Burial Chronological Sequencing of the Colonial Maya Cemetery at Tipu, Belize Using Fluoride Ion Analysis

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BURIAL CHRONOLOGICAL SEQUENCING OF
THE COLONIAL MAYA CEMETERY AT TIPU, BELIZE
USING FLUORIDE ION ANALYSIS

by
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ABSTRACT

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This thesis ascertains the sequence of burials using fluoride ion electrode analysis at the colonial cemetery at Tipu, Belize in order to explore demographic and other cultural effects associated with European contact. The cemetery at Tipu in west central Belize, dating from within the first century of Spanish contact, has provided one of the largest and best preserved Maya skeletal series, with over 500 burials recovered. While this series has undergone vast amounts of analysis, there has yet been an analysis conducted to view how patterns changed over time. This is of interest given the rapid culture change associated with the Spanish conquest of the Maya, especially given that fluctuations in population movement due to Spanish programs meant to convert and control the indigenous population. By measuring fluoride ion levels within the sample using an electrode, a relative chronology was determined using both horizontal and vertical location to test for patterning. The spatial location was analyzed for preferential treatment and trends over time. Given the limitations of the fluoride methodology, the sample size was limited to adult burials that had ribs for testing, resulting in 134 interments tested. The results of the study showed that both areas were utilized concurrently though the spatial preference did change over time, which differed from previous expectations of the nave filling prior to the surrounding church grounds. Sixty-
seven percent of the earliest burials were mostly located in the nave of the church while this trend switched in the most recent burials. Furthermore, within the nave, the area near the altar, a place reserved for elites and honored members of the community, was used differently as well. At first, the burials were located toward the rear of the nave away from the altar. Toward the end of the cemetery’s use, the altar was the preferred location. Of these more recent burials, 64% of the male interments were located closest to the altar as compared to 40% of the oldest burials. Additionally, the results showed that pre-Conquest Maya characteristics persisted well after the arrival of the Spanish due to either blatant rebellion or slow assimilation. Given these results, previously held assumptions of the cemetery’s usage and Maya behaviors are changed. Giving the interments of Tipu a temporal context, this project sheds a new light onto their agency and survival in this tumultuous time.
DEDICATION

I would like to dedicate my thesis to my parents, Charles and Rebecca Musselwhite, for their unending patience throughout my time in graduate school.

Without their words of encouragement and, at times, tough love, I could not have gotten through it.
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# TABLE OF CONTENTS

ABSTRACT........................................................................................................... ii  
DEDICATION........................................................................................................ iv  
ACKNOWLEDGMENTS......................................................................................... v  
LIST OF TABLES................................................................................................. viii  
LIST OF ILLUSTRATIONS.................................................................................... ix  

CHAPTER

I. INTRODUCTION.............................................................................................. 1  

II. HISTORY OF THE MAYA IN THE SOUTHERN LOWLANDS........... 4  
   Maya on the Eve of Conquest  
   Conquest of the Maya  
   Political Context of the Conquest  
   Spiritual Conquest  
   The History of Tipu  

III. MAYA AND ROMAN CATHOLIC BURIAL PRACTICES................. 34  
   Maya Burial Practices  
   Roman Catholic Burial Practices  
   Religion in the Colonial Maya Region  
   The Cemetery at Tipu  

IV. ARCHAEOLOGICAL DATING TECHNIQUES............................... 48  
   Chronometric Dating  
   Relative Dating  
   Fluoride Analysis  

V. MATERIALS AND METHODS................................................................. 62  

VI. RESULTS AND DISCUSSION................................................................. 68  
   Results  
   Discussion  

VII. CONCLUSION............................................................................................ 84
LIST OF TABLES

Table

1. Sample of Burial Testing Variation...............................................................69
2. Burials with Dental Modification.................................................................83
LIST OF ILLUSTRATIONS

Figure

1. Map of Modern-Day Belize with Tipu and Lamanai Noted..........................29
2. Map of the Cemetery at Tipu, Belize.........................................................45
3. Sex Distribution of Burials at Tipu, Belize..................................................47
4. Age Distribution of Burials at Tipu, Belize..................................................47
5. Spatial Distribution of Burials at Tipu, Belize.............................................47
6. Association between Burial Depth and Temporal Level Using Fluoride Analysis for Select Burials at Tipu.................................................................70
7. MT 169 and MT 171 at Tipu, Belize..............................................................72
8. mV versus pF with Temporal Delineations...............................................73
9. Level 1 Age Distribution.............................................................................74
10. Level 1 Sex Distribution...........................................................................74
11. Level 1 Spatial Distribution........................................................................74
12. Level 2 Age Distribution...........................................................................75
13. Level 2 Sex Distribution...........................................................................75
14. Level 2 Spatial Distribution........................................................................75
15. Level 3 Age Distribution...........................................................................76
16. Level 3 Sex Distribution...........................................................................76
17. Level 3 Spatial Distribution........................................................................76
18. Level 4 Age Distribution...........................................................................77
19. Level 4 Sex Distribution...........................................................................77
20. Level 4 Spatial Distribution........................................................................77
21. Level 5 Age Distribution...........................................................................78
22. Level 5 Sex Distribution .................................................................78
23. Level 5 Spatial Distribution .............................................................78
24. Burials Grouped in Temporal Clusters by Area of Interment in Church ..........80
25. Burials Inside the Church by Temporal Level ........................................81
26. Male Burials by Location in Church Nave and Temporal Level .................. 81
CHAPTER I
INTRODUCTION

“Without the ability to produce a temporal order, archaeology is reduced to a study of synchronic variation in which objects are examined simply for their functional, stylistic, and/or aesthetic characteristics. All of these aspects of artifacts are important components of archaeological inquiry, but at its core archaeology is the study of change.”

–Michael O’Brien and R. Lyman (1999:1)

The Spanish conquest of the New World was a tumultuous time as the indigenous people dealt with rampant warfare, virgin soil epidemics and cultural invasions. In particular, the Maya of Central America had to adapt to a new political and religious regime whose primary goal resulted in the dissolution of many ethnic identities. Their struggle is evident not only in the historical, ethnographical, and archaeological records surviving from the Colonial era but also in the bioarchaeological one as well. Human remains in the Maya region are not always recovered in ideal conditions necessary to conduct in depth bioarchaeological research due to the unfavorable, acidic soil conditions endemic in the jungles of Mesoamerica. The environment leads to remains often being too degraded for any significant analysis. However, in the 1980s, a church cemetery was discovered in association with the colonial town of Tipu, located along the Macal River in the modern-day region of Negroman in western Belize. With the remains of over 500 adults and juveniles, this cemetery offers bioarchaeologists one of the largest and best preserved skeletal collections in the Maya region. Over the last twenty plus years, this collection has been extensively studied as a whole in regards to health and genetic patterns (Cohen et al. 1994; Danforth 1989; Jacobi 2000; Wrobel and Danforth 2002).

While a small Pre-Contact component exists at Tipu, this colonial town was largely created in the Spanish reducción program as a means of acculturating and
controlling the indigenous inhabitants. Consequently, Tipu’s populace predominantly migrated from two separate areas in Central America, the Petén and Northern Yucatan, and grew quickly from a small village of 100 individuals to a bustling town of more than 1000 within the span of a decade (Jacobi 2000). Though the Spanish crown held on to New Spain over three centuries from 1519 to 1821 (O’Hara 2010), the town of Tipu had a much shorter occupation of approximately 150 years from the 1540s to 1707 (Graham 2011; Graham et al. 1989; Jacobi 2000). The lifestyle patterns of the Tipuans changed drastically over time as they learned to adapt from the first moment of contact to subsequent generations as populations were moved, and cosmologies shifted.

Establishing a burial sequence chronology, the goal of this study, is necessary to tease out such temporal changes. Previously the only chronology for Tipu came from a scatter of archaeological artifacts, analysis of mortuary practices, and the scant ethnographic record. While chronometric dating techniques, such as radiocarbon dating, cannot give an accurate picture of the sequencing of burials at Tipu due to the short occupation of only 150 years, other means were available. Measuring the rate of fluoride absorption in the remains and comparing the results among the interments allowed for the construction of a relative chronological sequence in the colonial cemetery. This sequence was then considered for temporal patterns of spatial use of the cemetery, including age and sex. Only adult interments met the requirements for the testing due to the necessity of consistent bone density; nevertheless, this partial burial chronological sequence of Tipu allowed testing of the ethnographical research in regards to demographic fluxes due to immigration fluxes and effects of social status, as well as opening up the collection for
new research questions based on tracking the changes the Maya experienced as a potential consequence of Spanish contact.
CHAPTER II
HISTORY OF THE MAYA IN THE SOUTHERN LOWLANDS

The history of the Tipuans does not evolve in a void separate from the rest of the Maya. In actuality, it is these people who produce the uniqueness of this visita. The development of the Maya cosmology is important to understanding how it changed with the Spanish incursions to the New World.

Maya on the Eve of Conquest

While scholars debate as to when the Maya initially settled in Central America, the prevailing theories lean towards a date of 1800 BCE when the Pacific Coast first had established communities (Hammond 1976; McKillop 2004). This point launched the start of the Preclassic period that lasted from 1800 BCE to 300 CE. Here, the Maya civilization got its start spreading across Central America from the Pacific Coast into Guatemala and the Yucatan. These sedentary, egalitarian people mainly produced maize, though jade and ceramic manufacturing also occurred during this period. The Maya, then, transitioned to the Classic period, which took place from 300 to 900 CE. Grandiose architectural construction occurred at major sites in order to fit the elaborate cosmology and expanding population (McKillop 2004). At Tikal in modern-day Guatemala, the population increased to an estimated 60,000 to 90,000 individuals while Caracol, in west-central Belize, had an estimated 115,000 to 150,000 people during the Late Classic period (Healy et al. 2007). In total, contemporary Belize had as many as 400,000 people occupying the region by the Late Classic period (Bolland 1993).

Deeply entrenched in the development of the Maya civilization is warfare. As populations increased, conflicts similarly increased as seen in the Pasión Basin and
Belize River Valley (Brown and Garber 2003). Evidence exists that Preclassic sites in the Northern Lowlands, such as Becán in Campeche and Blackmann Eddy in Belize, and the Southern Lowlands, such as Los Naranjos in Honduras, had a long tradition of building military fortifications, pointing to an early history of raiding (Brown and Garber 2003; Webster 1976). These early conflicts seated warfare within political and ideological confines. For instance, the Maya creation myth reinforced and justified the importance of warfare through the imagery of death and rebirth. Similarly, the ball-game replicated combat imagery (Brown and Garber 2003). The reasons for warfare shifted from a competition for resources as a means for survival to a more militaristic need to expand and build upon polities as Maya society became more complex into the Late Classic. While nonviolent diplomacy existed, raiding enemy polities, taking captives, and destroying important structures leads ultimately to the humiliation of enemies and establishing supremacy. Warfare became endemic throughout much of the Maya region well into the Terminal Classic around the ninth century.

Starting in the eighth century, the Maya centers that arose during the Classic period reached a pinnacle. The tropical jungle can support large populations when farmers use the correct agricultural techniques; however, the Maya did not utilize such techniques. Additionally, malnutrition and disease led to stress on the Maya, especially in regards to reproduction capabilities and productivity, which contributed to a decline in the labor force necessary to maintain the terrace, agricultural systems. Thus, surplus production declined as farmers had problems providing enough substance for their own families. This furthered the political decentralization as the non-elite took strides to focus on their nuclear household and moved away from agriculturally barren areas. Without
this support, whole complexes in the Southern Lowlands were drastically affected, and in combination with the endemic warfare, ultimately abandoned by the elites (Coe 2005).

Ecological problems aside, political competition also lead to the disintegration of Classic period Maya polities leading to their collapse. Endemic warfare eventually consumes more resources and labor than the polity has to offer. For instance, in the Middle Usumacinta River Basin on the border between Mexico and Guatemala in the Southern Lowlands, two Maya centers, Yaxchilan and Piedras Negras, established themselves in the vicinity of each other in the Early Classic Period (350-600 C.E.). At first, warfare and conflicts decreased in the area as the polities sought to establish themselves politically and culturally. As they increased their territory and established a tiered system of centers radiating outward from the primary capital, warfare increased, and a border zone was fortified by the Late Classic Period (600-810 C.E.). Just a few years after a military conflict in which Yaxchilan beat Piedras Negras in 808 C.E., both political centers quickly declined as the ruling elite left while the non-elites remained in the vicinity for a period of time. The fact that people remained settled in the area after the breakdown of the political centers points to a non-ecological basis for the collapse (Golden et al 2008).

However, while this played out in the interior, other areas of Maya occupation, such as the coastal regions of Belize, did not experience as swift and severe of a decline due to the availability of other nutritional resources, like those from marine ecosystems, rather than focusing entirely on maize production (Coe 2005; Santley et al 1986). These factors along with others, including climate change, started slowly and quickly snowballed to the inevitable collapse of the Maya civilization in the Southern Lowlands.
Even as these strongholds waned in power, the northern Maya region of the Yucatan experienced the pinnacle of their power starting in the 10th century [the Terminal Classic and Post-Classic] as they encountered new expansions from Mexico and a diaspora from the Southern Lowlands (Bolland 1993; Coe 2005). One of the most prominent and perhaps controversial examples of an outside invasion of people into the Yucatan happened at Chichén Itzá. Though founded in the Late Classic (600-900 C.E.), scholars argue that Chichén Itzá faced an incursion of Toltec warriors from the basin of Mexico lead by K’uk’ilkan [Feathered Serpent], whom Bishop de Landa credited with introducing idolatry to the Yucatan peninsula (Coe 2005). This site represents a puzzling mixture of Mexicana/Toltec with the Maya in both architecture and cosmology (Coe 2005; Marcus 2003; McKillop 2004). For instance, frescos, bas reliefs, iconography, and the addition of stone rings at the ball court found throughout Chichén Itzá clearly represent outside influence that existed alongside the Maya (McKillop 2004).

Another site that rose to power in the north after the collapse of the Southern Lowlands was Mayapán, approximately 60 miles west of Chichén Itzá. Two ruling families, the Cocom and Xius, came together during the 12th century from separate ancestral lineages and became the ruling elite of the site. Both groups exploited the use of revival-style architecture and iconography of their respective lineages in order to strengthen their political position. The Cocom came from Chichén Itzá, bringing serpent temples to honor Quetzalcoatl-Kukulcan, while the Xius claimed links to Uxmal and brought Chaac [the Maya Rain God] masks alongside the priesthood to serve the deity (Milbrath and Lope 2009). Thus, it appears that these elites used a cooperative government instead of ruling by the traditional Maya model of a centralized authority.
(McKillop 2004). At its pinnacle, the population ballooned to about 17,000 people over about a 8.8-10.1 sq. km area (Russell 2008). Mayapán quickly rose as a regional power in the Yucatan and similarly fell quickly as the suppressed Xiu elites revolted against the Cocom in 1461 C.E. This signaled the end of the ruling power as the Xius abandoned the site within a couple of decades (McKillop 2004; Milbrath and Lope 2009).

