

**THE SACRED LANDSCAPE AS A POLITICAL RESOURCE:
A CASE STUDY OF ANCIENT MAYA CAVE USE
AT CHECHEM HA CAVE,
BELIZE, CENTRAL AMERICA**

by

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Abstract

This is a case study of the archaeology of Chechem Ha Cave, an ancient Maya ceremonial site in western Belize. It adds to the growing body of archaeological research that seeks to explain the role of ritual and symbolism in the creation and maintenance of social power and hierarchical development. Ancient Maya caves were fundamentally associated with rain control. Because of this cognitive association they became important political resources in the establishment of elite power.

Chechem Ha is the earliest radiocarbon-dated cave site in the Maya lowlands. It contains a 2,000-year history of ancient Maya ritual cave use that spans the development of social complexity from early settlements through the rise of kingship and eventual political collapse. The study develops methodology to examine changes in ritual practice through time within the cave. Ritual transformations are situated within the framework of local settlement data, socio/political histories, and historical climatic conditions, which enables the study to articulate these changes with broader social and environmental contexts.

The correlation of cave usage with environmental and sociopolitical histories creates a context for understanding the ritual life of the ancient users and provides insight into the mechanisms used by agents for the consolidation and maintenance of political power during the development and elaboration of Maya social complexity. By evaluating the frequency and nature of cave ritual this study demonstrates that rain control was a major factor in both the establishment of elite dominance and the downfall of elite rulership.

Chapter 1

Introduction

1.1 Introduction

This dissertation adds to the growing body of archaeological research that seeks to explain the role of ritual and symbolism in the creation and maintenance of social power and hierarchical development. I argue that among the ancient Maya, caves were important political resources in the initial establishment of elite power and continued to play a major role in ritual life throughout the Classic period due to their ideological associations with rain control. By evaluating the frequency and nature of cave ritual I demonstrate that rain control was a major factor not only in the establishment of elite dominance but in the downfall of elite rulership.

Data for the study is derived from investigations conducted at Chechem Ha Cave, an ancient Maya ceremonial site in western Belize. Chechem Ha is the earliest radiocarbon-dated cave site in the Maya lowlands to date, containing a 2,000-year history of ancient Maya ritual cave use that spans the development of social complexity from early settlements through kingship ending with the ninth century collapse. The study examines changes in ritual practice within the cave over this extended temporal period.

Cave studies have traditionally taken a synchronic approach to understanding cave use. The following diachronic analysis is novel because no studies to date have explicitly examined changes in ritual practice through time within caves. I will argue that the use of ethnographic analogy in the interpretation of the archaeological record has largely masked these temporal changes in ritual practice.

Sherry Ortner described practice theory as a group of related theories that describe "...the production and transformation of the cultural order through a variety of forms of action and interaction" (1989b:199) and noted that they have received considerable refinement by scholars in past years (Giddens 1979; Bourdieu 1977; Ortner 1989a, 1989b; Sahlins 1981). Ortner characterized the study of practice not just as a methodology to locate the point of view of agents but one that seeks to understand "the configuration of cultural forms, social relations, and historical processes that move people to act in ways that produce the effects in question" (1989a:12). It is not surprising that Ortner advocates an historical overview and considers the historical perspective as vital to these studies. This suggests that despite limitations of their data, given appropriate methodology archaeologists are in a unique position to evaluate transformations in practice over considerable time scales.

A well-developed methodological approach for examining practice in the archaeological record is Behavioral Archaeology (Reid et al. 1975; Schiffer 1995). This school of thought seeks "to explain variability and change in human behavior by emphasizing the study of relationships between people and their artifacts" (Schiffer 1996, 1999). In other words the unit of analysis in a behavioral approach is the human behavior that produced the archaeological record. This study shifts the focus of the research away from analogical arguments aimed at understanding the general function and meaning of caves to the ritual behaviors that produced the artifact record. The new focus is primarily on when and how the site was used and how that use changed over time.

This study defines ritual transformations within the site and situates them temporally. In order to better understand what drives changes in ritual practice temporal changes are situated within the framework of local settlement data, socio/political histories, and the historical environmental conditions. The correlation of cave usage with environmental and sociopolitical histories creates a context for understanding not only the ritual life of the ancient cave users but also provides insight into the mechanisms used for the consolidation and maintenance of political power during the development and elaboration of Maya social complexity.

Previous studies have established that caves served as the quintessential symbol for the earth and were intrinsically related to agricultural fertility and the control of rain. They were recognized by the ancient Maya as the domain of entities associated with the life and death of all living things. These themes or concepts surrounding caves are ancient and can be demonstrated to date as far into antiquity as the Olmec culture. This is important because, according to ritual theorists, the symbolic value of rites and symbols increases when they are perceived as old and traditional (Bell 1997:210; Hayden 1987:33; Kertzer 1988:92-93). The antiquity of beliefs no doubt increased their symbolic value as did their association with rain and fertility.

This dissertation demonstrates that caves were not only a potent symbol in Maya ideology but an important political resource appropriated by Maya elites for the creation and maintenance of political power. Caves were not simply passive symbolic icons but were an active part of the Maya socio/political environment.

In this chapter I review methodological approaches that have been employed in cave studies and note their contributions to the field. This is to provide the reader with background information regarding caves as sacred space in Mesoamerica which is the paradigm on which this dissertation rests. Building on previous studies, I propose a new approach that evaluates changes in ritual practice over time. A new method of evaluating changes in behavior by evaluating use-intensity over time is described. I then discuss the importance of the cave context, the nature of ritual practice within caves, their importance in rainmaking, and the political implications of cave rites. This provides the reader with general information that models how caves functioned within ancient social systems.

Following this is a discussion of change continuity in Mesoamerican cultural systems. It is important to address this issue because of the importance that cultural continuity has played in archaeological studies. I argue that in cave studies, the emphasis on continuity has masked temporal changes in practice but point out that continuities are often tied to *core concepts* in Mesoamerican thought that are based on natural observable phenomenon that provide referents for social memory.

In the next section I discuss the relationship between the control of natural resources and acquisition and loss of political power. Ethnographic data based on African kingships are employed as models for understanding how power is attained and lost when rainmaking is used as a mechanism for gaining and maintaining political control. Unstable climatic conditions and the presence of

cyclical droughts coupled with the dependence on rainfall for agricultural success makes these models plausible analogs for similar environmental and technological conditions existing among the ancient Maya.

