The Depth of Death: Investigating the Mortuary Pattern of an Ancient Maya Chultun

A Thesis Submitted to the Committee of Graduate Studies
in Partial Fulfillment of the Requirements for the Degree of Master of Arts
in the Faculty of Arts and Science

TRENT UNIVERSITY, Peterborough, Ontario Canada

Anthropology M.A. Graduate Program
September 2023

ABSTRACT

The Depth of Death: Investigating the Mortuary Pattern of an Ancient Maya Chultun

Emily L. Jurasek

The ancient Maya utilized aspects of their landscape within their religious rituals and ceremonies, including caves. The study of ritual cave use is known as Maya cave archaeology and archaeologists in this subfield suggest that all holes in the earth, be it natural or man-made were viewed as ritually significant spaces to the ancient Maya (Brady and Layco 2018). This thesis analyzes the mortuary pattern of a chultun in relation to natural cave rituals and/or burials to determine if both types of subterranean spaces functioned in ritually similar ways. Through excavation of a dual-chambered chultun at the site of Ka'kabish, this research established a parallel pattern between burials found in natural caves and the burials within a chultun/artificial cave. In so doing, this thesis provides much needed data in support of applying Maya cave archaeology theories and practices in the excavation and study of ancient Maya chultuns.

Keywords: Chultun, Maya cave archaeology, mortuary archaeology, burials, caves, Belize, Late Classic Period, Terminal Classic, Postclassic Period

ACKNOWLEDGEMENTS

This thesis was made possible with the help and support of many people in my life. First, I must thank Dr. Helen Haines, one of my co-supervisors in the graduate program. It was her continuous support, guidance, and endless advice that helped shape this research. Further, I thank Dr. Haines for giving me the opportunity to travel abroad (for the first time in my life) to excavate an ancient Maya chultun in Belize. The experiences and knowledge I've gained as one of her graduate students is invaluable, and I am grateful for her continual support during the completion of this work.

I must also thank Dr. Jen Newton, my other co-supervisor during the course of this research. Dr. Newton's knowledge of bioarchaeology and mortuary archaeology provided integral guidance in my own writing and helped frame my own thoughts and ideas. Moreover, Dr. Newton's assistance during the excavation of Chultun B-2, at Ka'kabish, Belize, was extraordinarily helpful, and I truly could not have done it with out her.

Further thanks are given to Dr. Jocelyn Williams. As part of my supervisory committee, her advice and mentorship helped me realize important questions about the work I was doing, thus shaping the thesis into what it is today. Additional faculty in the graduate program at Trent University are also thanked, as well as my fellow students in the program for their support and friendship. I must also acknowledge funding for this research provided by Trent University.

I'd also like to acknowledge usefulness of comments and edits submitted by Dr. Gabriel Wrobel, of Michigan State University. As my external reviewer, and a prolific figure in cave archaeology, his perspective was extremely helpful in finalizing the complete draft of this thesis.

To the excavation team in Belize – Stephanie Aultman, Anna Dixon, Tamara Moore, Sonia Sanders, Milsy Westendorff, and Victor Lopez – I owe endless gratitude. This group of individuals all brought with them important strengths to the excavation of the chultun which were immensely helpful and necessary during the excavation process.

Finally, and most importantly, I would like to thank those closest to me. To my partner, Jason, you've been with me since this start of this journey, and I am forever grateful for your unyielding support and love. You've calmed me in times of stress, made me laugh through anxiety and tears, and you've listened to my ramblings about chultuns more than anyone else. To my siblings, Ann and Scott, you never really asked about my research which meant that when I was with you I got a small break from it all, so thank you for letting me relax. Finally, to my mom and dad, thank you. You knew I could do this even when I wanted to give up, even when I was stressed and overwhelmed, you were there for me. This work wouldn't have been possible without you both and your endless love and support. I dedicate this thesis to you, mom and dad, thank you for everything.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER ONE: INTRODUCTION

The ancient Maya evolved through centuries to become a complex society with ruling kingships and religious establishments. They used their religion to interact with and understand the landscape in which they lived, constructing their own cosmological beliefs about the creation and organization of the universe and the earth. Because of this, aspects of the Mesoamerican landscape which the ancient Maya inhabited became integral in ritual ceremonies and religious concepts involving the creation of the world. For this reason, caves, which are frequent throughout the Maya landscape, were important features in Maya cosmology and rituals.

Through a subfield of Maya archaeology known as cave archaeology, cave systems throughout the Maya landscape have been extensively mapped and excavated to understand the patterns of ritual use within these spaces. To understand these caves, Maya cave archaeologists argue that research must embody an emic approach (Brady 1997:603; Brady and Layco 2018:47; Moyes and Prufer 2013:228), allowing archaeologists to look at these subterranean spaces as the Maya did: as sacred holes in an animate and sacred earth (Brady 1997:603; Thompson 1970). Maya cave studies (e.g., Brady 1997; King et al. 2012; MacLeod and Puleston 1978, to name a few) investigate caves as ritual locales visited by the ancient Maya where they performed mortuary rituals necessary for the dead to travel into the underworld, or where public ceremonies were carried out to honour the gods and venerate ancestors (Woodfill 2021). Cave archaeologists further argue that any and all holes in the earth are sacred in this way, whether natural or constructed (King et al. 2012:612). This thesis evaluates this claim through application of cave archaeology theories upon the investigation of an ancient Maya chultun.

Chultuns are defined as artificial pits dug into the limestone bedrock (Cagnato 2017:75) and are known to have served various functions for the ancient Maya (i.e., storage spaces, middens, sweat baths, water cisterns). The first extensive research on the function of these spaces was conducted by Puleston (1965, 1971) who concluded that chultuns were food storage spaces. Since then, additional chultun studies have added to this literature, establishing an understanding of the utilitarian function of these spaces (e.g., Calderón and Hermes 2005; Sprajc et al. 2021; Stemp et al. 2018). In contrast, the literature regarding the ritual function of these spaces is severely limited despite roughly one-fifth of excavated chultuns within the Southern Maya Lowlands functioning as a burial space (Carlos 2018:86).

In spite of this lack of literature surrounding ritual chultun use, cave archaeologists claim that because chultuns are holes within the earth, they functioned as artificial caves, carrying out cave rituals within communities which lacked access to natural subterranean spaces (see Brady and Layco 2018). This thesis will add to literature regarding ritual chultun use by studying an ancient Maya chultun – Chultun B-2 at the ancient Maya site of Ka'kabish, Belize – which was used as a burial space during the Postclassic period (A.D. 900-1500). This research will also assess the applicability of Maya cave archaeology theories and methods in the investigation of Chultun B-2's mortuary pattern to address the useful of these methods in chultun excavations.

Research Objectives

The site of Ka'kabish, Belize (Figure 1.1) is excavated by the Ka'kabish Archaeological Research Program (KARP) which has thus far mapped a total of five chultuns at the site, including Chultun B-2 of the Baker group, which is the only dual-chambered Ka'kabish chultun to date. This research will utilize data from both the east chamber (excavated by the author in 2022) and the west chamber (excavated in 2012) to address the following research questions:

1) What is the composition of east chamber compared to the west chamber?
2) What is the overall mortuary pattern of Chultun B-2 compared to that of caves?

3) Is cave archaeology a useful lens for interpreting the chultun's mortuary pattern?

Addressing these questions will be a crucial step to further our understanding of chultun function, specifically in a mortuary context. Investigations of Chultun B-2 will be useful in inferring the ritual functions of additional chultuns as Ka'kabish, and by extension the Maya lowlands. It will also provide information about the people who used these features, and what types of meaning they might (not) have ascribed to these artificially made subterranean features.

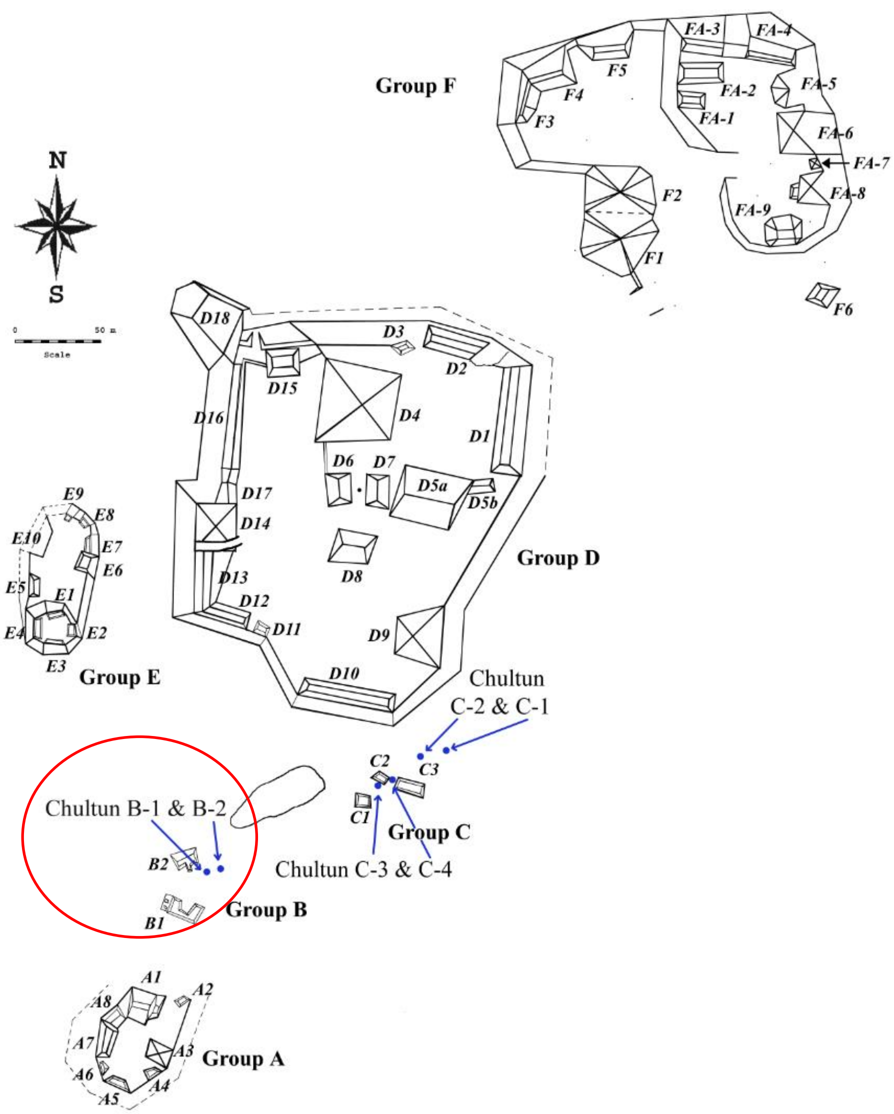

Figure 1.1. Site map of Ka'kabish, Belize, with area of study circled and Chultun B-2 indicated (adapted from Haines 2020:46).

Thesis Outline

Chapter Two of this thesis presents a summary of the ancient Maya, with a focus on the timeline of the society's development and subsequent collapse. The chapter also discusses the geographical range of the Maya and the geological formations which dominated the landscape, with specific discussion towards the karstic nature of the terrain.

Chapter Three moves onto chultuns and caves in the ancient Maya world. The first section defines chultuns and summarizes their forms and functions, as well as questions claims that they functioned as artificial caves. The chapter further details key aspects of Maya cosmology and its use in cave archaeology theories and methods. Mortuary archaeology is briefly presented. The chapter concludes with a summary and a brief explanation as to the possible conclusions this thesis may produce based on the theories presented.

Chapter Four presents the data from Chultun B-2. The data is presented in two parts based on the chultuns two chambers. The chapter concludes by briefly answering the first research question of this thesis.

Chapter Five establishes the function(s) of Chultun B-2 and discusses the final two research questions of the thesis. The primary purpose of this chapter is to demonstrate the applicability of cave archaeology theories and methods in the study of chultuns. It does so by summarizing established cave ritual patterns and comparing them to the mortuary pattern of Chultun B-2.

The sixth and final chapter of this thesis is the conclusion. It re-introduces the main research topic of this thesis and presents of overview of how it was addressed and additional research findings. Chapter Six also establishes limitations within this research and highlights potential areas for future research.

CHAPTER TWO: MAYA GEOGRAPHY, GEOLOGY, AND CHRONOLOGY

The cultural region of Mesoamerica, geographically known as Central America, has seen the rise of some of prehistory's and history's great civilizations. These include the early Olmec culture from sites such as La Venta and San Lorenzo along the Gulf coast; the Aztec empire of Central Mexico; and the Maya, located in eastern Mesoamerica. Knowledge of the Maya has changed dramatically since the first documented encounters by earlier European explorers. Areas such as the tropical jungles of the Maya Lowlands were once believed to be incapable of supporting civilization; the environment was characterized as uninhabitable, lacking the resources necessary to support large populations (Rathje 1971:275). However, archaeologists today are aware of the wide variety of environmental conditions that supported the Maya civilization through many centuries. Notably, the Maya culture can be traced back to as early as the Archaic period (roughly 8000 to 2000 B.C. [Lohse 2010; MacNeish 2001]). The following millennium witnessed the rise of technological innovations, monumental ceremonial centers, kingship, and religion throughout the Formative period (2000 B.C. to A.D. 250), and the subsequent decline of the culture after its Classic period (A.D. 250-900). The Postclassic era (A.D. 900-1500) saw migration and new population growth in the north and the establishment of new leaderships and conflicts up until the Contact and Colonial times at around A.D. 1500.

The following sections will outline the geographic area of the Maya to highlight the broad ecological and climatic zones that provided the subsistence and resources necessary for a rising civilization. The next section outlines the geology and geomorphology of the landscape to understand the karstic formations that the Maya used in many rituals. The final section describes the culture chronology of the Maya, beginning with the emergence of migrants into the Americas and ending with the modern Maya that still inhabit parts of the region today.

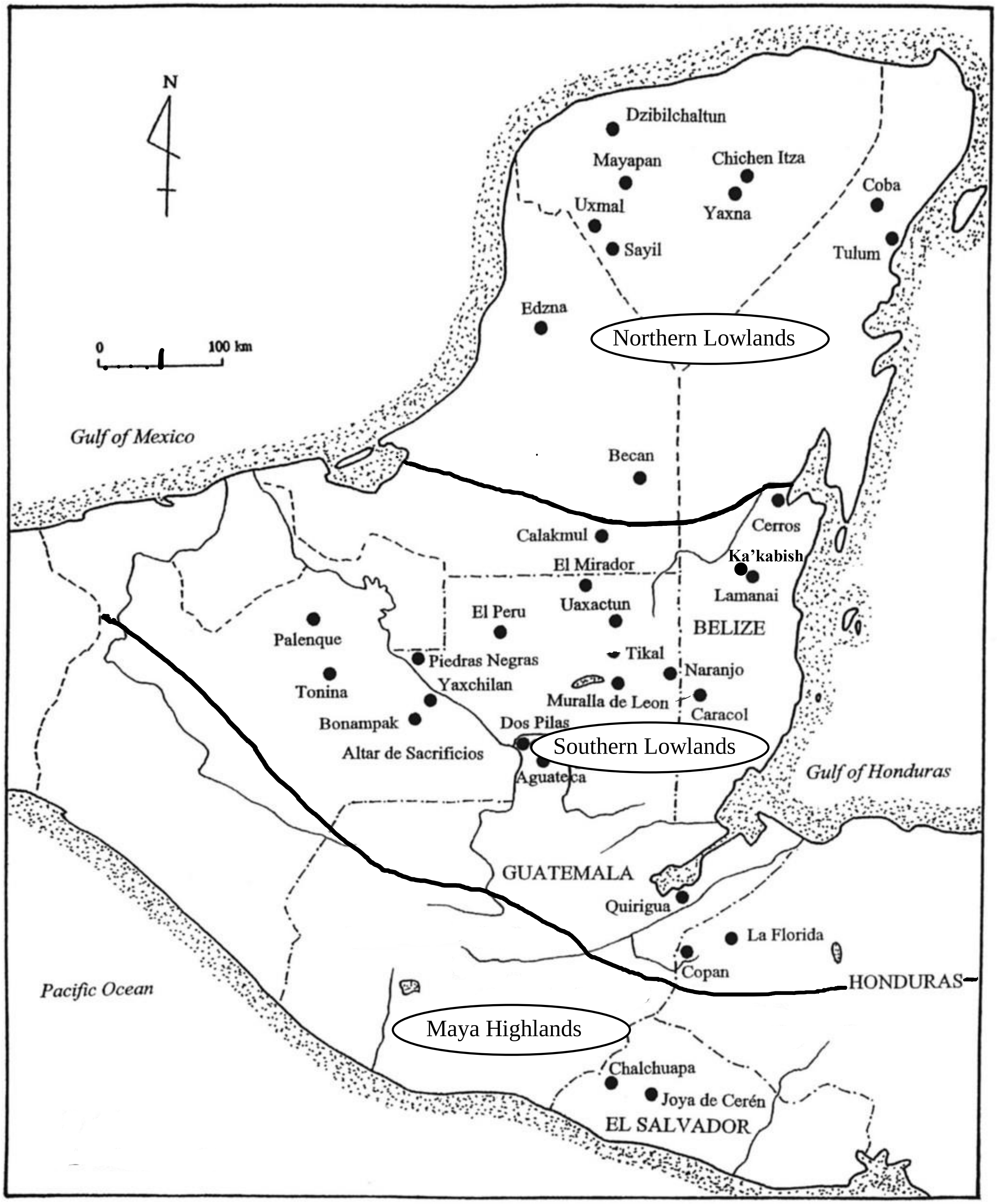

Figure 2.1. Map of the Maya culture area marking the three main regions: the Highlands, the Northern Lowlands, and the Southern Lowlands (adapted from Aoyama 2005:292).

Geography of the Maya

The Maya cultural area covers much of eastern Mesoamerica. Its geographical span encompasses modern-day Belize, El Salvador, Guatemala, the Yucatan Peninsula, and parts of Western Honduras and Chiapas. Archaeological literature divides the Maya cultural area into two subregions, the Maya Highlands and the Maya Lowlands (Figure 2.1). Southern regions of the Maya culture, specifically Honduras, El Salvador, and southern Guatemala constitute the Highlands (McKillop 2004:32) and contained early centers such as Kaminaljuyu and Chalchuapa. The Maya Lowlands consists of two subregions: the Southern Lowlands and the Northern Lowlands. The Southern Lowlands border the Highlands and include Belize, the Lowland areas of northern Guatemala and Honduras (McKillop 2004:29), regions home to many of the Classic period's large urban centers, such as Tikal. The Northern Maya Lowlands are located in north-east Mesoamerica and parts of the Yucatan Peninsula (McKillop 2004:29). Notably the distinction between these three subregions rests upon cultural and ecological foundations. The Maya of the Highlands and the Maya of the Lowlands (both north and south) adapted according to their varying environmental conditions, as described below.

The Maya Highlands

The Maya Highlands are situated along the mountain ranges of southern Guatemala and the Chiapas of Mexico. The topography is marked by various slopes along the Pacific coast of Guatemala, and intermontane basins throughout the region (Demarest 2004:11). The variation in average annual temperature and rainfall follows a mesothermal Highland climatic pattern (McKillop 2004:35). Rainfall along the piedmont of the Highlands averages amounts of 3,000 to 4,000 millimeters (mm) annually, while average precipitation along the coast ranges from 2,000 to 3,000 mm (Neff et al. 2006:292). At higher elevations, annual rainfall is significantly less, averaging approximately 500 to 1,000 mm (McKillop 2004:335). Precipitation throughout the Highlands is seasonal, with rainfall occurring primarily during the summer seasons beginning in late April and early May until the end of the season in late September/early October, with a brief drought period occurring during the mid-summer season (Neff et al. 2006; Meija Ramon and Johnson 2018:4).

Trends in temperature mirror that of seasonal rainfall patterns. The hottest months of the year coincide with the start of the rainy reason. Temperatures during these summer months average 27° Celsius (C) but can drop to a minimum of 2° C during January (Meija Ramon and Johnson 2018:4). Annual temperatures at lower elevations range between 16° to 30° Celsius on average, while the average annual temperature in higher elevations frequently falls below 15°C (Freidel et al. 2011:19; McKillop 2004:35). These climatic trends create a humid, subtropical environmental region (Grove 2016). Pine and oak forest thrive within this ecological zone, with coniferous pine trees prominent at 2,000 meters (m) elevation (Freidel et al. 2011:19; McKillop 2004:35).

Much of the fauna within this region were heavily exploited by the Maya Highland people. Along the Pacific coast, fish and mollusks constituted much of the diet and the importance of marine shell from these coastal locations can be shown on the painted ceramics and murals of the Maya (McKillop 2004). The rivers provided further subsistence in the form of fish, turtles, shellfish, shrimp, iguana, and crocodiles (Masson 1999:296). It is also important to note that most of these animals also made their way into the ritual iconography of the Maya. Shells were a very common ritual artifact (Halperin et al. 2003; Hansen 2001:53), and crocodiles were often depicted in an anthropomorphic form (Lohse 2010:344). Bones from these animals were also utilized in ritual deposits, carved with iconography, or used within offerings (Blackmore 2011).

Importantly, this is a geomorphically active region due to the volcanic formations found throughout, creating much of the land's topography (Freidel et al. 2011). Subsequently, volcanic tephra (ash, dust, and other such products of volcanic eruption air fall; Neff et al. 2006) provides the necessary nutrients for the production of highly fertile soil (Freidel et al. 2011). As a result, Highland soils were ideal for the intensive agricultural practices necessary to support the dense human populations of the region (Neff et al. 2006). Moreover, active volcanoes supplied the Highlands with abundant obsidian, a type of volcanic glass commonly transformed into sharp, cutting implements and utilized throughout the Maya world (McKillop 2004:33). The obsidian of the Maya Highlands represented its most prominent export. Obsidian tools, along with volcanic basalt blocks used for grinding maize and other sustenance, were heavily imported into the Maya Lowlands (Masson and Freidel 2012; McKillop 2004:33).

Notably, the river system of the Highlands made for easy trade routes. Access to the Motagua river proved to be a major transportation route between the Maya Highlands and the Carribbean coast, allowing the trade of obsidian, jade, and green stone (McKillop 2004:33). Travel was also prominent along the Pasion and Chixoy Rivers, where obsidian exports could reach inland areas of the southern Maya Highlands, and Maya Lowlands (Masson 1999).

The Maya Lowlands

The Lowland region broadly encompasses the Yucatan Peninsula (the Northern Lowlands), as well as the Peten and Belize (the Southern Lowlands). In contrast to the varied topography of the Highlands, the Lowland region is relatively flat with a gradually decreasing elevation eastward towards the Caribbean Sea (Wahl et al. 2006:381). Geologically, the bedrock of the Maya Lowlands is mainly composed of limestone, a soft and porous sedimentary rock. The type of limestone varies and can be grouped into four main grades of density, each of which correlates with specific uses within the Maya Lowlands (Horowitz et al. 2021). The first type, densely consolidated hard limestones, were commonly used for monumental architecture (Horowitz et al. 2021). An additional type includes especially hard re-crystallized limestone which could be easily reshaped for the user's needs (Horowitz et al. 2021:552). Some flaked tools could be produced using a third type of older limestone that had become silicified (Horowitz et al. 2021:552). The final type of limestone was more loosely consolidated and was used as foundation fill for structures or crushed for earthen floors (Horowitz et al. 2021:552).

Apart from limestone's general uses, it also contained an important stone in the everyday lives of the Maya: chert. Found throughout the limestone deposits of the Lowlands (McKillop 2004:32), chert deposits tend to vary in both quality and quantity. Very little chert is found in the Northern Lowlands, however northern Belize, located in the Southern Lowlands, contains a large outcrop of fine-grained chert (this region is appropriately labelled the Northern Belize Chert Bearing Zone [NBCBZ]; Horowitz et al. 2021:553; McKillop 2004:32). Chert's importance throughout the Maya Lowlands cannot be overstated. It was used to form a variety of tools and weapons, and frequently used within ceremonial contexts (Demarest 2004:12). Notably, those sites within the chert-bearing zone were specialized producers of these tools and ceremonial stones. The high-quality chert from northern Belize was often traded across vast distances of the Lowlands, underscoring the extensive trade networks between Maya cities (Hester and Shafer 1984).

The climatic conditions of the Northern Maya Lowlands, paired with the karstic nature of the limestone, produced a region that generally lacks permanent surface water, but does however contain several underground cenotes. In contrast, the Southern Maya Lowlands contain several large lakes and extensive river systems. Average temperatures throughout the Lowlands range from 25°C to 30°C (McKillop 2004:34). Annual precipitation in the Northern Maya Lowlands averages amounts of 500 mm while the Southern Maya Lowlands can see annual rainfall reach amounts of 2500 mm (Dunning et al. 2010). Notably, this annual average varies from year-to-year and is also highly seasonal. The Lowlands cycle through extremely dry seasons from January to as late as June and rainy seasons from June to December, a time in which 90% of annual precipitation falls (McKillop 2004; Wahl et al. 2006:381).

Moreover, the limestone bedrock means water can penetrate deep into the landscape, consequently leaving the Maya Lowlands with a complex groundwater system and the ability of the individual cities to adapt to this hydrology was critical to their survival and success (Dunning 2002). Not only did the Lowland Maya need to be able to collect rainwater during the rainy season, but they also needed to live close to those areas where ponds or semi-permanent water bodies could be found for most of the year. Natural or man-made ponds called *aguadas* were considered an important topographical feature that functioned as seasonal reservoirs for Lowland populations (Brewer 2018). Another prominent feature of this wet/dry tropical environment was the *bajos*. Approximately 40 to 60% of the Lowlands consist of perennial wetland ecosystems formed within the region's basins (Brewer et al. 2018:199; Dunning et al. 2010). The bajos often contain aguadas and marshes. Bajos also supported much of the flora and fauna important in the economy of the Maya Lowlands.

These wetlands were home to semi-deciduous forests in the Southern Lowlands and deciduous forests in the North (McKillop 2004; Wahl et al. 2006). Prominent trees included mahogany, ceiba, and rosewood, while the low-lying shrubs of the bajos included native palms, rubber plants, sapodilla, tropical cedar, and chicle, and additional species of annual ferns and grasses (McKillop 2004; Wahl et al. 2006). Fauna species present here are like those of the Highlands, including turtles and fish from the river systems. Deer (white tailed and brocket), wild boar, as well as lizards and avian species were also frequently hunted for subsistence, while the bones, shells, and feathers from these species were commonly used in rituals (Demarest 2004:144). Notably, bajos could stay dry for sufficient lengths of time, allowing the growth of maize, tubers, and other dry season crops (Demarest 2004:137). The most common form of agriculture in this environment was intensive wetland agriculture which utilized all the natural species of the plants and animals living within the ecosystem to support the populations of Lowlands sites and urban centers (Dunning et al. 2002).

Geology and Geomorphology of the Maya Landscape

Decades of archaeological and geoarchaeological studies of the Maya landscape have proven that the Maya region is more geologically, hydrologically, and geomorphologically complex than previously assumed during nineteenth-century research (Beach et al. 2008:310). It is now known that the Maya utilized and adapted their landscape for a variety of purposes and used the geological features surrounding them, including mountains and caves, as a guide and enhancement for their rituals (Moyes and Montgomery 2019).

Given the focus of this thesis, it is therefore necessary to understand the complicated geology and geomorphology of the region. This section will outline the geological processes that created a region riddled with caves (as of 2019 a total of 82 caves had been investigated by archaeologists in Belize alone [Moyes and Montgomery 2019:3]). In so doing, the distribution and variation of caves across the Maya landscape will be outlined to provide insight into which areas of the region had greater access to these natural subterranean spaces. The following section will discuss these topics through explanations of karstic landscapes, carbonate rock dissolution, and other geological and geomorphological characteristics of the Maya Lowlands and Highlands.

Karst Landscapes

The northeastern zone of Central America in which the Maya reside is classified as a karst landscape. Researchers posit that it is the karstic nature of both the Lowlands and the Highlands that created the valleys, ridges, sinkholes, caves known across the region (Beach et al. 2008; Brennan et al., 2013; Day 2007; Dunning et al., 1998; Krause et al., 2019:147). Ultimately, what makes these features, and the landscape as a whole, karst is the process of karstification upon the bedrock of Central America.

Previously mentioned in the discussion about Maya geography was the presence of limestone bedrock within the Maya Lowlands (both Northern and Southern) and portions of the Maya Highlands. This limestone represents a type of carbonate rock, a geological feature found across Central America, and predominantly in the Maya block. Spanning across most of the Maya area is a basement of Upper Paleozoic clastic and carbonate sediments, and Cretaceous (145.5 million to 66 million years ago) to Eocene (56 million to 33.9 million years ago) carbonate and evaporative rocks (Marshall 2007:78). In total, an approximate eight percent of Central America (roughly 40 000 km^2) is composed of this carbonate bedrock formation, and of that whole, forty percent of it is within the Petén region of northeastern Guatemala and parts of Belize (Day 2007:155).

According to Dunning and colleagues, “wherever carbonate rock occurs, karst landforms and processes follow” (1998:88). Karstic landforms occur in limestone terrain because these and other carbonate rocks undergo processes of dissolution caused by acidic running water and precipitation of rock from saturated water (Dunning et al. 1998:88). Karstic features such as cockpits, towers, valleys, sinkholes, and cave systems are products of the vulnerable composition, density, and porosity of the carbonate/limestone bedrock (Brennan et al. 2013:3180; Day 2007:155).

While much of Central America, and by extension the Maya area, is karstic, the type and intensity of karstification varies regionally. There are six key factors affecting the course of karstification: 1) sedimentary depositional environments, 2) bedding and lithification, 3) tectonic history, 4) groundwater flowpaths, 5) altitude, and 6) general climate and ecological variability (Troester et al. 1987, as cited in Day 2007:155). Subsequently, certain areas of the Maya region may be covered in karstic sinkholes (i.e., the Yucatan Peninsula), while other areas demonstrate their karstic nature through extensive cave systems (i.e., southern Belize).

Geology of the Maya Lowlands

Karst landscape features have formed throughout the Maya Lowlands, from the southern bases of the Maya Mountains to the northern reaches of the Yucatan Peninsula. These karstic formations are due mainly to a large expanse of carbonate rock (i.e., limestone) known as the Yucatan Platform, that spans across the Petén region, parts of Belize, and the Yucatan Peninsula (Dunning et al., 1998:88; Marshall 2007:81).