After the fall of Mayapán, “a place of harmony” (Clendinnen 2003: 150), the Northern Lowlands experienced a period of intense conflict and outside invasions. Alongside the Cocom and Xiu ruling chiefs at Mayapán, other elites from conquered regions became incorporated into the exuberant life at the center of the site. However, these elites dispersed back to their homeland after the Xius left Mayapán, which led to the creation of 16 loosely associated states throughout the region that lived in a state of conflict amongst each other and with Canuls, Mexican mercenaries (Clendinnen 2003; Coe 2005; McKillop 2004; Milbrath and Lope 2009). According to Clendinnen (2003), slaves became a major commodity of the Late Postclassic as raiding parties continuously invaded the region.

Aiding such behavior was a migration from the interior of the peninsula towards the eastern Caribbean coast in hopes of benefitting from the easily accessible marine resources and trade networks, which also led to the availability of more people to raiding parties (Clendinnen 2003; Marcus 2003; McKillop 2004). The coastline became so populated that archaeologists do not find many clear delineations between Yucatec sites. Port cities along the eastern Yucatan coast, including Xcaret, Xelha, and Tulum comprised a network of trade that involved southern sites in Belize found not only along
the coast, such as Punta Placencia, but also inland along rivers, such as Lamanai and as far inland as Tipu (Marcus 2003).

During the Postclassic, the site of Tipu, located near the border of Belize and Guatemala along the Macal River, represented a trade center with contact not only from the Yucatan to the north as aforementioned but also from the remaining vestiges of Itzá Maya in the Petén region of the Southern Lowlands (Jones 1998; Jones et al. 1986). While not as a large site as found elsewhere in Belize, such as Caracol, precontact Tipu had a population sufficient to support the building of a Postclassic ceremonial complex where Maya religious activity took place. The influence of the Northern Lowlands is unmistakable given the similarities of this Postclassic building with ones found at Mayapán. Additionally, evidence, in the form of religious offerings located in the Postclassic building, supports the theory that a small migration of elites from Yucatan resided at Tipu and oversaw the production of cacao in the fertile soil surrounding the area. Proof of a trade connection with the Itzá copper, jade, and Postclassic ceramics substantiate the claim that Tipu held trade connections with Itzá in the Petén region to the west (Jones et al. 1986). Hence, Tipu during the late Postclassic was a small, but nonetheless, important trade center linking the Yucatan with the Guatemalan interior.

Overall, by the eve of Spanish conquest, the Maya had long since seen the peak of their civilization during the Classic period in the Southern Maya Lowlands and the Terminal Classic in the Northern Maya Lowlands. The majority of the population left the administrative centers as evident by a significant decrease in social and economic systems (Bolland 1993). However, the Maya survived and spread throughout the Maya Lowlands in smaller contingencies until the arrival of the Spanish.
Conquest of the Maya

Attempting to break the stranglehold that Middle Eastern and Italian traders had on the Asiatic trade routes, 15th century explorers ventured out in search of a new sea route to the west. Unfortunately, little did the Europeans realize, unfortunately, that mathematical calculations of the earth were wrong, and another land stood in their path to riches (Alchon 2003). Within a matter of years, the newly discovered land, despite dramatically underestimating its size, became property of Spain as they strived to make their mark in the ever expanding world. Though the Yucatan was the first-discovered region in Mesoamerica, it was the last to be conquered (Chuchiak IV 2007). Conquest scholars take several different historiographical perspectives for examining and explaining this acquisition, in particularly that of Mesoamerica, of which three are used as a means to situate the conquest of the Maya in its political and spiritual context. First, the political context comes from a combination of two trends: the epic Spanish conquest and the *conquistadores indios* or native Mesoamerican conquistadors. Second, the spiritual context stems from the recreation of Maya spatial landscape, and third, the viewpoint of how the Maya both rejected and embraced Christianity (Schroeder 2007).

Political Context of the Conquest

Scholars dispute the exact details of the first ‘discovery’ of the Yucatan peninsula and, thus, the Maya mainland. Several Spanish historians from the 16th century, including Bernal Díaz del Castillo and Francisco López de Gómara, claimed that in 1511, a ship bound for Santo Domingo from the Darien coast of Panama ran aground, and the survivors drifted to land near Cozumel, an island off the eastern coast of the Yucatan. Cortes during his 1519 expedition later found a single survivor, Jerónimo de Aquilar,
enslaved by the Maya, freed him, and then employed him as a translator for the duration of his trip (Allen 2013; Diaz 1963). Given the numerous accounts of Aquilar’s ordeals along with the supporting evidence of an existing sea route between Santo Domingo and Darien (Harris 1984), the validity of at least parts of this story ranks fairly high.

Contrarily, a few scholars maintain that Juan Ponce de León discovered the Yucatan on his homeward bound journey from Florida in the summer of 1513 (Closs 1976; Tio 1972). They claim that documentation from Ponce de León’s travels as well as the Chilam Balam support the claim of Spanish-Mayas contact in 1513 along the Yucatan coastline (Closs 1976). Yet, more recent works, including a replicated sea voyage based on Ponce de León’s exact navigational bearings, showed that his journey from the Dry Tortugas to the Yucatan coastline, based on the captain’s log, would not be feasible (Kelley Jr. 1991; Peck 1992). Interestingly, however, Ponce de León’s chief pilot, Alaminos, served both Cordoba in 1517 and Grijalva in 1518 in the same capacity during their voyages to the Yucatan (Closs 1976).

Proper expeditions into the interior did not occur until 1517 with the expedition of Don Francisco Hernandez de Cordoba. After receiving permission from the Governor of Cuba, Diego Velazquez, to go on a slave-hunting expedition, he set out with three ships toward the west under the expertise of Alaminos. Instead of staying within known territory, they ventured out and, 21 days later, encountered the Yucatan coastline along with Itzá Maya (Clendinnen 2003). Cordoba did not accomplish his mission as the Maya put up enough defenses to soundly defeat Spanish advances at Cabo Catoche, the northern most point of the Yucatan, and he quickly headed back to Cuba (Diaz 1963; Jones 1989; Means 1917).
A year later and with Alaminos at the helm again, Juan de Grijalva set out with four ships commanded by three other encomenderos, tribute collectors, Alonso de Avila, Francisco de Montejo, and Pedro Alvarado, who are charged with seeing to the indigenous people’s physical and spiritual well-being in Cuba (Clendinnen 2003; Diaz 1963; Farriss 1984; Means 1917). Unlike the previous mission, which sought to bring back slaves, this quest endeavored to trade for as much gold and silver as possible as well as to determine the suitability for settlement (Diaz 1963). Grijalva and his ships traveled from Cuba to Cozumel where they continued north around the peninsula, hugging the coastline along the Bay of Campeche north to the Rio Panuco before returning back to Cuba. This expedition encountered a mixture of opposition and timid greetings from the Maya and arrived back in Cuba laden with goods (Diaz 1963; Means 1917).

These brief expeditions followed the guidelines of their permits, exploration and trade (Restall 1998); however in 1526, Francisco de Montejo the Elder, a lieutenant from Grijalva’s expedition and Cortes’ conquest of the Aztecs in central Mexico, successfully petitioned the Crown for a conquest permit and soon set off under his new title of adelantado, royal deputy, to pacify the Yucatan with a band of Spaniards (Chuchiak IV 2007). Montejo’s first entrada or expedition, started in 1527. He hugged the eastern coastline of the Yucatan from Ecab (near Cabo Catoche) in the north to Chetumal in the south (Clendinnen 2003; Restall 1998). His attempts to conquer the territory failed as Montejo’s men fell to disease, hunger, and wounds inflicted by skirmishes with the Maya. Almost as quickly as it began, the first entrada ended with retreat by 1529. The second entrada during 1531-1534 met similar results as the Montejo, his son (Francisco
de Montejo the Younger), and Alonso Dávila explored interior of the peninsula and the western coastline, including Chichén Itzá and Campeche (Restall 1998).

The reasons for Montejo’s failure reflect the nature of the Yucatan Maya culture at the time of the conquest. First, he encountered many politically distinct Maya villages, which was unlike the politically cohesive Aztec empire that he encountered in central Mexico. As such, a cohesive group can easily be defeated if the central ruling entity falls, as was the case at Tenochtitlán. Conversely, the Yucatec Maya’s 16 political states that existed at the time of the Spanish arrival to the region meant that the Spaniards had to conquer each territory separately, allowing for great leeway for resistance as seen in some regions for nearly two centuries (McKillop 2004).

Second, the terrain of the Yucatan proved a fierce element for the Spanish conquistadors to overcome. The hot, humid climate weighed heavily on the armor-laden Spaniards as they attempted to traverse the thick forest vegetation that included many hooked and barbed plants that inflicted festering wounds on the soldiers. Additionally, and most importantly, the karst topography of limestone makes easily accessible water sources nearly impossible to find beyond the occasional cenote; thus, severe dehydration posed a real threat to the health of the Spaniards (Clendinnen 2003; Farriss 1980, 1984). And lastly, gold, silver, other precious metals, and exportable resources found in central Mexico as well as elsewhere in Mesoamerica distracted the Spanish from Yucatan, which lacked any such reserves (Restall 1998). As colloquially stated, “donde no hay oro no hay barcos” (Farriss 1980: 155) or “where there is no gold there are no ships.”

Adelantado Montejo retreated and decided to pursue a more profitable venue of conquest, Honduras, where he and his son learned the key tactic to finally conquer the
Yucatec Maya: indigenous allies and auxiliaries. By no means did the Spanish ever conquer a major culture without the use of indigenous allies, as exemplified with Cortes’ use of Tlaxcallan nobles in the siege of Tenochtitlan. In his third entrada, Montejo employed a mixture of allies and auxiliaries from his encomiendas, a select group of native who provide tribute and labor to an encomenderos by royal grant, in central Mexico (but not Tlaxcallans), Tabasco, and Honduras in addition to African slaves. Some encomiendas, especially from Tabasco, experienced severe depopulation as the implementation of forced servitude affected the majority of the region’s people. Other indigenous allies were afforded greater respect (Chuchiak IV 2007); some became naborías or those who volunteered to assist the Spaniards in pacifying other indigenous people and then remained after conquest as colonists. Naborías maintained their ethnic identity and received positions overseeing the Yucatec Maya (Schroeder 2007). However, unfortunately, the importance of these indigenous allies in the Yucatan slowly faded as time passed except for the occasional legal suit brought by these non-Maya to the Crown (Chuchiak IV 2007).

With new supplies and allies (both indigenous and Spanish), Montejo and his son once again descended upon the Yucatan to conquer the Maya in 1540 and accomplished much within a mere five years. The experience gained by the Spanish since the first entrada and the use of indigenous allies/auxiliaries did not fully account for the swiftness of their success; events on the Yucatan peninsula that occurred in the interim of the second and third entradas also played a vital role in the Maya’s downfall. First, the Maya faced a food shortage due to drought and locust, which helped weaken their resolve. Second, during Montejo’s campaigns on the peninsula, he riled up preexisting
conflicts among various Maya territories, sparking a quasi-civil war after the second entrada left the region (Chuchiak IV 2007; Restall 1998).

Lastly, disease remains a major factor in weakening indigenous forces after the first contact between Spaniards and the New World inhabitants, including the Yucatec Maya. In dealing with virgin populations, those never before exposed to Old World diseases, an estimated 90% of indigenous people in North and South America died due to disease introduced by European explorers (Alchon 2003; Cook 1998). The epidemics took advantage of existing trade routes dispersing from group to group relatively quickly (Alchon 2003; Cook 1998; Farriss 1984). In the 16th century, the diseases infecting the Maya consisted of airborne diseases, namely smallpox, measles, and influenza. Other less communicable diseases made it across the Atlantic within the next two centuries, including typhus, bubonic and pneumonic plague, mumps, diphtheria, yellow fever, malaria, and cholera. Overall from 1519-1649, 11 epidemics swept through Mesoamerica, which included the Yucatan. Scholars found a correlation between vegetation and severity of depopulation due to disease where higher and thicker bush, as seen in the majority of the old Maya territories including Guatemala, the Yucatan, and Belize, related to a more severe level of population decline (Cook 1998).

Working these factors to their advantage, Montejo and his army developed an effective strategy to conquer the Yucatan: establishing base camps with a defense force. By doing so, the stability of supply line exponentially becomes more secure with a mixture of Spaniards and indigenous allies remaining behind to keep the pacified town under control (Chuchiak IV 2007). This allowed Montejo and his men to quickly establish four major towns correlating to cardinal directions in the Yucatan. Campeche, a
villa or small town to the west, fell first in 1540 and provided the first base camp for Montejo as he moved inward. Soon after Mérida, the northern town, was established quickly thereafter in 1542 (Clendinnen 2003) and became the capital of the region, a ciudad or large town (Vasquez de Espinosa 1968). Within the next three years, Montejo and his army secured all the land between these two towns (Restall 1998). This campaign founded Valladolid, located to the east-southeast of Mérida near Chichén Itzá about 30 leagues or 90 miles (Chamberlain 1948; Vazquez de Espinosa 1968), in 1544 (Graham et al. 1989). Montejo and his son worked quickly and decisively to situate the Spaniards on the peninsula.

On January 3, 1543, Montejo permitted Gaspar Pacheco and his sons, Melchor and Alonso, to conquer the Uaymil and Chetumal area approximately 60 leagues or 120 miles south of Valladolid. While Gaspar took ill soon after the expedition left Mérida and returned to the capital, his sons continued on their mission (Graham et al. 1989; Jones 1989). Melchor and Alonso earned reputations as cruel and sadistic conquerors as they killed and flogged the Maya, which lead to drastic population loss due to death or emigration. They justified their actions by claiming that the Maya resisted Spanish domination, thus voiding the requerimiento portion of Montejo’s conquest permit, which protected natives from war or enslavement if they would peacefully abide by Spanish control and renounce their pagan religion (Barteet 2007). With these atrocities, Melchor and Alonso Pacheco founded a villa called Salamanca de Bacalar in the Chetumal province. In addition to this region and Uaymil, the brothers also explored into the Dzuluinicob territory, where Tipu was located in modern-day Belize, and established Spanish control, even if only in name. And thus, under Montejo’s campaign, a ciudad
and three villas were founded in order to dominate the Yucatan (Clendinnen 2003). By 1545, the Spanish had created the first semblance of a permanent hold on the peninsula.