In this chapter's final section I elaborate on how changes in ritual practice at Chechem Ha Cave are defined and discuss the social implications for these changes. Both socio/political and environmental factors are expected to produce variability in cave use. Finally, models and expectations are presented.

The study that follows is organized into seven additional chapters. Chapter 2 puts Chechem Ha Cave into geographic, environmental, and historical contexts. Because of the extensive temporal depth of the study, the historical overview concentrates on the development of social complexity in the region, focusing heavily on developments of nearby sites in Belize. One of the primary goals of the dissertation is to correlate changes in ritual practice within the cave with these historical and environmental factors.

In Chapter 3 methods of recording and excavation are described. Chapter 4 is a detailed area by area description of the site as it was in 1998 when work began. It contains information about the tunnel system itself, its biology, and hydrology. The site description is organized spatially in that artifact descriptions, excavations, lab identifications, and analyses pertaining to each area are discussed within its own section.

The extensive horizontal excavations conducted in 2003 in Chamber 2 are detailed in Chapter 5. This chapter is devoted to the level by level description of the excavations, the detailing of new methods for studying use-intensity, the

results of the study, and the analysis of the data. Chapter 6 evaluates the site formation processes and related geochemical analyses. The data derived from the deep deposits in Chamber 2 are some of the most informative regarding the temporal aspects of cave usage, its intensity, and the nature of the cave deposits.

Changes in ritual practice within the cave are detailed in Chapter 7. This chapter integrates the surface finds, excavation data, and laboratory analyses to provide a synthetic historical reconstruction of 2,000 years of cave practice. Chapter 8 correlates these findings with regional socio political contexts and climatic fluctuations.

1.2 Methodological Approaches in Cave Studies

Over the past 30 years, Maya cave studies have followed four approaches though often more than one is applied to a single study: the epigraphic/iconographic approach (Bassie-Sweet 1991, 1996; MacLeod and Puleston 1978; Taylor 1978; Vogt and Stuart 2005), the regional approach (Bonor Villarejo 1989; Bonor Villarejo and Sanchez y Pinto 1991; Carot 1989; Prufer 2002; Reeder et al. 1998; Rissolo 2001), the landscape approach (Awe 1999; Brady 1997b; Brady and Ashmore 1999; Brady and Veni 1992; Halperin 2005), and the case study approach (Andrews 1970; Brady 1989; Graham et al. 1980; Navarrete, and Martínez 1977; Moyes 2001; Pendergast 1969; 1970; 1971; 1974; Reents-Budet and MacLeod 1997). Using these methods, many of us have tried to define the types of rituals that may have taken place within caves (Awe 1998; Brady 1989; Brown 2005; Helmke & Awe 1998; Morehart 2002a, 2002b; 2005;

Moyes 2001; 2005a: 2005b; Pohl 1981; Pohl & Pohl 1983, Reents-Budet & MacLeod 1997; Stone 1995; 2005b), with greater or lesser success. These methods are discussed below highlighting their contributions as well as their inherent problems.

Although scholars have taken various methodological approaches, the research agendas fall into two categories. The first and most basic question seeks to understand the symbolic function and meaning of caves among the Maya. The second seeks to identify, typify, or reconstruct the rituals that occurred within caves in the past. While all of these studies have provided multiple lines of evidence that have aided in the establishment of an interpretive paradigm of caves as sacred space and have suggested a number of activities that may have occurred in caves, there has been almost no diachronic analysis of cave use. Despite years of research, little is known about the how cave use may have changed over time.

The reason for this is based on the assumption that ethnographic analogy can be directly applied to the artifact record without critical evaluation. Critical debates among Mesoamericanists in the 1970s largely silenced opposition to the use of analogy in studies of iconography. The method has been well-accepted among Mayanists partially because ethnohistorians and ethnographers have noted that the ideologies within the region were conservative and slow to change.

Analogy has become the foremost interpretive method in cave studies mainly because it has proved to be useful in establishing that caves were sacred spaces for Pre-Columbian people. Brady (1989) made the single most important contribution to the understanding of the general meaning of caves by employing

ethnographic analogy to the archaeological record at Naj Tunich cave in Guatemala. Analyzing ethnographic to ethnohistoric cultural patterns enabled Brady to interpret the cave as a ritual venue and its contents as ritual artifacts. This approach was highly innovative at the time because it introduced an interpretive framework and methodology previously lacking in cave studies. It was primarily Brady's work that established a viable paradigm for interpretation, which marked the beginning of the sub-field of cave archaeology. Hence, Brady's dissertation provided a methodological model followed by most subsequent archaeological cave studies.

However, reliance on ethnographic analogy has its weaknesses. Most archaeologists agree that analogy is one of the best methods for developing hypotheses but is less reliable for scientific confirmation (Binford 1967, 1968; Kleindienst and Watson 1956; Watson 1979, 1980; Watson et al. 1984; Salmon 1982, 1993), though Alison Wylie argued that analogy produces compelling arguments in cases where hypothesis testing is impossible or impractical (1985; 1988; 1989).

Although analogy is one of our most important resources for model building, there are major drawbacks for cave studies. The first is the lack of existing analogs that address cave ritual. Ethnographers have had limited access due to its esoteric nature in Maya belief systems (LaFarge 1947:127; Petryshyn 1973; Prechtel and Carlsen 1988:123; Tozzer 1907: 148-149). Another is that anthropologists have not traditionally focused on the relationships between material culture and other cultural systems, and particularly, the materialization of

ideology. Additionally, not every cave ritual in the archaeological record may be directly analogous to known ethnographic rituals due to discontinuity. Analogies based heavily on ethnographic data may not account for the disjunction between the types of rituals performed by Classic Maya elites and post-collapse, post-colonial, and modern cave use. This is an important methodological issue in ritual studies as will be discussed below.

Early studies demonstrated the utility of analogy (Brady and Prufer 2005) and while it was useful in answering the questions posed at the time, its uncritical use has masked temporal changes in ritual practices. To examine new questions in the field requires new methodologies that focus primarily on the archaeological record. As part of this dissertation research, methods that analyze the behaviors that created the archaeological record are developed and the temporal aspects of changes in behaviors are noted. Changes in ritual behavior are correlated with changes in practice.