The limestone bedrock deposits within areas of the Southern Maya Lowlands, specifically Belize (home to the ancient Maya site of Ka'kabish, the area of focus for this thesis), creates two separate geologic and geomorphologic areas. Due to the type, and timing, of the carbonate rock deposition, northern Belize is characterized by Tertiary limestone and Cenozoic rocks covering about 5000 km^2, while the southern half of Belize, the Maya mountains and its surrounding area, contains a composition of Paleozoic metasediments, metavolcanics, and Cretaceous limestone covering another 5000 km^2, or roughly twenty-five percent of the country

(Day 2007:162; Gischler and Hudson 1998:335). Moreover, the two zones – northern and southern Belize – differ in elevations above sea level (asl). The tertiary carbonate bedrock of northern Belize ranges from 200 to 300 m asl, and southern Belize can reach elevations of 900 m asl within areas of the Maya Mountains (Marfia et al. 2003:938-939). This elevation difference is enough to cause variation in aspects of climate and ecological characteristics between both regions, which is a key factor to promote variation in karstification of the landscape.

Thus, while there are several features common to most Belizean karsts, such as sinking allogenic streams, valleys, and cave systems, the most extreme karstic formations affecting both topography and cave development are found within the Cretaceous carbonates downslope of the Maya Mountains and southern Belize (Miller 1996:103). This includes large and extensive cave networks, and over forty years of archaeological work have mapped out a total of 150 km of these multi-leveled cave systems (Miller 1996:117; Moyes and Montgomery 2019). In contrast, the landscape of northern Belize is known as poorly developed karst, which contains karst limestone escparments, dolines, springs, and smaller cave systems than its southern counterpart (Day 2007:162).

Further north, past the borders of Belize, the Northern Maya Lowlands lie upon a low-relief, limestone plateau that has been weathered and undergone forces of dissolution to form karst hills and depressions throughout the Yucatan Peninsula (Beach et al., 2008:310). Notably, the elevation of the Maya Lowlands decreases on a northward gradient and, subsequently, the Yucatan Peninsula sits at a range of zero to 30 m asl (Marshall 2007:81). Further, the carbonate platform of the region originated during the Cretaceous and Tertiary periods, creating a highly soluble limestone (Munro-Stasiuk et al., 2014:159). The karst landscape here is expressed as thousands of sinkholes and cenotes (flooded collapsed pits that access the groundwater table

[Marshall 2007:81]). The presence of these sinkholes, and the porosity of the limestone has created a region with intense subsurface water channels, rather than above-ground water flows, such as rivers and streams (Munro-Stasiuk et al., 2014).

Geology of the Maya Highlands

The geology of the Maya Highlands is slightly different from that of the Lowlands in terms of both its elevation and composition of geologic elements. The Maya Highlands, geologically known for its mountainous topography and volcanic activity, is composed of igneous, metamorphic, and sedimentary rocks built from volcanism in the region, as well as tectonic thrusting, folding, and tension (Beach et al. 2015:5). This deposition of rocks, as well as specific folding activities that created the deformations of valleys and ridges across the landscape, occurred during the Cretaceous-Paleogene age (Marshall 2007:78). Moreover, the geomorphology of the Highlands is controlled mainly by lithology and processes that deform the sedimentary rocks as well as activities within the metamorphic basement of the region (Marshall 2007:78). Certain regions of the highlands also contain Cretaceous limestone deposits, such as the state of Chiapas, Mexico, where there are dozens of surficial bodies of water, creating a known lake district in the region (Franco-Gaviria et al., 2018).

Culture Chronology of the Maya

The chronology of the Maya has typically been divided into three main categories within the archaeological literature: the Formative (or Preclassic) period, the Classic period, and Postclassic period (Table 2.1). Early twentieth-century ideas of the Maya culture often centered around the Classic period (A.D. 250-900) as the start of Maya civilization. Early works posited that the construction of great temples, intensive agriculture, and expanding population all began in the Classic period, and thus the more ‘primitive’ peoples of the preceding period were ‘Preclassic'. However, conceptions have since changed as more research was dedicated towards understanding the origins of these Classic Maya trends and it was found that iconography and writing, early forms of kingship, and massive monumental constructions all appeared prior to the Classic period. Thus, the term 'Formative period' is employed here, as it is a widely accepted and more appropriate term to describe the time before the Classic period (see Willey 1984).

Table 2.1. Ancient Maya time periods (based on data present below).

Period		**Date Range**
Contact/Colonial		A.D. 1500+
Postclassic	Late	A.D. 1350 – 1500
	Middle	A.D. 1250 – 1350
	Early	A.D. 900 – 1250
Classic	Late/Terminal	A.D. 600 – 900
	Early	A.D. 250 – 600
Formative	Late/Terminal	300 B.C. – A.D. 250
	Middle	1000 – 300 B.C.
	Early	2000 – 1000 B.C.
Archaic		8000 – 1000 B.C.
Paleoindian		pre-8000 B.C.

Notably, the earliest traces of the Maya culture have been found in the Archaic period (8000-2000 B.C.), however, it is important first to highlight the hunter-gatherer groups that occupied regions of Mesoamerica during the Paleoindian period (prior to 8000 B.C.). The proceeding sections will then highlight the Formative period (2000 B.C.-A.D. 250), divided into three main temporal spans (the Early, Middle and Late), and then focus on trends of the Early and Late Classic Periods (A.D. 250-600 and A.D. 600-900 respectively). Lastly, the Postclassic period (A.D. 900-1500) is described, along with a brief discussion of the Maya cultural continuity during the Contact/Colonial period.

The Paleoindian Period (Pre-8000 B.C.)

The Paleoindian period marks the earliest occupation of the Maya region, or more generally, the earliest occupation of the Americas. The earliest occupants of Mesoamerica were immigrants from the Old World who crossed what is known as the "Bering Strait" into the New World. These were *homo sapiens* who migrated from Northeast Asia sometime during the Late Pleistocene (Zeitlin and Zeitlin 2000). The absolute date for this crossing is unknown and has been heavily debated for decades. Widely accepted chronologies correspond with the appearance of the Clovis point (an early flaked stone tool) within western North America (Prufer et al. 2019).

Most evidence for the Paleoindian period in Mesoamerica is scarce, coming mainly from rock shelters and consisting of non-perishable artifacts; it is rare that the perishable technologies likely used by these people (including tools made from bone and wood) preserve at all (Clark and Cheetham 2002:279). Thus, data for Paleoindian occupation relies heavily upon lithics. The earliest stone tools of the Paleoindian people were bifacial spearheads and spearthrowers (Demarest 2004:54; Prufer et al. 2019), with one of the earliest bifacial stone tools found in Mesoamerica being a Clovis projectile point (Prufer et al. 2019). These tools were used for a variety of purposes (i.e., choppers, scrappers), most prominently though they functioned as hunting implements used to hunt now-extinct fauna (MacNeish 1964:532).

Notably, the Paleoindian period has been referred to as the "big game hunting" period, however subsistence patterns mainly focused on smaller omnivorous subsistence strategies (Lohse 2006; MacNeish 1964). The Paleoindians of Mesoamerica were comprised of nomadic microbands, with a subsistence strategy focused on gathering wild plants (such as squash, chili, and avocado) and hunting small mammals (such as rabbits, turtles, and rats [MacNeish 1964]).

The social organization of these nomadic bands was characterized by reciprocal economic relationships and integrated through kinship and marriage, substantial differences in wealth and status were absent (Demarest 2004:57). It is generally accepted that the Paleoindian period ended at approximately 8000 B.C. (Lohse 2006; Zeitlin and Zeitlin 2000).

The Archaic Period (8000 - 2000 B.C.)

The start of the Holocene, a generally warmer and dryer epoch than the preceding Pleistocene, marks the start of the Mesoamerican Archaic period (MacNeish 2001). This period spanned roughly 6000 years (8000 to 2000 B.C.), during which time populations increased and spread across the landscape (Canuto 2016). Within the Maya region several sites from northern Belize provide dense Archaic artifact assemblages, most notable among them is the site of Colha (Rosenwig 2015:136). Indeed, research in this area has identified Archaic groups as the likely precursors of the ethnic Maya (Lohse 2010).

The site of Colha has yielded what is known as the "Colha Lithic Tradition" which consists of two distinctive Archaic lithic types: Lowe points and constricted unifaces (Lohse 2010:318; Rosenwig 2015). The Lowe point is the most diagnostic technology of the Archaic period. It is a type of microblade and likely functioned as a hafted knife (Rosenwig 2015). This macroblade tradition underlines the foundations of a technology that would persist throughout the Maya culture (Lohse 2006:219). The constricted uniface type point was characteristic of the late Archaic period and saw extensive use in the Early Formative period (2000 - 1000 B.C.; Lohse 2006). This tool-type was used to cut hard materials and was likely employed as a wood-working tools, suggestive of horticultural practices (Lohse 2006; Rosenwig 2015:137). Archaic lithic assemblages also are comprised of *manos* and *metates*, stone grinding tools whose presence provides evidence for intensive processing of plants and seeds during this time (Zeitlin and Zeitlin 2000:76).

While the Archaic people still relied mainly on foraging and hunting of small mammals, by the end of the period there was a noticeable shift towards intentional cultivation of plant foods (Zeitlin and Zeitlin 2000). During the Archaic period nomadic microbands began to rely on the seasonal growth of certain plants and during the rainy season these microbands coalesced into larger macrobands for more intensive foraging of specific food crops (MacNeish 1964; MacNeish 2001).

This intentional selection of specific plant foods led towards early horticultural practices which produced the earliest Mesoamerican domesticated species by the end of the Archaic period: maize, the bottle gourd, and squash (Demarest 2004:56). By 2750 B.C., pollen evidence collected from Cob and Cobweb swamps in Belize reveal horticultural activities of forest clearance and widespread maize cultivation; patterns related to early agriculture (Zeitlin and Zeitlin 2000:87) Notably, maize soon became a staple crop within the Maya region, and the vast expansion of other domesticate plant species, along with the wide-spread Lowe point, suggest that there was some form of interaction amongst populations by the end of the Late Archaic (Iceland and Hester 2001; Lohse 2010; Rosenwig 2010; Zeitlin and Zeitlin 2000).

The Early Formative Period (2000 - 1000 B.C.)

The end of the Archaic period marks the end of the preceramic era of Mesoamerica. The start of the Formative (or Preclassic) period is thus marked by the appearance of the first Maya ceramics (McKillop 2004:77; Rosenwig 2015). Known as the pre-Mamom ceramic tradition, these early ceramic forms are not uniform across the region and are instead known from a few individual sites and vary stylistically between them (Clark and Cheetham 2002). The pre-

Mamom ceramics are divided into four main complexes: Xe, from the western Pasíon region; Eb, from central Petén; Cunil, located in the Belize River Valley; and Swasey, concentrated in northern Belize (Estrade-Belli 2011). These four ceramic complexes vary in their utilitarian forms, which differ in size and presence of a handle (Clark and Cheetham 2002). Contrastingly, two main similarities emerge in the pre-Mamom complex as a whole: (1) the similar style of the slipped serving vessels, and (2) the presence across all but the Swasey group of a dull, non-waxy monochrome finish, usually red (Clark and Cheetham 2002:301).

As these ceramic complexes developed so too did the appearance of more permanent villages and intensive forms of agriculture. The Early Formative period saw the continuation of domestication and agricultural practices. Pollen data indicates that extensive deforestation occurred throughout the Maya area between 2000 - 1000 B.C. promoting agricultural land-use exploitation (Pohl et al. 1996:). While agricultural practices did increase during this time, it had yet to make up a majority of the diet. Maize likely accounted for 30% of subsistence at Early Formative sites such as Cahal Pech and Colha, while most of the diet was still dependent upon Archaic ways of small-game hunting, fishing, and wild plant gathering (Sharer and Traxler 2006:163).

The increase in domestication of plants, specifically maize, squash, and beans, as well as animals, including dog and turkey, subsequently resulted in the appearance of agricultural villages during the Early Formative (Estrada-Belli 2011). These villages used pre-Mamom ceramics, along with most of the lithic tools from the Archaic (e.g., constricted uniface hand-held chopping implements). During the Early Formative there is no clear archaeological evidence to suggest social stratification, meaning these small villages were likely egalitarian and made up of small family groups (Canuto 2016; Clarke and Cheetham 2002). By the end of the period, families likely held larger plots of agricultural land which were managed by extended families (Canuto 2016). As more families grew, their ability to obtain success in maize production likely resulted in food surplus which in turn might have broadened their trade networks (Canuto 2016). By 1000 B.C., small farming villages witnessed increased social stratification as those individuals with maize surpluses and imported goods emerged as rulers under a political ideology founded on charisma and ritual (Canuto 2018; Clark and Cheetham 2002:308).

The Middle Formative Period (1000 - 300 B.C.)

The start of the Maya Middle Formative period is marked by an increase in monumental architecture, beginning around 1000 B.C. (Hansen 2005:56). Early archaeological research hypothesized that extensive Middle Formative architecture, along with additional components of Maya civilization, found its influence from the "*cultura madre*" (mother culture): the Olmec's of the Gulf Coast (Hansen 2005:52). Recent research has since suggested that the rise of Maya civilization during the Formative period paralleled that of the Olmecs, following a 'peer-polity' model, leading to conclusions that innovations occurred independent of external factors within the Maya Lowlands (Hansen 2005). Nakbe, located in the Mirador Basin, provides many of the earliest examples of monumental architecture within the Maya Lowlands, including the construction of causeways (*sacbeob,* or "white roads"), carved monuments (stelae and round slab altars, i.e., Nakbe's Stela 2 which dates to ca. 500-400 B.C.), terraced platforms, and large masonry constructions (Hansen 2016; Sharer and Traxler 2006:212). It is important to note, however, that this early appearance of stelae is rare, and most of these carve moments were erected during the Classic period.

Further, E-Group monumental architecture also dates to the Middle Formative period at the Lowland sites of Cival, El Palmar, Naranjo, San Bartolo, Tikal, and Uaxactun (Doyle

2012:359). Named after Group E at Uaxactun, E-Group monuments are typically formed by a western pyramid with radial stairways to the west, and a long platform to the east, sometimes containing three substructures (although these additional structures are more reminiscent of the Classic period [Doyle 2012; Estrada-Belli 2011]). These constructions are commonly associated with the ceremonial center of the site and likely served a ritualistic function. Notably, the construction of monumental architecture (including that at Nakbe) required large scale labor forces.

The Middle Formative was a time of increasing population and migration. There was an increase in lithic production and large-scale agriculture (although for the most part diet remained consistent with that of the Early Formative [Pugh 2021:9]), as well as craft specialization, including the production of jade, shells, and obsidian (Doyle 2012:371-372). The appearance of hand-modelled ceramic figurines increased during this time both in frequency and uniformity (Sharer and Traxler 2006:181). Further, the introduction of the Mamom sphere ceramics (800-300 B.C.) represents the first form of diagnostic Maya pottery from the Middle Formative (Callaghan et al. 2018). These ceramics were known for their orange paste and red-orange slip and were widespread throughout the Maya Lowlands (Callaghan et al. 2018; Clark and Cheetham 2002).

Such uniformity in vessels, as well as specialization in craft production suggests that long-distance trade was prominent during this period (Hansen 2005). Subsequently, the acquisition and trade of exotic goods, monumental architecture requiring a large-scale labor force, and the appearance of carved monuments on and around masonry buildings – often depicting common Middle Formative deities such as the Principal Bird Deity or the ‘Jester’ God (Hansen 2016) – is interpreted as patterns of extensive social hierarchy. The Middle Formative period was thus a time of cooperative organization guided by an elite figure (Pugh 2021). The elites of this time utilized cosmology and religion to prompt public monumental architecture and ritual. Indeed, ceremonial spaces were quite common throughout the sites of this period, often occurring upon large, monumental plaza platforms (Pugh 2021). The ability of emerging elites to control labor forces was likely related to their display of exotic goods, such as mirrors, masks, and bloodletters, all normally embellished with ritual motifs and symbols (Sharer and Traxler 2006:179). These symbols often related to rain and maize deities, and rulers drew most of their power from their ability to please these gods (Sharer and Traxler 2006).

Subsequently, the increase in ritual and monumental architecture speaks to the Maya's urge to alter their landscape to match their understanding of the world. Notably, the directionality of large ceremonial structures, including the E-Group (placed along an east-west axis [Estrada-Belli 2011]), coincides with cosmological patterning (e.g., the sunrise/sunset or solstices [Doyle 2012]). Additional aspects of the Maya landscape also were imbued with ritual meaning during the Middle Formative period, specifically mountains and caves connected with symbols of rain (Pugh 2021:23). Ritual practices during this period also include the use of caches. One of the most observable patterns of ritual during this time, caches regularly served as dedicatory offerings for the construction of new buildings (Pugh 2021). Moreover, during this period, buildings also were receiving dedicatory burials of family members beneath each new plaster fill of the floor (Doyle 2012).

Interestingly, despite the emergence of elite powers during this time, there is a lack of elite burials (i.e., tombs within pyramidal structures) during the Middle Formative (Estrade-Belli 2011:63). Subfloor burials remain the most common mortuary pattern analyzed during this period; however, this too varies from site to site: subfloor burials are rare at Ceibal, but extremely common at Cuello and K'axob (Pugh 2021:13). Furthermore, burials have been found in various other locations, including an early burial (ca. 820 B.C.) at Cival found within an artificial subterranean chamber, also known as a chultun (Pugh 2021:13). Burials are primarily furnished with ceramic vessels and sherds during this period (Sharer and Traxler 2006:203).

The Late Formative (300 B.C.- A.D. 100) and Terminal Formative Periods (A.D. 100 - 250)

The beginning of the Late Formative period coincides with the beginning of the Chicanel ceramic sphere, a standardized vessel style which replaced Mamom pottery. This pottery format is primarily a red-slipped, monochrome complex known as Sierra Red (Forsyth 1993). The typological and modal standardization of the Chicanel ceramic horizon represents a greater period of interregional trade (Forsyth 1993). Indeed, the standardization of this ceramic sphere reached many sites of the Southern and Northern Lowlands (Glover and Stanton 2010). In the Maya Highlands, Usulutan ceramics became prominent and were traded throughout the region (Demarest and Sharer 1982:210-211). Due to increased Highland-Lowland communication, Usulutan ceramics became highly valuable objects in the Maya Lowlands during the Late Formative (Demarest and Sharer 1982:219).

Unlike the limited grave furnishings found in Middle Formative burials, the Late Formative period is a time of more extensive grave offerings. Ceramics were continuously interred within graves, along with more abundant exotic goods, proof of the expanding divide between social classes during the Late Formative (McAnany et al. 1999:130; Estrada-Belli 2011:56). Elite burials are common during this period, marked by goods such as ceramics, jadeite, obsidian, and *Spondylus* shell, all of which demonstrate increased trade connections throughout the Maya region, both between the Highlands and the Lowlands, as well as between inland and coastal sites (Reese-Taylor and Walker 2002). Additional grave offerings include sacrificial victims, which provide direct evidence of conflict, raiding and warfare during the Late Formative (Freidel and Schele 1988; Sharer and Traxler 2006:183).

The varied burial types of the Late Formative period highlight increasing social stratification. There is a continual trend of subfloor burials during this time. The transition into the Late Formative saw commoners practice secondary interments of multi-person burials beneath domestic buildings, contrary to the often single-person, primary burial that marked the mortuary ritual in the Middle Formative (McAnany et al. 1999:133-134). This was a common practice for domestic areas and was likely done to dedicate the building and provide it with an ancestral 'soul' (McAnany et al. 1999:131). Subsequently, divergent burial types for elites began to emerge during the Late Formative. Specifically, within the Southern Lowlands, the Maya began to construct monumental funerary temples for their elites (Estrada-Belli 2009).

The use of funerary temples for elite burials in the Lowlands contributed to the increase in monumental architectural platforms throughout the Maya region during the Late Formative. These monumental platforms served a ritual function to reinforce public ideology and religion as well as the power of the ruling elite who partook in religious performance (Inomata 2006:16). Through these performances, rulers used their charisma and power, along with their connection to important deities, to gather a public following and manage large labor forces for the continued construction of monumental architectural complexes (Freidel and Schele 1988). Late Formative monumental architecture included the E-Group, which saw regional expansion, and an additional complex known as Triadic group. Triadic architecture is composed of a main temple placed at the back of an elevated platform flanked by two additional temples, set at opposite edges of the platform, facing each other (Szymański 2014:122). An important component of the Triadic group is the iconography along their basal facades. This iconographic program consists of large stucco masks, similar to that of the Olmec (Hansen 2005), which are consistent across all Maya Triadic groups, indicative of standardized decorative motifs during the Late Formative (Szymański 2014).

Nowhere is this Late Formative increase in social stratification and monumental architecture better exemplified than at El Mirador, neighbor of the Middle Formative site of Nakbe in the Mirador Basin (Reese-Tayler and Walker 2002). During the Late Formative, El Mirador emerged as the Maya's first ruling capital prior to the Classic period. Its large architectural buildings include the massive Dante and El Tigre complexes, the biggest masonry constructions in the entire ancient Maya world, larger than monumental complexes at the primary Classic cities of Tikal or Calakmul (Canuto 2016).

The architectural patterning of El Mirador's E-Group and Triadic groups, including the iconography, spread rapidly throughout the region, and is found at sites such as Lamanai, Tikal, and Uaxactun (Estrada-Belli 2011:69). This standardized iconography coincides with the increased appearance of carved stelae at the site which document the sequence of its rulers and other ideological notions. Notably, the use of hieroglyphic emblems on stelae marks the crystallization of a Maya writing and calendrical system, which had early roots at Nakbe during the Middle Formative (Sharer and Traxler 2006). The parallel appearance of hieroglyphic writing, carved monuments, vast public architecture, and ritual iconography of the Late Formative provided the framework for the emergence of kingship. Murals painted in Structure 1 of San Bartolo, Guatemala, show dramatic depictions of Late Formative inaugurations with accompanying hieroglyphic texts (Garrison and Dunning 2009). Subsequently, the rulers of El Mirador are the earliest examples of Maya kings and provided the foundations for the *ajaw* ("ruler") institution of Classic times (Freidel and Schele 1988).

The transition from Late Formative to Classic is marked by the Terminal Formative period (A.D. 100 - 250). The ceramic horizon of this period is termed “Floral Park” and is distinguished by the appearance of orange slips, mammiform tetrapods, and some polychrome decoration (Reese-Taylor and Walker 2002; Forsyth 1993). Notably, this ceramic type is not as widely dispersed amongst the Maya region and varies significantly in style from site to site (Forsyth 1993). The sudden departure from the uniform and standardized Chicanel sphere towards this heterogenous ceramic horizon is attributed to the sociopolitical atmosphere of the Terminal Formative (Glover and Stanton 2010).

During this time, the settlement pattern of the southern Maya Lowlands changed dramatically, beginning with the abandonment of El Mirador (Estrade-Belli 2011; Reese-Taylor and Walker 2002). Consequently, numerous Southern Lowland sites, including Cerros and Cival, witnessed rapid population loss and were almost completely abandoned during the Terminal Formative period (Estrada-Belli 2011). Explanations for this so-called Formative period ‘collapse’ range from environmental conditions, over-exploitation of resources, and extensive warfare (Estrada-Belli 2011:131; Ross 1992:31-32, 36-37). However, not all areas of the Maya region witnessed similar decline; Tikal experienced great growth and expansion during the end of the Formative period and would become a reigning state during the proceeding centuries (Estrada-Belli 2011).

The Classic Period (A.D. 250 - 900)

The subsequent centuries following the Late Formative ‘collapse’ represent the apogee of Maya society: the Classic period. It was during this time that the sociopolitical atmosphere established during the preceding centuries reached new heights within an ever-increasing population ruled by political endeavours. Monumental architecture, warfare, trade, and divine kingship spread across the region, coinciding with the appearance of several hegemonic dynastic states. The ability of archaeologists to trace the dynamics of these emerging dynasties is due to the increased use and standardization of the Maya writing system during the Classic period. While early stelae first appear at sites in the Mirador Basin dating the Formative period, it is during the Classic period that the erection of these and other carved monuments (i.e., round altars) is widespread across the Maya region (Demarest 2004:90).

Stelae became a common medium for displaying the established Maya iconographic system and, as such, these monuments quickly became a way of disseminating propaganda (Borowicz 2003). Stelae of the Classic period were carved with depictions of ritual programs, showing the ruling elite engaging in a performance dressed in full ceremonial garb, including a feathered headdress, pectorals, and masks (Inomata 2006:810). These iconographic displays were meant to portray rulers impersonating the Maize god, one of the most prominent deities of Classic Maya religious narratives (Houston and Inomata 2009; Inomata 2006). Further information engraved upon stelae include the accession of a ruler, the birth and death of a ruler, as well as interregional interactions, alliances, and polity names, displayed using the sites' designated emblem glyph (Demarest 2004:96). Stelae represent much smaller depictions of iconographic programs compared to that found on large monuments during the end of the Formative period. This is likely because stelae, given their small size, were mobile and thus worked well to spread political ideology and ritual propaganda of the ruling elite (Borowicz 2003:218).

An important aspect of the standardized writing system of the Classic period was the use of the *k'uhul ajaw* glyph ("sacred/holy ruler") which was used to depict the divine kings of the region (Houston and Inomata 2009:131). Indeed, a diagnostic feature of the Classic period was the appearance of divine kings, rulers of the Maya dynasties. Many dynasties emerged throughout the Maya Lowlands during the Classic period, the most significant among them being Tikal and Calakmul. These two main states achieved such great political expansion during both the Early Classic (A.D. 250-600) and Late Classic (A.D. 600-900) periods that their rulers might have been consider overlords, or 'king of kings', denoted by the *kaloomte'* glyph alongside *ajaw* (Houston and Inomata 2009:141; Martin and Grube 2000).

The divine rulers of the Classic period used a variety of methods to display their power, including the use of stelae propaganda and ritual. These displays of power required the construction of larger ceremonial complexes where the ritual could be viewed by much of the public (Inomata et al. 2015:4272). Public ceremonial complexes became common constructions throughout Maya polities of the Classic period and represented a trend towards performative and theatrical politics which entwined of the ruler's claim of power with aspects of Maya religion and spirituality (Cecil 2009:4). Indeed, the dynastic court was likely highly theatrical, sponsored by the ruling class to promote their ideology and power (Inomata 2006). The elaborate ceremonial costumes of the elite served to associate them with the gods, and through this association the kings could highlight their holiness and divinity (Houston 1999).

A further display of power is seen not in the ritual components of kingship, but in the construction of the complexes within which the rituals were held. These complexes often consisted of the same architectural formations that had become standardized in the Late Formative (i.e., triadic groups, E-Groups), however, those early constructions were expanded upon and covered by Classic period construction episodes. Subsequently, the enigmatic nature of Formative period monument constructions is largely due to the episodic and layered nature of masonry architecture (i.e., Inomata 2006:815-816; Rosenwig and Masson 2002:222). As new kings ascended the throne, they often partook in vast monumental works, requiring extensive resources and public labor forces. Moreover, it was common to expand upon past monumental complexes of preceding kings. The first expansions of such monumental architecture from the Late Formative period often involved destroying the earlier structure and/or burying it under a new floor fill (Inomata 2006). In so doing, the kings were displaying their power by laying claim to new and larger monumental works and hiding the efforts of past kings.

As construction episodes continued to build upon, and create, new monuments, Classic period palaces (multi-roomed structures) were constructed (Demarest 2004; Houston and Inomata 2009). Furthermore, large temples were also commonly constructed by reigning kings. These temples served a variety of functions, hosting rituals, celebratory events, and funerals. Significantly, the social hierarchy of the Classic period is further documented by the occurrence of vaulted tombs within monumental temples for the burial of elites, while commoner burials continued beneath the floors of domestic structures. Notably, inhumation beneath structures was such a homogenous practice throughout the Maya Lowlands that every type of structure and dwelling contains subfloor burials (Welsh 1988). It is extremely rare to find structures lacking burials beneath the floors (McAnany et al. 1999:130).

Ceramics are the most prevalent grave offerings from Maya burials. The diagnostic ceramics of the Classic period include the first true form of polychrome vessels, often cylindrical with tripod feet (Forsyth 1993). Subfloor burials of residential compounds contained no grave furnishings except ceramics, often a polychrome plate or bowl, placed over top, or near, the head (Welsh 1988:216). In contrast to the uniform appearance of commoner graves, the graves of rulers and elites were typically housed in specially constructed temples, and occasionally beneath ceremonial platforms as house shrines (Welsh 1988). Moreover, these burials were accompanied by a plethora of furnishings, not the least of which included ceramics. These ceramics were often more elaborate, with painted vessels (decorated with zoomorphic iconography), and specially crafted forms such as cylindrical tripod vessels and cacao drinking vessels (underscoring the importance of cacao throughout Mesoamerica at this time [Powis 2004; Welsh 1988]). Grave offerings of elite burials also included stone ornaments, obsidian, and shell artifacts, along with jade jewellery and feathered headdresses of a king's burial attire (Demarest 2004:96).

The appearance of sacrificial victims as offerings continued during the Classic period (Tiesler 2008:17-18; Welsh 1988). This increase in human sacrifice correlates with large-scale warfare characteristic of Classic Maya society. In the highly dynamic political atmosphere of the Classic Maya, the reigning elite of the dynastic kingdoms were often in contact with those of neighboring dynasties (Jackson 2013). Region-wide interaction was highly intense at this point, and specialized craft production resulted in the extensive trade of obsidian flakes, limestone extraction and plaster production, jadeite, basalt grinding implements (integral in many households for processing maize and other foods), and ceramics (Estrada-Belli 2011; Houston and Inomata 2009; Lentz et al. 2014). While alliance and trade were indeed prominent modes of interregional communication, warfare dominated the region. Nowhere was interregional interaction more prominent than that of Tikal and Calakmul, two cities at war.

The Early Classic Period (A.D. 250 - 600)

The beginning of the Early Classic Period was marked by the Late Formative decline of many sites, significantly the ruling capital of El Mirador and its secondary centers. During the Late Formative, the population of Tikal remained static, unlike that of its Southern Maya Lowland contemporaries (Estrada-Belli 2011:64-65) and as a result Tikal quickly became a seat of power during the Classic period, representing one of the largest primary centers in the Maya region (Woodfill and Andrieu 2012:190). Evidence suggests that at the onset of the Early Classic, ruling elites at Tikal had already started construction of the North Acropolis, one of the largest and most ambitious monumental constructions in the Maya region (Estrada-Belli 2011:63). Moreover, Tikal's dynastic line is documented as early as A.D. 292 on Stela 29, the earliest inscription at the site (Houston and Inomata 2009:105). Later inscriptions at the site, however, trace the founding of the dynasty to well within the Late Formative, in A.D. 90 (Houston and Inomata 2009).