While the Spanish swiftly conquered the region during the third entrada, Montejo still needed to recoup his losses from previous attempts as well as reward his Spanish allies from the campaign. The Yucatan might not have the riches seen in the mines of Peru or Mexico, but the region had other resources to utilize. The Spanish amassed exports ranging from lumber, beeswax, and the very important cacao beans (Vasquez de Espinosa 1968). Even the botanical knowledge of the Maya held special value as some of the earliest Spanish-Maya writing and dictionaries came from recording the Mayan name for plants and their gastronomic and medicinal uses (Scholes 1952). Though, perhaps the most valuable resource available on the peninsula was the collective labor of the Maya (Chamberlain 1948).

*Encomiendas* granted Spaniards the property rights over labor from the indigenous people but not the rights to the land itself. The Royal Crown of Spain bestowed these grants to the Spaniards but not without restrictions that guaranteed security to the Crown’s investment in the region. First, unlike the system of slavery, *encomenderos* had no claim to ownership over natives. Second, *encomiendas* could not be inherited indefinitely; the first generation *encomenderos* could pass the *encomienda* to a second generation, which would revert back to the Crown following their death. The Royal Crown would either retain the grant or pass it on to another Spaniard but not necessarily the third generation in the original family. And last, *encomenderos* could not relocate the natives from their original location. While these restrictions limited the
Crown’s potential revenue, it also bolstered their position among their subjects (Yeager 1995).

In 1549, around the time the peninsula appeared under Spanish control, Montejo handed out grants of *encomiendas* encompassing the newly subjugated territories of the Yucatan, Chetumal and Dzuluinicob, which included Tipu (Clendinnen 2003; Grant 1989). The Royal Crown claimed many encomiendas with the remaining grants distributed to Montejo’s supporters such as Gaspar Pacheco who received the Cacalud *encomienda* on the peninsula (Garcia Bernal 1978). The largest *encomiendas* were established in the mid-16th century. By the mid to late 17th century, however, *encomiendas* with more than 1000 Maya declining by 86% as the Crown began to increase their holdings in the region as a means to maintain their presence (Yeager 1995).

These grants stipulated that *encomenderos* had to “protect, supervise, and Christianize” (Farriss 1984: 87) their indigenous charges. In exchange, the Spaniards received compensation in the form of goods such as cacao beans from Tipu (Graham et al. 1989) and labor services (Yeager 1995). Additionally, they had to get rid of any idols on their *encomienda* as well as erect a church, though a church could be shared among several *encomiendas* if it were too small to individually support one (Simpson 1950). This was the ideal state; however, in many cases, *encomenderos* found a way around these stipulations or flat out ignored them, such as by limiting the amount and quality of religious instruction to a mere half hour per week, if any at all (Marcos 1992). Not only did the Crown need security, but the *encomiendas* allowed a meager number of Spaniards, only 175 *vecinos* (citizens) were on the Yucatan in 1550 (Clendinnen 2003), to maintain a system of management in the region (Farriss 1984). To accomplish this, they
used existing Maya hierarchy, which allowed the Maya to preserve a semblance of their political and social identity (Clendinnen 2003). Many encomenderos took advantage of their position, and the civil courts monitored to the best of their abilities (Farriss 1984).

The Crown formed audiencias or councils of secular and religious councilmen that not only dealt with such legal issues but also with abuses against the indigenous people (Pardo 2006; Simpson 1950). The Maya region was separated into two of these governing bodies, the Audiencia de Guatemala and the Audiencia de México, with the Yucatán and northern Belize, including Tipu and Lake Petén Itzá, falling under the Audiencia de México (Feldman 2000; Marcos 1992). These Audiencias had two periods of differing agendas. The first Audiencia phase in 1528 involved appointing the first council in Mexico City, which oidores, secular judges, sat on, including Nuño Guzmán (a vicious conquistador) (Kurtz 1982). The Crown charged the first Audiencia with overseeing legal arguments and keeping New Spain under control, such as granting encomiendas to Old Christians, a legal category of Spaniards who were born Christians and did not convert from another religion (Martinez 2008), who sought permanent settlement in the New World and married (Simpson 1950). However, this Audiencia fought vehemently with Bishop Juan de Zumárraga, protector of Indians, involving interdictions of excommunication against Mexico City and criminal charges against Franciscans (Kurtz 1982).

The second Audiencia phase represented a different mentality with a movement to give the indigenous populations more protection and power. Under the direction of President Sebastián Ramírez de Fuenleal, a bishop, this Audiencia suggested many new proposals. For instance, Fuenleal led the fight to abolish the slavery of indigenous people
in New Spain. The second Audiencia phase also wanted caciques, indigenous ruling elites, as the primary governing entity in villas (Simpson 1950). Most important to the Yucatan, the road from Mexico City to Veracruz underwent improvements in order to secure communications and create a way-station for travelers, which was the first step to connect the capital of New Spain to the peninsula (Hirschberg 1979). Overall, the second Audiencia attempted to address abuses to the indigenous populations as well as further establish the Crown’s control over New Spain.

Spiritual Conquest

Additionally, the Audiencias served to establish the reducción agenda by the mid-16th century, which called for the reestablishment of natives, the congregación program, into Spanish-styled towns that centered around a plaza. Through a series of ecclesiastical meetings and papal bulls, it was declared Indios ‘rational’ beings, yet in order to become true Christians they must first be disassociated from their pagan beliefs that were well founded in the spatial landscape. These new cities recreated the polis of the Old World, a place where civility existed. By recreating spatial order, the Spanish thought that they could transform the indigenous population into both rational people, by means of policía humana, and New Christian converts, a process of evangelization of the Indios or policía divinia (Martinez 2000). Conversion came as a two-folded prong: to be a converso, or New Christian, one must be civilized, but to be civilized one must be a converso (Wade 2011).

The earliest example of this spatial reordering in the New World appeared in Mexico City. Here, the Spanish wanted to create a new structure in order to maintain the “racially determined social boundaries” (O’Hara 2010: 33). The traza, or Spanish center,
in the middle of Mexico City was surrounded by the non-Indian parishes. As the city spreads outwards, canals separated this Spanish area from the *barrios*, non-Spanish neighborhoods, and parishes. Thus, Mexico City had not only physically constructed but also racially drawn corridors. The clergy reinforced this segregation as the regular clergy (those belonging to the mendicant orders, such as the Franciscan) oversaw the education of *conversos*, while the secular clergy (those not of a mendicant order) oversaw the Spanish parishes (O’Hara 2010). Ultimately, this spatial restructuring proved hard to maintain in Mexico City.

While the *reducción* program started in Mexico City, it served a slightly different purpose in the Yucatan, especially in the frontier (Clendinnen 1982). The Spanish meant to acculturate the Maya in four domains of their daily life: linguistic, spiritual and moral behavior, as well as the physical location. They aimed to play on the natural civility of the Maya to enforce the *lengua reducida* or the revamped version of the Maya language that was infused with a new sense of Christian morality. Alongside this new linguistic morality, the *reducción* program attempted to persuade the Maya to develop a new set of moral behavior that follows the scope of “*policía Christiana*” or Christian civility (Hanks 2010: xv). Unlike *encomenderos* who saw the indigenous population as economic assets, early Franciscan friars recognized the Maya as being receptive and rational people that could easily be molded into the model colonial Christian (Farriss 1984; Hanks 2010; Marcos 1992). The *reducciónes* created three products: *pueblos reducidos* (reduced towns), *indios reducidos* (civilized natives), and *lengua reducida* (a Christianized Maya language) (Hanks 2010).
Tomás López Medel, governor of the Yucatan from 1552-1553, wrote the Ordennzas in mid-16th century that helped guide the reducción agenda. He outlined several guidelines for this program including the general layout of congregated villages, moral orders, limitations to the exploitation of the Maya and protection for the Spanish (Hanks 2010). Generally, these guidelines worked, and the physical relocation provided religious orders with the opportunity for constant vigilance by the priests as the best and perhaps only way for Christianity to take root in the Maya (Farriss 1984). The first step in the congregación program started with the creation of doctrínas, or parishes, which the existing indigenous jurisdictional boundaries dictated in 1582. At this time in the Yucatan, only 27 doctrínas existed, which later the Spanish would divide further to create more parishes. As these parishes could be quite large, cabeceras served as the principle towns or centers within doctrínas so priests could use them as base camps to ride their circuits to visit parishioners (Farriss 1984; Hanks 2010).

The first wave of reducciónes happened in the 30 years after Medel wrote the Ordennzas, which reduced the number of Maya towns and recreated new towns. Before contact, Maya settlements were decentralized, usually small, independent villages. Under the congregación agenda, the Maya were forced into two levels of pueblo reducidos. The first type of pueblo reducidos involved the consolidation of small villages into towns. In the second, the Spanish consolidated anywhere from two to eight smaller towns into a larger town. Approximately 400 Maya hamlets were condensed into 170 in the mid-sixteenth century (Farriss 1984). This structure was called a guardianías where cabeceras were located at the center of multiple, smaller satellite pueblos called visitas. The distance between cabeceras and visitas varied with some visitas located close and
some located great distances away. This played a vital role in whether the populace resisted the reducción program or complied. In Campeche, for instance, the maximum distance between cabeceras and visitas was 30 leagues in 1582. However, as the program expanded and increased the number of guardianías, this decreased the maximum distance to eight leagues in 1610 (Hanks 2010), and more Maya fell under closer scrutiny.

Priests and friars travelled periodically from cabeceras to oversee the spiritual education of the Maya. While these clergy tried their best to oversee their parish, two major obstacles stood in their way. First, in the mid-sixteenth century, the ratio of clergy to indios remained high, especially in the Yucatan where a 1:1,600 relationship existed. Yet, in Guatemala, a more practical ratio of 1:500 could be maintained. Second, great distances created a hindrance for friars. Some visitas had weekly visits for supervision, whereas others did not see their friars for as long as a year (Hanks 2010). Extended absences and large distance allowed for Maya to resist acculturation. However, some indios missed the friars’ presence (Restall 2000). In terms of spatial orientation, the only requirement in visitas was a church, though no specifications were given beyond that. Typically, these churches served as both centers for religious education as well as social events for the community.

Cabeceras, on the other hand, had a specific geographical layout that became standard throughout the Spanish colonial world, following Medel’s guidelines. In the central plaza, a stone church became the focal point of the town. Any previous trade markets in the area dwindled down to a single market area with a repository for grain. Most importantly, the town proper was devoid of cemeteries and farms (Andrew 1991;
Regardless of Medel’s standards, variation existed in many colonial towns, such as in Campeche, Mexico. In the beginning, this town seemed to follow the standards as it had the required central plaza setup (Antochiw 2010) and the standard requirements for a *cabeceras* with “1 convent, 4 friars [and] 4 visitas” (Vasquez de Espinosa 1968: 124). As the population grew quickly in the late seventeenth century, however, Campeche hosted at least 8 churches, more than Medel’s recommendation. The most significant variation concerned the cemeteries in the town. Cemeteries should have been outside the town proper, according to Medel. But in Campeche, cemeteries were physically linked to their respective church (Hanks 2010). Some were part of the church’s foundations while others were in a plaza directly in front of the church (Antochiw 2010; Mas and Baqueiro 2010). Adherence to the standards remained important, but flexibility in adapting to local geography and political factors kept the *reducción* program alive, as evident in the port town of Campeche.

Many glitches existed in the practical application of both the *encomienda* and *reducción* programs, which allowed for the Maya to resist the Spanish incursion. For one, as aforementioned, a logistical issue arose concerning the clergy in terms of travel and the proportion of *indios* to clergy. The Spanish simply could not keep a diligent eye on the Maya on the frontier. Consequently, the Maya resisted the *congregación* program by either fleeing in large groups to the frontier area or moving between *pueblos* without official permission (Hanks 2010). Regardless of their immediate influence, the presence of the clergy in the Maya region served a beneficial role and, at times, a detrimental role. These men of the cloth were charged with saving the eternal souls of these ‘pagan’ populations of the New World (Clendinnen 1982; Perry and Perry 2002). From the start,
clergymen spoke out loudly in opposition to the abuses of the *encomenderos*, especially to the complaint that the *indios* could not be slaves (Bristol 2007). The Crown took such opposition to heart and acted to restrain their abuses at times by either stripping the *encomenderos* of their power or fining them as in the case of the Montejo family (Canedo 1952; Hanks 2010; Perry 2002). Subsequently, these apologetic clergy helped protect many Maya for nearly 30 years until 1570 (Marcos 1992).

During this time, the Franciscans saw the Maya as children to be studied and guided on the ‘right’ path (Wade 2011). Fray Andrés de Avendaño, a Franciscan friar on a visit to Tayasal, stated “If we do not understand them [the Maya], I affirm that the Indians can betray us face to face” (Scholes 1952: 414). Clergymen became scholars as they learned in depth about Maya botanical knowledge, history, and language as a means to better communicate and lead their new flocks (Kurtz 1982; Scholes 1952). Ultimately, they used the Maya habitus to synthesize a new worldview that incorporate Christian imagery and meaning. For instance, the Franciscans used *indios* to teach Christian doctrine to the children (*maestros cantores*) and to watch over the churches (*indios de confianza*), especially in the visitas. In fact, *almas de confesión* were *indios* who had met the requirements to be considered *a indios reducidos* and could administer sacraments in the absence of a priest (Hank 2010). Many Franciscans believed that their efforts were being received as they measured conversion by a number of means, such as the memorization and recitation of Christian prayers and partaking in sacraments like baptism (Wade 2010).

However, the Maya had learned quickly how to work within the system, so to speak. The Christian cross is a prime example. While the Franciscans used it as a
symbol of their faith, the Maya used it to mark boundaries and sacred locations as they had done with their ‘idols’ before the Conquest. They used the Spanish judicial system to solve conflicts amongst themselves, such as land disputes (Clendinnen 2003).

Outwardly, it appeared as the Maya became conversos, but inwardly a different reality occurred. Several events prompted the Franciscan order to reconsider their success in the spiritual conquest. For instance, in the mid-16th century, a group of 27 Maya from Mani, situated about 62 miles southeast of Mérida, schemed to kill two friars after it was discovered in pre-baptismal instruction that the Maya had to give up their slaves (Collins 1977).