1.2.1 Interpretive Approach

Interpretive studies may be divided between the iconographic/ethnographic and epigraphic methods and have both been useful in understanding the cognitive meaning of caves as sacred geographic features among the ancient Maya. Although the iconographic/ethnographic studies have introduced compelling ideas regarding cave symbolism, they have not been systematic in linking their findings to the artifact record. Both Karen Bassie-Sweet (1991; 1996) and Linda Brown (2002, 2004, 2005) have used this approach extensively

but neither has been successful in this regard. Brown has provided a number of testable models based primarily on ethnographic studies, but these have not yet been applied to the archaeological record. Bassie-Sweet has provided some interesting models based on interpretations of "epigraphic, iconographic, ethnographic, linguistic, and archaeological sources" (1991:238). However, in her work the archaeology of caves plays a minor role and she pays little attention to the extensive archaeological cave literature. While the models she sets up specifically target cave use of the Classic period they are not materially-based, therefore many of her ideas are not testable. The problem with this sort of approach is that if these ideas are not borne out by the archaeology they must remain forever in interpretive limbo.

The interpretive work of Mary Pohl and John Pohl (1983) suffer less from this problem as they focus more heavily on the archaeological record. One of their methods is to ascribe meaning to single artifacts found in particular caves. This is somewhat problematic because of our poor understanding of the nature of cave assemblages. It is unclear if cave artifacts were imported into the cave to be left as offerings, were the detritus of rituals occurring in caves, produced especially for cave ritual, chosen for particular qualities, were recycled broken or discarded household items, were broken ritual objects discarded in a sacred place as ritual trash, or were a combination of more than one of these behavioral processes. However, the assessment of artifact patterning at multiple sites will help to solve this issue.

Epigraphic studies have demonstrated that caves were important in establishing polities and have clarified their importance in Maya cosmology. By comparing the use of the cave symbol in ancient Maya place-name glyphs to ethnographic documentation of the use of caves in modern ritual, Vogt and Stuart (2005) illustrated there is a continuous Maya tradition in which caves were considered as sacred features of the landscape spanning the Classic period to the present. Vogt's ethnographic information demonstrated that, among modern Maya kinship groups in Zinacantan, caves were important features marking ritualized spatial boundaries. The identification of glyph for cave or *ch'een* (Stuart 1999) may heavily impact future studies of cave utilization because as new texts are deciphered they will provide models of utilization that can be tested in the archaeological record.

1.2.2 Regional Approach

Regional approaches have documented and mapped numerous sites within restricted areas demonstrating that caves are far more abundant than most archaeologists had realized (Bonor 1989; Bonor Villarejo and Sanchez y Pintos 1991; Carot 1989; Prufer 2002; Reader 1993; Reeder et al. 1995; Rissolo 2001). Because of the number of caves studied in surveys, detailed chronological controls were difficult to obtain, particularly for those on graduate student budgets. In his dissertation Dominique Rissolo (2001), working in Yucatan, surveyed 20 caves. He based his chronology solely on ceramics that provided relative dates. Rissolo noted the early use of caves in the area but no other

diachronic analyses were undertaken. Keith Prufer's survey of 90 caves in southern Belize utilized ceramic chronologies but also ran a large number of radiocarbon dates. Like Rissolo, he noted the use of caves appeared to precede the area's settlement, but no diachronic analyses of patterns of cave use were undertaken.

Both Prufer and Rissolo also contributed to our understanding of the differences in cave use by evaluating the morphological variation between caves in their areas. Both reached similar conclusions. Rissolo (2001:348; 2005) found that the art, architecture, and offerings found in the Yucatan caves represented elite use, adding that the restrictive nature of some caves further suggested exclusivity. Prufer's (2002a:638; 2005) data also suggested that dark zone rituals in secluded areas appeared to be more esoteric with less variation in the types of rituals conducted whereas large public ceremonies were conducted in lighter open areas. This agrees well with Brady (1989: 402-406) who posited differences between open public light zone spaces and enclosed private dark zone spaces at Naj Tunich in Guatemala.

1.2.3 Landscape Approach

The landscape approach has focused on the relationship of caves to both the built and natural environments and archaeologically demonstrated the importance of caves in settlement pattern analyses. This approach argues that caves were intentionally incorporated into site plans. Because they found beneath large structures in site cores it suggests they were salient features in the settlement

and planning of Maya sites. Using this method, Brady and Ashmore (1999) proposed that a mountain/cave/water complex existed throughout ancient Mesoamerican cosmology. They suggested that caves played a vital role in settlement patterns due to their association with water and perennial springs and demonstrated that both natural and artificial caves were used as landmarks in the orientation of monumental architecture.

Elsewhere Brady and George Veni (1992) documented a number of artificial caves located beneath Pre-Columbian structures in Guatemala. Since being brought to light, the list of instances has expanded considerably (See Appendix I for examples). The importance of these artificial caves is that the cave itself was vitally important in fulfilling the cosmological ideal of the mountain/cave complex that caves were created where there were none. It also indirectly underscores the manner in which elites may have used caves to establish and reify political power (Halperin 2005). This was also stressed in a paper by Andrea Stone (1992), which argued that elite architecture was essentially attempting to "capture" the natural landscape as a means of attaining ritual power. Elizabeth Benson (1985) made a similar point by describing Mesoamerican architecture as a metaphor for the sacred landscape and cosmological ideal. Keith Prufer and Andrew Kindon (2005) illustrated how the concept was reified in site planning at Muklebal Tzul in southern Belize.

1.2.4 Case Studies

Early case studies provided a solid exploratory basis for future efforts and many were well-executed reports (Andrews 1970; Graham et al. 1980; Pendergast 1969, 1970; 1971; 1974). However, these contributions typically lacked the extensive interpretation that has been the focus of more recent studies. Past case studies of note that both described and interpreted cave data were the unpublished study of Petroglyph Cave, Belize (Reents-Budet and MacLeod 1997), and James Brady's 1989 dissertation on the cave of Naj Tunich in Guatemala.