Importantly, the Early Classic marks the 'arrival of strangers'; migrants from the Central Mexican city Teotihuacan, an important influence for the florescence of Tikal's success (Borowicz 2003; Houston and Inomata 2009:106). Inscriptions from this time describe the arrival of Sihyaj K'ahk' on January 16, A.D. 378 at Tikal (Estrada-Belli et al. 2009:240). This arrival was so integral for the political influence of Tikal across the region, that Sihyaj K'ahk' appears on murals from the site of La Sufricaya, a Maya city from northeastern Peten, Guatemala (Estrada-Belli et al. 2009:232). These murals depict Sihyaj K'ahk' in full Teotihuacan warrior dress, complete with a drum-shaped headdress and eye goggles, both garbs of Teotihuacan warriors, leaving little doubt of his Teotihuacan origins (Estrada-Belli et al. 2009:235-237). The arrival of Sihyaj K'ahk' has direct affects on the dynastic rule of Tikal: the same day of his arrival, the local ruler Chak Tok Ich'aak "entered the water" (a euphemism for death) and a year later Yaax Nuun Ahiin ascended the throne (Houston and Inomata 2009:106).

During the reign of the Yaax Nuun Ahiin, Teotihuacan tripod ceramics and green obsidian were used throughout the city, and Teotihuacan symbols and images, such as Tlaloc, dominated murals and facades (Houston and Inomata 2009). Similar influence is seen at the Early Classic urban city of Copan – the first dynastic ruler is depicted in Teotihuacan clothing, and monuments describe his arrival in A.D. 426 (Stuart 2000:490). It is apparent that Teotihuacan had far-reaching influence from its location in Central Mexico during the Early Classic, however, just how substantial a role it played in the political field of the Maya Lowlands is heavily debated (see Stuart 2000).

While Tikal's power and influence continued to rise throughout the Early Classic, so too did other cities in the Southern Maya Lowlands throughout the fourth and fifth centuries. Dynastic lineages can be traced throughout Early Classic through the erection of stelae at Naranjo, Caracol, Copan, and Calakmul, amongst others. The parallel appearance of powerful dynasties during this time led to increased warfare as kings tried to gain more territory and demonstrate the strength of their rule. Significantly, the warfare between Calakmul (the seat of the Kan, "snake", dynasty) and Tikal is heavily documented; these two dynasties were the biggest seats of power in the Lowlands, home to the 'overkings' (Martin and Grube 2000). Consequently, after many successful military campaigns beginning at the start of the Classic period against Uaxactun, Tikal witnessed a near-fatal defeat in A.D. 562 at the hands of Calakmul and Caracol (another major dynasty and possible seat of an overking [Houston and Inomata 2009:109]).

The following 130 years at Tikal witnessed minimal construction and lacked the erection of carved monuments. In essence, Tikal experienced a Middle Classic hiatus (Martin and Grube 2000). During this time Calakmul flourished as the region's new leading power. This marks the transition from Early to Late Classic, a time when warfare only intensifies.

The Late Classic Period and Terminal Classic Period (A.D. 600 - 900)

One of many Classic sites to have had its origins in the Formative period, Calakmul's powerful Kan dynasty has been dated to as early as A.D. 410 with the inscription of a first ruler on Stela 114 (Martin and Grube 2000). During Tikal's hiatus, Calakmul experienced great florescence. At least 117 carved monuments have been found within the city, the most of any Maya Lowland sites (Martin and Grube 2000); notably at least 100 stelae were erected between A.D. 652 and 752, a clear indicator of Calakmul's apogee as a political and military state (Braswell 2004:169). Moreover, Calakmul's emblem glyph also appears extensively on carved monuments throughout the Lowlands during the seventh and early-eighth centuries, underlining the vast expanse of its kingdom and its control over trade throughout its hegemony (Braswell 2004).

One of the most important interregional relationships of the Classic period occurred between Calakmul and the urban center of Caracol; an alliance between these two major dynasties was the ultimate downfall of Tikal in A.D. 562 (Houston and Inomata 2009). However, Calakmul's reign did not last forever, and after decades of an intense hegemonic rule, the site began to experience a decline (Braswell 2004). The collapse of Calakmul began when it experienced defeat from a newly invigorated Tikal at the very end of the seventh century (Martin and Grube 2000). After which, the erection of monumental architecture at the site slowed, coinciding with the spread of the Calakmul emblem glyph upon stelae across the region. However, Tikal's revitalization, marked by key symbols of renewal connecting the city to the once-powerful Teotihuacan upon new construction phases at the site, was also short-lived and by the A.D. 869 the erection of stelae at Tikal ceased (Martin and Grube 2000:53).

Subsequently, all across the Southern Lowlands major dynastic rulers were suddenly disappearing and population rates were rapidly dropping. This period of decline has been termed the Terminal Classic period, which begins at approximately A.D. 800, however it did not occur simultaneously throughout the Lowlands (Chase and Chase 2004:13). By the turn of the ninth century not only were the major centers of the Classic Maya Southern Lowlands being abandoned, but smaller secondary and tertiary centers were also experiencing decline. The intense interregional system that bound these sites together was also the same system that caused region-wide abandonment. The smaller sites of the Late Classic were likely heavily affected by the constant warfare of Tikal, Calakmul, and Caracol; as the ruling cities collapsed, so to did their subjugate villages (Braswell 2004). The most notable change at these Southern Lowland sites was the cessation of vast construction episodes, although some of the last dynastic rulers attempted to re-establish royal power through new architectural buildings. Moreover, the use of stelae that marked the reign of these Classic period powers also ceased during the Terminal Classic. Various explanations have been raised in regard to this rapid decline, and most proponents highlight increased warfare causing political destress, over-exploitation of resources, and environmental catastrophe (Rice et al. 2004).

The product of this coalescence of factors was termed the Classic Maya 'Collapse' and marks the end of the Classic period in A.D. 900 (Chase and Chase 2004:12). Recent literature, however, has highlighted the misleading connotations of the term 'collapse' (Rice et al. 2004:2). While it is true that sites in the Southern Lowlands were rapidly abandoned, with elite and commoner populations leaving, and the end of extensive construction, these people did not just disappear. Instead, groups migrated to neighboring regions, including the Northern Maya Lowlands (Rice and Rice 2004). Notably, while many people migrated north, there stilled remained groups of people in the Southern Lowlands, evident by pilgrimages of former elite temples during the Terminal Classic and Postclassic (A.D. 900-1500) period (Fash et al. 2004:276). Subsequently, while the onset of the Postclassic period denotes a time of abandonment within the Southern Maya Lowlands it also marks a period of florescence for many sites in the Northern Lowlands which remained largely unaffected by the political turmoil of the ninth century (Rice and Rice 2004).

The Postclassic Period (A.D. 900 - 1500) and Beyond

The beginning of the Postclassic period marks a bitter-sweet moment in Maya culture history: much of the Southern Maya Lowlands were abandoned, while the Northern Maya Lowlands witnessed an increase of refugees and, subsequently, a florescence. Sites of the Petén Lake region, as well as northern Belize, and the far corners of the Puuc region witnessed continued occupation, while Tikal, Calakmul and their contemporaries collapsed (Rice et al. 2004:8). Likely as a result of the extensive warfare in the south, these new in-migrations in the north tended to favour settlements on islands or peninsular areas, including areas around lagoons, coastlines, and rivers, which could be easily fortified and defended (Masson 1999; Rice and Rice 2004).

Further benefits from settlements within range of aquatic sources, specifically along the coastline, was access to trade routes. The site of Lamanai is an important Postclassic site in north-central Belize. Lamanai's occupation has been dated to as early as 1500 B.C. and is arguably one of the longest-occupied Maya sites, providing archaeological evidence for continued habitation into the Post-conquest period (Graham 2000; Robin 2020). Lamanai's urban landscape is stretched along the banks of the New River Lagoon, one of three major waterways in northern Belize (Graham 2000:52; Masson 1999). Notably, routes along these main waterways via canoe were prominent and allowed the long-distance exchange of goods, such as marine shells, from the Gulf Coast of Mexico to areas along the Caribbean coast of Honduras (Masson 1999:285). Lamanai's position along the New River provided its elite with economic ties required for the procurement of exotic goods (Masson 1999).

Subsequently, while there were indeed ruling elites at these Postclassic sites, such as Lamanai, the political structure of the Northern Lowlands during this time lacked much of the hegemonic complexity of its preceding Southern neighbors (Rosenwig and Masson 2002:213). Instead of a complex network of primary, secondary, and tertiary centers, the Northern Maya Lowland sites of the Postclassic are characterized by autonomous and loosely integrated, independent polities (Kepecs and Masson 2003). This does not mean, however, that there was a lack of intrasite social stratification. Elites still existed at these sites, as is evident by continual differential burial practices and craft specialization of pigments and marine shells (Rosenwig and Masson 2002).

Subfloor burials still remain the typical mortuary pattern of the Maya well into the Postclassic period, as witnessed at the site of Caye Coco, located in the Freshwater Creek Drainage system (Rosenwig and Masson 2002). However, unlike the standardized practice of elite funerary temples across the Southern Lowlands during the Classic period, there was more regional variation in grave good assemblages during the Postclassic (Rosenwig et al. 2020). This relates to the value of local craft production; while elite burials still often contained exotic goods, local products were commonly abundant within these burials, representing a specific mortuary practice within independent cities (Rosenwig et al. 2020).

While the extensive warfare of the Classic period remained unmatched during the Postclassic, there were still observable conflicts both iconographically and within the archaeological record. These conflicts saw the rise and fall of prominent capitals such as Chichen Itza, which reached its apogee by the onset of the 11th century, and the Mayapán capital of Mexico, which saw its decline in A.D. 1440 (Kepecs and Masson 2003). Significantly, a further factor for the collapse of Postclassic sites was the arrival of the Spaniards in the early 16th

century, which marks the end of the Postclassic period and the start of the Contact/Colonial period beginning approximately A.D. 1500 (Andres and Pysburn 2004:402).

The first recorded contact between the Spanish and the Maya is A.D. 1511, when a Spanish ship sunk off the Caribbean coast and the surviving Spaniards were captured and sacrificed by Postclassic rulers from the Yucatan peninsula (Demarest 2004). By 1524, the Spanish conquest of the Maya kingdoms was full-fledged and with it came significant changes to the Maya culture (Demarest 2004). New farming strategies focused on the cultivation of cotton and the domestication of animals such as chicken and pigs took over past agriculture practices of the Maya, which focused on swidden crops (Danforth et al. 1997). Moreover, burial practices altered as European settlers moved into the region, bringing with them new ideals of religion, including churches and cemeteries (Danforth et al. 1997). After the domination of the Maya people during the Spanish Conquest which raided and destroyed sites, converted the Maya people from their previously held beliefs and towards Christianity, and brought forth new diseases hitherto unseen in the Maya world, the Maya culture prevailed, and Maya peoples still live throughout the Yucatan peninsula today (Houston and Inomata 2009).

CHAPTER THREE: THEORY

The goal of this research is to determine the usefulness of cave archaeology theories in interpreting chultun mortuary patterns. For years, researchers have supplied theories promoting the utilitarian function of chultuns (Chase 2016; Dahlin and Litzinger 1986; McSwain 1982; Moholy-Nagy 1997; Puleston 1965, 1971; Weiss-Krejci and Sabbas 2002); the ritual function of these spaces, in contrast, yields an apparent lack of extensive literature, this includes investigations of chultun mortuary practices. The available theories in this often-overlooked sphere of chultun research tend to suggest that the ritual function of caves was of such significance that the Maya constructed chultuns as a cave substitute at sites without access to natural caves. This chapter will present the theoretical underpinnings necessary to address this perspective – that chultuns served as artificial caves, and thus contain mortuary patterns meant to embody cave ritual – and if it is an appropriate perspective to use when examining Chultun B-2's mortuary pattern.

The following section will provide a detailed description of chultuns and the ongoing debate regarding their true functionality. Notably, our knowledge about caves, either artificial or natural, and their importance in the Maya world is founded upon our understanding of the Maya cosmos and concepts of scared geography. Therefore, this chapter also explains Maya cosmology and how the placement of caves in the landscape coincided with the order of the universe. The chapter will then present theories and methods of Maya cave archaeology, which rely upon Maya cosmology used in turn with an emic perspective to study the ritual function of caves in the Maya world. The techniques and approaches of cave archaeology described here will be applied to Chultun B-2 at Ka'kabish, Belize in later chapters (see Chapter Five) to address cave archaeology's usefulness in interpretations of the chultun's mortuary pattern.

Chultuns

A chultun is an artificial pit dug into the limestone bedrock (Cagnato 2017:75) and is usually single-chambered (Dahlin and Litzinger 1986). These features are prominent throughout the Maya region (332 have been documented within the Southern Maya Lowlands alone since 2018 [Carlos 2018:Table 4.2]) and have been noted in many early archaeological reports (see Tozzer 1913). Moreover, chultun use is not limited to one era of Maya civilization but rather these features were used from as early as the Middle Formative period in some regions (Cagnato 2017:75) and in other areas they were used as late as the Terminal Classic and Postclassic periods (Gonzalez 2015:79).

As indicated by their use over many centuries and their regional consistency, chultuns served an important role within the lives of the Maya. Through excavations of these subterranean features and subsequent research and analysis, we can begin to unravel the significance behind these features and, by extension, learn about the people who used them. Chultun excavations have been conducted for over a century and the cultural material they yield is typologically vast, indicating multiple possible uses for these features. The functional complexity of these artificial pits continues to draw archaeologists into investigations of chultun use within the ancient Maya community and landscape. Since the mid-twentieth century chultun function has been heavily debated (Brady and Layco 2018:46) and there is little consensus as to the ultimate function these subterranean features served.

Form and Function of Chultuns

Although the primary function of chultuns remains vastly undecided amongst researchers, one of the most conclusive functional forms is that of a water cistern-type chultun. Found almost exclusively in the Puuc Hills region and the northern Yucatán Peninsula (Brewer

2018:212), these chultuns served as a water storage feature in a region where four-month-long droughts caused scarce amounts of available permanent surface water (Weiss-Krejci and Sabbas 2002:343). These chultuns are lined with heavy plaster to prevent, or at the very least slow, the loss of water which would otherwise be absorbed into the limestone bedrock (Weiss-Krecji and Sabbas 2002). This is a prominent characteristic of other forms of water management within the Maya Lowlands. For example, man-made *aguadas* can be created by lining a natural depression in the landscape with clay or lime plaster, creating a small pond which holds water for a significant portion of the year (Brewer 2018:198). However, these water-storing chultuns differ in general shape than their counterparts in the Southern Lowlands. Plaster-lined chultuns are commonly bottle-shaped or bell-shaped (Figure 3.1a), and are notably deeper, extending approximately six meters downward into the bedrock, suitable for containing large quantities of water (Dahlin and Litzinger 1986:721; Sprajc et al. 2021).

In southern regions of the Maya Lowlands, shoe-shaped chultuns (Figure 3.1b) are prominent (Dahlin and Litzinger 1986). These chultuns, which extend laterally into the earth rather than vertically, lack plaster-lining and are consequently unfit for water storage. The leading hypothesis for these chultun forms is a food storage function proposed by Puleston (1965, 1971). Using an experimental approach, Puleston (1971) constructed a chultun in the Southern Maya Lowlands and stored within it several food crop varieties within the region, types that would have been available to the ancient Maya. He concluded that ramon (*Brosimum alicastrum*, or more commonly know as breadnut) was the only food crop that could be preserved within these subterranean pits for any significant length of time and still remain edible (Puleston 1971:332).

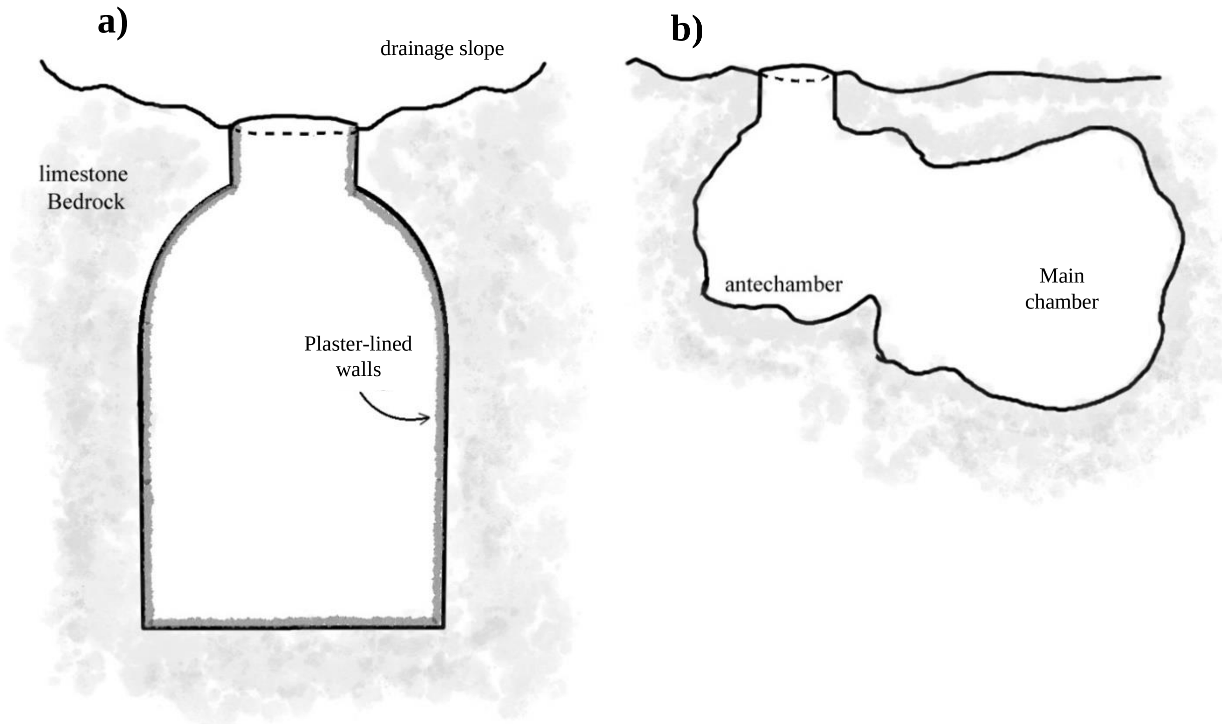

Figure 3.1 (a) A bell-shaped, plaster-lined water cistern chultun. (b) The shoe-shaped chultun form, note that it extends laterally into the earth but is not as deep as its bell-shaped counterpart (adapted from Puleston 1971)

Being the first study to formally examine the function of chultuns, Puleston's (1965, 1971) food storage hypothesis has remained popular within the literature and is a commonly assigned function for shoe-shaped chultuns. However, these food storage hypotheses tend to ignore that chultuns, due to their high humidity, are not conducive spaces for the preservation of staple food crops of the ancient Maya, such as maize, beans, or squash (Lentz 1999:4; Puleston 1971). Moreover, while Puleston (1971) advocates that the preservation of ramon within the experimental chultun is indicative of its importance in the Maya diet, the conclusion remains unsupported by paleoethnobotanical evidence. Very few remnants have been found of the resilient ramon seed within the archaeological record suggesting that it was infrequent in the Maya diet (Lentz 1999:14). Instead, ethnographic accounts note ramon's utility as a 'famine food', a food consumed as a last resort during times of drought or extremely low crop yield (Dine et al. 2019; Lentz 1999:13).

Consequently, other researchers suggest that these spaces were not just used for food storage, if they functioned as such at all. Other notable hypotheses surrounding the function of the shoe-shaped chultuns have since emerged. It has been suggested that, while these spaces are not favourable for long-term food preservation, the humid environment could promote the growth of bacteria, yeasts, and molds required for the fermentation of foods and beverages (Dahlin and Litzinger 1986:729). This conclusion assumes that chultuns provided a way for smaller, poorer residential households to create specialized economic goods (e.g., alcoholic beverages) valuable for trade (Dahlin and Litzinger 1986:732). Chultuns could have functioned as a midden; this explanation would account for the variety and seemingly random placement of artifacts within these features and their relative proximity to residential groups (Moholy-Nagy 1997). This coincides with the need to dispose of secondary materials produced during craft production of lithic and obsidian tools (Moholy-Nagy 1997:293). Another possible explanation of chultun function focuses on their use as burial and/or ritual spaces (Cagnato 2017; Carlos 2018; Welsh 1988).

Subsequently, chultuns served numerous functions ranging from ritualistic to utilitarian. Moreover, there has been a noted pattern of this function changing over time, with as noted by Dahlin and Litzinger (1896) and Carlos (2018) who note that while the most easily analyzed function of a chultun is it's final function, these subterranean features were likely used for many centuries, with several different functions over several centuries (see analysis section in Chapter Five). Notably, it can be difficult to detect the first initial use of a chultun, due to poor preservation of organic materials within these spaces.

Chultuns as Burial and/or Ritual Spaces

Initial reports of chultuns briefly note that these subterranean chambers also functioned as burials. As early as 1913, Alfred Tozzer noted several chultuns during his excavations at Nakum, Guatemala, which served as probable burial spaces. Similarly, Smith (1950) analyzed the chultuns of Uaxactun, Guatemala and found that three of these pits were used as burials as a secondary function. Since these early surveys, possible burials have been noted in several chultun excavations (Gonzalez 2013, 2014, 2015; Carlos 2016; Calderón and Hermes 2005; Chase and Chase 2017; Hunter-Tate 1994; Puleston 1965; Valdés 1997). The frequency at which human remains are found within chultuns demonstrates that these underground features were a prevalent grave type within the Maya region (Welsh 1988:17). And yet, despite these decades-old claims that chultuns functioned as burial spaces, there is a severe lack of extensive discussion and analyses of the mortuary patterns therein.

In-depth investigations of chultuns functioning as burial and/or ritual spaces has only recently been introduced within the literature and still remains limited to a few select authors (see Brady and Layco 2018; Cagnato et al. 2017; Calderón and Hermes 2005; Carlos 2018; Pugh 2005). Further, in many instances, the presence of human remains within chultuns has been minimally noted while investigative focus is directed elsewhere, extensively analyzing the presence of chipped stone tools, for example, with no discussion, nor direction towards an analysis, of human remains found within the same chultun (e.g., Stemp et al. 2018).

While comprehensive discussions of burials within chultuns are lacking, the presence of such burials are frequent, nonetheless. A survey of 142 chultuns with the Southern Maya Lowlands revealed that 20.4 percent (n = 29) of the chultuns were utilized as burials as their *final function* (Carlos 2018:86). Along with elite burials (human remains buried within pyramidal tombs) and residential burials (human remains buried within household platforms), the ancient Maya site of Ka'kabish, Belize (Figure 1.1) notably contains several burials within several chultuns (Haines and Helmke 2016; Haines et al. 2020). Human remains within chultuns have also been noted at several other ancient Maya sites, including Caracol (Chase and Chase 2017:199; Hunter-Tate 1994); and Tikal (Puleston 1965); as well as those already mentioned above (Smith 1950; Tozzer 1913) and others mentioned in Carlos' (2018) compilation of chultun data from the Southern Maya Lowlands.

Some researchers (Brady and Layco 2018; King et al. 2012; Lucero and Kinkella 2015; Pugh 2005) posit that these subterranean spaces are inherently ritualistic, and thus the mortuary patterns within chultuns are a product of their ritual function. Brady and Layco's (2018) theoretical approach to the investigation of chultuns is grounded in cave archaeology. This perspective posits that the Maya utilized chultuns in ritually similar ways to that of natural caves and it is through cave archaeology theories and methods that the patterning of burials within chultuns can be investigated. The foundation to this approach holds that because both chultuns and caves are subterranean spaces, and because both of these spaces are known to contain human remains, they served analogous functions to one another. Simply put, chultuns are subterranean spaces, caves are subterranean spaces, ergo chultuns are caves. Under this framework, chultuns become artificial caves, constructed within areas lacking natural caves in order to carry out the same ritual functions, related to aspects of Maya cosmology and religion (Pugh 2005:60). Multichambered chultuns are morphologically similar to multichambered caves, and thus further support the 'chultuns as artificial caves' hypothesis (Brady and Layco 2018:48). The foundation for the ritualistic identity of caves lies within Maya 'sacred geography', Maya cosmology, and landscape studies of the ancient Maya world.

This research will therefore use cave archaeology approaches and methods which frame caves as “singularly unambiguous religious contexts” such that all associated cultural material within, be it burials or additional artifacts, are interpreted through a religious ritual perspective (Prufer and Brady 2005:11). In so doing, the ritual and mortuary use of chultuns can be better framed and understood. Furthermore, this approach will determine whether chultuns exhibit patterns of cave ritual, as witnessed in natural caves, or if other mortuary practices of the Maya resulted in the patterns witnessed in these ‘artificial caves’.

The Problem with ‘Chultuns as Artificial Caves’

To conclude that chultuns are artificial caves and any mortuary pattern therein holds the same ritual and cosmological meaning as natural caves poses two main problems. The first of which concerns the type of burial pattern witnessed within caves compared to that of chultuns. If indeed chultuns hold the same ritual capacity as natural caves, then one would expect to encounter similar burial patterns, such as placement of the deceased or included grave furnishings often encountered in cave burials/rituals.

In recent decades, numerous research projects have been directed towards the mapping and excavation of cultural material within Maya caves, such as the Belize Cave Research Project (Moyes 2016), and the Petexbatun Regional Cave Survey (Brady et al. 1997a). These cave surveys have added substantially to the knowledge and literature of the ritual cave use, documenting the use of various chambers and the offerings and burials found within. In contrast, discussions of chultun mortuary patterns significantly lack the same extensive descriptions and interpretations when compared to natural caves. Consequently, this makes the comparison of chultun burials and cave burials difficult. There is simply not enough data to support or deny the claim that chultuns should be studied through the lens of cave archaeology because it is unknown if they contain cave burial patterning and/or elements.

The second problem with the 'chultuns as artificial caves' conclusion is that it fails to consider: (1) the possibility that chultuns might have functioned as a simple burial location without cosmological connotations, or (2) that the burials are products of other mortuary practices unrelated to cave ritual. This is an alternative perspective to studying the mortuary pattern of chultuns and it requires consideration towards the additional function(s) these features might have originally served. Welsh categorizes six Maya grave types including chultuns, which he defines as a "large chamber originally dug out of the soil and/or bedrock for purposes *other than mortuary*" (1988:17, emphasis added). As previously stated, chultuns likely served various functions throughout their use-cycle, and roughly 20% of those surveyed in the Southern Maya Lowlands were utilized as burials as their *final function* (Carlos 2018:86). It is reasonable to speculate that the mortuary use of chultuns came into effect as a practical means of disposing of the dead within pits which had already fulfilled their initial purpose, without invoking cave-like rituals.

Maya Cosmology

Maya cosmology refers to how the Maya people, both ancient and modern, view the structure and order of their universe. The Maya viewed their world as a sacred and animate place (Lucero and Kinkella 2015); the landscape around them was alive and imbued with cosmological meaning (Ashmore 2009:186). This sacred and animate earth is one part of a whole, one level within a layered and quadrilateral cosmos. The Maya saw the earth as a quadrilateral world with four horizons forming a square surrounded by and floating atop of water (Bassie-Sweet

1996:21). At the center of this square earth is the world-tree, whose branches extend into the multi-layered sky and whose roots grow into the layers of the underworld (Moyes 2016:173).

Notably, the sky and underworld contained several layers, marking the numerous levels of the cosmos. There are thirteen layers to the sky, or the heavens, which dome over the earth from horizon to horizon (Moyes 2016:176). The Maya underworld is known by two names: (1) *Mental* in the language of the Yucatan, and (2) *Xibalba*, as it is called within the *Popol Vuh,* a sacred book describing the Maya creation myth (MacLeod and Puleston 1978). The Popol Vuh describes Xibalba as a watery place composed of nine layers (Coe 1978:11), and home to the many Maya gods including One Death, Seven Death, Jaundice Demon, and Bloody Teeth (Moyes 2016:174). Xibalba has been known as a place of death and birth; it is the source of maize and the place from which humans emerged, as well as the place which humans return to after death (Bassie-Sweet 1996:21).

Centered along the midpoint of each horizon, aligned with the cardinal directions, are mythological and sacred mountains serving as the home of Maya ancestors and deities (Bassie-Sweet 1996:21). At the base of each of these mountains was a sacred cave entrance. Subsequently, caves and mountains share similar symbolic meanings because the cave entrance provided access into the mythological mountain (Bassie-Sweet 1996:44). Caves also gave passage into the many levels of Xibalba (McNatt 1996:81). Caves were transitional zones, allowing the sun to set into the cave entrance on the west horizon, travel through the nine levels of the underworld, and rise out of the cave entrance on the eastern horizon (Bassie-Sweet 1996:63)

Both the ancient and modern Maya have carried out numerous ritual ceremonies dedicated towards these sacred mountains and caves and the supernatural beings that dwell within, such as *Chaak* (the rain god), by utilizing these features within the real landscape. Ethnographic studies have found that the Maya today hold the same honour and respect for these sacred features within the landscape as their ancient ancestors did (Moyes and Prufer 2013). This cosmological ordering of the universe is not limited to the Maya, rather it is frequent throughout many pre-Columbian Mesoamerican cultural groups who saw certain geographic features as sacred and thus incorporated them into ceremonial and ritual life (Stone 1995:15). These features form what is known as sacred geography, defined as prominent topographic features “visited and prayed to in the rituals of the people” (Vogt 1981:119). Subsequently, archaeologists have relied on cave archaeology to study the ritual activity directed toward these features of sacred geography.

Cave Archaeology

Archaeologists have studied caves in the Maya region for several decades. These surveys document the mortuary and/or ritual patterning of ceremonial and religious rites within caves. Similar to chultuns, caves have many different functions, chief among them include sources of drinking water, sources of “virgin” water, religious rites, burials and ossuaries, art galleries (perhaps related to ritual), depositories for ceremonial offerings, and their minimal use as places of refuge (Thompson 1975:xiv). Understanding these possible functions includes noting material culture and burial composition, and these approaches for analysis have formed the subfield of cave archaeology.

Research of caves, conducted through the subfield of cave archaeology, within the Maya region is grounded in landscape archaeology. The study of the landscape typically investigates the spaces which generate and participate in an interaction of people and their environs (Ashmore 2009:183). This is an important perspective because it allows more consideration to be directed towards the three components that define the Maya cosmos and the real world: earth, water, and sky (Ashmore 2015:307). Cave archaeology is an extension of landscape archaeology, analyzing the utilization of the caves throughout the region by the ancient and modern Maya, interpreting both the ethnographic and archaeological records for the types of interactions that occurred within these subterranean spaces and the people who used them.