Franciscans in the Yucatan slowly discovered that Maya had maintained their old belief system alongside Christianity (Clendinnen 2003) likewise the clergy in Peru discovered the same event happened within the Inka populations as well (Charles 2010; Durston 2007). This concerned the friars who were charged with the indios’ spiritual education; they took strict measures to re-educate and convert the Maya (Hanks 2010; Marcos 1992; Perry and Perry 2002). With this new information, the Franciscans sought to combat the Maya insolence by inflicting very strict discipline and thwarting potential abuses. They argued that their spiritual work and the potential to save someone from eternal damnation outweighed any abuse, yet extreme cases of abuse came before the secular court systems. For instance, Friar Diego de Landa was brought up on allegations of burning indigenous inhabitants alive in the wake of idolatry being discovered (Clendinnen 1982; Marcos 1992). What the Franciscans saw as beneficial work had detrimental effects on the Maya.
While the Maya seemed helpless against the ecclesiastical authority, they had methods of subverting the Franciscans’ control. Most notably, the Maya used claims of sexual misbehavior against the friars in order to achieve two desired outcomes. First, the Maya leaders protected the indigenous populations from religious decay with claims of absenteeism of the friars. Second, the leaders concentrated on correcting economic agreements that were violated by the friars (Marcos 1992; Restall 2000). This may be seen in the case of Fray Andrés Mexía. The friar was brought up on four sets of charges ranging from sexual misconduct to operating outside the social norms of the visita. The regidores or councilmen of Zecpedz, a visita in the Mani doctrina, wrote in a 1573 petition:

He [the friar] says mass here in a twisted fashion, once again his children are left high and dry…As to the question of feasting: he also doesn’t come because of that. In other word, there’s nobody here in the cah [pueblo] because there’s no food…Our father, the padre, he doesn’t remember us, although we lead good lives (Restall 2000: 24).

The parishioners felt that the friar demanded far more than the people of Zecpedz received, an unfair economic trade. Additionally, in 1589, the townsmen of multiple visitas associated with Fray Mexía were concerned with sexual abuse as “he does not hear a woman’s confession unless she comes to him” (Restall 2000: 25). While petitions such as these went on for over a decade, the friar was finally exiled, fined and denied hearing confessions from women (Restall 2000). This is merely one example of a larger Maya agenda to use the Spanish systems against the invaders.

The story of the Maya conquest is too complex to completely be fleshed out in a few pages. It seemed that the Maya culture was unilaterally changed forever; however, pockets of resistance survived, largely due to the inhospitable landscape the Spanish
encountered. An undercurrent of struggle existed in the frontier where the *congregación* program did not take hold, allowing for the movement of Maya into the forest to survive outside the Spaniard’s control. As more foreigners arrived in the years after the initial conquests, the number of *indios reducidos* increased as complete resistance decreased into the eighteenth century.

The History of Tipu

Located on the shores of the Macal River in the Southern Maya lowland, the *visita* of Tipu had a unique colonial experience, like other sites on the frontier such as Lamanai. It was already an established post on the crux of two major trade routes even before the Spanish invaded the area when it served as a political center for the Dzuluinicob province (Bolland 1993; Graham 2011). Ethnohistoric and archaeological evidence points to a continued occupation at Tipu from the Preclassic (starting around 600 C.E.) to the present with varying inhabitant levels; according to the census, during the Spanish colonial period, though, the population peaked in 1643 at 1100 individuals. While still unclear, it is believed that the ethnic groups represented at Tipu included the Kowoj, Mopan/Chol, and Itzá Maya (Bolland 1993; Cohen et al. 1997; Graham 2011; Jacobi 2000; Jones 1998; Thompson 1977). In pre-Conquest Tipu, the residents had stronger connections with the Petén region rather than Northern Belize (Thompson 1977).
Tipu’s first contact with the Spanish most likely happened as the Dzuluinicob province came under official Spanish control in 1544. This town served as an important reducción site as encomiendas were also established in the area, but the Spanish had more pressing concerns in the northern Yucatan to contend with at the beginning of the Colonial era in Mesoamerica. As a result of the increasing Spanish control of the peninsula in the latter half of the 16th century, thousands Yucatec Maya migrated from the north down south to the frontier, in and around Tipu (Graham 2011; Jacobi 2000; Jones 1989). It is possible that these people followed established trade networks between Yucatan provinces, Bacalar in particular, and northern Belize, including the site of Lamanai, before traveling further south to Tipu on newly strengthened connections between Lamanai and Tipu (Graham 2011; Jones 1989). In colonial Mesoamerica, migration was a complex solution to dealing with the Spanish; it could be forced, as in
the *congregación* and *encomienda* programs, or voluntary as a means of resistance or a better economic situation (Farriss 1984; Lutz and Lovell 2000). In the case of migration to Tipu, it was the former, avoidance of Spanish control, and followed a general rural-rural migration (Graham 2011; Lutz and Lovell 2000). As Lutz and Lovell (2000) indicated, this type of migration was generally undertaken by males near frontier areas, such as Tipu.

As it became increasingly evident that the Spanish could not be avoided forever, resistance movements popped up across the Dzuluinicob province in 1567-68 (Clendinnen 2003; Graham 2011). This resulted in the Spanish taking more of an interest in Tipu, perhaps for the first real time. In fact, Juan de Garzón used the *visita* as a base camp to curtail these uprisings, subdue the indigenous populations, and enforce the first *congregación* decree (Graham 2011). It was at this time that Tipu’s spatial landscape started to change to more closely resemble that of the typical colonial town with the church, Ramada style, at the center and a *casa real* for Spanish visitors along with a few other structures (Andrews 1991; Antochiw 2010; Cohen et al. 1997; Graham 2011; Graham et al. 1989; Jones 1989).

From 1568 to the first half of the seventeenth century, the Spanish did not concern themselves as much with Tipu as other areas to the north. Given the *visita*’s spot on the far reaches of the frontier, Tipu was the last on the priests’ route. The priests would start their journey in Salamanca de Bacalar (in modern-day Quintana Roo, Mexico) via canoe and travel south, passing Chetumal on the Caribbean coastline. They would then follow the Caribbean coastline to the mouth of the New River, which would lead them by *visitas* such as Lamanay, Lamanai, and Zaczuuz (Scholes and Thompson 1977). The trip took
several days, at best, to reach the final town on their journey. At times, the priests’
circuit took them to Tipu a few times a year. This remoteness allowed Tipu to maintain a
sense of autonomy that more northern visitas could not (Graham 2011; Graham et al.
1989; Jacobi 2000; Jones 1989). When the priest would visit, Tipu “functioned
nominally as [a] Christian communit[y]” (Graham et al. 1989: 1257). Furthermore, this
isolation also limited the baptisms of new souls, newborns or new immigrants; this
limited the populace found in the colonial cemetery (Jacobi 2000).

While Tipu appeared as a subservient Maya community that adhered to the
Christian tenants on the surface, all was not as it seemed. The maestros, educated Maya
placed in charge of the daily religious welfare of visitas, were maintaining the traditional
indigenous education alongside the Christian (Collins 1977; Graham 2011). During this
period, Tipu bolstered its demographics and alliances with other Maya groups in the
unconquered Petén region. The population fluctuated some in the early 17th century;
however, from the 1620s to 1655, the number of inhabitants increased from 340 to a
booming 1100 individuals (Jacobi 2000). Again, the area broke out in widespread
rebellions from 1638 to 1695 with Tipu at the center. The visita broke ties with all
colonial powers during this time. Given its isolation and semi-autonomous behavior, this
insubordinate area was not a pressing matter for the Spanish until they started a campaign
in 1695 to connect Mérida to the Petén region via Tipu. At this point, the inhabitants
decided that they would cooperate with the colonial forces, possibly not entirely of their
own will. An envoy of Tipuans actually traveled north to Mérida in order to request that
the Franciscan friars return to their priestly duties in their town. After the successful
conquest of the Petén region, Tipu lost some of its influence, and by 1707, its inhabitants
were reduced by force to Lake Petén Itzá ending the existence of Tipu (Cohen et al. 1997; Graham 2011; Graham et al. 1989; Jacobi 2000; Jones 1989, 1998).

Researchers began in the early 20th century studying the Maya colonial experience in Belize. France Scholes and Eric Thompson presented one of the first studies of Tipu in 1977 during their examination of the Probanza of Francisco Perez and Matricula (census) of Tipu. The Probanza detailed Captain Francisco Perez’s journey and subsequent claim of reward for dealing with insurgents to the south of Salamanca de Bacalar. In these folios, he clearly referenced Tipu as being far from Bacalar, over 70 leagues, which though a great embellishment, aptly alluded to the remoteness of the visita. With Tipu reconquered, a new census, or Matricula, was conducted and included the specific identities of the inhabitants. The surnames listed are of particular importance as they are similar to those found in the Yucatan, which further supports the idea of a migration of Maya from the north to Tipu. Prior to 1977, the location of this visita had been reconstructed based on the journey of Friar Bartolomé de Fuensalida in 1618 from Salamanca de Bacalar to Tipu (Scholes and Thompson 1977).

Given these documents, Grant Jones retraced these routes, which put Tipu near modern-day San Ignacio, Belize in the midst of agriculture lands. Bolstered by initial testing in 1978 by Jones and David Pendergast, initial archaeological investigations by Robert Kautz and Claude Belanger in 1980 revealed the foundations of a church the structure of which did not match pre-conquest configuration. Over the following seven years, the site was excavated in its entirety with components ranging from Preclassic to historical, including the cemetery (Jones et al. 1986).
The remoteness of the visita gave the Maya the ability to resist conquest. The Maya at Tipu defied the Spanish in their own way through rebellions and incorporating the Catholic cosmology into their own, even if it was just nominally. Since the discovery of the colonial cemetery, the bioarchaeological and archaeological investigations have supported the historic documentation, giving researchers a unique insight to the colonial frontier experience.
CHAPTER III
MAYA AND ROMAN CATHOLIC BURIAL PRACTICES

Archaeological mortuary theory claims that the cultural-designated structures present during the life of a person are reflected in their death and interment, even in the case of social turmoil as seen in 16th century Mesoamerica (Wright 2006). The mortuary programs of the Spanish and Maya greatly varied from each other and reflected the religious cosmologies of the two cultures. While separated by the Atlantic Ocean for thousands of years, these two societies came into fierce convergence during Spain’s conquest of the New World. As aforementioned, the Spanish quickly moved to ‘civilize’ and control the indigenous populations through the encomienda and reducción programs. Yet, another means of acculturation came from a change in the burial practices of the Maya. To understand how the two cosmologies were synthesized, they must first be understood in their unadulterated forms.

Maya Burial Practices

Before the Spanish arrived in the New World, the Maya had a set of traditions with broad geographic and temporal variation, though the one unifying theme shared amongst all Maya was the afterlife. As such, unlike other Mesoamerican groups whom cremated their dead, this civilization preferred inhumation as a means to prepare themselves for life after death (Webster 1997). The Maya believed that there were more than one places in the afterlife. Some, such as warriors and certain women, ascended straight to the highest level of paradise while others arrived there after a brief journey through the underworld (Thompson 1990). Yet wicked people went straight down the nine levels of Xibalba or Metnal, the underworld and had to traverse a long and
dangerous path once there. Those people who had to contend with the trip to Xibalba needed the necessary earthly grave goods to accomplish this goal (Jacobi 2000; Wright 2006). Many times, dog skeletons are found in and around burials to act as guides through the three gates and the lake in Xibalba. Palm figures, set around the burials, could also serve to act in the place of the dogs to get across the lake. In some cases, a howler monkey bone was placed in the hand of an interment in order to ward off any interferences to this journey. Often times, the hair from the interred’s head can be found in the other hand to ward off any birds that might hinder the trip as well (Jacobi 2000; Thompson 1990; Wright 2006).

Not only did grave accoutrements reflect the Maya cosmology, but burial locations and context also played a significant role in the Maya mortuary practices and can be classified into three types: symbolic, elite and non-elite. Symbolic burial locations generally are found in ch’een, or caves, which hold a special place in the Maya worldview as a place linked to earth and the underworld. They saw the distinction between life and death as flexible and connected. In many cases, these burials in caves reproduce Maya myths or are places for human sacrifice to gods (Prufer and Dunham 2009). Additionally, non-elite ancestral bones were used as ceremonial objects either as trophies or in rituals as a way to sustain the social identity (Webster 1997).

The other two burial locations and contexts are based on social status. Firstly, Maya royalty, kings and queens, normally were buried in elaborate temples and tombs (McKillop 2003; Webster 1997). For instance, King Pacal of Palenque (d. 683 C.E.) was interred in a stone sarcophagus inside the Temple of Inscriptions. The outside of the temple had nine different layers representing the nine levels of Xibalba. Pacal was
situated in his sarcophagus in a crouched arrangement with a tree emerging from his stomach, which represents the tree of life or rebirth into the afterlife. He was also buried with a jade mask, an indication of his status (McKillop 2004). These burials were very elaborate with identity markers, but they were few and far between.

Lastly, most Maya were non-elites and were buried in and around residential groups. Non-elites had a tendency to bury their dead on the eastern sides of plazas (Chase 1997; Jacobi 2000; Webster 1997). Instead of creating cemeteries separate from their abodes, the non-elite Maya kept their ancestors close by as a means of maintaining their social status, which preserves their social memory. At Moho Cay located at the mouth of the Belize River, for example, the Maya buried their dead in small pits near house structures (McKillop 2004). When a group moved from a residential structure, they would reinter their ancestors in the new structure (Webster 1997).

As with the variety in spatial location of Maya interments, so too was there slight variation in the position of the burials themselves, especially in temporal context. At the site of Santa Rita Corozal in northern Belize, for example, different mortuary practices were displayed over the site’s 1400 year history. During the Preclassic, burials were simple, primary interments arranged in an extended or flexed position underneath residential areas. Early Classic burials had two types of interments dependent on status corresponding to the aforementioned. Elite individuals were buried in tombs with elaborate accoutrements while the non-elites were simple, flexed burials within the residential areas. Stone altars replaced tomb usage for the elite Maya in the Late Classic with little change in non-elite burials. Lastly, the Postclassic saw more multiple interments than the previous temporal frames (Chase 1997). In the Pasión region of
Guatemala, extended interments dominated the Preclassic; however, during the Classic period, most burials were found flexed on their right side with the exception of the *Altar de Sacrificios* site in central Guatemala where interments were found flexed on their left side regardless of the temporal context (Wright 2006). In terms of burial orientation (direction of the head), no discernable pattern was observed and largely depended on the site (Jacobi 2000).

Roman Catholic Burial Practices

While the Maya mortuary practices varied widely, the Roman Catholic mortuary practice reflected a single style based on their cosmology that started centuries beforehand. The theology of Christendom dealt with the continuity of the dead, undead, and those souls who have yet to be born. In the early Middle Ages, the view of death was one of acceptance with no means of changing one’s spiritual status in the afterlife: since everyone died, it was seen as part of the Lord’s plan. This understanding changed, however, in the late Middle Ages to a more individualistic notion of death where an individual was to be judged on his/her own laurels (Welford 1992). “Death is quite as much about the living as the dead,” according to St. Augustine (Binski 1996: 26). A thread linked the living and the dead together, distinguishing between Purgatory and Paradise, and as such, was reflected in burial practices (Davis 1977). It was important for the body to remain whole even in the afterlife; thus, cremations were rare (Binski 1996).