Due to the copious amount of work generated in the last 20 years from multiple lines of evidence, cave archaeologists as well as most Mesoamerican scholars generally accept that caves were (and are) sacred features of the landscape used as ritual spaces. But, another large issue that has not been well-articulated looms in the background. Although there appears to be a number of similarities in their function, variability in artifact assemblages, features, and modifications suggests that caves were used in different and sometimes unique ways. Some caves have petroglyphs or paintings whereas others do not. While Naj Tunich cave contains elite tombs (Brady 1989; Stone 1995), Actun Tunichil Muknal (Gibbs 1997, 2000; Moyes and Gibbs 2000) and Barton Creek Cave (Owen 2005) in Belize have evidence for human sacrifice. Additionally, the artifact inventories in caves are sometimes quite diverse. Some caves contain spindle whorls, celts, stingray spines, lithics, or other artifact classes while others are completely devoid of these objects (Moyes 2001, 2002b; Prufer 2002: 626-627). Petroglyph Cave contained a snake skeleton which is the only instance of

such a find (Reents-Budet and MacLeod 1997). It is only by the detailed analysis of these caves on an individual basis that we will be able to establish patterning in cave use via model building and testing.

1.2.5 A New Approach to the Case Study

Although the wide variety of approaches has been indispensable in the development of an interpretive paradigm, despite years of research little is known about the behavioral processes that produced the artifact assemblages in caves or about the nature of the relationship between caves and their ancient users residing in surrounding surface sites. It is now possible for cave archaeology to move forward into new areas of inquiry and to use the interpretive paradigms established in previous studies to deepen our understanding of ritual behavior. To date, cave studies have focused on the meaning of caves and their contents, but have not successfully articulated cave ritual with other social systems (including religion), political histories, or environmental conditions. For cave data to reach their full analytical potential, a deeper understanding of the site formation processes and behaviors that produced the artifact record are required.

By developing theory and methodology for problem-oriented research, intensive case studies conducted in caves offer one of the most fruitful avenues for ancient Maya ritual studies. The focus of the Chechem Ha research shifts efforts away from the interpretation of the meaning of artifacts to those aimed at understanding the behaviors that created the site's depositional patterns using a behavioral approach (Reid et al. 1975; Schiffer 1995). In this study, the

archaeological record becomes the primary data source for research questions pertaining to interior cave use in ancient times. Behavioral archaeologists also concern themselves with other site formation processes so that cultural patterns may be differentiated from natural diagenic processes or site disturbances (Schiffer 1983; 1987). To this end special attention is paid to non-human depositional processes in the cave as well.

Following William Walker's (1995) behavioral approach to the archaeology of ritual, the primary focus of the research is shifted from efforts to determine the meaning of artifacts to research aimed at understanding the behaviors that created the depositional patterns. Walker pointed out that anthropology has traditionally conflated ritual studies with studies of belief systems (Douglas 1966; Durkheim 1947; Geertz 1966). He contends that fruitful approaches to the study of religion in archaeology should focus on the ritual behaviors that produced the artifact record rather than the attempt to interpret meaning from artifacts. In Walker's model, it is the behavior or change in behavior that becomes a unit of analysis that may be articulated with other social processes.

In personal correspondence with Walker (2003), he has clarified that although he advocates the behavioral approach, he does not feel that it is impossible to study belief systems or the meaning of ritual practices but that defining the behavior is the first step to uncovering its meaning. It allows the behavior to be contextualized within socio/political history, which may in turn lead to better understandings of ancient conceptualizations.

Ideally, an understanding of belief systems could aid in interpreting behavior patterns. The behavioral approach emphasizes the identification of the behavioral patterns as a prerequisite to understanding other facets of the archaeology. By taking this approach it is possible to posit new and different questions and acquire new types of data. This advances cave studies by moving them into fresh areas of inquiry.

The study also employs a "high definition" (Gowlett 1997) methodology that entails an extensive dating program, a robust sampling strategy, and an evaluation of site formation processes. The establishment of a secure chronology of ritual activity within the cave is an essential element to the project's success. A major problem in establishing good chronologies in caves is that deposits are often found on the surface. These surface deposits are often have a palimpsest nature in that artifacts stylistically datable to a number of different time periods are found in the same locus (Brady 1989, Moyes 2002b, 2004; Ishihara 2000; McNatt 1996; Reents-Budet 1980; Rissolo 2001). Co-mingling potentially interferes with the determination of absolute dates from preserved or charred organic remains as well. Although the problem cannot be completely resolved, it is ameliorated by using a comprehensive dating program that evaluates both absolute and relative chronologies in both surface and sub-surface contexts.

While ceramic chronology is useful in producing a relative chronology of the site, it does not offer secure dates of artifact deposition. Objects may be curated over long periods of time and deposited at later dates, a known behavior among the modern Maya (Tedlock 1992; Brown 2000). Additionally, ceramic

chronologies are not fixed by absolute dates and styles may overlap considerably in time. For instance, Jaime Awe (personal communication 2002) has suggested that in the Belize Valley, Preclassic ceramics may have been used well into the Classic period and my data suggest that he is correct (See discussion in Chapter 3). Though conventional ceramic typologies can provide an estimate of when a ritual context might have been used, they cannot provide absolute dates, information on the frequency of use, information on the process by which that context was used, or insight into the potential variation in the way in which it was used.

Changes in ritual practice are defined, following Spaulding (1971), by the interrelationships between space, time and form. In the present study they are assessed by evaluating: 1) the spatial components of the periodicity of use, 2) intensity of use both locally (areas) and globally (cave system), 3) the chronological aspects of feature construction/cave modification, and 4) the evaluation of the artifact assemblage. Alterations in the use of space within the tunnel system are evaluated using excavation data coupled with radiocarbon dating.

Additionally, this study develops a new method to examine changes in the *use-intensity* of Chechem Ha over time. Ritual *use-intensity* is closely related to what is known in anthropological studies as "ritual density" (Bell 1997:173). According to Catherine Bell density studies examine why some societies or historical periods have more ritual than others. She noted that density is rarely studied directly and laments that "...there has been too little analysis of the

historical and sociocultural dimensions of ritual systems to give much sense to the principles at work" (Ibid.:209).