An important aspect of cave archaeology is its examination of aspects of the landscape from an emic perspective (Brady and Layco 2018:47). Rather than viewing caves as mere holes in the ground within which cultural material are found, this approach conceptualizes caves how the Maya saw them, as sacred spaces within an animate earth. In so doing, caves become inherently religious and/or ritual spaces. This emic approach to cave studies represented a shift from viewing caves as possible shelters and/or utilitarian spaces towards understanding since all of the earth is animate so too are caves and thus, they hold cosmological meaning (Prufer and Brady 2005).

Cave archaeology, apart from analyzing the religious use of the landscape (i.e., sacred geography), also promotes examining spaces of the landscape that are associated with all levels of society. In past Maya literature there has been a focus on more obvious patterns of the landscape, specifically the overall site configuration in relation to monumental architecture (Barrett and Scherer 2005:104-107; Mathews and Garber 2004; Sprajc et al. 2009). Notably, this form of study, like many earlier aspects of Maya archaeology, tends to highlight only the elites and their interaction with the landscape. The lower-class Maya, the non-elites, and their interactions and influences upon the landscape remain unacknowledged in these investigations. There are numerous critiques towards these approaches of studying the ancient Maya because such research maintains a fascination with the elite and frames residential households and commoners as inactive and passive participates within the sociopolitical atmosphere (Blackmore 2016). Cave archaeology analyzes the more subtle aspects of the interactions within the landscape, such as the remains of burials or offerings within smaller subterranean spaces, rituals which both the elite and non-elites participated in (Mathews and Garber 2004), thus bring attention to the ceremonial and religious life of non-elites and other such members of society.

The rudimentary focus on monumental architecture and the overall site layout that has dominated landscape archaeology analyzes only the horizontal partitioning of sites (Mathews and Garber 2004). Horizontal partitioning refers to the idea that the layout of many Maya sites coincides with the cardinal directions, and by extension with the cosmological ordering of the universe. For example, it has long been noted that architectural groups such as E-Groups and Triadic groups held ritual meanings due to their alignment with the cardinal directions, specifically arranged along the axis of the setting and rising sun (Estrada-Belli 2011:67). Cave archaeology examines additional concepts involved with the partitioning of the landscape. That is, cave archaeologists study not just how the ritual use of caves corresponds with the quadrilateral world, the horizontal partitioning, but also how it may reflect the many levels of Xibalba, a research focus known as vertical partitioning (Mathews and Garber 2004). In summary, cave archaeology performs two important functions. First, it analyzes the general horizontal ordering of Maya sites in respect to cave positioning and use. Second, cave research analyzes the material culture within caves to map out the ritual activities which occurred and their religious meanings, analyzing the vertical ordering of cave use.

During the last few decades of the twentieth century there was a “ritual turn” in the study of caves in the Maya region, a marked shift towards the development of cave archaeology (Woodfill 2021:1). It was noted that caves, especially the “dark zones” where cultural material has frequently been noted, were not desirable places for habitation or utilitarian activities, such as water collection, due to lack of light and the effort often required for these journeys (i.e., vertical drop-offs, crossing deep streams of water [Rissolo 2005]). A key component of the ritual turn was noting that the ritual artifacts, such as bloodletters and incense burners, found within dark zones suggested that the Maya utilized these areas of "total darkness and near total silence for triggering states of altered conscious" and other rituals (MacLeod and Puleston 1978:76-77).

Subsequently, caves and their associated material culture remains are viewed consistently and primarily as places of ritual activity, rather than as areas for habitation or other utilitarian functions (Prufer and Brady 2005:9). There are two models which cave archaeology employs to interpret the ritual function of caves, "caves as Underworld" and "caves as Houses" (Woodfill 2021:1). These two models often overlap and provide a mosaic explanation for the ritual use of caves and how they served as the road to Xibalba, and as a path into the sacred mountain, home of Maya deities. Mixed into these perspectives are secondary functions of cave rituals. These typically relate to ceremonial practices entwined with sociopolitical agendas, such as marking territory and place (Moyes and Prufer 2013).

Caves and Xibalba

Caves are sacred spaces that served as transitional zones between the earth and the underworld, allowing accesses to the nine levels of Xibalba (McNatt 1996). It is important to note that this framework does not posit that caves themselves represent the underworld, rather they are merely a pathway that leads into the supernatural realm (Bassie-Sweet 1996:44; Brady and Veni 1995:163; Stone 1995:38; Vogt and Stuart 2005:179). The concept that caves are the road to Xibalba became prominent following the work of MacLeod and Puleston (1978). The authors note that the complete darkness and silence experienced within the deep chambers of caves evoke a sense of synesthesia and detachment (MacLeod and Puleston 1978:77). The journey into the cave and the ceremonies carried out within its depths likely created an altered state of consciousness, promoting the feeling that the individual had indeed made a transition from the real to the supernatural, from the earth into Xibalba.

The rituals carried out within these dark zones allowed one to walk the path to the underworld, mirroring the journey of the Hero Twins, the main characters of the Maya creation myth depicted in the Popol Vuh (MacLeod and Puleston 1978:74; Tedlock 1996). The story of the Hero Twins tells of their descent into Xibalba and the defeat of the lords of the underworld (Coe 1978:12). The Hero Twins venture into the underworld to avenge their father who was sacrificed by the lords of the underworld, known as the bringers of death and disease, after losing a ball game (Moyes 2016:174). Having endured many harrowing tests against the lords of death, the Hero Twins triumph over the lords by tricking them with a performance, killing the gods of the underworld and resurrecting their father as the Maize God, who was destined to dwell within Xibalba (Tedlock 1996:137-138). The Twins are transformed into the moon and sun, re-enacting their victory in the underworld by rising and setting into and out of Xibalba through the sacred cave entrances during the daily solar cycle (Moyes 2016:174; Tedlock 1996:141). This story is depicted upon many Maya ceramics, including a specific Altar de Sacrificios vase which depicts the stages of the Hero Twin’s Xibalba performance, and was re-enacted by the Maya as a ritual rite of passage (Schele 1988).

Moreover, caves are further associated with Xibalba and death by their hieroglyphic depiction. Vogt and Stuart (2005) suggest that one of the most common elements of Classic Maya script is the cave glyph, *ch’en* or *ch’een*. This sign (Vogt and Stuart 2005:Figure 7.4) is known as the “impinged bone motif” due to its depiction of skeletal elements, such as the skull and mandible, indicative of affiliations with death and the underworld (Moyes 2016:175; Vogt and Stuart 2005:157). This type of cave depiction – that which uses a mandible symbol – is found throughout Mesoamerica, a sign described as the gapping maw of a beast, a common motif for illustrating a sacred portal (Stone 1995:23). It is suggested that the maw of this earth monster is the mouth of a *witz*, "mountain," monster (Lucero and Kinkella 2015), showcasing the sacred cave entrance into the mythical mountains of the cosmos. This *ch'een* symbol is carved onto the sarcophagus lid of the great Pakal, ruler of Palenque from A.D. 615-683 (Martin and Grube 2000:162-168; Pugh 2005:51). The engraved tomb shows the world ceiba tree, the sun, and Pakal entering into the maw of the earth monster and descending into the underworld (Pugh 2005:51). This association with the ch'een symbol and with a burial shows a clear association between caves and Xibalba, whereby the dead can pass on into the underworld.

Caves, then, are paths into Xibalba not just for the living to be transformed via a rite of passage analogous to the Hero Twins, but also for the dead to transition from the land of the living into the after life.

Caves as Houses of Deities and Ancestors

Caves are also seen as the home of Maya deities and as a pathway into the sacred mountain within which many Maya gods reside. This framework presumes that the ritual directed towards caves was conducted in honour of the gods who lived within these sacred spaces. Of significance is Chaak, the Maya rain god, who dwells within caves (Stone 1995:33). The Maya believed caves to be the origin of rain, clouds, lightning, thunder, and wind (Bassie-Sweet 1996:10). This is a reasonable association given that caves often contain their own natural water sources, including small pools of water and running streams (Pugh 2005). Further, large clouds of mist form within these moist environments and are often carried along with wind and out through the entrance of the cave (Woodfill 2021).

Thus, the moist environment of caves, along with the sounds of dripping or running water, and the literal emergence of clouds from these spaces, suggests that Chaak dwells within. This makes cave rituals important for many Maya farmers because appeasing the rain god meant rain enough for a fertile growing season (Brady et al. 1997a). Cave survey projects have noted that cultural material and ritual activities date most frequently to the Terminal Classic period (A.D. 800-900), and the collapse event (Lucero and Kinkella 2015). Both a notable time of drought and a time in which there was a larger population and thus more worshippers, the Maya, both elites and non-elites, increased their offerings and rituals towards Chaak in hopes of renewing their crops and earning a rainy season (Moyes 2016:180). The Maya also believed that maize originated from caves, as noted in the story of the Hero Twins and the resurrected Maize god. Thus, rituals for rain often coincided with rituals for an abundant maize crop yield (Bassie-Sweet 1996:11).

Subsequently, offerings and sacrifices were directed at or within these spaces in the name of the many gods who controlled life on the earth's surface. Sacrifice could take many forms, involving the killing of a victim, or autosacrifice which involved the giving of one's own blood. Either scenario resulted in giving the blood that strengthened the deities; a necessary elixir of life for the gods, a common-held belief throughout Mesoamerica (Thompson 1970:181). Cultural material has often been found within caves that hint towards sacrificial rites including human remains with traces of skeletal trauma, hinting towards sacrifice, as well as implements for bloodletting and autosacrifice, such as obsidian blades and awls (Awe et al. 2005; Brady 1989:359-362; Ishihara 2008:162; MacLeod and Puleston 1978; Thompson 1970:183). Offering types vary within caves and reflect their use by both elites and non-elites, often fitting into two categories: wealthy gifts and village community offerings (Thompson 1970:183). Wealthier assemblages offered by elites contained unique or rare objects, such as pyrite mosaic mirrors (MacLeod and Puleston 1978:72). The village community offerings are typically those objects that non-elites had readily available, such as ceramic jars, which were common household objects in which they placed maize, lithics, or faunal remains (Lucero and Kinkella 2015:165).

Further claims which support the "caves as a house" conclusion note that Chaak has been depicted within the cave openings in Maya art and inscriptions. One example of particular significance is witnessed in the La Pailita Cave, Guatemala. Within the entrance of the cave rests a life-sized sculpture of Chaak upon his throne, a sculpture which served an integral role in the community's rain ceremonies (Lucero and Kinkella 2015:166). La Pailita Cave was directly correlated with Chaak, and his sculpted presence within underscores the belief that the deity lived in these subterranean spaces and was honoured with ritual ceremonies. `

Caves therefore served two sides of the same coin, life and death. They provided passage to the land of the dead, Xibalba, but also served to bring forth rains and abundant crops, the substance of life. An important question is then raised, does this meaning hold true for all forms of caves, whether constructed or natural?

Artificial Caves versus Natural Caves

Viewing chultuns as artificial caves posits that they carry the same ritual and/or religious qualities as natural caves. This raises the question as to how the Maya defined caves. Did they, like many modern researchers now, have separate concepts of natural caves compared to artificial caves? Answering this question requires using an emic perspective to understand the use of caves, chultuns, rock shelters, or other subterranean spaces, whether constructed or natural, within the Maya landscape. Further, the answer to this question is important to consider when analyzing the use of chultuns as artificial caves.

First, how modern-day archaeologists define caves today may not coincide with the meaning the Maya gave to these spaces. A common definition of caves posits that they are "a *natural* cavity in a rock which is enterable by people" (Karkanas and Goldberg 2017:108, emphasis added). Defining caves using an emic approach, however, not only provides cave archaeologists the framework for examining cave rituals but also works to understand the culturally conceptualized Maya landscape, which is host to religious, artistic, or other cultural meaning (Knapp and Ashmore 1999:9). Cultural landscapes are culturally constructed, and thus must be viewed in light of the people who used it (Brady 1997). Accordingly, Maya cave archaeologists define caves as they claim the Maya defined them – that is, based on the use of the ch'een ("cave") glyph, which means "hole or cavity that penetrates the earth" (Brady 1997:603).

Additionally, the Maya believe in animatism, that all creation is alive and active, which in turn holds that constructing a hole in the ground gives it a sacred meaning (Thompson 1970:165). Thus, any hole in the ground is a sacred cave with supernatural and religious meaning simply because it is a feature within the sacred and animate earth, even if it used for mundane purposes (Brady and Layco 2018:52). Moreover, the sacred earth in Maya cosmology is surrounded by, and floats upon, water. The underworld, Xibalba, is a watery place because of this association with water. Accordingly, numerous openings in the earth, sinkholes, caves, chultuns, and even bodies of water provided access to the underworld (Lucero and Kinkella 2015:163). Under this framework, all these geographic landmarks, all these openings in the earth, are sacred because they provide access to the underworld, their origin is of no apparent significance.

It would thus appear that the Maya definition of caves has less to do with the origin of the cave (i.e., whether it was modified, naturally present, or a constructed pit in the ground) and more to due to its association with the animate earth. To the Maya, both modern and ancient, caves are animate beings, with unique identities and characteristics, fulfilling ritual and religious ceremonies in their own right (Woodfill 2021:1). This is further exemplified by the presence of constructed, artificial caves at sites that lack them naturally.

These sacred features served an important enough function that the Maya constructed them when they were absent (King et al. 2012:612), and researchers suggest that based on the proposed Maya concept of caves, all holes in the ground held ritualistic significance. But, as previously mentioned, little work has been done to examine the ritual patterning of constructed subterranean spaces such as chultuns. Through the lens of cave archaeology and its application upon the mortuary pattern Chultun B-2, it may be possible to interpret the ritual patterning therein. This will support the claim that the Maya did not differentiate between artificial or natural caves; or more specifically between chultuns, as artificially constructed caves, and caves found naturally within the landscape. Or it may become apparent that cave archaeology is not a suitable explanation, and another mortuary archaeology theory is more applicable in explaining the mortuary pattern within an ancient Maya chultun.

Mortuary Archaeology

The frequency of chultuns throughout the Maya Lowlands, and their classification as one of six categories of Classic Lowland Maya burials as defined by Welsh (1988), indicates that these features are significant mortuary spaces in the ancient Maya world. Understanding these burials, including that of Chultun B-2 at Ka'kabish, requires an understanding of mortuary archaeology methodologies and theories. Mortuary archaeology is the study of funerary practices, and assumptions of death, and their materialization in the past (Charles 2005:16). Also referred to as the archaeology of death, these studies are often multidisciplinary, relying on ethnohistory, bioarchaeology, sociocultural anthropology, and cave archaeology (Rakita and Buikstra 2005). By focusing on excavating the burial itself and interpreting the patterns therein, including the layout of any individual(s) and associated grave furnishings, it may appear as though the focus of mortuary archaeology is on identifying only those interred in the grave. Mortuary archaeology and approaches of bioarchaeology are indeed important tools for providing information about the physical remains of the dead; but the true goal of mortuary archaeology is not to study the dead but rather the living (Pearson 1999:3). After all, the dead do not bury themselves.

By analyzing the rituals of funerary practices in the past, mortuary archaeology studies the people who enacted these rites and why certain mortuary patterns persist (Pearson 1999:3). Numerous research endeavours within mortuary archaeology have mainly focused on the ability to denote socio-economic status, using processualist (New Archaeology) approaches to analyze social change and organization (Rosenwig et al. 2020). It was Binford (1971) and Saxe (1971) whose theories proved most influential in explaining society's influence upon mortuary patterns. Together, their theories create the well-known Binford-Saxe model of mortuary archaeology in which economic and political factors are drivers of mortuary ritual (Brown 1995). Carr (1995) added to this approach through his insistence that philosophical factors play an equal role in mortuary rituals. This latter point is important when one considers the Maya, for whom cosmology plays an important role in the boundaries between life and death. Subsequently, mortuary archaeology examines a multitude of aspects, including the economic climate, the political influences, and other religious/ideological variables that work in tandem to promote certain versions or forms of mortuary practices.

When examining the burial pattern within Chultun B-2, the question then becomes what socio-political or ideological factors played a part in its construction? Described above are theories of cave archaeology, in which cave rituals, and their associated ideologies, are suggested reasons for burials in chultuns. This research's main goal is to determine the applicability of this framework, to address if theories of cave archaeology and cave rituals are a useful lens with which to view chultun burials.

Summary

Typically single chambered, chultuns are artificial pits dug into the limestone bedrock. These subterranean features are frequent throughout the Maya region and have been documented for over a century as a mortuary space. Unfortunately, the burial patterns and practices within chultuns, while noted, have not received extensive formal discussion or analysis. Despite the lack of data, Maya cave archaeologists (i.e., Brady and Layco 2018; Pugh 2005) propose that the analysis of chultuns should utilize cave archaeology approaches because any subterranean spaces are inherently ritualistic as articulated through understandings of Maya cosmology. In this perspective, chultuns become artificial caves with cosmological connotations.

Using cave archaeology and mortuary archaeology, this research will analyze the use-pattern of an ancient Maya Chultun at Ka'kabish, Belize, specifically examining the burial patterning and other uses within the two chambers of Chultun B-2. This examination will help determine whether the burial pattern of chultuns mirrors the ritualistic burials of caves. Two possible conclusions are likely: (1) chultun burials are reasonably similar to cave burials such that they likely served analogous ritual functions ascribed by aspects of Maya cosmology and thus chultuns are ritual artificial caves; or (2) chultun burials do not resemble cave burials and by extension do not hold the ritual meaning necessary to be labelled artificial caves.

CHAPTER FOUR: METHODS AND DATA

This chapter presents the methods of data collection and subsequent data from an ancient Maya chultun located at the site of Ka'kabish, Belize. The chapter will contain two main sections. The first will detail the methods of excavation within the east chamber of Chultun B-2 at Ka'kabish conducted by the author during the 2022 field season. This will include descriptions of mapping processes and methods and types of data collection. The following section will construct a relevant database of the material assemblage recovered during the excavation. Data obtained from excavations on the chultun's west chamber, conducted during the 2012 field season, will also be presented. This will be key to addressing the first research question of this thesis – comparing the east chamber versus the west chamber – as will be discussed in the chapter's conclusion.

Chultun B-2 at Ka'kabish

Ka'kabish is situated approximately ten kilometers northwest of the major Maya site of Lamanai and was occupied from the Middle Formative (ca. 800-600 B.C.) to the Terminal Postclassic or early Contact period (ca. A.D. 1500 [Haines et al. 2020]). Research on the site is conducted by the Ka'kabish Archaeological Research Project (KARP). The site of Ka'kabish is host to a variety of mortuary patterns and practices known throughout the Maya world (Haines et al. 2020:45). Along with elite burials and residential burials (Haines and Helmke 2016; Moore 2021), Ka'kabish notably contains numerous burials within chultuns (Carlos 2018; Gonzalez 2013). KARP investigations have thus far mapped a total of five chultuns at the site, all of which contained human remains.

This thesis is focusing on the mortuary pattern of one specific chultun at Ka'kabish: Chultun B-2. What is most peculiar about Chultun B-2 is its architecture compared to that of the other chultuns. Chultuns C-1, C-2, C-3 and C-4 from the Hingston Group (see Figure 1.1) at Ka’kabish are all single-chamber constructions. Chultun B-2, located in the Baker Group, is the only dual-chambered chultun noted at Ka’kabish to date. Oriented along an east/west axis, the two chambers make this a unique feature at the site and call to question the functionality of the separate rooms, if they differ and, if so, why, and how. The west chamber of the chultun was excavated by KARP over a decade ago, and the east chamber was left unexplored until the field season conducted during the summer of 2022. The following section will detail the excavation and data collection of the east chamber of Chultun B-2 at Ka’kabish.

Methods of Excavation and Data Collection

Excavations conducted on Chultun B-2 began during the 2012 KARP field season. The excavation at this time focused on the west chamber of the chultun. The project in the west chamber, labelled Operation 9, was completed after five weeks of excavation as detailed in Gonzalez’s (2013) field report, and marked the first of many chultun investigations at Ka’kabish. The following KARP field seasons would witness the investigation of four other chultuns at the site (Chultuns C-1, C-2, C-3, and C-4) and related field reports (Carlos 2016; Gonzalez 2014, 2015). The excavation of the Chultun B-2’s east chamber, labelled Operation 24, was conducted by the author during the 2022 field season at Ka’kabish. The excavation was completed over a three-week period from late May to early June, and subsequent lab analysis of the material assemblage was completed by Dr. Helen R. Haines and Dr. Kerry Sagebiel in October 2022.

One of the first objectives of this thesis is to compare the composition of the west chamber and the east chamber of Chultun B-2. For the purposes of this comparison, the 2022 excavation of Chultun B-2’s east chamber attempted to adhere to the methodological standards established during the 2012 excavation of the chultun’s west chamber. In so doing, the excavation of either side should produce maps and data assemblages that are easily comparable. Moreover, the excavation processes of other chultuns at the site were also of value during the 2022 east chamber investigation as these operations were either conducted by the same excavator of Chultun B-2's west chamber or followed the same methodologies of said excavation (see field reports referenced above). It is hoped that the method of excavation described below will serve as both a comprehensive and insightful guide for further chultun excavations at Ka'kabish.

Figure 4.1. Entrance of Chultun B-2, with capstone along the northern/north-western lip of the circular entrance (Jurasek 2022).

Operation 24: Excavation of the East Chamber of Chultun B-2

Operation 24 at Ka'kabish commenced in May 2022 and was led by the author working alongside a small group of archaeologists for the purposes of excavating the east chamber of Chultun B-2. Prior to excavation, initial 'housekeeping' of the area was necessary, including the removal of debris (i.e., a large tree branch) out of the chultun entrance, and clearing foliage from the surrounding area. This allowed space for equipment and the mesh screens required for screening/sifting fill removal from the east chamber. Preliminary assessment deemed the chamber undisturbed by looters, likely due to its subterranean nature – underground features are often difficult to spot by archaeologists and looters alike. The capstone for the chultun was located on the northern edge of the chultun entrance (Figure 4.1). It is unclear when the capstone was removed, the earliest available literature note that Chultun B-2 was uncapped before its discovery by KARP (Haines 2007:8). Despite the chultun remaining opened for at least fifteen years, even during the 2012 excavation of the west chamber there appeared to be no signs of looting within either chamber.

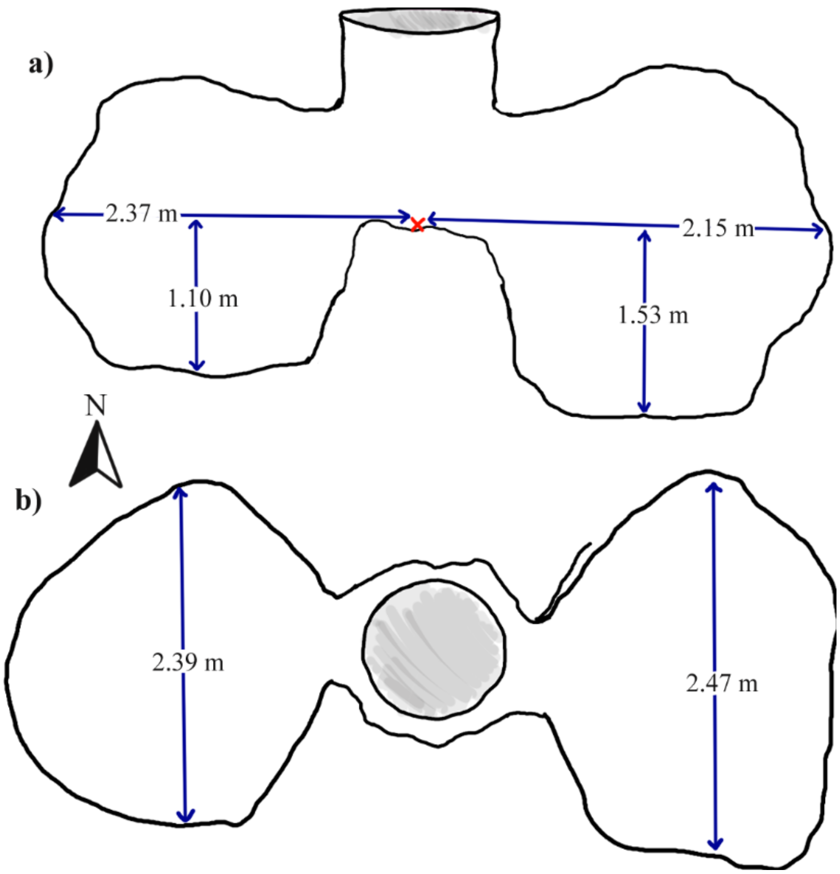

Figure 4.2. Schematic sketch of Chultun B-2: (a) profile of the chultun showing the depth measurements from the datum (red X in earthen platform), as well as the length of the chambers from west to east; (b) aerial perspective of the chultun showing the chamber measurements from south to north (Jurasek 2022).

The entrance of the chultun is almost perfectly circular (Figure 4.1), indicating its anthropogenic origin, and measures 59 cm by 62 cm. Directly below the entrance (47 cm below the surface) is an earthen platform which serves as the divide between the east and west chambers (Figure 4.2). The 2012 excavation placed a nail within this platform centered on the midpoint of the entrance to serve as the datum point for all unit measurements and maps. During the 2022 field season, the same nail was found still embedded in its original location and was also used as the datum point for excavations within Chultun B-2's east chamber. There was approximately one meter of clearance from the ceiling to the fill of the chultun. Headlamps were required as little to no sunlight could reach into the chamber, especially once one moved from the entrance. As the excavation continued and the artifact density increased, additional light sources such as portable rechargeable lamps were required, this was especially necessary during mapping processes.

The excavation process began with unit Level 1. This level was composed of humus intermixed with limestone fill and limestone ceiling collapse. Using the combined efforts of rock picks and shovels, the first step was to remove the large limestone boulders on the initial surface of the fill. These larger excavation tools were used exclusively to remove these larger limestone fragments, enabling the excavators to quickly and efficiently clear away the first several centimeters of fill lacking any cultural material. The initial appearance of cultural material (i.e., small ceramic sherds) marked a switch to trowels and other small tools. This allowed for more control and a lighter touch when excavating to limit any damage to the material assemblage. All levels were changed according to changes in the stratigraphic layers rather than cultural material. This meant that levels were maintained as long as the soil remained the same consistency and colour and no clear change was visible in the sediment fill or along the chultun wall. Thus excavations continued in Level 1 in accordance with the soil matrix, rather than changing to Level 2 due to the appearance of a few ceramic sherds. All fill removed from the chultun was screened through 6 mm mesh throughout the entirety of the excavation, in accordance with standards set during the 2012 excavation of the west chamber.

The change from Level 1 to Level 2 was notable along the walls of the chultun, where the white/light grey, very poorly sorted soil from Level 1 transition into a dark grey/black moderately sort soil, marking the new stratigraphic level (Figure 4.3). The process of excavation remained the same. The types of material collected at this point included obsidian blades, ceramic sherds, faunal remains, lithics, charcoal, and on a few rare occasions, bone beads (see below for more detail). All artifacts were kept regardless of size or material excluding two categories: land snail shells, and certain ceramic sherds. The former was not collected as these were not cultural inclusions, but were present naturally within the chultun, as they are at other contexts throughout the site. The latter were only kept if they were bigger than a Canadian quarter or if they were diagnostic.

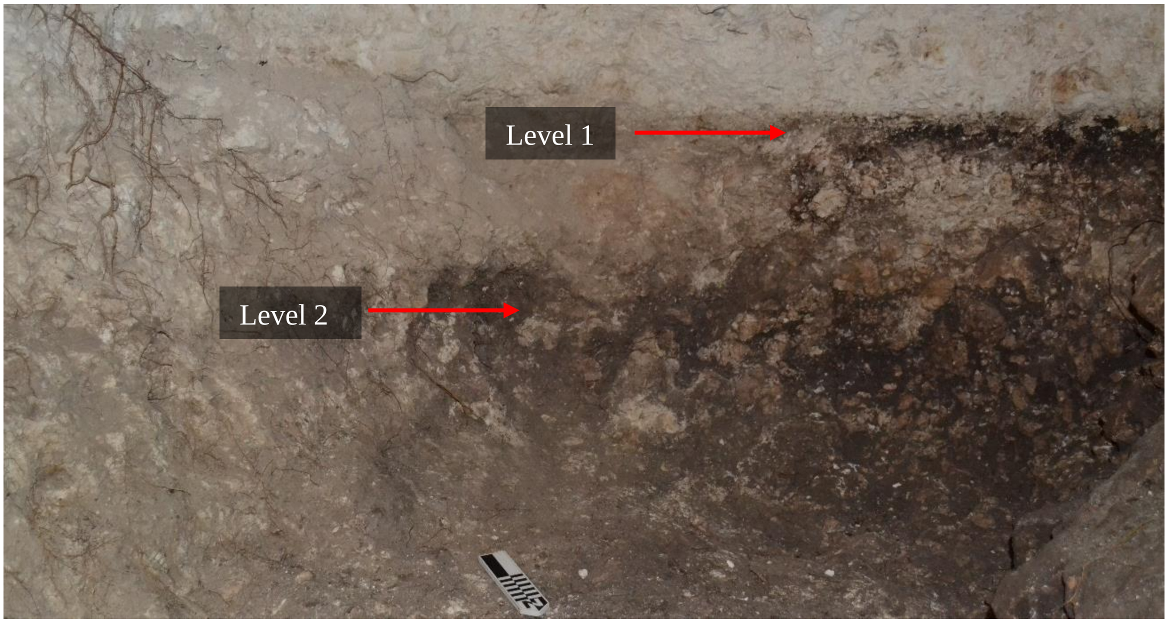

Figure 4.3. The change from strata Level 1 to Level 2 seen in the soil changes marked along the southern wall of the east chamber and labelled on the image (Jurasek 2022).

The remainder of the excavation process carried on following the above methodology until bedrock was reached at approximately 142 cm below datum. The final task was clearing out all remaining soil/fill and mapping the dimensions of the chamber itself to obtain a general outline and size of the east chamber which could then be compared to the west chamber.

Mapping the East Chamber

Level 2 consisted of a high density of cultural material, including four ceramic clusters (Figure 4.4). This required extensive mapping and was one of the most challenging aspects of the excavation due to lack of light, extreme humidity within the chamber, and inability to lay a permanent baseline. Moreover, field notes on the excavation of Chultun B-2's west chamber provide no detail on the mapping process, and thus mapping within the east chamber required more discretion on behalf of the author. This section is provided as guidance for future chultun mapping.