Two events drastically affected how burial practices developed in Christendom: first with the legitimization of Christianity in 313 C.E. by Emperor Constantine and secondly with the Great Schism between Christendom and Eastern Orthodoxy in 1054 C.E. Gradually, people started locating burials from outside the city walls to inside the
walls to be closer to their holy saints to guarantee their fate in the afterlife and receive the
healing properties (Jacobi 2000). It was an honor to be buried inside the city walls in early Christendom, an honor that few earned. The saints, special intercessors to God for those still alive, were the first to receive this honor as they existed between the living and the dead. The bodies of saints were thought to transmit healing powers similar to the spread of contagion. Healing, both spiritual and physical, was at the center of Christianity as sickness and death were results of sin, not biological pathogens.

Churchyard cemeteries started out as churches began erecting small chapels over saints’ and martyrs’ tombs (Binski 1996). Still, religious leaders tried to limit those interred in churchyards. In the 13th century, Durandus, Bishop of Mende in southern France, declared that only men of the cloth and wealthy patrons could be buried in the churchyard (Jacobi 2000). Moreover, the condition of these churchyard cemeteries was a concern as they grew. It was proclaimed that cemeteries should be enclosed and guarded in order to prevent animal or human defilement (Puckle 2008).

From the late Middle Ages through the late 16th century, the church set further limits on churchyard cemetery interments, varying from absolutely no one to only distinguished Old Christians. Over time, the general rule developed that only baptized individuals were deemed worthy of being buried on consecrated grounds within the churchyard. In the case of limited churchyard space, charnel houses were used as consecrated space (Welford 1992). Additionally, individuals could be interred with their spouses and children or separate with their parents (Davis 1977). However, there were exceptions to this rule as in the case of the dredges of the religious community, such as suicides, unknowns, and even baptized pagans, such as Moriscos [Moors] (Jacobi 2000).
Additionally, there have been cases were social criminals, shipwrecked sailors, outsiders, and people with mental disorders were inhumed in specific locations around or near the church, outside of consecrated land. Burials in the earthly realm reflect their position in the afterlife as those outside of consecrated ground were consigned to limbo (Finlay 2000; Puckle 2008). Murderers were supposedly located north of the church while their victims could be found in every other direction [east, west, and south] (Puckle 2008).

In terms of grave accoutrements, the idealized goal was to imitate the simplicity of Christ’s original burial, which was largely followed for lay people (Hoggett 2007; McEwan 2001). In fact, grave goods were supposedly forbidden to all but priests who were limited to rosaries (McEwan 2001). At the church site at St. Peter’s at Barton-Upon-Humber in Lincolnshire, England, for instance, scant grave goods were found with two exceptions. A pair of priests was each found with mortuary chalice and paten (Waldron 2007). However, there are also many examples of variation and exception to this rule with burials found with such grave goods as mortuary crosses and staffs (Daniell 1997).

Most burials in the Middle Ages were wrapped in shrouds that were knotted at both ends of the body and held with pins. Both elite and non-elites ascribed to this program with some variation in the quality of material used (Daniell 1997; Welford 2001). The material used for the shrouds was usually linen or flax clothe; although alternative wrappings of material such as grass, hay, and moss can be found dating to a Bronze Age tradition. Elites in Europe could afford options beyond just a shroud, including embalmment, a lime lining, and coffins, although there is evidence of coffins being loaned to non-elites for the funeral procession only but not for the purpose of
burials (Daniell 1997). The hands and feet are usually found to be symbolically crossed. And lastly, the interments were buried at a variety of depths ranging between 1.83 meters and 50 centimeters below the natural surface based on issues of soil texture and seasonality (McEwan 2001; Waldron 2007).

Christian graves in Europe may or may not be indicated by long term markers. Given the rising population and virulent diseases, such as Justinian’s Plague (541 C.E.) and the Black Plague (1346-1350 C.E.), primary graves were often disturbed in order to fit burials within the consecrated ground. Thus, the more disturbed the grave, the less likely it would be marked. Wealthy individuals could afford long-term markers made of marble or brass. Primary burial disturbances can also make a graveyard appear randomly laid out even though the original layout can be quite particularly set in “straight rows, usually shoulder-to-shoulder” (Daniell 1997: 146).

One aspect of the Roman Catholic mortuary program indicative of Christian interments is burial orientation with the bodies laid out in a supine position in an east-west orientation. This pattern of orientation is not of Christian origin but can be traced back to a pagan tradition from early sun worshippers (Puckle 2008). The head faced the west in order for the feet to face the east in preparation to rise for the summoning of the Final Judgment as Christ was to appear in the east. This is the general rule, yet there are exceptions. The most notable concessions to this strict orientation were priests, who after 1600 could be found in a west-east orientation in order to rise and face his congregation upon resurrection (Daniell 1997). This fixation on the Final Judgment is also the reason that Christians found it important for the remains to be as physically intact as possible (Binski 1996; Davis 1977; Hoggett 2007; Jacobi 2000; McEwan 2001; Puckle 2008).
However, this did not stop a select few, mainly royalty, from going through the embalming process that originated in Egypt (Welford 1992) as in the case of Jane Seymour in England (Daniell 1977).

Religion in the Colonial Maya Region

As Spaniards set out to cross the Atlantic Ocean to discover new trade routes and eventually new lands, they brought their Roman Catholic cosmology and ultimately their ideas regarding the afterlife with them. They viewed time in a linear fashion that incorporated cyclical events, such as Advent, as a means to look towards culmination of a single event, the Final Judgement. An example of a major cyclical event in Christianity is the sacrament and event of transubstantiation. While it is not a true cyclical event in the sense that it is representing the first sacrifice, it is recurring in remembrance of a particular event. Pre-conquest Maya cosmology represented the exact opposite view of time; it was cyclical with linear integration. In the face of a new dominant cosmology (Roman Catholicism), the Maya elite took great efforts to garner an in-depth understanding of this new religious cosmology and eventually learned to assimilate it to their advantage (Farriss 1987). The ‘Story of the Dance of the Conquest’ details how the Maya reinterpreted Christian motifs to avoid war with the Spanish (Jacobi 2000). Crosses were understood not in the sense of the crucifixion story exactly but as a wholly Maya symbol representative of the Tree of the World, which connects the Xibalba with earthly world and heaven (Clendinnen 2003).

Additionally, archaeological investigations into early Colonial settlements, such as Tanach-Tulum, Tipu, and Lamanai, found that the pre-Contact Maya mortuary program changed in reaction to the dominating Catholic influence even in areas on the
periphery of Spanish control (Graham et al. 1989; Miller 1982; Pendergast 1981; Saul 1982). Not only were churchyard burials important to the community, but they also contributed to the monetary upkeep of the new Catholic churches in the form of taxation of the parishioners (Jacobi 2000). For example, Structure 71 at Tanach-Tulum in the Quintana Roo region of Mexico is a church that dates from approximately 1543 to 1668. The church resembled one located at Dzibilchaltun with a simple pole and thatch constructed building that included an altar, indicative of the early Colonial period. While some pre-contact Maya burial practices survived in the early colonial period, such as burials under the stucco floor to keep them in close relationship to residential areas, by in larger, the interments followed the Christian mortuary practices. They were buried in an East-West manner with no grave goods both inside and outside the church (Miller 1982).

While males and females were both represented at Tanach-Tulum, there was a near absence of older adults, which can be attributed to the fragmentary nature of the majority of burials that did not allow for proper identification of every skeleton beyond subadult or adult. Over a quarter of the individuals identified in Structure 71 were considered late adolescents and seemed to have been interred shortly after Spanish conquest of area. This is attributed to European disease and neither trauma nor nutritional stress (Saul 1982). Alongside this typical early Colonial influence, researchers found ceramics, not directly associated with burials, in the pre-Contact Maya style sequence. Structure 71 represents the early synthesis of Maya and Christian cosmology; however due to the brevity of Colonial occupation, it is unclear how this synthesis would have evolved at Tanach-Tulum.
At Lamanai in Northern Belize along the New River, the early Colonial experience was similar in some regards to that of Tanach-Tulum as the church was found burned by 1641. However, the Spanish exerted more influence here as archaeological excavations turned up evidence of two church structures, YDL I and II. The earlier church yielded 230 burials beneath the floor of the nave that were heavily disturbed in order to accommodate the larger number within the consecrated grounds. In accordance with the Christian cosmology, the interments were oriented facing east. There was evidence of some grave goods, such as bone beads and a rosary, but by far most burials lacked any discernable accoutrement. At the older church YDL II, only 13 individuals were excavated, and these were significantly less disturbed primary burials. These graves were not found within the structure itself but in a separate area to the east. Even though the mortuary practice may reflect a Christian burial, excavations found animal effigies, reflective of Maya cosmology, in association with both church structures (Graham 2011). Thus, the syncretism at Lamanai may not have been as integrated as that found at Tanach-Tulum.

While both the Maya and Christians developed complex, religious cosmologies separate from each other, it is at the clash of these two cultures that a third paradigm emerges. A syncretism occurred during the Spanish conquest of Mesoamerica that left a religion that is a blend of the old and new faiths. The Maya incorporated this new dogma into their pantheon to maintain their culture in the midst of destruction as well as to enrich it. Although the Spanish empire fell many centuries ago, the blend of religions is still evident to the present.
The Cemetery at Tipu

While all elements of Tipu’s occupation are important, particular interest has been given to the church and associated cemetery. First, the researchers found the definite remains of a Ramada-style church approximately 25 meters long and 10 meters wide, though it was poorly constructed (Graham 1991). These churches were generally “small, simple rectangular structures in which the chancel and nave form a continuous space under a thatched roof” (Andrews 1991: 366-7). The simplicity of these types of churches, found mostly on the frontier, reflected both the size of the community as well as the limited resources to build more elaborate churches as seen in Mexico City (Andrews 1991; Early 1994; Graham 2011; Jacobi 2000). At Tipu, the church had masonry walls, not all of which reached the thatched roof, and two doors on the north and south wall. Additionally, there was a wall dividing the nave from the altar at the east end of the church (Graham 2011). This feature as well as the thatched roof and masonry walls are also found at Lamanai (Graham 1991).

The second aspect extensively analyzed is the colonial cemetery yoked with the church. As seen in Figure 2, over 500 interments were found by Mark Cohen and his associates in their excavations at Tipu from 1982 to 1987, with no noticeable demographic patterns spatially linked. These burials stemmed mainly from Tipu’s time as a Spanish visita from 1544 to 1707; however, the temporal usage of the cemetery is unclear. While the town was set up as in the reducción program soon after the conquest of the Dzuluinicob province in 1544, the extensive Spanish influence in 1567-68 could be the beginning of the cemetery’s use based on dating from the church. The rebellions starting in 1638 marked a point when the church was desecrated; however, the presence
of intrusive burials at these points represents a continued usage of the cemetery past this point. Thus, the maximum extent of the cemetery is 163 years from 1544 to 1707, but could be as short as 71 years (Cohen et al 1997; Jones et al. 1986).

Figure 2. Map of the Cemetery at Tipu, Belize.

According to osteological examination, researchers determined the age and sex of the 585 historic and 19 prehistoric burials using cranial, pelvic, and sexual dimorphic elements (Cohen et al. 1997; Jacobi 2000). Individuals were placed in one of seven categories for sex: male, probably male, female, probably female, unknown adult, juvenile and unknown. As depicted in Figure 3, of the colonial burials, “176 were male [probable male], 119 female [probable female], 249 juveniles and 41 adults of unknown sex” (Jacobi 2000: 86). The determination of age was based on but not limited to tooth
development, auricular surface and pubic symphysis morphology, and cranial suture closures (Cohen et al. 1997). From this, 294 individuals were labeled adults; specific age ranges varied from adult (18-99 years old) to more specific ranges, such as 22-25 years old. For the sake of this analysis, four categories are used: young adult [18-30 years old], middle-aged adult [31-39 years old], old adult [40 + years old], and unknown, as seen in Figure 4.

In terms of spatial distribution as seen in Figure 5, the burials were found both inside and outside the church walls. The burials inside of the church seemed unevenly distributed with more interments jumbled in the back of the nave in comparison to the front toward the altar, perhaps representing a status symbol. Burials outside the church walls are located to the direct north, south, and west. However, for inexplicable reasons, these interments on the north-south axis do not extend beyond the church’s altar. With only a few exceptions, all the interments followed the Christian mortuary program and were oriented on an east-west axis. Though there were slight variations, it does not appear to represent a deliberate act but were most likely due to disturbance of primary burials. Additionally, few burial goods were found, all of which follow the Christian mortuary program and include shroud needles, iron nails for coffins, and a thurible (Graham 2011; Jacobi 2000). Osteological analysis concluded that, by in large, Tipu’s population was healthy with low rates of disease and trauma regardless of massive influxes in population size and origins; however, this does not exclude disease from cause of death. Widespread epidemics that swept through Mesoamerica with abandon killed too fast to elicit osteological changes (Cohen et al. 1997; Graham 2011; Jacobi 2000).
Figures 3, 4, and 5. Demographic and Spatial Distribution of Burials Used in Study at Tipu, Belize.

The colonial cemetery at Tipu, Belize represented the culmination of the Roman Catholic agenda to convert Maya. All the interments were buried in accord to the Christian ideology, even though Tipu was located on the frontier away from the close watch of the Spanish. Additionally, the demographics of these burials followed the expectations of indigenous population during the conquest and the expectations of the ethnohistorical record.
CHAPTER IV
ARCHAEOLOGICAL DATING TECHNIQUES

Archaeological investigations would be for naught without the ability to set a temporal context to the findings. For example, how could one distinguish a battlefield linked to the Hundred Years’ War from the French Revolution if not to date the artifacts found at the site? Archaeologists have a plethora of means to aid their endeavors, which can be confined into two, broad categories: chronometric and relative. Both dating methods offer value in different ways based on the archaeological evidence presented.

Chronometric Dating

Throughout the 20th century, especially during the 1950s and 60s, the creation of chronometric dating methodologies grew exponentially and from which two different categories of dating archaeological artifacts sprung: radioactive and geological/botanical. As a consequence of the prolific wars of the 20th century there arose new archaeological methods, of which radiocarbon dating is perhaps the best known. This method can use organic artifacts, such as wood, clothes, and bone, to determine the rate of carbon decay in the sample. Radiocarbon dating gives a chronologic date, which is very helpful in determining chronological sequences for some archaeological sites. However it can also be very problematic in that there is a margin of error associated with the resulting date, which may not be tied directly to a calendar date and loses validity if it is less than a few hundred years old (Blackham 1998). Since the first uses of radiocarbon dating, other radioactive dating methods have been invented including Potassium-Argon, Thermoluminescence, and Fission Track for dating non-organic artifacts (Joukowsky 1980; Michels 1973).
Apart from radioactive dating techniques, there are other chronometric dating methods that draw from other disciplines. Climatostratigraphy uses methodologies from geology, palynology [pollen studies] and chemistry (Aitkin and Stokes 1997; Joukowsky 1980). Dendrochronology is another popularized technique borrowed from geology, which can be used to age a tree based on the number of layers that it [the tree] has accumulated over its lifespan. Generally these ‘rings’ are formed in a set pattern, one ring for one year, and as such, archaeologists can analyze local trees in order to date contemporary archaeology sites. These chronometric dating methodologies can give absolute dates for archaeological analysis, yet they are not perfect solutions for every site. At Tipu for example, a burial chronological sequence cannot be determined with radioactive nor chronometric techniques because the relatively short use of the cemetery falls within the acceptable margin of error for many of these tests as well as the lack of preserved wood due to the climate.