Ritual density is a difficult issue for ethnographers to address for two reasons. First it is diachronic. One has to have an historical perspective to evaluate changes. Having said this, there has been some very interesting work using oral histories and historical documents, but these often have inherent biases that are difficult to control. The second issue is that the quantification of "density" is problematic. Ritual studies have relied heavily on ritual typologies in order to quantify the numbers of types of rituals within a society. So what Bell means when she says that density is not studied directly is that it becomes a typological exercise. *Use-intensity* addresses both of these issues. It is unique because it studies ritual density directly and the method offers a broad perspective over long temporal periods.

In the archaeological record, *use-intensity* is studied by identifying a material signature that correlates with ritual activity. The repetitiveness of ritual and the fact that it must be repeated in proscribed ways (Marcus and Flannery 1994:56; Rappaport 1979:176; Whitehouse 2004; Vogt 1965:602-603) suggests that material correlates will remain the same until there is a change in practice. At Chechem Ha, charcoal rain from torches was identified as a proxy for ritual behavior. The charcoal proxy is referred to as *use-intensity* and not frequency is that from these data alone it is impossible to distinguish whether they are the result of more numerous cave visits, whether there were more participants in a fixed number of rituals, or whether rituals were of a longer or shorter duration.

Other data sets can help to inform us which of these scenarios are more likely.

What charcoal proxies do offer are estimates of the fluctuations in the amount of activity occurring in the cave over time. The presence or absence of charcoal flecks within excavated strata is of particular interest because their absence suggests periods of disuse.

Feature placement, modifications to the cave, and the chronological variation in the artifact assemblage are correlated with these data to model cave use over time. These results are organized within a Geographic Information System (GIS). With the above data in hand it is then possible to begin to explain any changes in ritual practice by correlating ritual transformations with environmental and socio/political factors.

1.3 Caves in Context

Various approaches to cave studies have provided multiple lines of evidence that demonstrate that caves have a long history as sacred spaces in Mesoamerica. The following sections discuss the importance of the cave context, the nature of ritual practice within caves, the importance of caves in rain making, and the political implications of cave rites.

Plunkett (2002:1-4) has identified two major problems in the archaeological study of ritual. The first is the dearth of comparative descriptive data and the second is that of identifying ritual in the archaeological record. In household contexts it is problematic for two major reasons. Firstly, little is known about ritual deposition or accretion processes and secondly, ritual

abandonment processes can mimic other forms of cultural deposition (LaMotta and Schiffer 1999). Additionally, it has been noted that the same artifact types may function in both domestic and ritual contexts (Hayden and Cannon 1984:239; Walker and Lucero 2000; Walker 1998). Contextual analysis helps to solve these problems by focusing on the spatial aspects of ritual use rather than relying on objects for interpretation (Flannery 1976:333-334; Marcus and Flannery 1994). This is an important point because studies of contextually homogeneous material may inform studies of ritual conducted in other venues by isolating spatial patterns and artifact configurations from known ritual contexts.

Before venturing farther is important to clarify what is meant by a "cave" and to differentiate between caves and rock shelters. This is an important issue as there is both a functional and perceptual differences between the two. Charles Faulkner (1988) proposed that caves could be divided into three zones, light, twilight, and dark. Rockshelters have both light and twilight areas but do not have dark zones. In this dissertation open rock shelters are never referred to as caves.

This is important because the quality of light within a cave or rockshelter is vital to the interpretation of the artifact record. Natural light impacts the affordances of human usage as well as the overall biology of the cave. William Farrand (1985:23) proposed that dark zones of caves are useless for even temporary habitation except under extreme or desperate conditions. In their recent article on the geoarchaeology of caves, Paul Goldberg and Sarah Sherwood agree that humans do not use cave interiors as habitation areas (2006:15).

Faulkner and others (Hole and Heizer 1965:47) also contend that dark zones of caves are used most typically as ritual spaces. According to Chester Chard (1975:171), in archaeological reports, most “caves” used for refuge are actually rock shelters.

Caves in tropical areas are often dank and are most are inhabited by bats and insects, which carry a number of deadly diseases including histoplasmosis, rabies, and chagas. Because dark zones may only be used temporarily both artifacts and modifications to tropical caves may be considered to be the result of ritual performances or other related activities. This is advantageous to the archaeologist because it resolves the contextual problem.

All available archaeological, ethnographic, and ethnohistorical evidence suggests that in the Maya lowlands, caves were used almost exclusively for ritual purposes (Brady 1989; Stone 1997). There are, however, a few isolated examples in which Maya caves may have been used as temporary refuges under adverse conditions. Henry Mercer (1975:141) was told that people hid in caves during war time and Hatt and his colleagues (1953:21) reported that farmers lived in caves close to their fields in times of peril. It must be pointed out that neither of these scholars actually witnessed people living in caves even temporarily. J. Eric Thompson (1975:xli) in his seminal article on the Maya use of caves lists "places of refuge" as one of the functions of caves but notes that archaeological evidence for this is "scant." In his survey of Mesoamerican caves, James Brady (1989:5-6) has gone as far as to state that “habitation within the dark zone is practically inconceivable.”

In my own experience I have witnessed farmers camping in the mouth of Stela Cave in western Belize in order to be close to their fields to keep them from being looted. It is of note that the farmers did not utilize the dark zone of the cave. I have also been told that caves provide shelter during hurricanes for people living in the Macal Valley. In taking this anecdotal evidence into account, it is also important to remember that none of these informants are ethnically Maya or harbor any beliefs in caves as sacred spaces.

1.3.1 Caves as Esoteric Spaces

Ideology is expressed and reified as symbols and actions such as rituals that may be studied in the archeological record via its "materialization." Elizabeth DeMarrais and her colleagues (1996) argue that it is through its materialization ideas are communicated and manipulated and it is by this means that individual beliefs are molded for collective social action. They contend that materialization of ideology organizes and gives meaning to the external world through its tangible manifestations by which leaders can strengthen and legitimate institutions of elite control. The materialization of ideas serves to reify social status and encourage hierarchical relationships that lead to increased social complexity. The authors point out that for the ideological material to be effective as a source of power, it cannot be freely accessible to the populace.