The procedure for mapping within the east chamber was triangulation, a common measuring/mapping process within archaeological excavations. When a feature (i.e., Ceramic Cluster 1 [Figure 4.5]) was encountered within east chamber of Chultun B-2, a base line was placed across the cluster for mapping purposes. Next, several measurement were required. The first step was triangulating the placement of the base line in relation to the datum point. Triangulation of the baseline was accomplished by collecting the following data for the start and end nails of the baseline: (1) the distance from the datum point to the nail using a plump bob and a line level; and (2) the degrees from north the nail was situated, which later allows all maps to be overlain, with the datum nail as a shared point in space, for analysis of feature locations and relations.

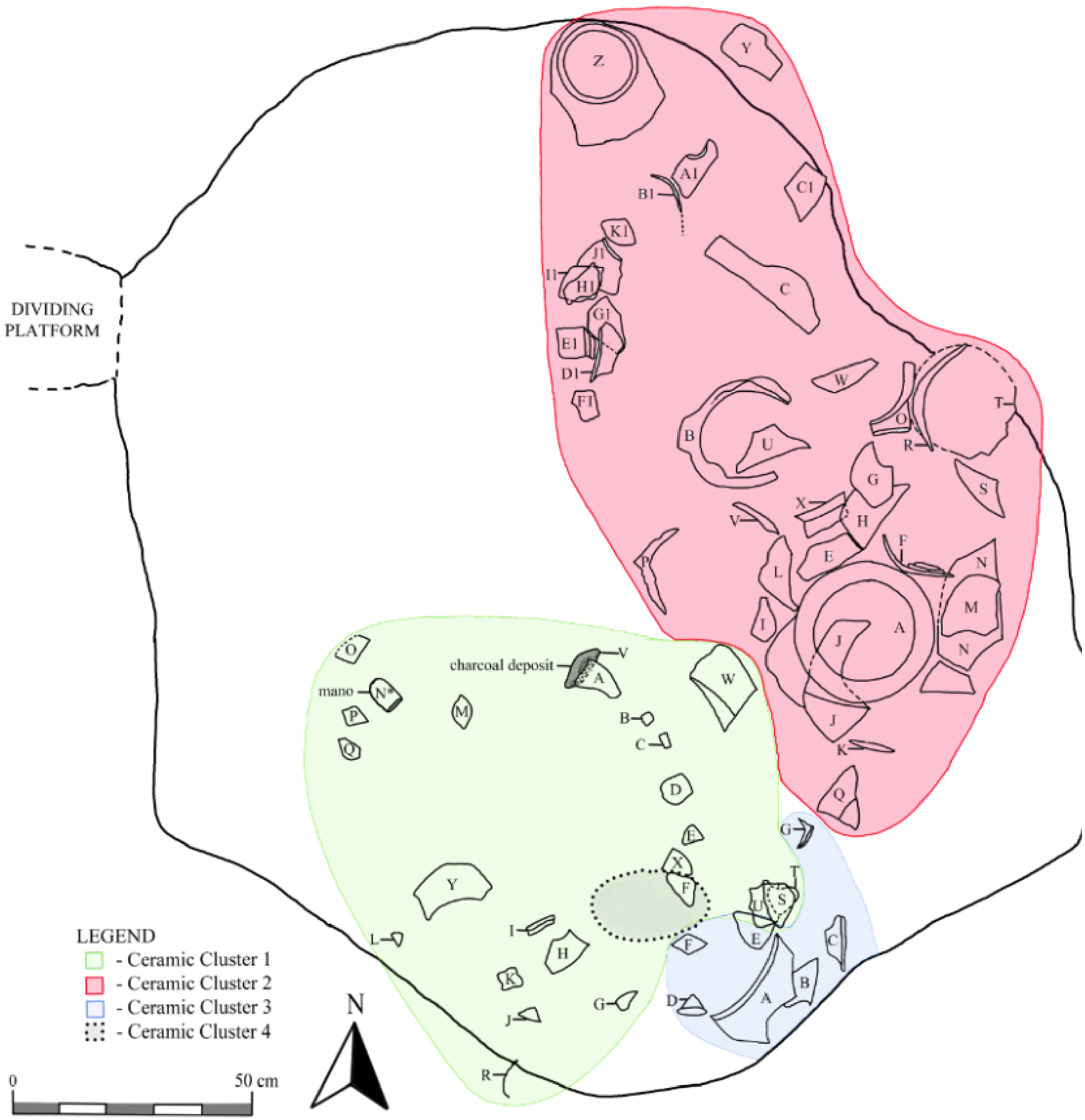

Figure 4.4. Map of Chultun B-2 showing the ceramic clusters. Note what appears to be a few ceramic sherds falling outside the outline of the chultun – the chultun chamber measurement was taken at a higher elevation than the clusters and the walls of the chamber are concave, thus in reality allowing more surface area for the ceramic clusters than the map allows. Not mapped here are the sherds of Ceramic Cluster 4 due to overlap with Cluster 1, instead a measured outline of Cluster 4 is provided (Jurasek 2022).

Figure 4.5. Image of Ceramic Cluster 1 during the mapping process (the trowel marks north). The yellow string marks the baseline used for triangulating the sherds seen in this photo (Jurasek 2022).

The next step in the mapping process was measuring the location of the material assemblage. Each sherd was measured in relation to its distance along and above/below the baseline, as well as depth below datum. When a sherd was mapped, it was also assigned a letter to distinguish it from other sherds and for later analysis of prominent vessels. Using this mapping process meant that the baseline could be removed and replaced if necessary, or even extended outward to encapsulate any other artifacts uncovered while mapping and excavating.

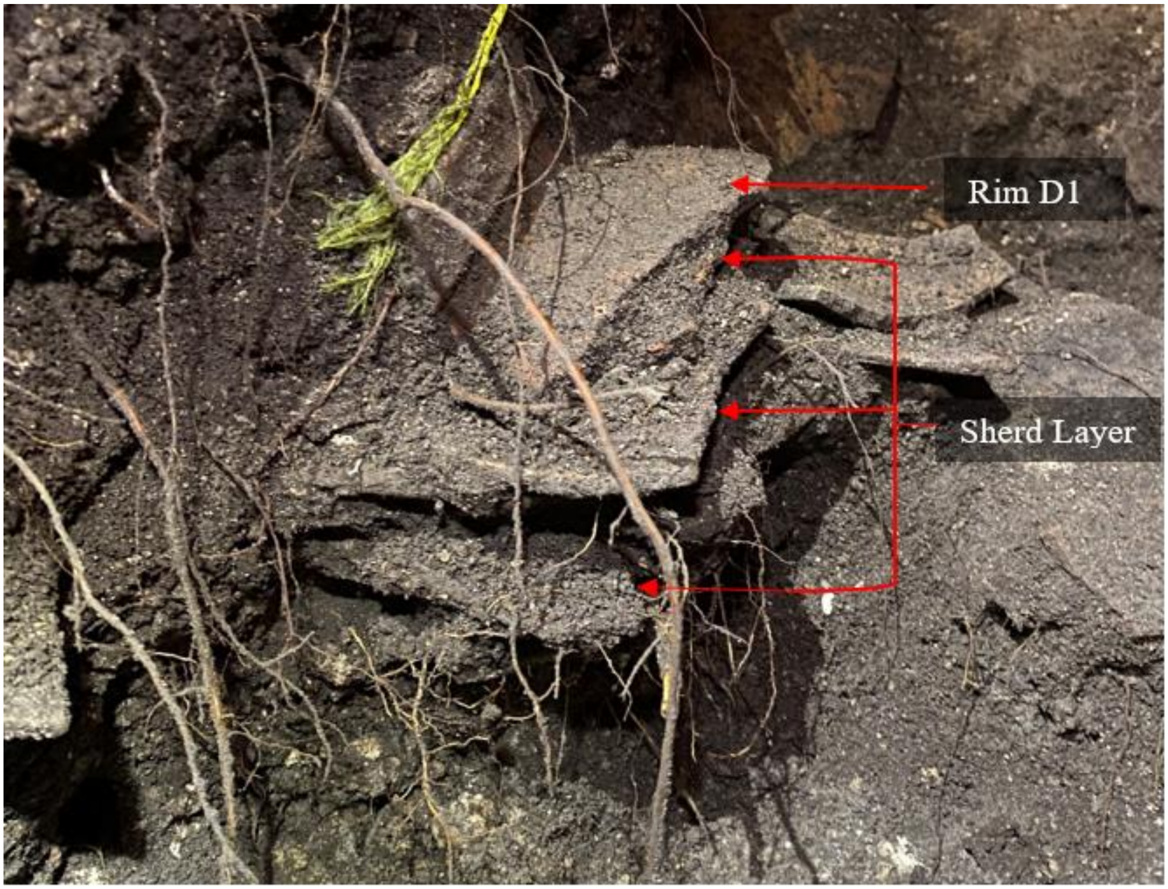

Figure 4.6. This photo taken of ceramics *in situ* shows the stacking of sherds within Ceramic Cluster 2, with Rim D1 on top of the stack, followed by at least three other body sherds directly below each other (Jurasek 2022)

While excavating Ceramic Cluster 2 specifically, many of the ceramic sherds were stacked and overlapped throughout the cluster (Figure 4.6). The number of layers in this pile is unknown. Due to time constraints and the sheer quantity of sherds, the mapping process involved mapping all those sherds found on the surface of the cluster, including complete rim pieces and large body sherds. This cluster was so large and contained such a high density of artifacts that its map was sectioned into 4 main parts (i.e., Ceramic Cluster 2: Section 1, etc.,) for ease of mapping and to allow for more detailed measurements, and all ceramics were bagged according to the section from which they were removed. Apart from the surface sherds, any substantial ceramics of note, mostly rim pieces, were mapped at any level of the cluster and their surrounding sherds were all bagged together. Once the surface sherds of the cluster were mapped, any sherds directly below were removed without mapping and placed in the same bag as their surface sherd to maintain context. The final measurement taken of the cluster was noting the depth at which it ended, providing an approximate total area of the ceramic cluster. When creating the final composite map (Figure 4.4) of the ceramic clusters the four sections were combined to show the entirety of Ceramic Cluster 2 (Figure 4.7).

Additional changes were made to the mapping procedure when excavations encountered Ceramic Cluster 4. This cluster (described below) contained very few ceramic sherds and no large rim sherds and was located directly on the bedrock. Located below Ceramic Cluster 1, the mapping of Ceramic Cluster 4 did not use triangulation, but rather measured the cluster's distance from the four walls of the chultun. Subsequently, its general placement can be viewed in Figure 6, within the center of Ceramic Cluster 1.

Chultun B-2: Data from the East Chamber (Operation 24)

The investigation of Chultun B-2 at Ka'kabish spans several years and produced several articles, theses, and other forms of literature about its excavation, human osteological material, and other material artifacts (see Carlos 2018; Gonzalez 2013; Howell 2022; Sagebiel 2014; Smith 2020a, 2020b; Verdugo 2014). This section will present the data collected during the author's 2022 excavations in the east chamber of Chultun B-2 specifically; the proceeding section will compile the data from the west chamber of the chultun using the above-mentioned literature and other data sources.

Figure 4.7. Ceramic Cluster 2, *in situ* (north is the top of the photo [Jurasek 2022]).

Overview of the Data and Stratigraphic Levels

Unlike excavations in the west chamber of Chultun B-2, as well as at all other chultuns thus far excavated at Ka'kabish, the East Chamber of Chultun B-2 yielded no human burials and very little in the way of human osteological material. One human permanent molar represents the extent of human remains discovered within the chultun, and this was found whilst screening the fill of Level 2. Instead, the east chamber's distinguishing characteristic is the presence of hundreds of ceramic sherds, separated into four distinct ceramic clusters. All of these ceramic clusters were located within Level 2.

Notably, almost all cultural material was recovered from Level 2, implicating this stratigraphic level as a clear marker of cultural activity. In contrast, Level 1 contained very little in the way of material cultural. During excavation of Level 1 a few artifacts were recovered prior to screening, but a majority were discovered only after sorting fill through the 6 mm screen. The artifacts recovered here consisted of small ceramic sherds, many too small to be diagnostic; faunal remains, whole and fragmented and mostly smaller than a Canadian quarter; a variety of lithic artifacts; and a scattering of land snails, which were noted throughout the chamber in no pattern or density deemed culturally intentional or significant. The ceramic sherds and lithic fragments recovered were likely mixed with the matrix used to fill the chultun, either from turbation, due to animal activity, or eroded into the chamber from the surface through the uncapped entrance due to rainfall.

Artifact density increases significantly during excavations of Level 2. Ceramic sherds, lithics, and faunal remains (including land snail shells) are still present, but in a higher volume and larger variety, this is especially true for the ceramics. Additional materials are also present in this level including charcoal, shell beads, a human molar, and obsidian fragments.

Ceramics

Four ceramic clusters represent the main cultural features found in Chultun B-2’s east chamber (Figure 4.6). These clusters are found at varying depths within the chultun, three of which (Ceramic Clusters 2-4) terminated only several centimeters above bedrock, and as such are believed to have been resting on the de facto floor of the chultun when it was initially in use. Later ceramic analysis, performed by Dr. Kerry Sagebiel, noted that sherds and rims from throughout all clusters and cluster sections (i.e., Ceramic Cluster 2, Section 3) could be refitted together, indicating all clusters represent one large cultural deposit with 24 distinct and identifiable vessels. The following paragraph details the work of Dr. Kerry Sagebiel's ceramic analysis.

The majority of whole vessels date to the Late/Terminal Classic period (A.D. 750-900) and consist of two main types: Dumbcane Striated (*n* = 7; all jar forms) and Encanto Striated (*n* = 8; all jar forms). Other types and vessel forms which make up the assemblage include Tinaja Red plates (*n* = 2) and jars (*n* = 2), Cubeta Incised vases (*n* = 2), one Achote Black bowl (*n* = 1), one Cameron incised vase (*n* = 1), and a single indeterminate cream jar (*n* = 1). Notably, the jar form dominates the assemblage (17 distinct vessels) this, combined with the presence of plate forms strongly suggest that these ceramic sherds are the remnants of storage vessels. Apart from these distinct vessel types, there were a variety of sherds removed from the east chamber, these were remnant of several different vessel forms and type-varieties, as listed in Appendix A, Table 1. The following subsections will provide further detail on the ceramic clusters encountered within Chultun B-2's east chamber.

Ceramic Cluster 1.

Located within the southern and south-eastern quadrant of Chultun B-2's east chamber, this ceramic cluster was encountered approximately 95-100 cm below datum. The cluster was mapped after the removal of a large limestone rock which was surrounded by several sherds. This limestone rock was likely produced from ceiling collapse; however, it is not the cause of the broken vessels. There were no sherds found beneath this rock, nor were there sherds of the same type numerous enough to complete a vessel within the cluster, both factors would be expected had the limestone collapse been the cause of the fragmented vessels. It is likely, then, that the ceramics found within Ceramic Cluster 1 (CC1) were culturally deposited as sherds, not as whole vessels. Other non-ceramic artifacts were encountered within this area. This includes the end of a mano, faunal bones, and one shell bead.

Ceramic Cluster 2.

This ceramic cluster was located in the north-east quadrant. Ceramic Cluster 2 (CC2) is significant in terms of size and completeness of ceramic fragments. There were three key vessel fragments of note: Rim A, Rim T, and Rim Z. Rim A, T, and Z (Figure 4.8, 4.9, and 4.10, respectively) are the only complete rim pieces recovered from the east chamber of Chultun B-2. Rim A was found in an upright position, and several soil samples were taken from within the fill of the vessel in hopes of detecting any food and/or botanical remnants which may indicate the functionality of the vessel. For example, a soil sample was taken when excavations encountered a high density of tiny pale yellow/white seed-like elements (approximately the size of a sesame seed). Curiously, unlike its counterparts, Rim Z was not found with any ceramic sherds within or directly outside the vessel. If the vessel was broken *in situ* one would expect to encounter the rest of its fragments in range of the rim, however Rim Z was found resting directly atop of bedrock, with no sherds directly below it and the next closest ceramic piece 10 cm away. This is indicative of the vessel having been broken elsewhere, perhaps outside the chultun and the resulting sherds dumped into the chamber, or likely broken within the chultun and then swept aside by the Maya as they continued to use the space, rather than removing the pieces entirely, the resulting rim piece placed apart from its sherds. In either case, its placement and fragmentation are cultural, not taphonomic.

Figure 4.8. Photo of Rim A *in situ* in Chultun B-2, east chamber. Rim J is also pictured to show how it’s positioned both under and in Rim A (Jurasek 2022).

Figure 4.9. Photo of Rim T taken after excavation, mapping, and removal from Chultun B-2, east chamber (Jurasek 2022).

Figure 4.10. Photo of Rim Z *in situ* within Chultun B-2, east chamber (north is the top of the photo [Jurasek 2022])

Figure 4.11. Fragment of worked stone, likely from a statue (Jurasek 2022).

Additional artifacts found within CC2 consist of faunal bones, one human tooth (the only human osteological material recovered from the east chamber), mollusks, chert debitage, a chert flake, and several (*n* = 6) obsidian prismatic blade fragments. Of particular note is the presence of what is presumably a stone statue fragment (Figure 4.11), found within the general fill of the ceramic cluster.

Ceramic Cluster 3.

Ceramic Cluster 3 (CC3) was found at roughly the same elevation of Ceramic Cluster 2 (119 cm below datum to 130 cm below datum) but was located in the same area of Ceramic Cluster 1 (in the south-east quadrant of the east chamber). Its proximity to the wall of the chultun chamber meant that some ceramic sherds were mere centimeters from, if not already resting upon, the bedrock where the wall curved down to form the floor of the chultun. It contained less than a dozen diagnostic sherds, the most notable being a large rim piece (Figure 4.12). This ceramic cluster did not contain any other material culture inclusions.

Ceramic Cluster 4.

The smallest ceramic cluster of Chultun B-2's east chamber was noted during the final layer of Level 2, while clearing away the final few centimeters of fill until bedrock. Ceramic Cluster 4 (CC4) was significantly smaller than the other clusters, measuring 24 cm by 14 cm across, nor did it contain large, diagnostic rim pieces. The cluster was located at an average of 30 cm directly below Ceramic Cluster 1. Consequently, due to its placement below a larger cluster, and minimal distribution and sherd count (Figure 4.13), CC4 was not formally mapped (as discussed in the preceding section). Instead, it was measured in relation to the walls of the east chamber: it was 257 cm from the north wall, 72 cm from the east wall, 66 cm from the south wall, and 48 cm away from the west wall of the chamber (Figure 4.6). It did not contain any other artifacts.

Figure 4.12. A large rim piece from Ceramic Cluster 3 (labelled Rim A in Ceramic Cluster 3 in Figure 6 [Jurasek 2022]).

Figure 4.13. Ceramic Cluster 4, *in situ* (north is the top of the photo [Jurasek 2022]).

Chultun B-2: Data from the West Chamber (Operation 9)

The 2012 excavation of Chultun B-2's west chamber at Ka'kabish, Belize uncovered several features within several designated cultural layers. This chultun excavation took place over five weeks and mapped at least two separate burials and three ceramic clusters within the west chamber. The following subsections will present a summary of the data as it pertains to this thesis. For further detail regarding excavation methods see Gonzalez (2013).

Overview of Data and Stratigraphic Levels

Unlike the excavation conducted on the east chamber, which classified two stratigraphic levels, Operation 9 conducted within Chultun B-2's west chamber demarcated nine levels. Several levels are notable cultural features (e.g.. Levels 3 and 6 are Burial Chultun B-2/2 and Burial Chultun B-2/1, respectively, and Level 8 is the west chamber's Ceramic Cluster 3), other level changes are marked by stratigraphy or variation in cultural inclusions.

West Chamber-Level 1 is similar to East Chamber-Level 1 in that is noncultural – composed of humus and limestone and the smallest density of artifacts, including small ceramic sherds (*n* = 97) and faunal remains. West Chamber-Levels 2 through 9 all contain marks of cultural activity. Apart from the burials and ceramic clusters, a variety of cultural material was discovered including obsidian blades, ceramic sherds, loose human teeth, faunal remains and shells, bone beads and other implements made of bone, charcoal, and lithic artifacts.

Ceramics

The majority of sherds from all levels are of the Late/Terminal Classic (A.D. 750 - 900) period Petén-style and Early Postclassic (A.D. 900 - 1250) typical of Lamanai and eastern Belize (Sagebiel 2014). In fact, only 20 identified sherds from the whole ceramic assemblage of Chultun B-2's west chamber dated earlier than the Late Classic/Terminal Classic (Appendix A,

Table 2). The ceramics vary in form and type, but the majority are striated jars from the Late/Terminal classic, not unlike those of the east chamber. The ceramics of the west chamber date slightly later in the upper levels than in the lower levels. Levels 1-6 contain red-slipped Postclassic period (A.D. 900-1250) sherds which are completely absent in Levels 7-9 (Sagebiel 2014).

Each cultural level of the west chamber contained ceramic sherds, but the most abundant sources are from three ceramic clusters. Two ceramic clusters, Ceramic Cluster 1 and Ceramic Cluster 2, were found in Level 5 near the south-east and south-west walls, respectively. Ceramic Cluster 1 also included an obsidian blade and fragments of burnt non-human bone. The third, Ceramic Cluster 3, was located in the northern and north-western portion of Level 8, below the general area of Burial B-2/1. The pattern and deposition of ceramic vessels in the west chamber indicates that the space, as with the east chamber, was used as home for storage vessels from approximately A.D. 750 to 1250. Interestingly, this activity is not contemporaneous with the burials, as evidenced by the radiocarbon dates obtained and discussed below.

West Chamber Burials

The excavations in the west chamber revealed at least two separate burial deposits/clusters containing a minimum number of four individuals (MNI = 4 [Howell 2022:36-37]) found in Levels 2, 3, 4, 5, and 6. The remains recovered from Levels 2, 3, 4 and 5 likely represent a commingled grave, labelled Burial Chultun B-2/2, containing at least three individuals dispersed throughout the levels two through five (Howell 2022:36). Level 6 contained of a separate, single individual (MNI = 1) and was labelled Burial Chultun B-2/1. For additional information on the human skeletal material recovered from Chultun B-2’s west chamber, refer to Smith (2020b).

Burial Chultun B-2/1 from Level 6 was located along the western wall of the chamber, slightly north from center. The human remains were laying upon a bed of land snail shells and small pebbles, the density and location of which labels this feature an intentional inclusion within the burial. The skeletal material was discovered under several large rocks, which likely fell from the ceiling causing fragmentation to the osteological material. Due to the fragmentation, it was difficult to obtain a general orientation of the remains, however it is noted that skull fragments were encountered in both the northern and southern ends of the grave.

The burial is associated with the smallest ceramic sherd density of the west chamber (*n* = 56), dating from the Late/Terminal Classic to the Postclassic periods. Additional cultural material from this area includes loose human teeth (*n* = 41), charcoal pieces, one bone needle, and a bone spindle whorl/ear spool. Radiocarbon dates taken from bone collagen date Burial Chultun B-2/1 to A.D. 1290 to 1396.

Burial Chultun B-2/2 (MNI = 3, from Levels 2, 3, 4, and 5) was positioned along the northern wall/floor of the west chamber. A majority of material associated with Burial Chultun B-2/2 was located in Level 3, which contained more sherds (*n* = 194) than Level 6 but a smaller variety of other artifacts. The rest of the material assemblage included charcoal, one bead, and lithic fragments, and loose teeth (*n* = 24). Samples of bone collagen provided Burial Chultun B-2/2 with a radiocarbon date of A.D. 1298-1400. The quality of the remains presented little for orientation analyses of the individuals interred. This is to be expected as both the collapsed ceiling of the chultun and the high humidity within these subterranean spaces create an environment that is unfavorable for the preservation of osteological material.

Additional osteological material from the west chamber of Chultun B-2 includes several dozen (*n* = 65) permanent human teeth, proportionately anterior and posterior and disproportionately mandibular (*n* = 44) and maxillary (*n* = 21 [Howell 2020:56]). One tooth was recovered from Level 1 and could not be securely dated, all other teeth (*n* = 64) date to the Late Classic and Postclassic periods, due to association with other securely dated artifacts (Howell 2022:55). Further detail about Chultun B-2's dental data can be found in Devon Howell's 2022 thesis.

Faunal Artifacts

A majority of faunal remains (analyzed by Norbert Stanchly) from the west chamber follow patterns of that recovered in the east chamber: small bones (likely from a rodent of some kind) either fragmentary or whole, scattered at random throughout the chamber, a pattern indicative of natural processes. The west chamber did, however, contain additional faunal remains of note. This includes tools and other implements made from animal bone, burnt/charred bone, and the cultural inclusion of a significant quantity of land snail shells beneath Burial Chultun B-2/1 (Stanchly 2013:19; Stanchly, personal communication)

The artifacts made from fauna bone include a needle/awl, two ear spools, a single bead, and a flute. One ear spool was encountered in Level 2 excavations of the west chamber. It was found in the northern half, within a cluster of human bone fragments. This ear spool was constructed out of shark cartilage (Stanchly 2013:19), and likely accompanied the individual(s) of Burial B-2/2. The sole bone bead was found within the same burial and serve as one of its few accompanying grave accoutrements. Also of note is the bone flute encountered in Level 5, likely another associated grave offering for Burial B-2/2. The Level 6 burial, Burial Chultun B-2/1, housed the second ear spool and the sole bone awl/needle, which were likely intentional inclusions within the grave.

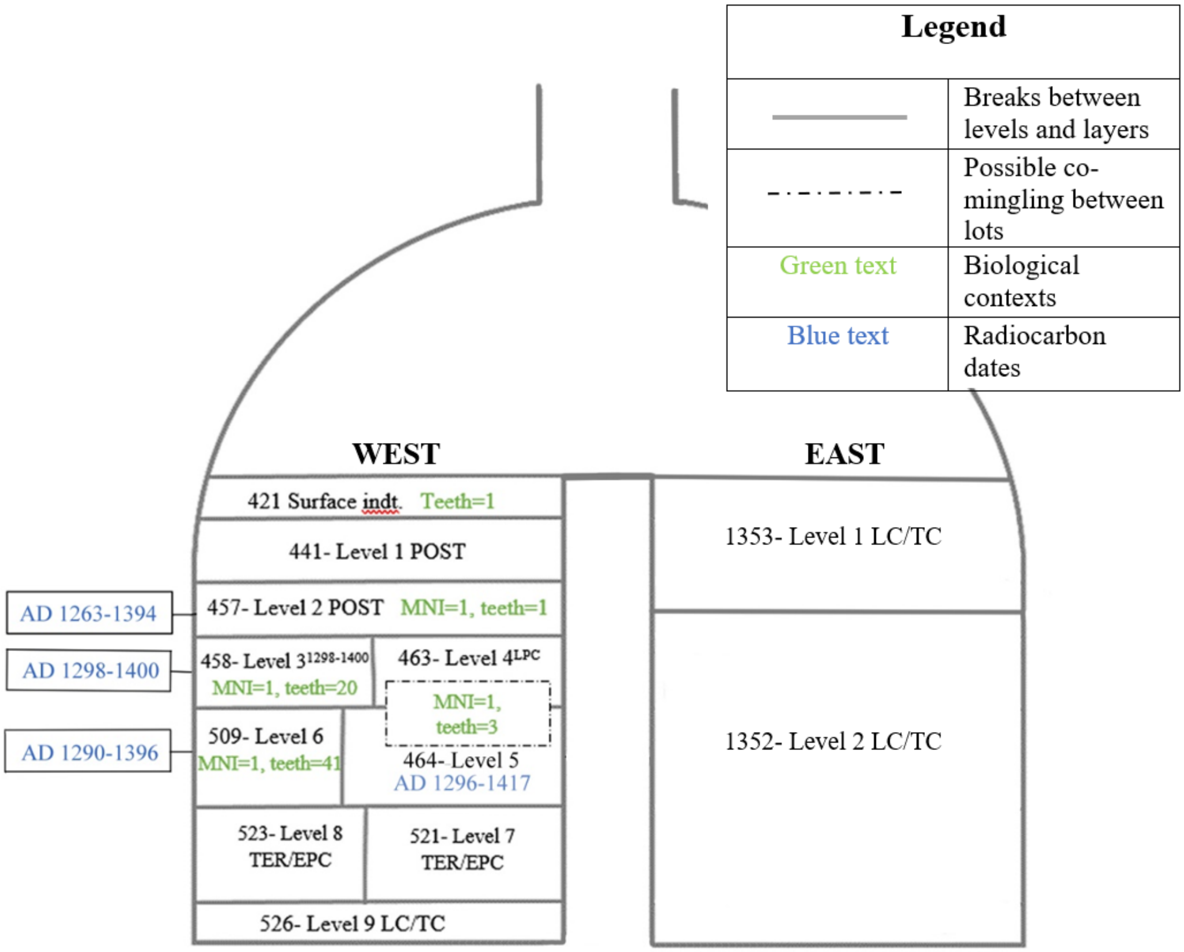

Figure 4.14. Schematic of Chultun B-2 showing the breakdown of the levels, date ranges (Late Classic [LC], Terminal Classic [TC], Early Postclassic [EPC], Postclassic [POST], Late Post Classic [LPC], and indeterminate date [INDT]), radiocarbon dates, and burials (adapted from Howell 2022:Figure3.4).

Conclusion

The above information presents the data from the east chamber of Chultun B-2 and the west chamber of Chultun B-2 separately. Reconstructing the composition of both chambers is necessary to understand how each chamber functioned and, by extension, if they functioned independent of the other, or if the composition of one side was dependent on the cultural activities of the other. If, for example, both the west and east chambers contained burials of similar patterns and positions, or if their material assemblages as a whole were vastly similar (i.e., loose teeth found in both chambers) then it can be assumed that the ancient Maya used them for similar purposes. Subsequently, this similarity of use would serve the same function, and presumably hold the same meaning, to the other single-chambered chultuns at the site.

What this data chapter reveals is that there is indeed a significant difference in the composition of the material in Chultun B-2's west chamber and east chamber. The chambers diverge in function most notably in the Postclassic. Moreover, the composition of the east chamber as a whole diverges not just from the west chamber but also from the other single-chambered chultuns known thus far at Ka'kabish, as witnessed in the east chamber's lack of burials. It is important to consider why the east chamber and the west chamber varied, and what that means for the entire mortuary ritual of the chultun. This chapter helped to initiate a discussion directly comparing Chultun B-2's east chamber and west chamber. Doing so will help answer the first research question of the thesis: What is the composition of Chultun B-2's east chamber compared to the west chamber?