Relative Dating

Before the discovery of the aforementioned absolute dating techniques, archaeologists had to rely on a different means of determining chronologies, which are still used in specific cases to confirm absolute dates and in cases where chronometric dating methods cannot be implemented. While absolute dates can measure the amount of time that has elapsed between events, a relative date provides a measurement of time in relationship to other events without an indication of time elapsed. An ordinal scale of time is used for this technique in which the gauge runs on a sliding ruler where time is measured as greater than or less than sample x. For instance, given three samples (x, y, and z), sample ’x’ could be said to be older than ‘y’ but younger than ‘z’. Unlike
absolute dating that gives concrete numbers of how much older or younger, relative dating lack this fine discrimination.

O’Brien and Lyman (1999) used the Mohs Hardness Scale developed by geologists in scaling mineral hardness as a way to explain how this scale works for archaeology and relative dating. For example, in geology, minerals are given a numeric value from 1 to 10, with diamonds being the hardest [10], orthoclase in the middle [6] and gypsum on the other end [2]. These numbers reflect a degree on a scale and are arbitrary. Moreover, while the numeric difference between diamonds/orthoclase and orthoclase/gypsum is the same [4], the degree of hardness between the two sets is not equal. In archaeology, relative dates are viewed on a similar scale from youngest to oldest.

There are two types of relative dating methodology: non-destructive and destructive. The non-destructive methods entail three different means of processes: stratigraphy, seriation and cross-dating. These techniques work on the postulation that “similar artifacts are more closely related in time” (Blackman 1998: 178). Stratigraphy follows three main principles. The first is the Law of Superposition, which dictates that the upper archaeological layers are younger than those found below. Hence the lower the layer, the older the artifacts found within the stratum should be (Harris 1979). Second, seriation is a “process of arranging comparable units along a line” (Marquardt 1978: 258). It uses matrices to compare attributes and/or the frequency of the attributes in order to create units for a chronological order (Marquardt 1978). Lastly, cross-dating is another non-invasive method for dating artifacts from multiple sites. Here, “similar artifacts are contemporaneous” (Joukowsky 1980: 283). For instance, if ‘x’ artifacts are
found at site A and site B, then they are thought to be contemporaneous. Additionally, this theory can be applied to strata. If ‘x’ artifacts is found in the first stratum at site A and the second stratum at site B, both strata are contemporaneous (Joukowsky 1980).

Stratigraphy, seriation, and cross-dating can also be used in conjunction with chronometric dating techniques in order to solidify absolute dates.

Worsaae’s Law follows similar principles of relative dating in the application of burial sequencing. In 1843, Jens Jakob Asmussen Worsaae proposed a law based on the primary notion that artifacts found in relationship to a burial are from the same chronological period as the individual. This theory is ideal for burials with a chronological sequencing problem; yet it undertakes several suppositions in order to be useful. First, there is an assumption that it is universally customary to bury artifacts as part of the mortuary program. Additionally, Worsaae postulated that heirlooms are not generally buried, which does not always hold true. In many instances, durable, utilitarian or non-utilitarian artifacts are passed down and buried with individuals who have a close relationship with the object. Nevertheless, Worsaae either overlooks the exceptions to his assumption or considers them rare enough that they would be easily recognizable in comparison with other artifacts present. Lastly and most importantly, there is an assumption that artifacts are only placed with burials at the time of interment and are not disturbed afterwards, intentionally or inadvertently (Rowe 1962). This is perhaps the most problematic assumption for Worsaae’s Law to be accepted as there are many cases that nullify this supposition.

Although Worsaae’s Law does have its issues, nevertheless, Rowe suggested that there are two cases where this principle in ideal circumstances can be applied to
archaeological dating: 1) cases were seriation has yet to be established at a site, and 2) cases where seriation has been established but is not useful in burial sequencing. This principle is not meant to be a ‘stand-alone’ dating method for burials as Worsaae seemed to suggest in 1843 but to be used in conjunction with other relative dating methods in order to provide a more cohesive and reliable chronology. Burial stratigraphy helps identify which artifacts belong to which burial, especially when combined with seriation if possible (Rowe 1962). In particular, Worsaae’s Law can be useful when there are a multitude of artifacts on the site as a whole. Unfortunately, the cemetery at Tipu did not meet the criteria for Worsaae’s Law to be useful due to the Christian mortuary program present at Tipu in terms of the lack of artifacts as well as the disturbed stratigraphy of primary and secondary burials.

Since the implementation of these non-destructive approaches, destructive relative dating techniques have been developed based on advanced chemical analysis. Many early studies in the mid-20th century used three chemicals [uranium, nitrogen, and fluoride] in tandem to date human and faunal remains (Oakley 1963; Pollard et al. 2007). Uranium is often used when the artifact cannot be dated via radiocarbon due to the artifact exceeding the maximum time range in which radiocarbon can be accurately used. In other words, uranium series dating can date artifacts ranging from a few hundred thousand to half a million years (Schwarz 1997). Still, the reliability of dating bones with uranium series is questionable due to the debatable nature of uranium absorption. In a study of prehistoric burials from Sunnyvale and the Del Mar Man, Bada and Finkel (1982) used uranium series age to determine the age of the human remains. They worked under the assumption that the bones are an open system for uranium absorption for only a short
period of time after which the remains are interred. However, Bischoff and Rosenbauer (1981) argue that this assumption is wrong; thus uranium series cannot be used as a reliable dating technique.

Unlike uranium levels that increase over time, nitrogen analysis measures the rate of nitrogen loss in bone. As in the case of radiocarbon dating, nitrogen can be tested on organic artifacts, but this test mainly focuses on dating bones [human and faunal]. Nitrogen decay varies on two main environmental factors: temperature and soil pH. Ortner et al. (1972) found that an increase in temperature along with a decrease in the soil’s pH quickens the rate of nitrogen decay. Thus, in order to accept a valid nitrogen reading, the researcher would have to uphold assumptions dealing with temperature and soil chemistry. Firstly, it is assumed that the temperature of the archaeological site maintains a constant rate. Though this idea may seem inconsequential to historic sites, especially in the New World, the temperature has varied when the archaeological sites are thousands or tens of thousands of years old. Secondly, the soil environment is assumed to be a closed and constant system after the artifact is placed in the ground. As such, nitrogen testing does not often give reliable results and is not used for most cases (Ortner et al. 1972).

**Fluoride Analysis**

Out of the three chemicals that can be used in relative dating, fluoride analysis has a long seated history in the development of dating methodology. Middleton in 1844 first suggested a link between fluoride levels in bones and determining age. The connection was again recognized by Adolphe Carnot and Emile Riviére in the late 19th century (Cook and Ezra-Cohn 1959; Pollard et al. 2007). It was not until the early 20th century
that this analysis began to be implemented as a relative dating technique. Williams and Willard in 1933 created a standard methodology that future researchers replicated. This technique interpolated fluoride amounts in bone based on titrating thorium nitrate in order to create hydrofluorosilicic acid. Here, the fluoride is recorded as a percentage weight. Within a few decades, this method was widely used. In fact, the controversies surrounding the Piltdown Man and the Calaveras Skull were laid to rest as these skeletal remains were proven to be fraudulent due to great discrepancies in fluoride values within the same set of remains, too great to be normal variation (Cook and Ezra-Cohn 1959; Pollard et al. 2007; Taylor et al. 1992).

In order to understand how these methods work in determining the fluoride content, the manner in which the fluoride is absorbed in the bone must be discussed. While nitrogen analysis deals with the protein collagen, fluoride analysis is concerned with the mineral composition of bones. Bone is made up of calcium hydroxyapatite, $Ca_{10}(PO_4)_6(OH)_2$, which is a mineral hexagonal, crystallized lattice. The hydroxyl ion (OH-) can be replaced by fluoride (F-), silicon (Si-), and chloride ions (Cl-) (Johnsson 1997; Schurr 1989). This changes the mineral crystalline structure from calcium hydroxyapatite to fluorapatite, $Ca_5(PO_4)_3F_2$ (Sudarsanan et al. 1972). While this structural change may seem counterproductive because it decreases calcium concentration, this process actually creates a stronger crystalline lattice that is tighter and thus more stable. Due to this, in modern times, fluoride is added to tap water in order to help strengthen dentine against caries (Burton 2008). On average, compact bone at the time of death is found to have less than a .05% fluoride content level (Sudarsanan et al. 1972). Archaeologically, this chemical process of changing calcium hydroxyapatite to
calcium fluorapatite occurs when fluoride ridden groundwater interacts with the burials that are in unlined burials with no obstructions that would prevent the flow of water.

In the mid-20th century, many researchers altered the technique for fluoride analysis from the accepted technique developed by William and Willard involving hydrofluorosilicic acid. Two differing techniques were implemented. Haddy and Hanson used a proton inelastic scatter technique (Haddy and Hanson 1982; Schurr 1989). However, fluoride ion specific electrode analysis is ‘especially simple, rapid, economical, and is well suited for use on well-preserved, unfossilized bone” (Schurr and Gregory 2002: 284). The general method involved dissolving a ground bone sample with acid then diluting with buffers and water. An electrode probe, similar in function to a pH probe, was then placed in the resulting solution in order to measure the millivoltage output of the sample. In order to convert the reading from millivoltage (mV) to fluoride content a calibration curve was necessary (Singer and Armstrong 1968; Parker et al. 1974; Schurr 1989). While several researchers worked with this method, it was Schurr’s work in 1989 that began to standardize the method that has since been widely used in archaeological science.

Even though many researchers supported relative dating through fluoride analysis, there were those who questioned the validity of the results due to the variables involved in the test, such as biological composition, environmental, and operator error. Firstly, the absorption rate of fluoride varies based upon the type of bone being tested. Some studies suggested that consistency was key to test either trabecular or cortical bone but not both (Callaghan 1986). Though trabecular and cortical bone have the same composition, the porosity levels differ, which would affect the absorption of fluoride. Cortical bone being
denser and less porous provides more consistent levels and rates of fluorapatite formation (Johnsson 1997). Thus, this type of bone is preferred for fluoride testing. Moreover, it is suggested that certain cortical bone in different skeletal elements can be affected by environmental changes more so than others, for example ribs as compared to long bones (Johnsson 1997). The dentine of teeth can be tested but not the enamel. Tests have shown that the enamel has a low rate of permeability, and thus the fluoride has a hard time permeating the crystallites (Parker et al. 1974). Ultimately, it is mostly consistent in sample selection essential in fluoride testing.

The individual’s age can also affect bone composition. Juvenile bones do not have a consistent mineral composition when comparing the age ranges as a whole due to histological changes in the bone as a person ages. Two year olds will have a different structure than 18 year olds (Guerrero et al. 2011; Schurr 1989). Furthermore, certain palaeopathological diseases that manifest skeletally can affect the composition of the bone’s density by excessive ossification, as in the case of periostosis, or deossification as with leprosy (Wrobel 2007). Due to this, the sample should be comprised solely of compact bone from adults that are not affected by obvious disease processes.

Soil chemistry can interfere with fluoride absorption in three different aspects: texture, temperature and composition. Soil texture plays a role in the ability of groundwater to move through the soil. Clay soils can be very compact, which restricts the amount of groundwater. Conversely, sandy and loamy soils are more loosely compacted and allow for free flowing groundwater. Additionally, elevation above the water table effects how often and how much groundwater the remains are exposed to (Callaghan 1986; Schurr and Gregory 2002). Different types of soil composition affect
not only the movement of groundwater but also the natural fluoride levels within the soil. For instance, volcanic soil has a natural high level of fluoride, which would muddle any fluoride readings (Callaghan 1986). Next, fluoride levels are sensitive to temperature changes, similar to nitrogen decay. Temperature affects the taphonomic process that bone undergoes once buried. The rate of this process affects how and when hydroxyapatite is exposed to fluoride (Cook and Ezra 1959). Temperature variation could be long term over thousands of years or as simple as season of death, especially in tropical climates (Wrobel 2007). Soil chemistry issues are not limited to those discussed, but they are the main concerns.

In addition to the soil texture and temperature, soil composition affects the electrode used to measure the fluoride content. The electrode measures the electrical charge of the ‘free’ fluoride ions; however, these free ions can bond with other ions 
\[ H^+, Al^{3+}, Fe^+ \] while the bones are in the soil. For instance, hydrogen \([ H^+ ]\) ions only pose a problem for fluoride testing when the soil pH is greater than 4, more basic. Aluminum \([ Al^{3+} ]\) ions are also especially present in clay or when red ochre is found in significant quantities. In order to overcome these issues, a chemical buffer is used, which in the case of fluoride analysis is a ‘Total Ionic Strength Adjustment Buffer’ [TISAB]. TISAB helps to negate the effects of \( Al^{3+} \) and \( Fe^+ \) [iron] as well as balance the pH of the solutions so that the \( H^+ \) ions are not a problem (Callaghan 1986; Schurr 1989).

Due to the destructive nature of fluoride analysis as well as issues related to the test’s validity, this method is not commonly used. Nonetheless, there are several prominent cases of successful fluoride analysis via an electrode; five will be discussed in detail. First, Callaghan (1986) worked on the Grey site from the northern plains of
southwest Saskatchewan, which is characterized with sandy soil. The cemetery alone was roughly 130 m² in size. Preliminary radiocarbon dating proved that the burials, 304 in total, ranged over approximately 2000 years. Of the original sample size, 101 interments were chosen to be analyzed via an ion electrode. Callaghan based his methodology on Singer and Armstrong’s work from 1968 with a few revisions. The sample, 40-60 mg of bone ash, was dissolved in .25M of HCl [hydrochloric acid] and then diluted with TISAB, distilled water, and .125M of NaOH [sodium hydroxide] (Callaghan 1986; Singer and Armstrong 1968). These results were found to be useful in determining not only a preliminary chronology but also ascertaining ideal samples for additional radiocarbon dating (Callaghan 1986).

