edited by Elizabeth H. Boone, pp. 7-48. Dumbarton Oaks Research Library and Collection, Washington, D.C.

Schele, Linda, and David Friedel
1992 *A Forest of Kings: The Untold Story of the Ancient Maya.* William Morrow and Company, Inc., New York.

Schele, Linda, and Mary Ellen Miller
1986 *The Blood of Kings: Dynasty and Ritual in Maya Art*, Kimbell Art Museum, Fort Worth.

Scherer, Andrew K.
2007 Population Structure of the Classic Maya Period. *American Journal of Physical Anthropology* 132:367-380.

Shelach, Gideon
1996 The Qiang and the Question of Human Sacrifice in the Late Shang Period. *Asian Perspectives: The Journal of Archaeology for Asia and the Pacific* 35:1-26.

Storey, Rebecca
1999 Late Classic Nutrition and Skeletal Indicators at Copán. Honduras. In *Reconstructing Ancient Maya Diet*, edited by Christine D. White, pp. 169-182. The University of Utah Press, Salt Lake City.

Stuart-Macadam, P. L.
1989 Nutritional Deficiency Diseases: A Survey of Scurvy, Rickets, and Iron-Deficiency Anemia. In *Reconstruction of Life from the Skeleton*, edited by Mehmet Yasar Iscan and Kenneth A. R. Kennedy, pp. 201-222. Alan R. Liss, Inc., New York.

Thompson, J. Eric S.
1928 Some New Dates from Pusilhá. *Man* 28:95-97.

Tiesler Blos, Vera
2001 *Decoraciones Dentales entre los Antiguos Mayas*. Ediciones Euroamericanas/Instituto Nacional de Antropología, Mexico.
2004 Maya Mortuary Treatments of the Elite: An Osteotaphonomic Perspective. In *Continuity and Change: Maya Religious Practices in Temporal Perspective*, edited by Daniel Graña Behrens, Nikolai Grube, Christian M. Prager, Frauke Sachse, Stefanie Teufel, and Elisabeth Wagner, pp. 143-156. ACTA Mesoamericana Vol. 14, Verlag Anton Saurwein, Markt Schwaben, Germany

Tiesler Blos, Vera and Andrea Cucina
2006 Procedures in Human Heart Extraction and Meaning: A Taphonomic Assessment of Anthopogenic Marks in Classic Maya Skeletons. *Latin American Antiquity* 17:493-510.

Tiesler Blos, Vera, Andrea Cucina, and Arturo Romano Pacheco
2002 Vida y Muerte del Personaje Hallado en el Templo XIII-sub, Palenque: I. Culto Funerario y Sacrificio Humano. *Mexicon* 24:75-78.

Tozzer, Alfred M.
1941 *Landa's Relacion de las Cosas de Yucatan,* Papers of the Peabody Museum of American Archaeology and Ethnology, Vol. 18. Harvard Unversity, Cambridge, Massachusetts.

Verano, John W.
1997 Human Skeletal Remains from Tomb 1, Sipán (Lambayeque River Valley, Peru); and their Social Implications. *Antiquity* 71:670-682.

Volta, Beniamino P.
2007 Archaeological Settlement Patterns in the Kingdom of the Avocado. Unpublished Masters thesis, Department of Anthropology, University of California, San Diego.

Weiss-Krejci, Estella
2001 Restless Corpses: 'Secondary Burial' in the Babenberg and Hapsburg dynasties. *Antiquity* 75:769-780.
2003 Victims of Human Sacrifice in Multiple Tombs of the Ancient Maya: A Critical Review. In *Antropología de la Eternidad: La Muerte en la Cultura Maya*, edited by Andrés Cuidad, Mario Humberto Ruz Sosa, and María Josefa Iglesias Ponce de Léon, pp. 355-381. Sociedad Española de Estudias Mayas/Centro de Estudios Mayas, Universidad Nacional Autónoma de Mexico, Madrid.

Welsh, W. B. M.
1988 *An Analysis of Classic Lowland Maya Burials*. BAR International Series 409. British Archaeological Reports, Oxford.

White, Christine D.
1994 Dietary Dental Pathology and Cultural Change in the Maya. In *Strength in Diversity: A Reader in Physical Anthropology*, edited by Ann Herring and Leslie Chan, pp. 279-302. Canadian Scholars' Press Inc., Toronto.
1997 Ancient Diet at Lamanai and Pacbitun: Implications for the Ecological Model of Collapse. In *Bones of the Maya: Studies of Ancient Skeletons*, edited by Stephen L. Whittington and David. M Reed, pp. 171-180. Smithsonian Institution Press, Washington D.C.
2005 Gendered Food Behavior among the Maya: Time, Place, Status, and Ritual. *Journal of Social Archaeology* 5:356-382.

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* 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* 12:371-393.

White, Timothy D.
2000 *Human Osteology*, 2nd ed. Academic Press, San Diego.

Whittington, Stephen L.
1999 Caries and Antemortem Tooth Loss at Copán: Implications for Commoner Diet. In *Reconstructing Ancient Maya Diet*, edited by Christine D. White, pp. 151-168. The University of Utah Press, Salt Lake City.

Whittington, Stephen L., and David M. Reed
1997 Commoner Diet at Copán: Insights from Stable Isotopes and Porotic Hyperostosis. In *Bones of the Maya: Studies of Ancient Skeletons*, edited by Stephen L. Whittington and David. M Reed, pp. 157-170. Smithsonian Institution Press, Washington D.C.

Willey, Gordon R., William R. Bullard, Jr., John B. Glass, and James C. Gifford
1965 *Prehistoric Maya Settlement in the Belize Valley*. Papers of the Peabody Museum of Archaeology and Ethnology, Vol. 54. Harvard University, Cambridge.

Williams, Jocelyn S., and Christine D. White
2006 Dental Modification in the Postclassic Population from Lamanai, Belize. *Ancient Mesoamerica* 17:139-151.

Wright, Lori E.
1997 Ecology or Society? Paleodiet and the Collapse of the Pasión Maya Lowlands. In *Bones of the Maya: Studies of Ancient Skeletons*, edited by Stephen L. Whittington and David. M Reed, pp. 181-195. Smithsonian Institution Press, Washington D.C.
2005 Identifying Immigrants to Tikal, Guatemala: Defining Local Variability in Strontium Isotope Ratios of Human Tooth Enamel. *Journal of Archaeological Science* 32:555-566.
2006 *Diet, Health, and Status among the Pasión Maya: A Reappraisal of the Collapse*. Vanderbilt University Press, Nashville.