The phenomena that materialize ideology are rituals and ceremonies, symbolic objects and icons, public monuments and landscape features, and writing systems. An attribute of these phenomena is that they cannot be copied,

faked, or otherwise easily reproduced. This is a particularly interesting in terms of model building in archaeology because it suggests that the more costly, rare, secluded, or esoteric the phenomena, the greater probability that it may be recognized in the archaeological record as an important source of power or as an object of control. This suggests the cave itself as well as the esoteric rites performed within it would be a salient form of power among the ancient Maya elites. Rites occurring in the dark zones of caves would be expected to be some of the most powerful forms of ideological expression.

Ritual activity in Mesoamerica has been a subject of intense study by both the early Spanish chroniclers and modern ethnographers but little is known about rituals conducted within cave sites. Ethnographic information suggests that modern cave rites are esoteric rituals conducted only by ritual specialists and community leaders but very few of the classic ethnographic reports describe events that occurred within these spaces primarily because ethnographers were either unaware of the occurrence of cave rites or because they were not encouraged to attend these rituals.

So, why were these rites so secretive? There is evidence to suggest that Maya rituals were conducted in caves after the Spanish Conquest to avoid repercussions (recall that it was the chance discovery of a sacrificed deer in a cave in 1562 which prompted Bishop de Landa's brutal *auto de fe* at Mani), which may explain why cave use is considered an esoteric practice among the Maya today. But this does not explain why only ritual specialists organize and conduct rites in caves. The pervasive Mesoamerican notion that caves are both sacred and

dangerous better accounts for proscriptions in modern cave use and explains why only those with esoteric knowledge would venture into the dark zones of caves. The pervasiveness of these concepts suggests that they are quite old and represent continuity from the Classic period.

For instance, June Nash (1970:23), working in Chiapas, noted that in yearly festivals a procession consisting of curers, political officials, and townspeople went to a cave entrance on the Day of the Cross. The leading curers were the only ones to enter the cave to speak with ancestors, claiming that inside of the cave lay a lake and a beautiful field. The rest of the group waited outside and upon the curers return, were given a prognostication for the year. One year during the fiesta, the people asked to see the cave owners. A boy went 20 ft. inside with the curers but did not see the lake or the field. When the boy questioned the curers he was told that, "It is all a lie....now you know; don't tell the people."

Ralph Beals working among the Mixe, noted that regarding rituals in caves or at mountain shrines, "...the people of the town were so secretive that I almost gave up hope of discovering anything about the rituals..." (Beals 1945:85). Oliver LaFarge (1947:124-129), working at Santa Eulalia in highland Guatemala, also admitted that he did not have access to many of the esoteric rituals. He was warned "emphatically and many times" not to approach the cave of Yalan Na', which was clearly of significant importance to the local Maya. Additionally, LaFarge recorded a story about a Ladino woman who entered the Yalan Na' but was stopped by the cave closing in on her and a serpent binding her legs.

Similarly, Alfred Tozzer (1907: 148-149) reported that, while studying the Lacandon, he accompanied a family on a visit to a cave shrine. Upon arrival, the father and eldest son went to the cave while Tozzer and the rest of the family waited behind in a canoe. These types of report lead Petryshyn (1973; 2005) to believe that he was the first person to be an eye-witness to a Lacandon cave ceremony.

Throughout Mesoamerica caves are considered to be very dangerous places among modern people. Not only are natural caves often physically hazardous, but Mesoamerican beliefs emphasize the spiritual dangers associated with them. This suggests that among ancient Mesoamericans, relatively few people actually entered the dark zones, although many may have made pilgrimages to cave entrances. Ethnographic accounts attest that cave entrances are guarded by dangerous entities. Allen Christenson (1998:87-90) reported that among the Tz'utujil Maya at Santiago Atitlan, the nearby cave of Paq'alib'al is guarded by pumas, jaguars, and snakes so that only those who are pure of heart may enter without being bitten.

One of the beliefs that prevent non-specialists from entering caves is that malevolent beings inhabit them. Eva Hunt (1977:107-109) describes the cave dwelling Matlacihuatl from the Cuicatec region of Mexico. They are evil licentious women who seduce men. She compares this entity to the Charcoal Cruncher of Zinacantan who lures drunks into clumps of magueys to have sex. When they touch her sexual parts they turn into excrement (personal

communication to Eva Hunt from Robert Laughlin, Ibid:105; Vogt 1969:332-340).

At Santa Eulalia in the Guatemalan highlands, Oliver LaFarge (1947:128-129) reported a story of a Ladino woman who once went into the dark zone of the cave of Yalan Na' and was kidnapped by a snake. She was not released until the Praymakers came for her, and shortly after the incident the woman went insane. In the Maya at the village of Socotz in Western Belize, a monster known as the *zizimit* carried sinners off to a cave to be eaten (Coe & Coe 1951:160-161). The authors relate the monster to the Aztec *Tzitzimime* that descended from the sky to eat people during eclipses and Eric Thompson (1950:85) identified these beings as the Maya *bacabs*.

Evon Vogt (1969:455) noted that during lineage ceremonies in Zinacantan, at the crosses at senior and junior Stomach Cave, "the participants were extraordinarily quiet, and there was an aura of fear as the shamans made their offerings especially to the Earth Lord." The Earth Lord lives underground and is envisioned as a fat Ladino who controls the water holes and will exchange riches for a person's soul (Ibid: 302). Also among the Tzotzil, is the "Blackman" a hyper-potent cave-dwelling demon that impregnates women causing them die from over-menstruation or multiple births (Blaffer 1972:20, 17, 148-149; Holland 1962:173-180). William Holland (1962:173-180) adds that the Blackman is one of many deities of death thought to reside in caves. Others include the *mukta pishol* (large hat), the *walapatok* (reversed feet), the *natikiljol*, the *yalem bek'et* (down flesh), *kitsil bak* (noisy bones) and the female *shpakinté*. An additional

female cave denizen is the *me'chamel* (mother of disease) who wanders the town crying. If her cries are heard they are taken as an evil omen that someone is about to become ill and die, but if she is encountered her glance is fatal.

Possibly the worst of the cave denizens are those possibly of greatest antiquity, the Lords of the Underworld described in the Popol Vuh, the Quichean Maya hieroglyphic text translated into Spanish orthography in the 16th century (Tedlock 1992). These were fearsome deities who resided in Xibalba, the Maya Underworld, the entrance and exit of which has long been argued ethnographically and ethnohistorically to be a cave (MacLeod and Puleston 1978; Las Casas: 1967:IIclxxx.347). Many of their names--such as Scab Stripper, Blood Gatherer, Demon of Pus, Demon of Jaundice, or One and Seven Death--suggest that they are associated with human frailty and illness.