Shortly after Callaghan’s work in 1986, Mark Schurr published his analysis of the Angel site’s burial chronology. This site dates to the middle Mississippian period, 1250-1450 CE, and is located along the Ohio River in southwest Indiana. Over 300 burials were recovered, 28 of whom were tested. Five grams of the ribs from each interment were ultrasonically cleaned and then dried for 48 hours at 158°F. This cleaned sample was then ground to a fine powder with an agate mortar and pestle. Afterwards, .50 mg was weighted and dissolved with 60 μl [micro liters] of .5M perchloric acid then diluted with 120 μl of deionized water and 120 μl of TISAB II solution. An ion electrode was placed in the resulting solution for two minutes in order to ascertain the voltage reading, which was next compared to a calibration curve to determine fluoride content. Ultimately, the results showed fluoride variation that changed previously conceived notions about the site’s occupation (Schurr 1989).
James Ezzo (1992) also used fluoride analysis to determine both the burial chronology for 141 adult burials at Grasshopper Pueblo as well as test the validity of this method of fluoride testing. Located in the east-central Arizonian Mountains, the site has approximately 500 rooms dating from the late 13\textsuperscript{th} to the 14\textsuperscript{th} century. Nearly 700 burials were excavated from the site representing a wide range of demographics; however, females outnumbered males at this site. He based his work on Schurr’s methodology with a few revisions. These included but were not limited to an increased amount of bone powder, nitric acid instead of perchloric acid and spinning the solution with a vortex mixer. With the cortical bones from the long bones, the results showed that there was an obvious chronological division of burials supported by the fluoride results from 18 burials of known chronology (Ezzo 1992).

Similar to the ecological sphere as Callaghan’s site, Guerrero and colleagues (2011) applied this method of fluoride analysis to burials found in Syria. The site of Tell Halula is a Neolithic era village dating to 7600-5500 BCE located in the middle of the Euphrates River Valley. Unlike the previous studies that used cortical bone samples, this study used the dentine from 40 teeth from 28 burials, both juvenile and adult. The one drawback from this site involved the mortuary practice that placed clay over the burials, which could restrict groundwater flow. Schurr’s method from 1989 was once again used as a template for analysis (Schurr 1989); however, the weight of the bone powder was increased in order to obtain a more accurate reading. The results proved two known theories, one involving different absorption rates based on age at death of the interment and the other involving the soil texture’s effect on groundwater movement. Yet some
sense of relative dating was accomplished between the middle and late Pre-Pottery Neolithic B era for a select number of burials (Guerrero et al. 2011).

As a whole, only one major fluoride study has been undertaken in the Maya region as a means to establish burial chronology. Wrobel tested the cortical portion of long bones from approximately 180 burials ranging over an 1100 year span at the site of Chau Hiix, a prehistoric Maya site in northern Belize (Wrobel 2007). Schurr’s method was used as template for Wrobel’s work (Schurr 1989). While the previous four studies have provided positive results, environmental and taphonomic processes played roles in restricting flow of groundwater at Chau Hiix, yielding unreliable results. The interments were largely located in architectural features, not in the soil at ground level. There was wide variability of interment practices that lead to some burials being exposed to less groundwater than others, regardless of temporal context. Additionally, it was found that trapped soil in the bones could result in an influx of fluoride. Thus, a thorough preparation of samples is necessary in order to avoid contamination. Lastly, Wrobel found that the thickness of the cortical bone samples varied enough to affect the absorption of fluoride in bones (Wrobel 2007). Ultimately, fluoride analysis at Chau Hiix was not able to determine the burial chronology.

While Wrobel’s research is the sole major project in the Maya region, Schurr did preliminary testing on five interments from Tipu. Based on the mortuary program, two Postclassic burials and three historic burials were analyzed to test if fluoride analysis would work at Tipu. Schurr’s results concluded that the cemetery at Tipu was not negatively affected by the soil environment or mortuary practices (Jacobi 2000). Hence,
some of the aforementioned concerns relating to fluoride analysis do not hold ground in regards to the site of Tipu.

Many dating techniques are available to archaeologists to aid their search in determining the temporal context of a site and can be classified into two categories: chronometric and relative. While the more methods used to narrow down the time frame of an artifact, the better, such luxury cannot be afforded for every archeological site. In the case of the colonial cemetery at Tipu, Belize, the high frequency of disturbed burials, lack of grave goods and brevity of occupation at the church leaves only relative dating techniques to set the interments in a chronological order. Of these methods, fluoride analysis offers the most economic, simplistic and reliable method available to researchers.
CHAPTER V
MATERIALS AND METHODS

As previously stated, fluoride analysis requires the cortical bone from either ribs or long bone. It is essential to remain consistent in sampling in order to reduce variability in bone density. Some studies, such as the one involving Chau Hiix (Wrobel 2007), used cortical samples from long bone samples to run fluoride testing; however, long bone sampling can be erroneous in two ways. First, long bones have a potential usefulness in other osteological analysis, as in the case of musculoskeletal marker analysis, for example. Secondly, in order to maintain consistency, the same place on the same anatomical portion of bone should be sampled in order to maintain absolute consistency. Even within the same bone, there can be variability in bone density that could potentially skew results; for instance, the mid-shaft thickness is different from either the proximal or distal ends (Schurr 1989). In contrast, ribs are advantageous for sampling, because they offer little osteological information and are sufficiently numerous that taking one rib for sampling is not detrimental to future osteological analysis. While there remains an issue of consistent cortical density, ribs offer the best case for sampling since they are basically homogenous in morphology. At Tipu, the ribs are well preserved, though fragmentary, while the long bones that preserved are not as fragmentary and have much to offer to prospective researchers. Thus, ultimately, ribs were chosen to be sampled for fluoride analysis.

The issue of bone density pertains not only to the anatomical location sampled but also to determining the particular demographic subgroups sampled at Tipu. In this regard, age is a significant factor. Bone density varies throughout the lifespan of an
individual, increasing from infancy to adulthood. Yet, bone densities can vary significantly in juveniles of the same age if they are in different nutritional situations or other stressful situations that alter juvenile development. These variations generally lessen and become consistent with adulthood. Consequentially, juvenile interments are generally not sampled for fluoride analysis (Callaghan 1986; Schurr 1989; Schurr and Gregory 2002).

As previously discussed, 294 individuals were labeled adults, which was further narrowed to the 134 individuals with sufficient ribs to sample. Among these, the ages varied from ‘adult’ (18-99 years old) to more specific ranges (22-25 years old) based on how much of the interment was available for demographic analysis. For this analysis, four categories are constructed: young adult [18-30 years old], middle-aged adult [31-39 years old], old adult [40 + years old], and unknown [18-99 years old]. Moreover, the ages are represented by the average age range to represent a single number rather than a range; for example, an individual given an age range of 22-25 years old will be reduced to 23.5 years old (see Appendix A).

In analyzing these 134 samples, Schurr’s methodology from his 1989 research was used as a template. While there are numerous other methodologies available (Callaghan 1986; Ezzo 1992; Guerrero et al. 2011; Oakley 1963; Schurr and Gregory 2002; Wrobel 2007), Schurr improved the previous methodology from prior to the 1980s, and subsequently most researchers after 1989 have followed this methodology with modifications. To begin, each rib fragment was first cleaned thoroughly using a nylon brush and reverse-osmosis water in order to remove all organic material, such as dirt, from the rib sample (Schurr and Gregory 2002). After cleaning, the rib samples were
dried in open air in the USM Archaeology Laboratory for a minimum of 72 hours to ensure the samples were sufficiently dried. After this, the samples were pulverized into a fine powder using an agate mortar and pestle. In order to avoid cross-contamination between grinding the samples, a wash of 70% alcohol was used to clean the mortar and pestle after each use. When able, multiple rib fragments from the same individual were used as a means of avoiding intra-skeletal variation of fluoride levels. Additionally, when at all possible, the powder was of the finest texture, a fine dust. Each sample, after grinding, weighed 1.5 g (Schurr 1989). The bone powder samples were stored in labeled paper cups covered with aluminum foil until the electrode analysis was started.

While Schurr’s method served as a template, adjustments were made under the supervision of Dr. Wujian Miao, an analytical chemist, in order to ensure the increased reliability of results and to adjust for advancements in the equipment since 1989 (Miao 2010). Schurr’s protocol called for .50 μg [micrograms] of bone powder to be dissolved in 60 μl of .5M perchloric acid solution, to which 120 μl of deionized water and 120 μl of TISAB II buffer is added. While Schurr used these amounts in 1989, they are very small, and the probe did not have a sufficient enough quantity to get an accurate reading. Consequently, the amounts of the sample weight and liquid solutions were multiplied by 10 to produce more reliable results. For the sake of this analysis, 5 mg [+/- .01mg] from the original 1.5 g sample was measured using an analytical scale, accurate to .01 mg.

Once weighed, the sample was placed in a glass vial that included a plastic stopper and was labeled. While plastic is recommended in order to avoid chemical in the glass from reacting with the solution, measures were taken in order to minimize exposure. The bone powder was dissolved in 600 μl of .5M perchloric acid and then
diluted in 1200 μl of deionized water and 1200 μl of TISAB II buffer. Instead of preparing all 140 samples at once, only three samples were prepared and tested at a time. This ensured that the ions from the glass would not have adverse reactions to the solution and affect the test. Additionally, to ensure that the bone powder was as dissolved as possible, the vial was ultrasonically agitated for 280 seconds with the stopper on top. Before the probe can be used, the sample was allowed to cool to room temperature, which was essential due to the temperature sensitivity of the probe readings (Miao, pers. comm., 2010).

In order to first use the VWR Fluoride Electrode Probe, which read the millivolt output of the sample, the device was first calibrated using a set of standard, known solutions of sodium fluoride (NaF). In descending order of percentage fluoride, the sodium fluoride standard solutions were .19 ppm (parts per million), 1.9 ppm, 19 ppm, 190 ppm, 1900 ppm. The resulting values in millivolts were then plotted out on a graph in order to determine the relationship between millivolts (mV) and fluoride content. A simple slope intercept formula (y = mx+b) was delineated from this graph in order to correlate millivolts to the fluoride content. While it was recommended to recalibrate the probe after each daily session in order to determine the slope intercept formula, the standard solutions were tested each day to check for fluctuations. It was determined that it was not necessary to recalibrate the probe (Miao 2010).

After calibrating the probe, the samples were ready to be tested. The probe, which resembles a pH probe, was inserted into the solution so that the crystal tip was submerged in liquid but did not rest on the bottom of the glass vial as the probe’s crystal bottom responsible for the reading is sensitive to touch. Once immersed, the probe
immediately began to give a reading; however, it was critical for the machine to stabilize, indicated by a solid symbol on the device, before results are recorded. In order to avoid drift over time, the results were recorded immediately after stabilization happened. Each sample was tested twice in order to verify the results. A drift of 5% between the two results was acceptable (Miao 2010).

Using the slope intercept formula from the calibration, the millivoltage results were converted to fluoride content. They were then imported into ArcGIS, a computer program that works with GIS [geographic information system] to compile spatial data for analysis, in order to distinguish levels of burial chronology based on a classification system in ArcGIS. There were six different methods of classification that the computer program uses to sort nominal data: Jenks, equal interval, defined interval, quantile, geometric interval, and standard deviation. Each method has its benefits, but the Jenks method fit the purpose of this analysis. This method not only can be used for most data sets but also with “unevenly distributed data” as the case in the case of Tipu (Price 2010: 68). Jenks separates the data based on natural breaks in the data groups (Price 2010). While the user can chose any number of levels, the data from Tipu was divided into five different levels with level 1 representing the youngest chronologically in the cemetery and level 5 representing the oldest interments in the cemetery. While these levels are arbitrary, they are the best way to analysis the results as relative dating is subjective by definition.

Two different categories were analyzed spatially: sex and age. These categories were broken down by spatial location in the cemetery [north, south, west, inside front of the church, and inside back of the church] as well as by chronological level. Due to the
scarcity of unsexed and/or un-aged individuals, they were ignored during this statistical analysis in order to ascertain a better statistical understanding of the fluoride results. While researchers cannot get a complete burial chronological sequence for the entire cemetery at Tipu due to the constraints of sampling, the 140 interments can offer a good statistical model in determining any categorical patterns.
CHAPTER VI
RESULTS AND DISCUSSION

In the colonial visita of Tipu in Belize, the remains of over 500 individuals, dating from the mid-16th to early 18th century, were discovered and excavated. These interments represent an excellent insight to the biological effects of the Spanish Conquest of Central America. While there has been much bioarchaeological analysis of the series to date, there has not been an opportunity to place this data in a temporal context to track changes over time due to the lack of chronological references of the burials. Therefore, fluoride-ion analysis was conducted on 134 adults in order to attain a relative chronological burial sequence.

Results

The sequence is based on the pF or parts fluoride recorded in the sample. The value for each individual was determined via converting the original reading of millivolts from the electrode to parts fluoride with results ranging from 4.15 to 6.09 pF. The osteological sample was run twice and then the two numbers averaged together as seen in Table 1. The range between the numbers was typically insignificant, signifying a low level of intra-observer error and providing confidence in the accuracy of the values.
Table 1

Sample of Burial Testing Variation

<table>
<thead>
<tr>
<th>Burial</th>
<th>Test #1</th>
<th>Test #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT 32</td>
<td>5.22</td>
<td>5.21</td>
</tr>
<tr>
<td>MT 47</td>
<td>5.11</td>
<td>5.12</td>
</tr>
<tr>
<td>MT 432</td>
<td>5.48</td>
<td>5.47</td>
</tr>
<tr>
<td>MT 513</td>
<td>4.90</td>
<td>4.90</td>
</tr>
</tbody>
</table>

As a means of testing the validity of the results, two factors are considered: the depth of the burial and the degree of disturbance. Generally, the older burials should be deeper than more recent burials; however, this could be highly variable for a number of subjective reasons pertinent to the situation at Tipu, such as the available labor force needed to dig the graves, number of individuals buried at once as in the case of deaths caused by epidemics and fluctuating population at the visita proper. There was no distinct correlation between stratigraphy and chronology as seen in the example below.
Depths below the surface are most helpful in regards to disturbed burials. Again, with burials stacked upon each other, the deepest one should be the oldest burial as the more recent burials would not necessarily be buried deeper. Within the sample, three specific cases were analyzed to verify the results.

First, MT 369 was located directly above MT 393 to the north of the church, as specified by the excavation notes. Both burials are males that were in their early 20s. MT 369’s deepest recorded depth was 62 cm below the surface, 25 cm above MT 393. While both are classified as Level 3 burials, MT 393 had a reading of 5.06 pF as compared to MT 369 having 4.93, a difference of .13, which is indicative of an older burial.

The second case involved burials MT 400 and MT 404, located to the west of the church. MT 404 was found underneath MT 400. These two were both young adult males.

![Figure 6. Association between Burial Depth and Temporal Level Using Fluoride Analysis for Select Burials at Tipu](image-url)
with MT 400 being slightly older. While again they are classified in the same general
temporal level as with the previous case, there is a difference of 0.23 between the burials
with the fluoride levels being 4.67 and 4.90 respectively. Thus, they follow the
parameters of relative dating with the older interment located ten centimeters below the
younger one. Both the aforementioned cases support the validity of these results.