The schematic presented here (Figure 4.14) is a summary of the most prominent differences between the two chambers of Chultun B-2's two chambers, highlighting their distinct functional and temporal characteristics. The following chapter of this thesis will work to analyze and discuss why the west chamber contained burials instead of the east chamber, subsequently addressing the final two research questions of this thesis.

CHAPTER FIVE: ANALYSIS AND DISCUSSION

The previous chapter concluded with a question: why did the ancient Maya select the western chamber of Chultun B-2 for burials over the eastern chamber? This chapter will combine the data from Chapter Four with the theories mentioned in Chapter Three to analyze and discuss the mortuary pattern of Chultun B-2. The main point of discussion will evaluate the mortuary pattern of the chultun, compare it to cave burials, and investigate it through cave archaeology. In so doing, this chapter will address the final two research questions of this thesis: what is the overall mortuary pattern of Chultun B-2 compared to that caves? and, is cave archaeology a useful lens for understanding the chultun's mortuary pattern?

The first section will analyze how the ancient Maya utilized Chultun B-2 based on the data collected. Cave burial data will also be presented to demonstrate the parallels between the chultun's mortuary pattern and cave mortuary patterns. The following section will then move to aspects of Maya cosmology, as mentioned in Chapter Three, highlighting how the east/west dichotomy in the Maya belief system is reflected in the burial patterns of caves and Chultun B-2. In so doing, this chapter will end with a discussion about the application of cave archaeological theories and methods within the investigation of chultun burials.

The Function of Chultun B-2

The previous chapter presented data from Chultun B-2, including burials, ceramic clusters, and the temporal range of use of both the east and west chambers. Markedly, the data indicate that the chultun's original function was not that of a burial space, but rather as a storage space. It was not until several hundred years later that the chultun was revisited for mortuary purposes. The following will analyze in further detail the use-pattern of Chultun B-2 and how it compares to other ancient Maya chultuns in the Southern Maya Lowlands.

The Initial Function: A Storage Space

Chultun B-2’s east and west chambers were used as storage spaces during the Late/Terminal Classic and Early Postclassic Periods. Support for this conclusion is seen in the abundance of unslipped, and mainly undecorated, ceramic ware sherds (i.e., Dumbcane striated) found in clusters within both the west chamber and east chamber (Sagebiel 2022, personal communication). The ceramic analysis, conducted by Dr. Kerry Sagebiel, was able to reconstruct two dozen vessels from these ceramic sherds; those vessels, along with additional diagnostic sherds created a ceramic assemblage consisting primarily of storage vessels and the plates used as lids for these vessels (Appendix A). Moreover, the lack of polychrome ceramics, and the presence of such types as Dumbcane Striated and Encanto striated jars, which are simple, incised vessels with no slip and minimal, if any, decoration is also indicative of the utilitarian function of the chultun chambers. The distinction between polychrome vessels and utilitarian vessels is related to specialization of polychrome pottery production in the elite social sphere, while domestic wares were created by and traded between households for household tasks and thus did not require specialized construction (Ball 1993; Jordan 2017). In sum, the presence of large, undecorated jars such as Dumbcane striated, paired with a lack of polychrome vessels, indicate that both the east and west chambers were used as a storage space during the Late/Terminal Classic to Early Postclassic periods (Rice and Forsyth 2004:36-38). This is the first identifiable function for Chultun B-2; it may have been used earlier than the Late/Terminal Classic, but the material evidence for any previous function is absent.

This is a significant conclusion when one recalls the use of chultuns as food storage spaces, as discussed in Chapter Three. These subterranean spaces are known for their extreme humidity, which produces yeast, mold, and bacterial growth, consequently causing deterioration of particular foods left in these spaces for any significant length of time (Dahlin and Latzinger 1986:729). Puleston's (1971) experimental approach to determining chultun function concluded that many staple food crops of the ancient Maya (i.e., maize, beans, squash) could not be stored within these spaces – the only exception to this was *Brosimum alicastrum*, known as ramon. This nut was not a preferred source of food for the ancient Maya but was instead consumed during times of famine (Lentz 1999:13; Dine et al. 2019). Ramon's reputation as a famine food stems from many factors including ease of preparation (the nut could be eaten raw or cooked), productivity (ramon needed little cultivation as it grows naturally in the forests of the lowlands), and hardiness of the food (Dine et al. 2019:Table 1; Peters and Pardo-Tejeda 1982:169). Thus, while it is unlikely that key food crops were stored within Chultun B-2 due to conditions resulting in poor preservation, the evidence presented supports hypotheses that it was a food storage space, however, determining the food type is beyond the scope of this research.

Moreover, recall that Dahlin and Litzinger (1986) mention that perhaps the humidity in these spaces was more conducive to food or beverage fermentation rather than storing food for long periods of time. The storage vessels present in both chambers could also be indicative of this type of storage function; that is, storage for the purposes of food fermentation. However, similarly to determining the type of food that was stored in these vessels, looking for further evidence of this function is beyond the scope of this research.

The Final Function: A Burial Space

The data revealed that Chultun B-2 was initially constructed for use as a storage space, and it was not until it had ceased function in a domestic capacity (or any original function therein) that the ancient Maya considered it an appropriate grave site during the Middle to Late Postclassic Period. The mortuary pattern of Chultun B-2 is the presence of burials in the west chamber and lack of burials in the east chamber. This pattern, in which a chultun was used in a domestic capacity for a period of time and later revisited for ritual purposes, is not uncommon (see Carlos 2018).

Dahlin and Litzinger (1986:723) emphasize that many chultuns were often backfilled with trash or soil, or even covered by household plazas or other constructions, having outlived their use. Chultun excavations are likely unearthing secondary or later deposits, which represent the abandonment of the chultun (Dahlin and Litzinger 1986; see also Carlos 2018). Therefore, because these spaces are often backfilled and they are poor preservers of organic material, it is often difficult to determine the primary and/or original function of chultuns. For example, a chultun may hold evidence of lithic production as indicated, for example, by the presence of debitage and cores found within the Chaa Creek chultun, indicating the space was likely used as a midden within which remnants of lithic products could be dumped (Stemp et al. 2018), but the chamber's first function could have been, hypothetically speaking, food storage, and any food remnants would not preserve in the given environmental conditions making this functionality difficult to detect. In the case of Chultun B-2, the type of material stored in the vessels is, at this point, unknown, but the presence of ceramic vessels is enough to demonstrate the chultun's primary function.

The east and west chambers of Chultun B-2 were abandoned for several hundred years before the west chamber was used as a burial space for a minimum number of four individuals. This transition of chultun function from a domestic storage space into a mortuary space has been investigated and is a common occurrence throughout the Maya Lowlands (see Carlos 2018). In an analysis of the final function of chultuns throughout the Southern Maya Lowlands, Carlos (2018:Table 4.5) noted that 20.4 percent (n = 29 of a sample of 142) of these subterranean spaces were repurposed as burial spaces. Carlos' analysis, which compiled primary data from direct excavations and secondary data from published literature regarding chultuns in the Southern Maya lowlands, found that the second most-frequent final and/or secondary function of these chultuns was ritualistic (*n* = 24, 16.9% [Carlos 2018:Table 4.5]). Carlos (2018:Table 4.5) identifies several other categories of chultun final function listed in the literature: burial/ritual (*n* = 1), midden/ritual (*n* = 1), storage/burial (*n* = 1), storage/ritual (*n* = 1), and utilitarian/ritual (*n* = 1). Overall, the study recorded that over one-third of chultuns within the Southern Maya Lowlands served a ritualistic/mortuary function as their final function, including Chultun B-2. Subsequently, it is not uncommon for chultuns to serve two or more functions, and further it is not uncommon for the final function to serve in a ritual capacity.

The ancient Maya used chultuns for many reasons, as water cisterns, middens, spaces for food storage, food and beverage fermentation, and as mortuary and/or ritual spaces. Simply put, chultuns served utilitarian and ritualistic purposes. This section analyzed the data from Chultun B-2 and found it functioned within both domestic and ritual spheres of Maya life; first, as a storage space and then as a burial space many hundreds of years later. Having established how and when the ancient Maya used the chultun the question becomes why the west chamber was favoured for burials while the east was avoided. This question will be addressed through an analysis of cave burials and their similarities to Chultun B-2, and by extension, through Maya cave archaeology methods and theories.

Cave Burials

Chultun B-2's burial pattern follows an east versus west dichotomy in which the western chamber was chosen for burials while the eastern chamber was not, despite equal access to both chambers. This thesis is focusing on the usefulness of Maya cave archaeology within the study of chultun burials. Cave archaeologists state that the Maya saw any hole in the ground as a cave whether natural or man-made and subsequently any subterranean space would be host to cave rituals. If this is true, one would expect similarities in the use pattern and/or cultural assemblage between these spaces (i.e., caves and chultuns). It is therefore necessary to assess if this east/west dichotomy is seen in cave assemblages in order to assess to applicability of cave archaeological theories and methods unto the study of Chultun B-2's mortuary pattern.

Caves, being natural formations within the karst landscape, cannot be easily divided into eastern and western halves, but rather have a variety of formations, chambers, and tunnels, and do not follow strict cardinal directions. Consequently, there is no clear east versus west patterning of burials within caves as witnessed in Chultun B-2. That is not to say, however, that there is no parallel pattern within caves and Chultun B-2. Significantly, there is a pattern which persists in caves in which burials are often placed in one specific area and are absent another. This is recognized as the dark zone versus light zone dichotomy of ancient cultural material and burial patterns within natural caves of the Maya region.

Light Zones and Dark Zones

Many caves utilized by the ancient Maya show similar distributions of burials amongst each other such that the dark zones of these natural subterranean spaces were the chosen locales for burials while the light zones often lack graves of any kind. This pattern has been reported in Naj Tunich (Brady 1989), Cueva de Sangre (Brady et al. 1997a), Spider Cave at Maax Cave (King et al., 2012), Petroglyph Cave (MacLeod and Puleston 1978), Actun Tunichil Muknal (Moyes 2005), Footprint Cave (Graham et al. 1980), Actun Yaxteel Ahau, Laberinto de las Tarantulas, and Actun Nak Beh, of Upper Roaring Creek Valley (Awe and Helmke 2007), Mayehal Xheton and other caves in the Ek Xux and Muklebal Tzul region, southern Belize

(Prufer 2005), Bats'ub Cave (Prufer and Dunham 2009), Actun Toh (Rissolo 2005) to name a few examples. The term 'dark zone' is used here to refer to those areas within a cave system which lack natural light. The light zones of caves are merely those spaces where natural sunlight penetrates such as the entrance and the space around it.

The Maya utilized these two distinct areas in caves differently; the former was a space for mortuary rituals or simply more private rituals for a few select participants while the latter was the focal point of more public ceremonies and ritual (Prufer 2005:205, 210). Within this distinction lies an important factor to this dichotomy: the dark zone need not always include burials in order to be functionally different from the light zone of a cave, its ritual components simply reflect preference for private ceremonies, which may include mortuary practices. As a result, additional differences can simply be the frequency and typology of ceramics found in these two different areas of the cave. For example the presence of polychrome vessels often revered in public ceremonies are found distributed within the entrance/light zone of a cave, while the restricted dark zones hold domestic pottery types and/or plain storage vessels and incense burners (Brady 1989:406; Brady et al. 1997a:361).

The pattern witnessed in the caves mentioned above, as well as many others, differ from one another and from region to region, however, the general trend of particular ritual rites practiced in light zones differing from those in dark zones is consistent. This dichotomy has been noted in cave archaeological literature for decades (see MacLeod and Puleston 1978) and is an important trend in the ritual turn of cave archaeological studies in the Maya region (Woodfill 2021). Along with noting this dichotomy, literature has also focused on how this patterning has changed over time. The dark zone/light zone dichotomy as it present in this thesis – burials in the dark zone and lack of burials in light zones – is a pattern that appears during the Late/Terminal

Classic period, contemporaneous the use of Chultun B-2. Notably however, Formative period and Early Classic period burials in natural subterranean spaces were found in light zones of caves or rockshelters (Wrobel et al. 2009). Thus, there was a shift in this preferential placement of burials over the span of the Classic period, resulting in more burials placed in the dark zones than light zones by the Late/Terminal Classic period (i.e., Wrobel et al. 2009:201).

This Late/Terminal Classic dark zone/light zone dichotomy is seen in James Brady's (1989) doctoral thesis on investigations of Naj Tunich Cave is an important component in deconstructing and understanding this light zone/dark zone pattern. A brief discussion of Brady's (1989) examination of Naj Tunich Cave will be presented below, followed by an overview of archaeological studies in Actun Tunichil Muknal, as it displays mortuary patterns not unlike Chultun B-2. These two caves are presented as a summary for the types of light zone and dark zone patterns displayed in caves. For further examples, please see those caves previously mentioned.

Naj Tunich. Investigated and reported by James E. Brady, Naj Tunich is an extensive cave system located in the Peten region of Guatemala, only several kilometers from the Belizean border (1989:72). Excavations recovered several human interments within Naj Tunich. The cave system contained at least seven burials, all distant from the entrance and distributed throughout dark tunnels, alcoves, and chambers (Brady 1989:130-152, 354). In contrast to the dark areas of Naj Tunich, the entrance of the cave features no burials, but rather another form of ritual done for public ceremony (Brady 1989:101). This is evident by the presence of a two-tiered balcony construction, centered around what appears to be a stage or altar (Brady 1989:101). Here the sun-lit entrance chamber of the cave, with its terraced architecture, likely served as a public ritual space where the community could gather and watch the ritual taking place in the center of the chamber, unlike those tight, confined spaces in the darker areas of the cave, in which burials were placed.

The cave presents the light zone versus dark zone dichotomy in more ways than just the presence of burials in the dark zone and lack of burials in the light zone. The dichotomy also extends to artifact types. The light zone, with its altered construction for a more public ceremony features a high concentration of polychrome vessels (Brady 1989:406). In contrast, the dark zones contain domestic vessels (Brady 1989:406). The preference for burials and domestic wares in small, enclosed dark zones creates privateness and allows for smaller, non-public rituals by non-elites. In contrast, the light zones represent a different part of the cave's ritual capacity by offering a space for public ceremonies.

Actun Tunichil Muknal. Actun Tunichil Muknal (ATM) is five-kilometer-long cave system heavily utilized during the Late/Terminal Classic period in Upper Roaring Creak Valley (Awe and Helmke 2007:32-33). Here, cave archaeologists witnessed a preference for mortuary rituals in the Main Chamber, located 500 meters from the main entrance (Moyes 2005). Initial archaeological investigations within ATM noted four main regions of ancient Maya activity (Awe et al. 2005:224). Of these four major areas, the Main Chamber and the Upper Entrance Chamber are the best examples of the dark zone and light zone activity, respectively.

The Upper Entrance Chamber is adjoined to the Eastern Entrance of ATM and is one of the cave's light zones (the cave has several light zones, each corresponding to its four separate entrances [Awe and Helmke 2007]). Investigations revealed Late Classic and Terminal Classic ceramic vessels, as well as a few select Early Classic ceramics which were broken or severely fragmented (Awe and Helmke 2007:33). There were no burials or other forms of ritual within this chamber.

In contrast, the Main Chamber is the furthest area within ATM to exhibit cultural activity (Awe and Helmke 2007:33). Within this dark zone the Maya partitioned passageways into separate chambers, including a burial chamber, using stalagmite columns and boulders (Moyes 2005:271). Notably, the Main Chamber contains the remains of fourteen individuals along with associated grave goods (Awe et al. 2005:224). What is most significant, for the purposes of this thesis, is the GIS (geographic information system) cluster mapping performed by Moyes (2005) within ATM's dark zones. Through linear distribution analysis, Moyes (2005:281) located four distributions within the Main Chamber, each corresponding to one of the cardinal directions. The western linear distribution is the most explicit area of cultural activity (Moyes 2005:281). Specifically, in parallel with Chultun B-2's west chamber, at the termini of the westernmost wall is a cluster of human remains, while the eastern wall of the chamber lacks burials (Moyes 2005:281).

In this brief overview of ATM, there is a clear dichotomy between how the Maya utilized two different chambers. The Upper Entrance Chamber, whilst noted as a zone of frequent cultural activity, lacks burials, while the Main Chamber contains burials, with an MNI of fourteen. The choice to carry these individuals 500 meters into the Main Chamber rather than a simple journey into the Upper Entrance Chamber is likely the product of the same belief system that influenced the selection Chultun B-2's west chamber for burials over the east chamber. The following sections will re-introduce Maya cave archaeology theories and methods and how they draw upon the Maya belief system to explain the east/west and light/dark dichotomy witnessed in caves and Chultun B-2. In so doing, the patterns witnessed in Naj Tunich, ATM and other caves, and most importantly, Chultun B-2 can be investigated and understood.

Cave Archaeology Revisited

Situated within north-central Belize, Ka'kabish is a Maya polity of the Southern Lowlands and is located approximately 10 kilometers northwest from the major Maya site of Lamanai (Haines et al., 2020:45). This geographic range places Ka'kabish upon the Tertiary limestone bedrock and Cenozoic basement of northern Belize, an area typically classified as a poorly developed karst (Day 2007:162). Consequently, karstic developments in this region, including caves, are smaller and less prominent than their southern Belizean counterparts (see Chapter 2 for more details of the geology and geomorphology of the Maya landscape).

Accordingly, cave archaeologists propose that a lack of natural caves within the region would have encouraged the ancient Maya to produce their own caves within which they could carry out cave rituals (King et al. 2012:612). Moreover, translations of the Maya word *ch'en*, "a hole in the sacred earth", include bodies of water, natural caves, and artificial subterranean pits, in spite of their man-made quality (Brady 1997:603; Brady and Layco 2018:52; Lucero and Kinkella 2015:163). This would mean that Chultun B-2, as a subterranean space within a sacred and animate earth, functions as an artificial cave and the mortuary pattern therein is the product of ancient Maya cave ritual. This section will reintroduce cave archaeological theories and methods to demonstrate that such methodologies are indeed useful for understanding the mortuary pattern of Chultun B-2.

The East/West Dichotomy in the Maya Belief System

Cave archaeological theories and methodologies are grounded in two aspects of Maya archaeology, the first being landscape archaeology, which assesses how people regard and interact with their landscape (Ashmore 2009). Maya cosmology and studies of the Maya belief system are also necessary for the study of cave archaeology. Using a conglomeration of these two areas of research, cave archaeologists, using an emic perspective, view the Maya landscape as a sacred and animate space, imbued with ritual meaning (Ashmore 2009, 2015). Under this framework, caves within the Maya region become sacred elements of landscape and an integrated part of the Maya cosmos. As a result, research focused on caves examines how the elaborate rituals carried out within these subterranean areas reflect religious aspects of ancient Maya life (Brady et al. 1997b; Prufer and Brady 2005).

This ritual turn in the study of cave archaeology created a realm of research in which caves in the Maya world held two sacred meanings: (1) as a path to the Maya underworld, Xibalba, and (2) as access into the sacred mountain, home of venerated ancestors and Maya gods (Woodfill 2021). The latter premise, that caves grant access to the Maya gods, or rather these subterranean spaces are themselves the houses within which these supernatural beings live, relates to the idea that caves are sources of rain, wind, lightning, and maize (Bassie-Sweet 1996:10; Woodfill 2021). The other meaning associated with caves – as paths into the dark and watery underworld – is associated with the story of the Hero Twins from the Maya creation story, the Popol Vuh (MacLeod and Puleston 1978). As a result of these two distinct meanings, caves were associated with a variety of ritual practices (Stone 1995:7), each related to the cave's specific role in the Maya belief system. The cave becomes a liminal space of both life and death (Pugh 2005:50), where the Maya could honour the rain god for a fertile growing season or where their dead could be placed so that they may begin the journey into Xibalba (McNatt 1996:81).

This duality of caves, as a border between life and death, is dictated by Maya cosmology and the Maya belief system, which is grounded within the story of the Hero Twins from the Maya creation story. Upon defeating the Xibalbans, lords of the underworld, and the resurrection of their father, the twins, Hunahpu and Xbalanque, "ascended straight on into the sky, and the sun belongs to one and the moon to the other" (Tedlock 1996:141). Set in motion on this day of victory over the lords of Xibalba is the solar cycle, the rising and setting of the sun and moon, and the creation of life (Tedlock 1996:145). Subsequently, the Hero Twins are destined to recreate their great journey into Xibalba through the daily setting of the sun in the east and the rising of the sun in the west (Moyes 2016:174). This cycle works part in parcel with how the Maya viewed the order of the universe.

Chapter Three described Maya cosmology, outlining the ordering of the Maya universe. Recall that the Maya world was quadripartite, viewed as a square with four separate horizons to the north, east, south, and west (Bassie-Sweet 1996:21). At the midline of each of these horizons sits a sacred mountain with a sacred cave entrance (Bassie-Sweet 1996:21). The setting sun enters the western cave entrance, and when the sun rises the next day, it emerges from the eastern cave entrance (Bassie-Sweet 1996:29). In tying together Maya cosmology and the Maya creation story, the western cave becomes the path into Xibalba while the eastern cave represents the birth of the sun and moon and their emergence from the underworld.

Therefore, the story of the Hero Twins and the cosmological ordering of the Maya world birthed the east/west dichotomy of the Maya belief system in which the west represents darkness, death, and emergence into underworld (Pugh 2005:63-64), while the east represents life, rebirth, re-emergence (Awe 2006:66; McNatt 1996:81). It is this opposition between life and death, light and darkness, the eastern cave and the western cave, that formed the ritual practices and patterns of the ancient Maya. Indeed, this east/west pattern is prevalent through the ancient Maya world. It is noted in architectural patterns, such as E-Group complexes in which the central buildings are oriented along an east/west axis, favoring the solar cycle (Estrada-Belli 2011:67). Moreover, it is a noted patterned within caves, as mentioned above. Cave archaeology utilizes this knowledge of landscape archaeology and Maya cosmology to look for and investigate these binaries within ritual remnants of the past.

Cave Archaeology and Cave Burials

This binary opposition of life and death and its material realization in cave rituals forms recognizable patterns that are rightly attributed to the ancient Maya conceptualization of caves. The light zone/dark zone dichotomy prevalent in cave assemblages is proof of this. The dark zones of caves, those areas that are more private and are often selected as a favourable burial space (Prufer 2005:205), are selected for such rituals because they represent the path to Xibalba. In terms of Maya cosmology, the dark zone of the caves represents the western cave entrance, where the sun sets, metaphorically dying and returning into the underworld (MacLeod and Puleston 1978; Pugh 2005:63-64).

It is the complete lack of natural sunlight partnered with the often-present natural water sources within these areas of the cave that mimics the Maya concept of a dark and watery underworld (Moyes 2016:173; Stone 1995:35-43). Subsequently, the placement of the dead within these dark areas of caves is done as a means of leaving the deceased closer to the underworld, making these parts of the cave a transitional path from the world of the living into the world of the dead (Lucero and Kinkella 2015:16). That is why there is such a prominent light zone/dark zone dichotomy within Maya cave systems, as noted above and described in the Naj Tunich and ATM examples. The east/west dichotomy is just as important as the light/dark dichotomy because it directly relates to the continuous cycle of the sun into the western cave entrance, its path through the underworld, and its rebirth in the east, as was witnessed in ATM and its western linear distribution (Moyes 2005). This type of patterning, where smaller, often mortuary, rituals are carried out within the dark zones or western area of caves, falls into the ‘caves as the underworld’ theory of cave archaeology.

At the other end of the spectrum is the east, the light zone, the entrance of these Maya caves. These areas are centers of larger, public rituals (Brady 1989:406; MacLeod and Puleston 1978:72; Moyes and Prufer 2013:227; Prufer 2005:205). Recall the cave burial data mentioned above in which the entrances of caves are often adapted to hold community-based rituals through the construction of walls, floors, pavements, and platforms (Brady et al. 1997a:362). These architectural modifications, along with the high density of polychrome vessels often found in these areas, demarcate public areas of the cave, and the rituals carried out here are those honouring fertility and community boundaries (Moyes and Prufer 2013; Wrobel et al. 2017:99).

Rituals of this sort, carried out within the large, sunlight-filled entrances of caves fall into the ‘caves as houses’ conceptualization. The foundation of this sacred meaning is the belief that venerated Maya gods live within these spaces. This includes the rain god, Chaak, and through rain ceremonies carried out within cave entrance, the Maya called forth rain for a fertile growing season (Brady et al. 1997a). Thus, these rituals signify acts of fertility and birth for the whole community, creating a spiritual connection between the community’s leader and Maya earth deities (Moyes 2016:180; Moyes and Prufer 2013:227). The light zone of caves is the chosen locale for these rain rituals because they not only provide ease of access and space enough for community worship of the deity, but they also utilize the light of the sun, reminiscent of the sun’s birth out of the eastern cave entrance, bringing with it light and life.

Cave archaeology was formed through the application of Maya cosmology and landscape archaeology within the study of ritual cave use. As a result, the patterns witnessed in caves, this light versus dark partitioning, is explained in terms of life versus death, and by extension, 'caves as houses' versus 'caves as the underworld'. This chapter has already pointed out the parallel patterning between the light zone and dark zone of caves and the east and west mortuary pattern of Chultun B-2. The question is then, given this parallel pattern between cave burials and Chultun B-2, do the theories of cave archaeology extend to the study of the mortuary pattern of Chultun B-2?

Cave Archaeology and Chultun B-2

Based on the above analysis and discussion and the data present from Chultun B-2, cave archaeology's theories and methods of analysis are indeed applicable to the study of Chultun B-2's mortuary pattern. Detailed throughout the preceding discussion and data chapter, the mortuary pattern of Chultun B-2 is a western burial chamber and an abandoned eastern chamber. Without applying cave archaeology theories and methods, the selection of one chamber over the other for burials would seem apparently random. Both the east and west chamber are of nearly equal size, and both are equally accessible from the main entrance of the chultun as well as from the earthen platform which separates the chambers. Moreover, both served the same initial function during the same time period, functioning as a storage space from the Late/Terminal Classic to the Early Postclassic. Consequently, given this and the data on-hand, Chultun B-2's east/west dichotomy would appear arbitrary.

Cave archaeologists have argued for the expansion of their approach into other areas of Maya archaeology based on an emic understanding of Maya cave rituals. As such, cave archaeologists such as Prufer and Brady (2005) claim that Maya cave studies should be applied to chultuns, cenotes, rockshelters, and other holes in the earth, including bodies of water (Lucero and Kinkella 2015:16). Through the application of cave archaeology to the study of Chultun B-2, the western burial placement becomes an intentional and conscious decision, rather than a random selection of west over east.

The western chamber was selected for burials because it represents a path to Xibalba. In accordance with both Maya cosmology and cave ritual patterning described above, the west represents death and darkness; it is the location through which the Hero Twins, reborn as the sun and moon, recreate their journey into the Underworld. Thus, the western chamber of Chultun B-2 is the path to Xibalba, and in labeling the chultun an artificial cave, it becomes the dark zone, within which mortuary rituals are carried out. The ancient Maya of Ka'kabish placed their dead in the west chamber rather than east because of this sacred meaning. The four individuals placed within the west chamber are therefore closer to the underworld and can begin their journey into the afterlife.

The included grave furnishings within the west chamber further support this conclusion. Specifically, the abundance of snail shells, both land and aquatic, laid out as a sort of bed beneath Burial 1. Recall that the underworld is seen as a watery place because it is several levels below the earth, which floats upon a body of water (Bassie-Sweet 1996:21). Subsequently, Maya underworld symbolism throughout the Formative, Classic, and Postclassic periods often include aquatic creatures (Chase and Chase 2009:219) because of their ability to pass through the water and into the many levels of Xibalba. This symbolism can also include animals found both on land and in water because they represent the comingling of the terrestrial and supernatural realms (Stross 1991:105), not unlike the liminal spaces of caves which served as the border between this world and the underworld (Pugh 2005:80). Subsequently, snails and mollusks, as creatures found naturally on both land and in bodies of water throughout the Maya region, represent symbols of death (Brady 1989:378).

As such, snails are often found in many burial deposits, including those in the great city of Tikal where Moholy-Nagy (1978:65) reports that the most common archaeological contexts containing marine shells included burials, caches, and special deposits. At Petroglyph Cave, MacLeod and Puleston's (1978:76) foundational 'caves as Xibalba' study noted a pathway "of literally millions of shells of freshwater and terrestrial snails" leading into the dark zone of the cave, a feature they claim represents the road to Xibalba due to the snail's association with Maya death symbolism. Thus, the ancient Maya of Ka'kabish, by placing Burial 1 atop of a bed of snail shells was providing the deceased with a path into the underworld, not unlike other burial patterns witnessed in caves.

Since the west chamber of Chultun B-2 is the road to Xibalba, one might expect the east chamber of Chultun B-2 to serve as a house to the rain god and other earthen deities, following the patterning of seen in the light zone of caves. The east chamber, however, bears no evidence of use past the Early Postclassic period, and only held materials indicative of domestic use. Notably, this is to be expected when one considers that the rituals of fertility and life in the light zones of caves are large public ceremonies, enabling and requiring community engagement. These rituals required offerings and community leaders to establish their relationship with the gods that live within these sacred spaces, demonstrating their power to communicate with the supernatural and bring forth rain and a good growing season (Lucero and Kinkella 2015; Moyes 2016; Thompson 1970). The small, restricted space of the eastern chamber was not conducive to these larger rituals. Furthermore, the space itself is still a space of darkness, and without the presence of abundant natural sunlight it does not parallel the light zone of caves used to honor Chaak and other Maya deities.

Another aspect of Chultun B-2 to consider is it use as a storage space. In assessing the ceramic data obtained from both the east and west chamber, it was concluded that they both served a utilitarian function prior to any ritual connotation brought on by the burials in the west chamber. Notably, cave archaeology views caves as inherently ritualistic spaces, because carrying out domestic tasks could be quite difficult in this often dark, confined, hard-to-reach spaces. Chultuns, however, have been known to function in a domestic or utilitarian capacity (see Chapter Three). Thus, in this instance, the best method for understanding the ceramic assemblage of Chultun B-2 was not through the scope of cave archaeology, but rather with theories of chultun's domestic use already prevalent in the literature (i.e., Puleston's 1971 food storage hypothesis).

Summary

The mortuary pattern of Chultun B-2 was investigated through the lens of cave archaeology. In so doing, a pattern which was otherwise arbitrary is now framed as an important decision in the mortuary ritual for the deceased. By placing the deceased individuals within the western chamber instead of the east the living community members were placing their dead closer to Xibalba. The addition of a bed of snail shells within the burial assemblage provides additional guidance for the deceased into the watery underworld. The eastern chamber, as a result of the east/west dichotomy within the Maya belief system, was abandoned rather than repurposed for ritual.