The relationship of death and infirmity with caves denizens probably contributes to the idea that caves are regarded as toxic to the body. William Hanks (1984:134), working in Yucatan noted that caves are considered to be chaotic Underworld spaces, polluting to the body and inhabited by harmful witches. At Yalcoba, the cave dwelling *alux*, play evil tricks and make people sick (Sosa 1985:411). The Tzeltal believe that dangerous spirits of the hills and caves have the power to mislead, make slaves of people, or give illness (Nash 1970:23-24). This agrees with the *Ritual of the Bacabs* (Roys 1965:67-68), which describes disease-causing winds as having originated in caves. Hanks summed up the modern Yucatec attitude towards caves as, "The stagnant, dank atmosphere is

itself perceived to be polluting to the body, but beyond this, it is the potential for harboring evil that motivates caution” (1984:134).

Although reports of Underworld helper spirits can also be located in the literature (Hanks 1990:134), most ethnographers emphasize the evil or negative aspects of direct contact with cave dwellers. These types of beliefs no doubt discouraged many non-specialists from venturing unattended into the interior of caves both in Pre-Columbian and post-contact Mesoamerica, and could explain why there are few ethnographic accounts of rituals conducted in cave interiors.

One of the few ethnographic eye-witness accounts was a cave ceremony recorded by Alfredo Barrera Vásquez (in Andrews 1970:72-164). The circumstances under which it occurred served to demonstrate the potential dangers associated with caves and their denizens. E. Wyllys Andrews IV and his crew were working at the Yucatec cave of Balankanche in 1959. The local *h'men* informed the team that because they had violated the sacred precinct they were in danger and needed a ceremony to protect them. The arrangements were made and the ritual conducted. Although the ritual resembled or in fact was a *Ch'a Chak* (bring rain) ceremony, it was conducted in the midst of rainy season which prompted Vásquez to question the *h'men* as to its purpose. The *h'men* replied that:

I have not come to celebrate any ceremony now, but rather to see the place and to determine what will be advisable to do to protect those who have violated these sacred precincts. It is necessary to do something so that nothing bad will happen to them. The Yum Balames who are in the cave are displeased, and they must be pacified (Andrews 1970:72).

Vásquez related a similar incident in which he accidentally stumbled onto a hidden cenote while in the company of the son of a local *h'men*. When the *h'men* was informed, he immediately arranged to conduct a ceremony for Vásquez and the boy in order to protect them from danger, but died before it could be carried out. This lead Vásquez to ponder whether the *h'men* died from worry over the incident (Ibid: 77-78).

These incidents at Balankanche and other caves attest to the modern beliefs and prohibitions regarding the space. Evidence not only from the Maya regions, but from Mesoamerica in general demonstrates that beliefs about the nature of caves and the dangers associated with them are quite similar. Though the forms of cave-dwellers differ, the pervasiveness of the belief that caves contain evil or harmful entities suggests that this is an old idea. It appears to function both as a deterrent designed to prevent unwanted visitors or the uninitiated from entering caves and as a means by which modern ritual specialists may retain ritual power and exclusivity. As Keith Prufer (2002a; 2005) has argued, it is unlikely that anyone but ritual specialists would have ever used caves or conducted rites in rock shelters.

1.3.2 Caves and Rain Making

Throughout the known ethnographic record in Mesoamerica rain is considered to be a terrestrial phenomena originating in caves (Vogt 1969: 302). John Monaghan (1995:107) reports that among the Mixtec of Oaxaca caves are considered to be "rain houses" that people treat as shrines. Water dripping from

the walls of the cave is considered to be "raindrops" and rain clouds are thought to pour from the cave before storms. In the Maya area working among the Tzotzil of Highland Chiapas, Vogt (Vogt 1969:387; Vogt and Stuart 2005:164-165) reported having a number of conversations in which he tried to convince local people that clouds formed in the air not in caves. Watching the storm clouds in the Grijalva River Lowlands stream over the highland ridges he had to admit that based on the empirical information the belief was understandable. This concept is an old tradition that is illustrated in the El Rey monument from Chalcatzingo (Figure 1-1), which dates to the Olmec period (1200-200BC). In the rock carving a man is shown sitting on a cloud scroll within a cave. Mist or smoke emanates from the entrance and clouds rain on the scene (Angulo 1987:133-158; Grove 1984: 110-111; Reilly 1994:78-79).

Rain deities such as the Maya *Chac*, the Zapotec *Cocijo*, and the Central Mexican *Tlaloc* (Miller and Taube 1993:184) are thought to dwell in caves (Bassie-Sweet 1991, 1996; Brady 1989; Stone 1995). There are iconographic depictions from the Maya Classic and Postclassic periods that illustrate Chac the rain god sitting in his cave or in a cenote (sinkhole) its functional equivalent. Depictions of Chac seated in his cave are found in the Dresden Codex on pages 30a and 67b (Bassie-Sweet 1991:91-95) and in the Madrid Codex pages 29 and 73 (Bassie-Sweet 1996:98-103). One of the clearest examples is from a Classic Maya vessel (Coe 1978:78, no.11) that depicts Chac seated within his house-like cave, which is rendered as the mouth of an anthropomorphic monster (Figure 1-2). A reified example of this is found at the Classic period cave of La Pailita in

Guatemala where a life size sculpture of Chac sits on his throne in the cave's interior (Graham 1997). This is not only a Maya concept, but the Aztec god Tlaloc also lived in caves or mountaintops and was described by ethnohistorian Diego Durán as the god of rain, thunder, and lightning. The name means Path under the Earth or Long Cave (in Heyden 1975:134).

Evidence from ancient Maya cave sites suggest that water rites were conducted in caves in the Classic period. In his survey of 48 caves in the Yalahau area of Quintana Roo, Dominique Rissolo (2001; 2005) noted a number of features that suggested that caves in the region were the focus of these types of rituals. He noted that many of the caves in his survey contained interior water features such as intermittent pools. At Actun Toh a stairway feature lead down to an intermittent pool. Rissolo's excavations indicated that that the pool had been maintained and cleared of debris periodically. Many of the ancient pools were marked with rock art and art at the cave of Pak Che'n contained rain-god motifs.