Lastly, MT 417 and MT 419 represent a small stack of disturbed burials
associated with another burial MT 415. According to the excavation notes, MT 415,
disturbed MT 417, and MT 419 were mixed with MT 415. For this group, it was hard to
distinguish which burial was primary and which were secondary. According to the
fluoride results, MT 417, a young male, was the oldest interment with a fluoride level of
5.59. MT 415, another young male, had a value of 5.49. While there is a 0.10 difference
between these two, they are both relatively temporally close. However, MT 419, a young
female, represents a completely different context with a fluoride level of 4.89, a more
recent burial in relationship to the other two. The problem with this grouping is that the
depths of the interments do not match up with temporal framework. While MT 417 is the
oldest burial, it is the shallowest one, and MT 415 located 20 cm deeper with MT 419
sandwiched between the two. The only explanation is that the rib samples were
erroneously assigned to the wrong burial as previously explained. A more plausible
account is the rib samples from MT 419 belong to MT 417 and MT 417 belongs to MT
415.

In the area south of the church, MT 169 and MT 171 present a special case to
study. These individuals were discovered buried with their hands intertwined, strongly
suggesting that they were interred at the same time.
Both of the individuals were females around the same age (early 30s). The fluoride results were 5.39 and 5.41 respectively. All the samples were tested twice in order to avoid errors in testing, and as such, a difference of 0.02 is within the normal deviation for any one sample. Thus, it is reasonable to place MT 169 and MT 171 in the same temporal context further confirming the validity of the results.

The highest reading obtained among the 134 individuals tested was 6.09 pF and denotes the oldest burial while the lowest reading was 4.15, signifying the youngest burial. In order to subdivide the data into chronological groupings analysis, the results were broken down into five groupings or levels based upon Jenks’ methodology, which separates the data “at naturally occurring gaps between groups of data” (Price 2008:68). This type of data classification is used with non-uniform data sets and basically sets intervals with variable number, as seen at Tipu in Figure 7 below.
In this data set, Level 1 represents the most recent burials or the ones placed in the cemetery last and Level 5 represents the ‘oldest’ interments or those first placed in the burial grounds. Levels 2, 3, and 4 signify the gradient between these two extremes. Five groups were subjectively chosen in order to get enough temporal distance without sacrificing nuances to better distinguish the groupings, those buried in the 16th century versus those in the 18th century. It is important to note that these group divisions are not definitive and are subjectively chosen as a means to analyze the data by both spatially and demographically within each temporal level.

Level 1. Level 1 represents the 18 burials with a pF level between 4.15 and 4.46. There were 13 young adults (18-30 years old) and five mature adults (31 years or older).
Of the 18 total individuals, males accounted for 72% of the 18 individuals, and females for 27%, which follows the general distribution of the sample. When comparing the spatial distribution in Level 1, the interments were nearly equally divided between outside and inside the church. Outside of the church, the burials were twice as likely to be buried to the west as compared to the south, and no burials in this level were found to the north of the church. In regards to inside the church, there was no preference to the front or back of the nave.

Figures 9, 10, and 11. Level 1 Age, Sex, and Spatial Distribution.

Level 2. Level 2 included those burials with pF levels of 4.58-4.93, which accounts for 27 interments. As seen in Level 1, the majority (74%) of the individuals were between 18 and 30 years old. Males constitute 78% of the Level 2 burials, with one individual of undeterminable sex and females comprising the rest, which again follows the sample distribution and expectations. In terms of spatial distribution, 74% were
buried outside the church. As expected, most interments were found to the west of the church with only two located to the north and seven to the south. The inside of the church was utilized differentially, however, with a preference given to the front of the church were 71% of these burials were found.

Figures 12, 13, and 14. Level 2 Age, Sex, and Spatial Distribution

**Level 3.** The 40 burials with pF values between 4.94 and 5.32 were placed into Level 3. Continuing with the age distribution pattern seen in the previous levels, 68% of these interments were young adults, 25% were mature adults, and 7% were adults of indeterminate age. However, in this temporal group, the sex classification was nearly equally divided between males and females, representing 52% and 43% of this level respectively. Spatially, there seems to be no drastic preference for placement of burials outside the church (62%) and inside the church (43%). Among the burials outside the church, the area to the west was well represented, comprising 56% of the interments; the
remaining 11 burials were divided between the northern and southern areas. Inside the church, there was no apparent preference in regards to spatial distribution.

*Figure 15, 16, and 17. Level 3 Age, Sex, and Spatial Distribution*

*Level 4. Level 4 includes 40 samples with readings between 5.34 and 5.71.*

Similar to the previous level, young adults comprised the majority of the burials (70%) and the sex distribution was nearly equal (43% males and 45% females). However, in this level, there seems to be a slight spatial preference with 57% buried within the confines of the church, and of those, they were equally distributed between the front and back of the nave. Outside the church, the remaining 43% of the burials were predominantly located to the south (47%) and the west (35%).
Figures 18, 19, and 20. Level 4 Age, Sex, and Spatial Distributions

Level 5. The oldest chronological group had pF ranges from 5.72 to 6.09, which accounted for eight individuals. In keeping in line with the previous levels, young adults represented three-quarters of this subsample, and again, males and females were equally distributed. Additionally, there was a preference to being interred within the church, representing 71% of the Level 5 burials. Within the nave, 60% were buried toward the front and 40% toward the back. Outside the church walls, there were no burials to the north. The south had slightly more interments (66%) compared to the west (34%).
This research examined the burial sequence at the colonial Maya cemetery at Tipu, Belize. Contrary to the original assumptions, the results showed that the area within the church was not filled to capacity before the surrounding area outside the church was used. Instead, a highly variable pattern of spatial use of the church and cemetery was observed and highly depended on temporal ranges. Before discussing in depth these findings, there are several factors that should be mentioned that could have a bearing on the analysis. Primarily, it was noted during processing that some of the ribs were treated with the preservative polyvinyl acetate to stabilize the bone. Unfortunately, the sample had to be ground to a fine powder in order to be fully dissolved by the perchloric acid. With the preservative, the bone could not be processed as well as non-preserved samples creating a powder with coarser texture and, at times, small particles, which could have negatively affected the probe’s reading. However, these particular
samples with preservative were tracked but no distinct trend in results (e.g., all high or all low) was noted.

Accurate assignment of ribs to an individual was also an issue. Ribs, especially fragmented ribs, can be hard to separate when they were recovered in a cluster of burials at the cemetery. While some comingled cases were easy to be secure about the various elements belonging to a specific individual, cases with individuals of similar build and rib morphology could have had elements joined into a single sample. This had two effects: 1) it decreased the sample size as a whole, and 2) it reduced the number of cluster samples that could be used to create a more detailed picture of the cemetery’s temporal and spatial uses.

Although these concerns must be kept in mind, the results appear overall to have been valid as seen in the specific cases aforementioned and reveal a complicated picture of temporal usage of the cemetery. It was expected that the Maya would first have utilized the nave of the church due to both Maya and Catholic cosmological viewpoints of the sanctity of holy grounds (Webster 1997; Welford 1992). They would have then begun to use the areas outside of the church only as the inside became too crowded. In the older temporal ranges, 67% of the burials were found inside the church and 33% were outside. This did change some in the more recent ranges with 59% found outside and 41% inside. While the area inside the nave was never completely abandoned, it does appear that the frequency with which it was used decreased over time, although the change is admittedly small. This may indicate that the Maya at Tipu were increasingly selective as to who was buried within the church wall given the limited space.
A peak in burials within the church is seen during the middle levels (levels 3 and 4), which accounts for more than 63% of the burials inside (Figure 23). This could coincide with the rise in population over time due to the reducción program as well as fluctuations into and out of Tipu during the rebellious periods during the late 17th century as people, mainly males, sought a means of survival and mutiny against the invading foreigners. The immigrating Maya are thought to largely be coming from the Yucatan, an area that had longer and more intense colonial contact with the Spanish. And as such, they would be expected to have been more indoctrinated to the Catholic cosmology, and be the maestros of the church, a special status within the population at Tipu.

Figure 24. Burials Grouped in Temporal Clusters by Area of Interment in Church

In terms of burial location as a sign of status, it would be expected that a burial’s placement within the church could be indicative of status with the area closer to the altar holding special meaning.
Figure 25. Burials Inside the Church by Temporal Level.

However, the results showed that this did not follow expectations and actually varied over time, as seen in figure 25. When considering only males inside the church, an interesting pattern emerges. In the older temporal levels (Levels 4 and 5), most males (60%) were buried toward the back of the church. In contrast, in Levels 1 and 2, only 36% were located in the rear with 64% closer to the altar. Therefore, these results reverse expectations in that while they were all presumably of a higher status than those outside the church, there could be a further delineation of status amongst those in the nave. This could very well be due to an influx of males, particularly elites, in the mid-17th century that immigrated to Tipu. Interestingly, Cohen et al. (1997) did not find any osteological indicators suggesting status differences by spatial location.

Figure 26. Male Burials by Location in Church Nave and Temporal Level
In another line of analysis of cemetery usage over time, Jacobi in his dental investigation found that eight individuals had dental modification, which he suggests indicated “some of the original or earliest native Tipu population converted by the Spanish” (Jacobi 2000:175). He hypothesized that this pre-conquest practice would decline with increasing Catholic influence. Additionally, 75% of these individuals were located in the nave of the church, indicating a sign of status in an otherwise homogeneous population. Out of these eight, three burials were tested using the fluoride ion electrode: MT 81, MT 174, and MT 317. The results of this analysis do not support Jacobi’s hypothesis. MT 174 and MT 317 were both assigned to Level 3, and MT 81 grouped in Level 4. While all interments were definitely not the most recent Maya buried in the cemetery, this data also suggests that they were not among those first interred at Tipu. The retention of some pre-conquest characteristics could be from blatant resistance to the Spanish. In regards to the two burials located in the nave, the one furthest from the altar is the earlier burial. It could be suggested that age may have played a role, then, as the one toward the front of the nave is demographically older than the one toward the back regardless of when temporally they were buried. Additionally, there may have been a preference based on the sex of the individual; however, the sample size is not large enough to make any definitive assumption given that MT 174, a female, was one of two of Jacobi’s original sample found outside the church walls.
Table 2  

*Location and Temporal Level of Burials with Dental Modification*

<table>
<thead>
<tr>
<th>Burial No.</th>
<th>Location</th>
<th>Temporal Level</th>
<th>Sex</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT 81</td>
<td>Nave- Back</td>
<td>4</td>
<td>Male</td>
<td>20</td>
</tr>
<tr>
<td>MT 174</td>
<td>West</td>
<td>3</td>
<td>Female</td>
<td>30</td>
</tr>
<tr>
<td>MT 317</td>
<td>Nave- Front</td>
<td>3</td>
<td>Male</td>
<td>30</td>
</tr>
</tbody>
</table>

Jacobi (2000) also speculated that family groupings or plots may have existed at one point at Tipu. However, he found that any familial clusters were disturbed to the point of becoming indistinguishable on the surface, especially in the nave. Yet a pattern could be discerned with temporal data. While there are no overarching spikes of burials in any one spatial location or temporal group, it could be argued that previously discussed clusters could be related, especially the two individuals (MT 169 and MT 171) holding hands. Conversely, it could have been mere happenstance that due to spatial constraints or unmarked burials that they were disturbed. Further analysis of these clusters may in the future be able to tease out these questions.

While not all-inclusive to the whole population at Tipu, the temporal sequence provided by the fluoride ion analysis sets a framework for future research to track how health patterns changed over time in a unique colonial setting. It was previously thought that they had at least nominally integrated Christianity into their existing cosmology based on the changes in mortuary program, such as burial orientation. However, the Spanish conquest of the Maya is still a complex picture. The usage of the cemetery was variable, yet the results did provide insight as to how the cemetery was utilized.
CHAPTER VII

CONCLUSION

This is the first attempt at creating a burial chronology for the colonial Maya cemetery at Tipu, Belize. The ability to have a working chronology gives researchers the ability to track the effect of the Spanish conquest on a Maya population on the frontier. It allows researchers to track trends over time. This site represents the largest and most well-preserved colonial Maya series and offers an invaluable opportunity to better understand the lives of those individuals living on the Spanish frontier. The Tipuans managed to exist in a time where the Spanish were forcefully remolding the cultural and physical landscape. This visita may have been created during the reducción and congregación programs, but the Maya were able to recreate a world that they could survive in. Many researchers have studied this particular collection from a macro point of view without much ability to track the micro history of these people.

The results of this study revealed a more complex picture of the cemetery’s usage than previously thought. While a predictable usage of the cemetery may exist, the results did not reveal any discernable pattern. First, this study seems to support the ethnographic records detailing a fluctuating population into and out of Tipu during the 17th century. Second, the nave of the church was not filled front to back as was expected, but there may be subcategories of social or religious status, which would account for the front and back of the nave being used concurrently over time. Though the cemetery was used simultaneously, the earlier burials were more likely to be interred inside the church versus on the church grounds. And lastly, pre-conquest Maya characteristics, dental modification for instance, did survive well into the Spanish conquest, which signifies that
there were still veins of rebellion against the Catholic cosmology beyond physically escaping from *visitas* and *pueblos*.

This research could benefit from increasing the sample size. The limitation on the methodology for fluoride analysis does not allow for the inclusion of juvenile burials; however, as the collection is reanalyzed, new interments could be added to the sample size. As this chronology is a relative one, a larger sample size would likely allow more detail and identification of trends to be gleaned from the information. Additionally, new research in reanalyzing the multiple clusters and stacked burials at Tipu could aid this endeavor tremendously. As these clusters are teased out, rib samples could be reassigned to new interments, possibly clarifying the confusion seen in MT 417, MT 418, and MT 419, for example. As well, stable isotope analysis could be applied to these results in order to track immigration in and out of Tipu over time. This could also be useful in further identifying familial groups.

For the residents of Tipu, life on the frontier during the Spanish conquest represented a chance for cultural survival and agency in a time fraught with confusion. Though not a complete sequence for the entire cemetery, this study does give the ability to track the physical effects of cultural change from the time the first generation of Maya met the Spanish to several generations after the first contact. Lacking constant, direct supervision from their conquerors, these particular Maya adapted to the changes in their own timing to survive in the ever-changing world.
## APPENDIX A

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Abbreviations:

- **Sex**
  - Male = 1 or 5
  - Female = 2 or 6
  - Undetermined = 4

- **Age**
  - Undetermined = A

- **Location**
  - ib = inside the church, back
  - if = inside the church, front (near altar)
  - west = outside of church to the west
  - south = outside of church to the south
  - east = outside of church to the east
REFERENCES


Chase, D. Z. (1997). Southern Lowland Maya Archaeology and Human Remains: Interpretations from Caracol (Belize), Santa Rita Corozal (Belize), and Tayasal (Guatemala). In S. L. Whittington, & D. M. Reed (Eds.), *Bones of the Maya: Studies of Ancient Skeletons* (pp. 15-27). Washington, DC: Smithsonian Press.