Conclusion

The pattern of cave rituals is divided such that it mimics the Maya cosmos where the west represents death, and the east represents life. This belief is founded upon the sacred cave entrances at the boundaries of the Maya world, and it is through the western cave that the sun dies at the end of each day and rises again out of the eastern cave. Cave archaeology applies this aspect of the Maya belief system to frame the distinct pattern of cave use by the ancient Maya. This chapter analyzed and demonstrated the effectiveness of applying this approach in the investigation of an ancient Maya chultun. This form of research has been severely lacking within the literature despite the claims that chultuns can and should be investigated under the scope of cave archaeology (see Brady and Layco 2018). After reintroducing cave archaeology, previously detailed in Chapter Three, and highlighting its applicability within cave studies, this chapter proved that the mortuary pattern of Chultun B-2 at Ka’kabish could be better understood using cave archaeology theories and methods. In so doing, the final two research questions of this thesis were addressed and will be summarized in the proceeding chapter.

CHAPTER SIX: CONCLUSION

The final chapter of this thesis will present a summary of the findings as they relate to the initial research questions introduced in Chapter One. This summary section will conclude by presenting the initial goal of this thesis and the final conclusions made in that regard and the significance of this work. The next sections discuss the limitations of the study and potential avenues for future research in this field.

Summary of Findings

This thesis evaluated the applicability of cave archaeology theories and methods in the investigation of an ancient Maya chultun, a man-made subterranean pit. Cave archaeologists who excavate and examine the ritual activities in caves throughout the Maya region (e.g., Actun Tunichil Muknal, described in Chapter Five) suggest that all subterranean spaces in the Maya world were utilized in ritually similar ways which honoured the earth gods and served as a path into Xibalba, the Maya underworld. This research involved the excavation of, and investigation of data recovered from Chultun B-2 at Ka'kabish, Belize, to address three main research questions related to the usefulness of cave archaeology in the investigation of the chultun's mortuary/ritual pattern. These three questions were answered throughout the thesis and are reintroduced and summarized below.

What is the composition of the east chamber compared to the west chamber?

The two chambers are quite similar when examining their first detectable function. Both were locations for large storage vessels during the Late/Terminal Classic (A.D. 600-900) and Early Postclassic (A.D. 900-1250) periods. This is made evident by the type and form of the ceramics. The vessel types found in both sides (i.e., Dumbcane striated, Encanto Striated, etc., [Appendix A:Table 1, Table 2]) are common utilitarian vessels, and their pairing with plates indicates that these jars were capped as a means of preserving their contents. Determining what was stored within these vessels is outside the scope of this research, but earlier chultun excavations (i.e., Puleston 1971) have suggested that food, specifically ramon, known as breadnut, was preservable within these high-humidity spaces.

The most apparent, and most severe, difference between the two chambers is the lack of burials in the east chamber and the presence of burials (MNI = 4) in the west chamber. Here, the west chamber conforms to, and the east chamber diverges from, those assemblages recovered from the single-chambered chultuns at Ka'kabish. Moreover, the ceramic analysis and the radiocarbon dates clearly demonstrate that the burials of the west chamber and the ceramics of both chambers are non-contemporaneous. The radiocarbon-dated burials from the west chamber, as well as other radiocarbon dates obtained from charcoal samples, indicate that the west chamber was used as a grave site during the Middle and Late Postclassic (ca. A.D. 1263-1417).

Thus, several hundred years after the deposition of the ceramics, the Maya repurposed the chultun as a burial space (see Figure 4.14 for a visual representation of the temporal use of both the east and west chambers). Specifically, the west chamber witnessed mortuary rituals 300 to 500 years after the cessation of probable domestic activity within Chultun B-2. This temporal inconsistency suggests, as stated above, that the burials were later inclusions into the chultun, indicating that the Maya were reusing the space, transforming it from a domestic storage unit into a burial space. This finding is consistent with chultun research conducted by Carlos (2018) who assessed the final function of chultuns throughout the Southern Maya Lowlands and found that approximately one-fifth of chultuns with a reported final function were used as a burial space.

What is the overall mortuary pattern of Chultun B-2 compared to that of caves?

Chultun B-2 is a unique construction at the site of Ka'kabish, Belize, being the only chultun thus far discovered with two chambers, rather than one. These two chambers are oriented along an east/west axis and are separated by a natural earthen platform directly below the opening of chultun. The chultun served two functions during its lifespan. First, both chambers were used as a storage space from the Late/Terminal Classic into the Early Postclassic period. Several centuries later, during the Middle to Late Postclassic, the ancient Maya repurposed the chultun for burials. Notably, only the west chamber was chosen for these burials, while the east chamber remained unused past the Early Postclassic era. This pattern is the result of a mortuary ritual that favoured the west over the east, creating a dichotomy between the two chambers.

This dichotomy is not unique to Chultun B-2 and is in fact commonly witnessed within cave burials and/or rituals. In a few select instances a direct west versus east pattern is prevalent in cave systems, such as that at Actun Tunichil Muknal. However, in most cases the parallel between Chultun B-2's mortuary pattern and caves is the light zone/dark zone dichotomy. Similar to the western chamber of Chultun B-2, the dark zones of caves are chosen for burials in spite of the difficulty in transporting the deceased to these small, constricted areas which are at times 500 meters away from the cave entrance. In contrast, the light zones often lack burials, similar to the east chamber, and are the focus of more public rituals. Therefore, there is an apparent similarity between the mortuary pattern of Chultun B-2 and that of caves.

Is cave archaeology a useful lens for understanding the chultun's mortuary pattern?

Given the parallels between cave assemblages and the chultun assemblage, one would therefore expect that if cave archaeology were an acceptable and useful perspective for studying the mortuary pattern of caves it would also be a useful perspective for studying the mortuary pattern of a chultun. This was demonstrably true. Through the lens of cave archaeology, Chultun B-2's east/west dichotomy demonstrates a mortuary ritual focused on guiding the deceased into the Maya underworld, Xibalba. In the Maya belief system the path into the underworld is through the sacred cave entrance on the western horizon, evidenced by the setting sun in the west. Mimicking the sun, and by extension the journey of the Hero Twins and their victory in Xibalba, the ancient Maya placed their deceased within the western chamber of Chultun B-2. In contrast, the east chamber was ignored, as it represents the sacred eastern cave entrance of the Maya cosmos, an area of life and rebirth, evidenced by the rising sun in the east.

Without the application of cave archaeology, the east/west dichotomy of Chultun B-2's mortuary pattern might have been viewed as redundant. Due to the prevalent reuse of these subterranean spaces from a domestic function to a ritual function, it would not be unreasonable to submit the claim that the ancient Maya repurposed the space simply because it was a quick and easy way of disposing of the dead. But the parallel between the mortuary pattern witnessed in Chultun B-2 compared to that of caves, and the mere presence of the east/west dichotomy within the chultun, shows cosmological connotations which are best understood through the lens of Maya cave archaeology.

Significance of these Findings

Overall, this research found that cave archaeology as practiced in Maya archaeology was a useful lens with which to view the mortuary pattern of Chultun B-2 at Ka'kabish, Belize. It was noted early on in this thesis that the study of chultun mortuary patterns is severely limited and thus any parallel relationship between chultun cultural use patterns and cave use patterns is unknown. This research also showed how these two different subterranean spaces compare (i.e., east and west chambers of Chultun B-2 are equivalent to light and dark zones in natural caves).

In this evaluation and comparison, this thesis added to the minimal literature regarding chultun use and excavation. What is more, this thesis was able to provide important data-supported evidence for the application of cave archaeology in the study of chultuns. This is significant because prior to this research, little had been done to support the claims from cave archaeologists which suggest that all subterranean spaces served the same ritualistic functions. In conclusion, this research shows that Chultun B-2's mortuary pattern is similar to that of caves and that same mortuary pattern was best understood through the lens of cave archaeology.

Limitations of this Research

While this research is an important contribution to chultun literature and how the ancient Maya utilized these spaces, it is prone to limitations. The goal of this thesis was to determine if cave archaeology theories and methods were a useful lens with which to view mortuary patterns within a chultun. This research utilized data from Chultun B-2 at Ka'kabish and found that cave archaeology was a useful tool for understanding the mortuary pattern within Chultun B-2. However, this study is a case study of one chultun of many at one site in the Southern Maya Lowlands. There remain hundreds of chultuns in the Maya region, and at least half-a-dozen known at the site of Ka'kabish alone. Without a large sample of chultuns to analyze, it is not yet possible to conclude that cave archaeology could be used to successfully interpret the mortuary pattern seen in other chultun excavations.

There remains the possibility that chultuns, when (re)used as burial spaces, only functioned that way because it was readily available space, which had already served its initial function, for the Maya to place their dead. Often located close to residential platforms and often easy to access, the Maya could have simply chosen chultuns as burial spaces for practicality's sake. Chultun B-2 is proof that there is a similarity between cave burials and chultun burials, but it is not proof that *all* chultuns containing burials were used as artificial caves to invoke cave-like rituals and mortuary practices.

Moreover, this research did not extensively apply other mortuary theories (such as ancestor veneration) unto the investigation of Chultun B-2's mortuary pattern. So, while cave archaeology appears to be the most fitting theory for analyzing the distribution of burials in Chultun B-2, the investigation of the individual burial patterns may point towards other Maya mortuary practices from the Middle to Late Postclassic.

Future Research

As noted above, there are several limitations to this study. There remains, however, future research opportunities which may mitigate these limitations. First, would be expanding the application of cave archaeology from one case study, as conducted here on Chultun B-2, into a larger sample. The first step would be to analyze the other excavated chultuns at Ka'kabish. Recall that there are four other chultuns that have been excavated, all of which contained burials and all of which were single-chamber constructions. Future research would focus on the patterning within those chambers, looking for indications of the dark zone/light zone and/or east/west dichotomy which, as discussed in Chapter Five, parallel cave burial and ritual patterns. There is also the potential for the study to expand regionally, perhaps with extensive investigation of any chultun in the Belize region which contain burials, in order to assess the usefulness of cave archaeology as a lens with which to interpret those burial patterns. Unfortunately, at the regional level, it would become increasingly difficult to conduct this study because the degree in which chultun mortuary patterns are document is often minimal, if reported at all (as noted in Chapter Three).

Thus, another area for future research would simply be more chultun excavations. This would include documenting any possible use of the chultun, as done in this thesis in its examination of Chultun B-2, including documenting any first initial use and final use and the patterning of artifacts and cultural material which are indicative of those functions. Moreover, the ritual and/or mortuary pattern of these spaces deserve more attention in the literature such that archaeologists will have easy access to data required (i.e., mortuary pattern descriptions) to evaluate cave archaeology's usefulness in investigating those burials.

Another avenue for potential research is assessing the applicability of other forms of mortuary theories on the study of chultun burials. This could be done by applying theories of ancestor veneration, for example, unto the study of a chultun's burial to assess the usefulness of that perspective in understanding the overall mortuary pattern.

Overall, this study is but a single case study done in hopes of expanding interest and understanding in chultun excavations and chultun burials. Moreover, it provides guidance for understanding why these artificially made subterranean spaces were used as burials, adding to the literature which evaluates the ritual/mortuary function of chultuns. By pointing out these future research endeavours, further data may be obtained which will support, or perhaps negate, the work of this research and thus help Maya archaeologists understand the scope and capabilities of cave archaeology theories and methods.

References Cited

Andres, Christopher R., and K. Anne Pysburn
2004 Out of Sight: The Postclassic and Early Colonial Periods at Chau Hiix, Belize. In *The Terminal Classic in the Maya Lowlands: Collapse, Transition, and Transformation*, edited by Arthur A. Demarest, Prudence M. Rice, and Don S. Rice, pp. 402-423.

Aoyama, Kazuo
2005 Classic Maya Warfare and Weapons: Spear, Dart, and Arrow Points of Aguateca and Copan. *Ancient Mesoamerica* 16(2):291-304.

Ashmore, Wendy
2009 Mesoamerican Landscape Archaeologies. *Ancient Mesoamerica* 20(2):183-187.

2015 What Were Ancient Maya Landscapes Really Like?. *Journal of Anthropological Research* 71(3):305-326.

Ashmore, Wendy, and Pamela L. Geller
2005 Social Dimensions of Mortuary Space. In *Interacting with the Dead: Perspectives on Mortuary Archaeology for the New Millennium*, edited by Gordon F.M. Rakita, Jane E. Buikstra, Lane A. Beck, and Sloan R. Williams, pp. 81-92. University Press of Florida, Gainsville.

Awe, Jaime J.
2006 *Maya Cities and Sacred Caves: A Guide to the Maya Sites of Belize*. Cubola Productions, Belize.

Awe, Jaime J., Cameron Griffith, and Sherry Gibbs
2005 Cave Stelae and Megalithic Monuments in Western Belize. In *In the Maw of the Earth Monster,* edited by James E. Brady and Keith M. Prufer, pp. 223-248. University of Texas Press, Austin.

Awe, Jaime J., and Christophe G.B. Helmke
2007 Fighting the Inevitable: The Terminal Classic Maya of the Upper Roaring Creek Valley. *Research Reports in Belizean Archaeology* 4:28-42.

Ball, Joseph W.
1993 Pottery, Potters, Palaces, and Polities: Some Socioeconomic and Political Implications of Late Classic Maya Ceramic Industries. In *Lowland Maya Civilization in the Eight Century A.D.,* edited by Jeremy A. Sabloff and John S. Henderson, pp. 243-272. Dumbarton Oaks Research Library and Collection, Washington, D.C.

Barrett, Jason W., and Andrew K. Scherer
2005 Stones, Bones, and Crowded Plazas: Evidence for Terminal Classic Maya Warfare at Cohla, Belize. *Ancient Mesoamerica* 16(1):101-118.

Bassie-Sweet, Karen
1996 *At the Edge of the World: Caves and Late Classic Maya World View*. University of Oklahoma Press, Norman.

Beach, Tim, Sheryl Luzzadder-Beach, Duncan Cook, Nicholas Dunning, Douglas J. Kennett, Samantha Krause, Richard Terry, Debora Trein, Fred Valdez
2015 Ancient Maya Impacts on the Earth's Surface: An Early Anthropocene Analog? *Quaternary Science* 124:1-30.

Beach, Timothy, Sheryl Luzzadder-Beach, Nicholas Dunning, Duncan Cook
2008 Human and Natural Impacts on Fluvial and Karst Depressions of the Maya Lowlands. *Geomorphology* 101:308-331.

Binford, Lewis R.
1971 Mortuary Practices: Their Study and Their Potential. In *Approaches to the Social Dimensions of Mortuary Practices,* edited by J.A. Brown, pp. 6-29. Memoirs of the Society for American Archaeology, Number 25.

Blackmore, Chelsea
2011 Ritual Among the Masses: Deconstructing Identity and Class in an Ancient Maya Neighborhood. *Latin American Antiquity* 22(2):159-177.

2016 Ancient States and Ordinary People: A Feminist Re-Imaging of Ancient Maya Power and the Everyday. *Critique of Anthropology* 36(2):103-121.

Borowicz, James
2003 Images of Power and the Power of Images: Early Classic Iconographic Programs of the Carved Monuments of Tikal. In *The Maya and Teotihuacan: Reinterpreting Early Classic Interaction,* edited by Geoffrey E. Braswell, pp. 217-234. Unversity Press, Texas.

Brady, James E.
1989 An Investigation of Maya Ritual Cave Use with Special Reference to Naj Tunich, Peten, Guatemala. PhD dissertation, Department of Archaeology, University of California, Los Angeles

1997 Settlement Configuration and Cosmology: The Role of Caves at Dos Pilas. *American Anthropologist* 99(3):602-681.

Brady, James, and Wendy Layco
2018 Maya Cultural Landscapes and the Subterranean: Assessing a Century of Chultun Research. *International Journal of Archaeology* 6(1):46-55.

Brady, James E., Ann Scott, Allan Cobb, Irma Rodas, John Fogarty, and Monica Urquizú Sánchez
1997a Glimpses of the Dark side of the Petexbatun Project: The Petexbatun Regional Cave Survey. *Ancient Mesoamerica* 8(2):353-364.

Brady, James E., Ann Scott, Hector Neff, and Michael D. Glascock
1997b Speleothem Breakage, Movement, Removal, and Caching: An Aspect of Ancient Maya Cave Modification. *Geoarchaeology: An International Journal* 12(6):725-750.

Brady, James E., and Georgy Veni
1995 Man-Made and Pseudo-Karst Caves: The Implications of Subsurface Features within Maya Centers. *Geoarchaeology* 7(2):149-167.

Braswell, Geoffrey E., Joel D. Gunn, María del Rosario Domínquez Carrasco, William J. Folan, Laraine A. Fletcher, Abel Morales López, and Michael D. Glascock
2004 Defining the Terminal Classic at Calakmul, Campeche. In *The Terminal Classic in the Maya Lowlands: Collapse, Transition, and Transformation*, edited by Arthur A. Demarest, Prudence M. Rice, and Don S. Rice, pp. 162-194. University Press of Colorado, Boulder.

Brennan, Michael L., Eleanor M. King, Leslie C. Shaw, Stanley L. Walling, Fred Valdez Jr.
2013 Preliminary Geochemical Assessment of Limestone Resources and Stone Use at Maya Sites in the Three Rivers Region, Belize. *Journal of Archaeological Science* 40:3178-3192.

Brewer, Jeffrey L.
2018 Householders as Water Managers: A Comparison of Domestic-Scale Water Management Practices from Two Central Maya Lowland Sites. *Ancient Mesoamerica* 29:197-217.

Brown, James
1995 On Mortuary Analysis – With Special Reference to the Saxe-Binford Research Program. In *Regional Approaches to Mortuary Analysis*, edited by Lane Anderson Beck, pp. 3-26. Springer Science+Business Media, New York.

Borowicz, James
2003 Images of Power and the Power of Images: Early Classic Iconographic Programs of the Carved Monuments of Tikal. In *The Maya and Teotihuacan: Reinterpreting Early Classic Interaction*, edited by Geoffrey E. Braswell, pp. 217-234. University Press, Texas.

Buikstra, Jane E., and Douglas H. Ubelaker
1994 *Standards for Data Collection from Human Skeletal Remains.* Arkansas Archaeological Survey, Fayetteville.

Cagnato, Clarissa
2017 Underground Pits (Chultunes) in the Southern Maya Lowlands: Excavation Results from Classic Period Maya Sites in Northwestern Petén. *Ancient Mesoamerica* 28:75-94.

Calderón, Zoila, and Bernard Hermes
2005 Chultuns in the Surrounding Areas of the Yaxha Lagoon, Peten. In *Simposio de Investigaciones Arqueológicas en Guatemala*, pp. 111-130. Museo Nacional de Arquelogía y Etnología, Guatemala.

Callaghan, Michael G., Daniel E. Pierce, and William D. Gilstrap
2018 The First Maya Trade Ware? New Data on Middle Preclassic-Period Mars Orange Paste Ware from Holtun, Guatemala. *Latin American Antiquity* 29(4):821-827.

Canuto, Marcello A.
2016 Middle Preclassic Maya Society: Tilting at Windmills or Giants of Civilization? In *The Origins of Maya States*, edited by Loa P. Traxler and Robert J. Sharer, pp. 461-506. University of Pennsylvania Museum of Archaeology and Anthropology, Philadelphia.

Carlos, T. Gwynne
2016 Investigations of Chultuns C-2 and C-3. In *Ka'kabish Archaeological Research Project (KARP) Report on the 2015 Archaeological Field Season,* edited by Kerry L. Sagebiel and Helen R. Haines, pp. 44-52. The Institute of Archaeology, Belmopan, Belize. Electronic document, https://www.kakabish.org/field-reports.html, accessed October, 2021.

2018 A Question of Space: Insights into the Function of Chultuns in The Maya Southern Lowlands. Master's thesis, Department of Anthropology, Trent University, Peterborough, Ontario.

Carr, Christopher
1995 Mortuary Practices: Their Social, Philosophical-Religious, Circumstantial, and Physical Determinants. *Journal of Archaeological Method and Theory* 2(2):105-200.

Cecil, Leslie G.
2009 Introduction. In *Maya Worldviews at Conquest*, edited by Leslie G. Cecil and Timothy W. Pugh, pp. 1-15. University Press of Colorado, Boulder.

Charles, Douglas K.
2005 The Archaeology of Death as Anthropology. In *Interacting with the Dead: Perspectives on Mortuary Archaeology for the New Millennium,* edited by Gordon F.M. Rakita, Jane E. Buikstra, Lane A. Beck, and Sloan R. Williams, pp. 15-24. University Press of Florida, Gainsville.

Chase, Adrian S.Z.
2016 Beyond Elite Control: Residential Reservoirs at Caracol, Belize. *WIRES Water* 3(6):885-897.

Chase, Diane Z., and Arlen F. Chase
2004 Hermeneutics, Transitions, and Transformations in Classic to Postclassic Maya Society. In *The Terminal Classic in the Maya Lowlands: Collapse, Transition, and Transformation*, edited by Arthur A. Demarest, Prudence M. Rice, and Don S. Rice, pp. 12-27.

2009 Changes in Maya Religious Worldview: Liminality and the Archaeological Record. In *Maya Worldviews at Conquest*, edited by Leslie G. Cecil and Timothy W. Pugh, pp. 219-237. University Press of Colorado, Boulder.

2017 Caracol, Belize, and Changing Perceptions of Ancient Maya Society. *Journal of Archaeological Research* 25(3):185-249.

Clark, John E., and David Cheetham
2002 Mesoamerica's Tribal Foundations. In *The Archaeology of Tribal Societies*, edited by William A. Parkinson, pp. 278-339. International Monographs in Prehistory, Michigan.

Coe, Michael D.
1978 *Lords of the Underworld: Masterpieces of Classic Maya Ceramics*. Princeton University Press, New Jersey.

1988 Ideology of the Maya Tomb. In *Maya Iconography*, edited by Elizabeth Benson and Gillet Griffin, pp. 222-235. Princeton University Press, New Jersey.

Dahlin, Bruce H., and William J. Litzinger
1986 Old Bottle, New Wine: The Function of Chultuns in the Maya Lowlands. *American Antiquity* 51(4):721-736.

Danforth, Marie Elaine, Keith P. Jacobi, and Mark Nathan Cohen
1997 Gender and Health Among the Colonial Maya of Tipu, Belize. *Ancient Mesoamerica* 8(1):13-22.

Day, Michael J.
2007 Karst Landscapes. In *Central America: Geology, Resources and Hazards*, edited by Jochen Bundschuh and Guillermo E. Alvarado, pp. 155-170. Taylor & Francis, London.

Demarest, Arthur
2004 *Ancient Maya: The Rise and Fall of Rainforest Civilization*. Cambridge University Press, Cambridge.

Demarest, Arthur, and Robert J. Sharer
1982 The Origins and Evolution of Usulutan Ceramics. *American Antiquity* 47(4):810-822.

Dine, Harper, Traci Ardren, Grace Bascopé, and Celso Gutiérrez Báez
2019 Famine Foods and Food Security in the Northern Maya Lowlands: Modern Lessons for Ancient Reconstructions. *Ancient Mesoamerica* 30:571-534.

Doyle, James A.
2012 Regroup on “E-Groups”: Monumentality and Early Centers in the Middle Preclassic Maya Lowlands. *Latin American Antiquity* 23(4):355-379.

Dunning, Nicholas P., and Timothy Beach
2010 Farms and Forests: Spatial and Temporal Perspectives on Ancient Maya Landscapes. In *Landscapes and Societies*, edited by I. Peter Martini and Ward Chesworth, pp. 369-389. Springer, New York.

Dunning, Nicholas, Timothy Beach, Pat Farrell, and Sheryl Luzzadder-Beach
1998 Prehispanic Agrosystems and Adaptive Regions in the Maya Lowlands. *Culture and Agriculture* 20(2/3):87-101.

Dunning, Nicholas P., Sheryl Luzzadder-Beach, Timothy Beach, John G. Jones, Vernon Scarborough, and T. Patrick Culbert
2002 Arising from the Bajos: The Evolution of a Neotropical Landscape and the Rise of Maya Civilization. *Annals of the Association of American Geographers* 92(2):267-283.

Estrada-Belli, Francisco
2011 *The First Maya Civilization: Ritual and Power Before the Classic Period*. Routledge Press, New York.

Estrada-Belli, Francisco, Alexandre Tokovinie, Jennifer M. Foley, Heather Hurst, Gene. A. Ware, David Stuart, and Nikolai Grube
2009 A Maya Palace at Holmul Peten, Guatemala and the Teotihuacan “Entrada”: Evidence from Murals 7 and 9. *Latin American Antiquity* 20(1):228-259.

Fash, William L., E. Wyllys Andrews, and T. Kam Manahan
2004 Political Decentralization, Dynastic Collapse, and the Early Postclassic in the Urban Center of Copan, Honduras. In *The Terminal Classic in the Maya Lowlands: Collapse, Transition, and Transformation*, edited by Arthur A. Demarest, Prudence M. Rice, and Don S. Rice, pp. 260-287.

Forsyth, Donald W.
1993 The Ceramic Sequence at Nakbe, Guatemala. *Ancient Mesoamerica* 4(1):31-53.

Franco-Gaviria, F., A. Correa-Metrio, C. Cordero-Oviedo, M. Lopez-Perez, G.M. Cardenes-Sandi, F.M. Romero

2018 Effects of Late Holocene Climate Variability and Anthropogenic Stressors on the Vegetation of the Maya Highlands. *Quaternary Science Reviews* 189:76-90.

Freidel, David A., and Linda Schele

1988 Kingship in the Late Preclassic Maya Lowlands: The Instruments and Places of Ritual Power. *American Anthropologist* 90(3):547-567.

Freidel, Dorothy E., John G. Jones, and Eugenia Robinson

2011 Volcanic Eruptions, Earthquakes, and Drought: Environmental Challenges for the Ancient Maya People of the Antiqua Valley, Guatemala. *Yearbook of the Association of Pacific Coast Geographers* 73:1-26.

Garrison, Thomas G., and Nicholas P. Dunning

2009 Settlement, Environment, and Politics in the San Bartolo-Xultun Territory, El Peten, Guatemala. *Latin American Antiquity* 20(4):525-552.

Gillespie, Susan D.

2001 Personhood, Agency, and Mortuary Ritual: A Case Study from the Ancient Maya. *Journal of Anthropological Archaeology* 20:73-112.

Gischler, Eberhard, and J. Harold Hudson

1998 Holocene Development of Three Isolated Carbonate Platforms, Belize, Central America. *Marine Geology* 144:333-347.

Glover, Jeffrey B., and Travis W. Stanton

2010 Assessing the role of Preclassic Traditions in the Formation of Early Classic Yucatec Cultures, Mexico. *Journal of Field Archaeology* 35(1):58-77.

Gonzalez, Toni Ann

2013 Exploring Chultun B-2 in Group B at Ka'Kabish. In *Ka'Kabish Archaeological Research Project (KARP): Interim Report on the 2012 Field Season*, edited by Cara G. Tremain and Helen R. Haines, pp. 73-80. The Institute of Archaeology, Belmopan, Belize. Electronic document, https://www.kakabish.org/field-reports.html, accessed October, 2021.

2014 Investigation of Chultun C-1 at Ka'kabish. In *Ka'kabish Archaeological Research Project (KARP): Report on the 2013 Field Season*, edited by Helen R. Haines, pp. 37-45. The Institute of Archaeology, Belmopan, Belize. Electronic document, https://www.kakabish.org/field-reports.html, accessed November 2021.

2015 Investigation of Chultun C-2. In *Ka'kabish Archaeological Research Project (KARP) Report on the 2014 Archaeological Field Season*, edited by Helen R. Haines, pp. 38-45. The Institute of Archaeology, Belmopan, Belize. Electronic document, https://www.kakabish.org/field-reports.html, accessed November 2021.

Graham, Elizabeth
2000 Collapse, Conquest, and Maya Survival at Lamanai, Belize. *Archaeology International* 4:52-56.

Graham, Elizabeth, Logan McNatt, and Mark A. Gutchen
1980 Excavations in Footprint Cave, Caves Branch, Belize. *Journal of Field Archaeology* 7(2):153-172.

Grove, David C.
2016 Preclassic Central Mexico: The Uncertain Pathway from Tlatilco to Teotihuacan. In *The Origins of Maya States*, edited by Loa P. Traxler and Robert J. Sharer, pp. 59-82. University of Pennsylvania Museum of Archaeology and Anthropology, Philadelphia.

Haines, Helen R.
2007 *The 2007 Spring Mapping Project of the Ka'kabish Archaeological Research Project (KARP)*. The Institute of Archaeology, Belmopan, Belize. Electronic Document, https://www.kakabish.org/field-reports.html, accessed March, 2022.

Haines, Helen R., and Christophe Helmke
2016 Painted Hieroglyphs from Tomb FA-6/1 at Ka'kabish, Belize. *Mexicon* 38(5):120-127.

Haines, Helen R., Kerry L. Sagebiel, and Alec McLellan
2020 The Beginning to the End and Over Again: An Overview of the Occupation History of Ka'kabish, Belize. *Research Reports in Belizean Archaeology* 17:45-56

Halperin, Christina T., Sergio Garza, Keith M. Prufer, and James E. Brady
2003 Caves and Ancient Maya Ritual Use of Jute. *Latin American Antiquity* 14(2):207-219.

Hansen, Richard D.
2001 The First Cities: The Beginnings of Urbanization and State Formation in the Maya Lowlands. In *Maya: Divine Kings of the Rain Forest*, edited by Nikolai Grube, pp. 51-64. Koenneman, Cologne.

2005 Perspectives on Olmec-Maya Interaction in the Middle Formative Period. In *New Perspectives on Formative Maya Cultures*, edited by T.G. Powis, pp. 51-72. Archaeopress, Oxford UK.

2016 Cultural and Environmental Components of the First Maya States: A Perspective from the Central and Southern Maya Lowlands. In *The Origins of Maya States*, edited by Loa P. Traxler and Robert J. Sharer, pp. 329-416. University of Pennsylvania Museum of Archaeology and Anthropology, Philadelphia.

Hester, Thomas R., and Harry J. Shafer
1984 Exploitation of Chert Resources by the Ancient Maya of Northern Belize, Central America. *World Archaeology* 16(2):157-173.

Horowitz, Rachel A., Mary E. Clarke, and Kenneth E. Seligson
2021 Querying Quarries: Stone Extraction Practices and Socioeconomic Organization in Three Sub-Regions of the Maya Lowlands. *Journal of Field Archaeology* 46(8):551-570.

Houston, Stephen D.
1999 Classic Maya Religion: Beliefs and Practices of an Ancient American People. *Brigham Young University Studies* 38(4):43-72.

Houston, Stephen D., and Takeshi Inomata
2009 *The Classic Maya*. Cambridge University Press, Cambridge.

Howell, Devon J.
2022 Use and Utilization of Loose and Commingled Human Dental Remains in Investigations of Ancient Human Populations. Master's thesis, Department of Anthropology, Trent University, Peterborough, Canada.

Hunter-Tate, Clarissa C.
1994 The Chultuns of Caracol. In *Studies of the Archaeology of Caracol, Belize,* edited by Diane Z. Chase and Arlen F. Chase, pp. 64-75. Pre-Columbian Art Research Institute, San Francisco.

Iceland, Harry, and Thomas Hester
2001 Lowland Mesoamerican Archaic. In *Encyclopedia of Prehistory, Volume 5: Middle America*, edited by Peter N. Peregrine and Melvin Ember, pp. 292-302. Springer, New York.

Inomata, Takeshi
2006 Plazas, Performers, and Spectators: Political Theaters of the Classic Maya. *Current Anthropology* 47(5):805-842.

Inomata, Takeshi, 猪俣健, Jessica MacLellan, Daniela Triaden Jessica Munson, Melissa Burhama, Kazuo Aoyama, 青山和夫, Hiroo Nasu, 那須浩郎, Flory Pinzón, Hitoshi Yonenobu, and 米延仁志
2015 Development of Sedentary Communities in the Maya Lowlands: Coexisting Mobile Groups and Public Ceremonies at Ceibal, Guatemala. *Proceedings of the National Academy of Sciences of the United States of America* 112(14):5268-4273.

Ishihara, Reiko
2008 Rising Clouds, Blowing Winds: Late Classic Maya Rain Rituals in the Main Chasm, Agueteca, Guatemala. *World Archaeology* 40(2):169-189.

Jackson, Sarah E.
2013 *Politics of the Maya Court: Hierarchy and Change in the Late Classic Period*. University of Oklahoma Press, Norman.

Jordan, Jillian M., and Keith Prufer
2017 Identifying Domestic Ceramic Production in the Maya Lowlands: A Case Study from Uxbenka, Belize. *Latin American Antiquity* 28(1):66-87.

Karkanas, Panagiotis, and Paul Goldberg
2017 Cave Settings. In *Encyclopedia of Geoarchaeology*, edited by Allan S. Gilbert, pp. 108-118. Springer, Dordrecht, Netherlands.

Kepecs, Susan, and Marilyn A. Masson
2003 Political Organization in Yucatan and Belize. In *The Postclassic Mesoamerican World*, edited by Michael E. Smith and Frances F. Berdan, pp. 40-44. University Press, Utah.

King, Eleanor M., James E. Brady, Lesli C. Shaw, Allan B. Cobb, C.L. Kieffer, Michael L. Brennan, and Chandra L. Harris
2012 Small Caves and Sacred Geography: A Case Study from the Prehispanic Maya Site of Maax Na, Belize. *Latin American Antiquity* 23(4):611-628.

Knapp, A. Bernard, and Wendy Ashmore
1999 Archaeological Landscapes: Constructed, Conceptualized, Ideational. In *Archaeologies of Landscape: Contemporary Perspectives*, edited by Wendy Ashmore and A. Bernard Knapp, pp. 1-30. Wiley-Blackwell, Malden, MA.

Krause, Samantha, Timothy Beach, Sheryl Luzzadder-Beach, Duncan Cook, Gerald Islebe, Manuel R. Palacios-Fest, Sara Eshleman, Colin Doyle, Thomas H. Guderjan
2019 Wetland Geomorphology and Paleoecology near Akab Muclil, Rio Bravo Floodplain of the Belize Coastal Plain. *Geomorphology* 331:146-159.

Lentz, David L.
1999 Plant Resources of the Ancient Maya: The Paleoethnobotanical Evidence. In *Reconstructing Ancient Maya Diet*, edited by Christine D. White, pp. 3-18. University of Utah Press, Salt Lake City.

Lentz, David L, Nicholas P. Dunning, Vernon L. Scarborough, Kevin S. Magee, Kim M. Thompson, Eric Weave, Christopher Carr, Richard E. Terry, Gerald lslebe, Kenneth B. Tankersley, Liwy Grazioso Sierra, John G. Jones, Palma Buttles, Fred Valdez, and Carmen E. Ramos Hernandez

2014 Forest, Fields, and the Edge of Sustainability at the Ancient Maya City of Tikal. *Proceedings of the National Academy of Sciences of the United States of America* 1111(52):18513-18518.

Livarda, Alexandra, and Richard Madgwick
2017 Ritual and Religion: Bioarchaeology Perspectives. In *The Bioarchaeology of Ritual and Religion*, edited by Alexandra Livarda, Richard Madgwick, and Santiago Riera Mora, pp. 1-13. Oxbow Books, Oxford.

Lohse, Jon C.
2010 Archaic Origins of the Lowland Maya. *Latin American Antiquity* 21(3):312-352.

Lohse, Jon C., Jaime Awe, Cameron Griffith, Robert M. Rosenwig, and Fred Valdez Jr.
2006 Preceramic Occupations in Belize: Updating the Paleoindian and Archaic Record. *Latin American Antiquity* 17(2):209-226.

Lucero, Lisa J., and Andrew Kinkella
2015 Pilgrimage to the Edge of the Watery Underworld: an Ancient Maya Water Temple at Cara Blanca, Belize. *Cambridge Archaeological Journal* 25(1):163-185.

MacLeod, Barbara, and Dennis E. Puleston
1978 Pathways into Darkness: The Search for the Road to Xibalba. In *Tercera Mesa Redonda de Palenque, Vol. IV*, edited by M.G. Robertson and D.C. Jeffers, pp. 71-77. Herald Printers, California.

MacNeish, Richard S.
1964 Ancient Mesoamerican Civilization. *Science* 143(3606):531-537.

2001 Early Mesoamerican Archaic. In *Encyclopedia of Prehistory, Volume 5: Middle America*, edited by Peter N. Peregrine and Melvin Ember, pp. 116-128. Springer, New York.

Marfia, A.M., R.V. Krishnamurthy, E.A. Atekwana, W.F. Panton
2003 Isotopic and Geochemical Evolution of Ground and Surface Waters in a Karst Dominated Geological Setting: A Case Study from Belize, Central America. *Applied Geochemistry* 19:937-946.

Marshall, Jeffrey S.
2007 Geomorphology and Physiographic Provinces. In *Central America: Geology, Resources and Hazards*, edited by Jochen Bundschuh and Guillermo E. Alvarado, pp. 75-122. Taylor & Francis, London.

Martin, Simon, and Nikolai Grube
2000 *Chronicle of the Maya Kings and Queens: Deciphering the Dynasties of the Ancient Maya*. Thames and Hudson Press, London.

Masson, Marilyn A.
1999 Postclassic Maya Communities at Progresso Lagoon and Laguna Seca, Northern Belize. *Journal of Field Archaeology* 26(3):285-306.

Mathews, Jennifer P., and James F. Garber
2004 Models of Cosmic Order: Physical Expression of Sacred Space among the Ancient Maya. *Ancient Mesoamerica* 15(1):49-59.

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

1998 Ancestors and the Classic Maya Built Environment. In *Function and Meaning in Classic Maya Architecture*, edited by Stephen D. Houston, pp. 271-298. Dumbarton Oaks Library and Research Collection, Washington, D.C.

McAnany, Patricia A., Rebecca Storey, and Angela K. Lockard
1999 Mortuary Ritual and Family Politics at Formative and Early Classic K'axob, Belize. *Ancient Mesoamerica* 10(1):129-146.

McKillop, Heather
2004 *The Ancient Maya: New Perspectives*. ABC-CLIO Inc., California.

McNatt, Logan
1996 Cave Archaeology of Belize. *Journal of Cave and Karst Studies* 58(2):81-89.

McSwain, Rebecca
1982 Stone Tools in Secondary Refuse: Lithics from a Late Preclassic Chultun at Cuello, Belize. *Atlatl* 3:1-20.

Meíja Ramon, Andrés G., and Nadia E. Johnson
2018 Sociopolitical Organizaiton, Landscape Change, and Hydrualic Engineering in Teotihuacan Valley, Mexico: 1250 B.C.-A.D. 1810. *Wiley Interdisciplinary Reviews: Water* 6(2):1-25.

Miller, Thomas E.
1996 Geologic and Hydrologic Controls on Karst and Cave Development in Belize. *Journal of Cave and Karst Studies* 58(2):100-120.

Moholy-Nagy, Hattula
1978 The Utilization of Pomacea Snails at Tikal, Guatemala. *American Antiquity* 43(1):65-73.

1997 Middens, Construction Fill, and Offerings: Evidence for the Organization of Classic Period Craft Production at Tikal, Guatemala. *Journal of Field Archaeology* 24(3):293-313.

Moore, Tamara
2021 Creation During Abandonment: Researching the Hingston Group at Ka'kabish, Belize. Master's thesis, Department of Anthropology, Trent University, Peterborough, Canada.

Moyes, Holley
2005 Cluster Concentrations, Boundary Markers, and Ritual Pathways: A GIS Analysis of Artifact Cluster Patterns at Actun Tunichil Muknal, Belize. In *In the Maw of the Earth Monster*, edited by James E. Brady and Keith M. Prufer, pp. 269-300. University of Texas Press, Austin.

2016 Xibalba, the Place of Fear: Caves and the Ancient Maya Underworld. *Arys* 14:171-190.

Moyes, Holley, and Shane Montgomery
2019 Locating Cave Entrances Using Lidar-Derived Local Relief Modeling. *Geosciences* 9(98):1-22.

Moyes, Holley, and Keith M. Prufer
2013 The Geopolitics of Emerging Maya Rulers: A Case Study of Kayuko Naj Tunich, A Foundational Shrine at Uxbenká, Southern Belize. *Journal of Anthropological Research* 69(2):225-249.

Munro-Stasiuk, Mandy J., T. Kam Manahan, Trent Stockton, and Traci Ardren
2014 Spatial and Physical Characteristics of Rejolladas in Northern Yucatan, Mexico: Implications for Ancient Maya Agriculture and Settlement Patterns. *Geoarchaeology: An International Journal* 29:156-172.

Neff, Hector, Deborah M. Pearsall, John G. Jones, Bárbara Arroyo, Shawn K. Collins, and Dorothy E. Freidel
2006 Early Maya Adaptive Patterns: Mid-late Holocene Paleoenvironmental Evidence from Pacific Guatemala. *Latin American Antiquity* 17(3):287-315.

Pearson, Mike Parker
1999 *The Archaeology of Death and Burial*. Texas A&M University Press, College Station.

Peters, Charles M., and Enrique Pardo-Tejeda
1982 Brosimum alicastrum (Moraceae): Uses and Potential in Mexico. *Economic Botany* 36(2):166-175.

Pohl, Mary D., Kevin O. Pope, John G. Jones, John S. Jacob, Dolores R. Piperno, Susan D. deFrance, David L. Lentz, John A. Gifford, Marie E. Danforth, and J. Kathryn Josserand
1996 Early Agriculture in the Maya Lowlands. *Latin American Antiquity* 7(4):355-372.

Powis, Terry G.
2004 The Role of Pottery and Food Consumption Among Late Preclassic Maya Commoners at Lamanai, Belize. In *Ancient Maya Commoners*, edited by Jon C. Lohse and Fred Valdez, Jr., pp. 49-72. University of Texas Press, Austin.

Prufer, Keith M.
2005 Shamans, Caves, and the Role of Ritual Specialists in Maya Society. In *In the Maw of the Earth Monster*, edited by James E. Brady and Keith M. Prufer, pp. 186-222. University of Texas Press, Austin.

Prufer, Keith M., Asia V. Alsgaard, Mark Robinson, Clayton R. Meredith, Brendan J. Culleton, Timothy Dennehy, Shelby Magee, Bruce B. Huckell, W. James Stemp, Jaime J. Awe, Jose M. Capriles, and Douglas J. Kennett
2019 Linking Late Paleoindian Stone Tool Technologies and Populations in North, Central, and South America. *PLoS One* 17(2):p.e0219812.

Prufer, Keith M., and James E. Brady
2005 Introduction: Religion and Role of Caves in Lowland Maya Archaeology. In *Stone Houses and Earth Lords: Maya Religion in the Cave Context*, edited by Keith M. Prufer and James E. Brady, pp. 1-22. University Press of Colorado, Boulder.

Prufer, Keith M., and Peter S. Dunham
2009 A Shaman's Burial from an Early Classic Cave in the Maya Mountains of Belize, Central America. *World Archaeology* 41(2):295-320.

Pugh, Timothy W.
2005 Caves and Artificial Caves in Late Postclassic Ceremonial Groups. In *Stone Houses and Earth Lords: Maya Religion in the Cave Context*, edited by Keith M. Prufer and James E. Brady, pp. 47-69. University Press of Colorado, Boulder.

2022 Social Complexity and the Middle Preclassic Lowland Maya. *Journal of Archaeological Research* 30:545-594.

Puleston, Dennis E.
1965 The Chultuns of Tikal. *Expedition* 7(3):24-29.

1971 An Experimental Approach to the Function of Classic Maya Chultuns. *American Antiquity* 36(3):322-335.

Rakita, Gordon F.M., and Jane E. Buikstra
2005 Introduction. In *Interacting with the Dead: Perspectives on Mortuary Archaeology for the New Millennium,* edited by Gordon F.M. Rakita, Jane E. Buikstra, Lane A. Beck, and Sloan R. Williams, pp. 15-24. University Press of Florida, Gainsville.

Rathje, William L.
1971 The Origin and Development of Lowland Classic Maya Civilization. *American Antiquity* 36(3):275-285.

Reese-Taylor, Kathryn, and Debra S. Walker
2002 The Passage of the Late Preclassic into the Early Classic. In *Ancient Maya Political Economies*, edited by Marilyn A. Masson and David A. Fredial, pp. 87-122. Altamira Press, Walnut Creek, CA.

Rice, Prudence M., Arthur A. Demarest, and Don S. Rice
2004 The Terminal Classic and the "Classic Maya Collapse" in Perspective. In *The Terminal Classic in the Maya Lowlands: Collapse, Transition, and Transformation*, edited by Arthur A. Demarest, Prudence M. Rice, and Don S. Rice, pp. 1-11. University Press of Colorado, Boulder.

Rice, Prudence M., and Donald Forsyth
2004 Terminal Classic-Period Lowland Ceramics. In *The Terminal Classic in the Maya Lowlands: Collapse, Transition, and Transformation,* edited by Arthur A. Demarest, Prudence M. Rice, and Don S. Rice, pp. 28-59. University Press of Colorado, Boulder.

Rice, Prudence M., and Don S. Rice
2004 Late Classic to Postclassic Transformations in the Petén Lakes Region, Guatemala. In *The Terminal Classic in the Maya Lowlands: Collapse, Transition, and Transformation*, edited by Arthur A. Demarest, Prudence M. Rice, and Don S. Rice, pp. 125-139.

Rissolo, Dominique
2005 Beneath the Yalahau: Emerging Patterns of Ancient Maya Ritual Cave Use from Northern Quintana Roo, Mexico. In *In the Maw of the Earth Monster: Mesoamerican Ritual Cave Use*, edited by James E. Brady and Keith M. Prufer, pp. 342-372. University of Texas Press, Austin.

Robin, Cynthia
2020 The Role of Northern Belize in Shaping Maya Archaeology. *Research Reports in Belizean Archaeology* 17:3-16.

Rosenwig, Robert M.
2015 A Mosaic of Adaptation: The Archaeological Record for Mesoamerica's Archaic Period. *Journal of Archaeological Research* 23(2):115-162.

Rosenwig, Robert M., Margaret L. Briggs, and Marilyn A. Masson
2020 Burying the Dead during the Maya Postclassic Period: Saxe, Binford and Goldstein's Continued Relevance to Mortuary Analysis. *Journal of Anthropological Archaeology* 58:1-22.

Rosenwig, Robert M., and Marilyn A. Masson
2002 Transformation of the Terminal Classic to Postclassic Architectural Landscape at Caye Coco, Belize. *Ancient Mesoamerica* 13(2):213-235.

Ross, Hassig
1992 *War and Society in Ancient Mesoamerica*. University of California Press, Berkely.

Sagebiel, Kerry L.
2014 Ka'kabish Ceramic Analysis: Examination of Ceramics from Three Critical Contexts. In *Ka'kabish Archaeological Research Project (KARP) Report on the 2013 Field Season*, edited by Helen R. Haines, pp. 55-81. The Institute of Archaeology, Belmopan, Belize. Electronic Document, https://www.kakabish.org/field-reports.html, accessed March, 2022.

Saxe, Arthur A.
1971 Social Dimensions of Mortuary Archaeology in a Mesolithic Population from Wadi Halfa, Sudan. In *Approaches to the Social Dimensions of Mortuary Practices,* edited by J.A. Brown, pp. 39-57. Memoirs of the Society for American Archaeology, Number 25.

Schele, Linda
1988 The Xibalba Shuffle: A Dance after Death. In *Maya Iconography*, edited by Elizabeth Benson and Gillet Griffin, pp. 294-317. Princeton University Press, New Jersey.

Schwake, Sonja Andrea
2008 The Social Implications of Ritual Behaviour in the Maya Lowlands: A Perspective from Minanha, Belize. PhD Dissertation, Department of Anthropology, University of California, San Diego

Sharer, Robert J., and Loa P. Traxler
2006 *The Ancient Maya*. 6th ed. Stanford University Press, California.

Smith. A. Ledyard
1950 *Uaxactun, Guatemala. Excavation of 1931-1937*. Carnegie Institution of Washing Publication 588, Washington, D.C.

Smith, Grant
2020a Osteological Analysis of Postclassic Maya at Ka'kabish, Belize. In *Ka'kabish Archaeological Research Project (KARP) Report on the 2019 Archaeological Field Season and 2018 Laboratory Season*, edited by Kerry L. Sagebiel and Helen R. Haines, pp. 119-126. The Institute of Archaeology, Belmopan, Belize. Electronic document, https://www.kakabish.org/field-reports.html, accessed November, 2021.

2020b Postclassic Maya Diet: Stable Isotope and Osteological Analysis of Human Remains from Ka'kabish, Belize. Master's thesis, Department of Anthropology, Trent University, Peterborough, Canada.

Sprajc, Ivan, Nicholas P. Dunning, Jasmin Stajdohar, Quintin Hernández Gómez, Israel Chato López, Ales Marsetic, Joseph W. Ball, Sara Dzul Góngora, Octavio Q. Esparza Olguín, Atasta Flores, Esquivel, and Ziga Kokalj

2021 Ancient Maya Water Management, Agriculture, and Society in the Area of Chactún, Campeche, Mexico. *Journal of Anthropological Archaeology* 61:1-21.

Šprajc, Ivan, Carlos Morales-Aguilar, and Richard D. Hansen

2009 Early Maya Astronomy and Urban Planning at El Mirador, Peten, Guatemala. *Anthropological Notebooks* 15(3):79-101.

Stanchly, Norbert

2013 A Preliminary Analysis of the Ka'kabish Faunal Remains. In *Ka'Kabish Archaeological Research Project (KARP): Interim Report on the 2012 Field Season*, edited by Cara G. Tremain and Helen R. Haines, pp. 73-80. The Institute of Archaeology, Belmopan, Belize. Electronic document, https://www.kakabish.org/field-reports.html, accessed March, 2023.

Stemp, W. James, Charles G. Stoll, Christophe G.B. Helmke and Jaime J. Awe

2018 Down the T'uhl: Technological, Metric, and Functional Analyses of Chipped Stone From an Ancient Maya Chultun. *Lithic Technology* 43(1):51-62.

Stone, Andrea J.

1995 *Images from the Underworld*. University of Texas Press, Austin.

Stross, Brian

1991 Classic Maya Directional Glyphs. *Journal of Linguistic Anthropology* 1(1):97—114.

Stuart, David

2000 "The Arrival of Strangers" Teotihuacan and Tollan in the Classic Maya History. In *Mesoamerica's Classic Heritage: Teotihuacan to the Aztec*, edited by D.R. Carrasco, L. Jones, and S. Sessions, pp. 463-513. University Press of Colorado, Boulder CO.

Szymański, Jan

2014 Between Death and Divinity. Rethinking the Significance of Triadic Groups in Ancient Maya Culture. *Estudios de cultura maya* 44(44):119-166.

Tedlock, Dennis

1996 *Popol Vuh: The Mayan Book of the Dawn of Life.* Revised Ed. Touchstone, New York.

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

1975 Introduction to the Reprint Edition. In *The Hill Caves of Yucatan*, by Henry C. Mercer, pp. vii-xliv. University of Oklahoma Press, Norman.

Tiesler, Vera
2008 Funerary or Nonfunerary? New References in Identifying Ancient Maya Sacrifical and Postsacrificial Behaviours from Human Assemblages. In *New Perspectives on Human Sacrifice and Ritual Body Treatments in Ancient Maya Society*, edited by Vera Tiesler and Andrea Cucina, pp. 14-44. Springer, New York.

Tozzer, Alfred M.
1913 A Preliminary Study of the Prehistoric Ruins of Nakum, Guatemala. *Memoirs of the Peabody Museum of American Archaeology and Ethnology, Harvard University* 5(3). Cambridge.

Valdés, Juan Antonio
1997 Tamarindito: Archaeology and Regional Politics in the Petexbatun Region. *Ancient Mesoamerica* 8(2):321-335.

Vogt, Evon Z.
1981 Some Aspects of the Sacred Geography of Highland Chiapas. In *Mesoamerican Sites and World-Views,* edited by Elizabeth P. Benson, pp. 119-139. Dumbarton Oaks Research Library and Collections, Washington D.C.

Vogt, Evon Z., and David Stuart
2005 Some Notes on Ritual Caves Among the Ancient and Modern Maya. In *In the Maw of the Earth Monster: Mesoamerican Ritual Cave Use*, edited by James E. Brady and Keith M. Prufer, pp. 155-185. University of Texas Press, Austin.

Wahl, David, Roger Bryne, Thomas Schreiner, and Richard Hansen
2006 Holocene Vegetation Change in the Northern Peten and its Implications for Maya Prehistory. *Quarternary Research* 65:80-89.

Weiss-Krejci, Estella, and Thomas Sabbas
2002 The Potential role of Small Depressions as Water Storage Features in the Central Maya Lowlands. *Latin American Antiquity* 13(3):343-357.

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

Willey, Gordon R.

1984 Changing Conceptions of Lowland Maya Culture History. *Journal of Anthropological Research* 40(1):41-59.

Williams, Jocelyn S., Shannen M. Stronge, Gyles Iannone, and Fred J. Longstaffe
2017 Examining Chronological Trends in Ancient Maya Diet at Minanha, Belize Using Stable Isotopes of Carbon and Nitrogen. *Latin American Antiquity* 28(2):269-287.

Woodfill, Brent K.S.
2021 Contextualizing Caves within an Animate Maya Landscape: Caves as Living Agents in the Past and Present. *Religion* 12(12):1109-1124.

Woodfill, Brent K.S. and Chloé Andrieu
2012 Tikal's Early Classic Domination of the Great Western Trade Route: Ceramic, Lithic, and Iconographic Evidence. *Ancient Mesoamerica* 23(2):189-209.

Wrobel, Gabriel D., Carolyn Freiwald, Amy Michael, Christophe Helmke, Jaime Awe, Douglas J. Kennett, Sherry Gibbs, Josalyn M. Ferguson, and Cameron Griffith
2017 Social Identity and Geographic Origin of Maya Burials at Actun Uayzba Kab, Roaring Creek Valley, Belize. *Journal of Anthropological Archaeology* 45:98-114.

Wrobel, Gabriel D., Jillian M. Jordan, and Jessica Hardy
2009 Social and Political Transformation in the Caves Branch River Valley: Evidence from Natural and Constructed Ritual Environments. *Research Reports in Belizean Archaeology* 6:199-207.

Zeitlin, Robert N., and Judith Francis Zeitlin
2000 The Paleoindian and Archaic Cultures of Mesoamerica. In *The Cambridge History of Native Peoples of the Americas, Vol. II Mesoamerica Part I*, edited by Richard E. Adams, and Murdo J. MacLeod, pp. 45-121. Cambridge University Press, Cambridge.

Appendix A: Ceramics Data Sets

Table A.1. Chultun B-2, East Chamber ceramic counts (* possibly jar sherds; † possible plate sherds)

LOT	LEVEL	DATE	TYPE/VARIETY	VESSEL FORM (sherd count)						TOTAL BY PERIOD AND LEVEL
				unidentified	jar	bowl	plate	dish	vase	
1351	1	unidentified	eroded	24	1					
			TOTALS	**24**	**1**					**25**
1352	2	Unidentified	eroded	9	8		1			18
		Late Preclassic	Eroded					1		
			Sierra Red	1	1					
			Sierra Group	1						4
		Terminal Classic	Society Hall Red			3				3
		Classic	Lamanai Polychrome				12			
			Unidentified red				19			31
		Late Classic/ Terminal Classic	Unidentified red				4			
			Unidentified cream		1					
			Dumbcane Striated		41					
			Encanto Striated		32					
			Tinaja red		4		13			
			Cameron incised						20	
			Cubeta incised						48	
			Achote black			12				
			Plamar orange polychrome						3*	178
			TOTALS	**11**	**87**	**15**	**49**	**1**	**71**	**234**
1353	General Fill	Unidentified	Eroded	1	2					
			Unidentified red	15†			1			18
		Preclassic	eroded		1					1
		Classic	Unidentified orange-polychrome			1				
			Unidentified black			1				2
		Early Classic	eroded	1				1		
			Aguila orange	3*	1					6
		Early Classic/ early Late Classic	Eroded		1					1
		Late Classic/Terminal Classic	Eroded		1					1
		Postclassic	eroded		1					1
		Colonial		32	1					33
			TOTALS	**52**	**8**	**2**	**1**	**1**		**63**

Table A.2. Chultun B-2, West Chamber ceramic counts (* possible censer)

LOT	LEVEL	DATE	TYPE/VARIETY	VESSEL FORM (sherd count)					TOTAL BY PERIOD AND LEVEL
				unidentified	jar	bowl	plate	dish	
441	1	Unidentified	eroded	86	1		1		
			striated		4				92
		Late Classic	Late Classic red	1					1
		Postclassic	eroded	1	2				
			Postclassic red	1					4
			TOTALS	**89**	**7**		1		**97**
457	2	Unidentified	eroded	218	5	1	1		
			unslipped		1				
			striated		13				239
		Late Classic	Late Classic red	3					3
		Terminal Classic	eroded		1	1			2
		Postclassic	eroded		1				
			Postclassic red	2					3
			TOTALS	**223**	**21**	**2**	**1**		**247**
458	3	Unidentified	Eroded	178	3				
			unslipped		1				
			striated		5				187
		Late Classic	Late Classic red	2					
			Tinaja Red		1				3
		Terminal Classic	Dumbcane Striated		3				
			Redneck mother striated		1				4
			TOTALS	**180**	**14**				**194**
463	4	Unidentified	eroded	11	2	7			
			eroded polychrome			4			
			unslipped	2*					26
		Late Classic	eroded	1					
			Late Classic red	3					
			Late Classic red-polychrome eroded			2			
			Late Classic orange-red		2				
			Achote Black	1		4			
			Tinaja Red		4				
			miscellaneous brown	3					20
		Terminal Classic	eroded			1			
			Achote black			1			6

			Rubber Camp Brown	2					
			Lemon Cream-esque		2				
		Postclassic	eroded		2				
			unslipped	1					
			Postclassic red		13				16
		Late Postclassic	eroded	1					1
			TOTALS	**25**	**25**	**19**			**69**
464	5	Unidentified	eroded	148	11		6		
			unslipped		12	1	1		
			striated		160				
			striated and washed		23				
			Unknown red wash	4					366
		Early Classic	Balanza Black	1					1
		early Late Classic	Belize valley red	2					2
		Late Classic	Late Classic Red	27		5	45		
			Late Classic orange-red		1				
			Achote black	9		7			
			Tinaja red		7				
			Cambio unslipped		1				
			Lamanai polychrome			1			103
		Terminal Classic	eroded		8				
			Achote black			26			
			Dumbcane striated		7				
			Rubber camp brown	4		19			
			Lemon cream-esque		4				68
		Postclassic	Postclassic red		2				2
			TOTALS	**195**	**236**	**59**	**52**		**542**
509	6	unidentified	eroded	36					
			unslipped	1	1				
			striated		6				
			striated and washed		1				45
		Late Classic	Late Classic red				1		
			Tinaja red	2	4				7
		Terminal Classic	Achote black			1			
			Dumbcane striated		1				
			Rubber camp brown			1			3
		Postclassic	eroded	1					1
			TOTALS	**40**	**13**	**2**	**1**		**56**
521	7	unidentified	eroded	70			1		
			unslipped		6				
			striated		31				
			striated and washed		5				113
		Formative	eroded	2					
			Sierra red					2	4
		early Late Classic	Belize valley red	2					2
		Late Classic	Late Classic red	2			6		26

			Late Classic polychrome				6		
			Tinaja red	6	5				
			Chilar fluted	1					
		Terminal Classic	Achote black			6			
			Dumbcane striated		1				
			Rubber camp brown	1					8
			TOTALS	**84**	**48**	**6**	**13**	**2**	**153**
523	8	Unidentified	eroded	101					
			unslipped	7	12				
			striated		282				
			striated and washed		47				
			Unknown cream	2					451
		early Late Classic	Belize valley red	1			1		2
		Late Classic	eroded	50		1	4		
			Late Classic orange	1					
			Achote black	12	4	1			
			Encanto striated		3				
			Lamanai polychrome	7		3	1		
			eroded Lamanai polychrome	102		4	9		
			Lamanai-style polychrome	9		5	2		
			Tinaja red		7				225
		Terminal Classic	Terminal classic red	8	10				
			Achote black			35			
			Dumbcane striated		6				
			Encanto striated		5				
			Lamanai-style polychrome			2			
			Redneck mother striated	1					
			Rubber camp brown	6		5			78
			TOTALS	**307**	**376**	**56**	**17**		**756**
526	9	unidentified	eroded	62		1			
			striated		11				
			striated and washed		11				85
		Formative	Sierra red	6	9				15
		Late Classic	eroded Lamanai polychrome	6		2			8
		Terminal Classic	Terminal Classic red	1					1
			TOTALS	**75**	**31**	**3**			**109**