At the cave of Balankanche in Yucatan, large anthropomorphic censurs were scattered around the "Throne of Balam" a stalagmitic column and found in the "Water Chamber" as well as other cave areas were radio-carbon dated to the early to mid ninth century (Andrews 1970:69). Most of the censurs were modeled with images of the central Mexican rain god Tlaloc. Similarly, at the site of the Gruta de Chac Andrews (1965:14) reported finding large number of painted globular jars with water motifs

such as stylized frogs and water birds. These were located throughout the passage that led to an underground pool.

My own research conducted with Jaime Awe in the Main Chamber at Actun Tunichil Muknal in Belize also suggested that water rites were salient features of cave ritual (Moyes 2001; Moyes and Awe 1998; 2000). A spatial analysis of artifact placement was conducted in the chamber. Results based on 1408 artifacts demonstrated that 51% of the assemblage was placed between rimstone dams in intermittent pools.

Additionally, 16% of the assemblage consisted of speleothems (stalactites and stalagmites) that had been removed and cached with other offerings. These were the second most abundant group of artifacts in the cave and were present in 23% of the individual ritual deposits (Moyes 2000, 2001). These objects were first noted and studied by Brady and his colleagues (1997a) who noted their use in ritual contexts in caves as well as surface sites and their use has been well-documented at many cave sites throughout the Maya region (Andrews 1970; Bonor and Martínez 1995; MacLeod and Puleston 1978; Prufer 2003; McNatt 1996; Pendergast 1970; Peterson 2005; Reents-Budet 1980; Rissolo 2001). While the specific meaning of these objects remains obscure there is growing evidence to suggest that they are connected with the earth and water (Brady et al. 2002; Moyes 2000; 2001).

In addition to the artifacts there were also the remains of fourteen individuals. These are arguably sacrificial victims (Gibbs 1997, 2000; Moyes and Gibbs 2000). Ten of the skeletons were placed in pools. Their association with

water suggests a connection to rain or water deities, particularly since half were infants or sub-adults. Sub adults also composed half of the human remains identified at other Belizean caves sites notably Barton Creek (Owen 2005:333), Yaxteel Ahau (Owen and Gibbs 1999) and Petroglyph Cave (Reents-Budet and MacLeod 1986). Vanessa Owen (2005:333) argues that incidences of skeletons of sub-adults in caves do not correlate with age distributions of general populations and that the high incidence of children was that they were preferred sacrifices for cave-dwelling deities.

According to ethnographic and ethnohistoric data, children were the sacrifice *par excellence* in rain-related rites. This is well documented throughout Mesoamerica both in central Mexico (Sahagun 1981 1-2, 5, 42-44, 192; Nicholson 1976: Table 4; Heyden 1981:19-20; Brundage 1985:54-56), and the Guatemalan highlands (Fuentes y Guzman 1932:336). In Yucatan, the drowning of children in the Cenote of Sacrifice at Chichen Itza was documented both ethnohistorically (Tozzer 1941:44n), and archaeologically (Hooton 1940). The practice was not limited to the Cenote at Chichen Itza but seems to have been a widespread practice (Scholes and Roys 1938:615).

1.3.3 Caves as Political Space

Most of the early models and interpretations regarding caves rites were derived from ethnographic or ethnohistoric sources. Rites reported in ethnographic contexts mostly entail calendrical rites or fertility themes such as agricultural rituals or rain making (see Brady 1989). Linda Brown (2005) has

suggested, based on her ethnographic studies of rockshelters and Classic period iconography, that hunting rites may have occurred in ancient Maya caves due to the presence of animal bone found in archaeological sites. However, other studies using similar methodology by Mary Pohl (1981:524) and John Pohl (Pohl and Pohl 1983) have suggested that deer bones found in archaeological sites represented elite rites that were political in nature. Based on primarily iconographic studies, Taube (1988a) made a convincing argument for the association between caves and yearly renewal rites. However, with expanding research there is a growing body of epigraphic and archaeological data pertaining to rites of the Classic period.

Evidence from the archaeological record is producing a wider variety of rites than were previously imagined based on ethnographic analogy alone. Political rites in caves are reported in the Classic period epigraphy (Brady and Colas 2005; Colas 1998). Rituals of foundation (Moyes 2001, 2005a), termination (Brady and Colas 2005), accession rites (Helmke and Awe 1998), scribal rites (Stone 2005b), ritual sweatbathing (Moyes 2005b), human sacrifice (Gibbs 1997; 2000; Moyes and Gibbs 2000; Owen 2005; Reents-Budet and MacLeod 1997; Scott and Brady 2005) and acts of war (Colas 1998) are all activities associated with ancient Maya cave use.

This implies that ancient Maya cave sites were not used exclusively for limited types of ritual, but rather, were generalized ritual venues in which various ritual types occurred often within the same site. The variation in the artifact record in caves and in modifications to the spaces also attests to this. A pattern is

developing which suggests that many of these ritual types are those associated with elite behavior.

The term "elite" is extremely problematic and somewhat vague. While the use of "elite" and "non-elite" suggests a two-class system, this may not be the case among the Maya who may have had a middle class strata as well (Chase and Chase 1992). There may also be a hierarchy within the nobility that has prompted the use of the term "apical elite" to refer to kings. In this dissertation I am referring to elites as those of elevated status.

Elite contexts are identified in the archaeological record by luxury goods, elaborate architecture, and treatment at death (Chase and Chase 1992:4). Although both monumental architecture and interments exist in cave sites, elite usage is usually suggested by the use of space or from the artifacts found at the site. For instance in an unpublished work, Christophe Helmke (1999) convincingly demonstrated that molded-carved vessels found in numerous Belizean caves were objects used by the elite or secondary elite. His study evaluated the provenience data for the vases in surface contexts and concluded that they were primarily found in pyramidal structures in site cores. This suggested to Helmke that cave use may have been an elite prerogative of high status individuals. Helmke's study adds to the growing evidence from archaeological cave research that suggests that esoteric elite rituals were performed in caves in the Classic period.

We are slowly coming to understand that caves served as highly politicized ideological resources that were appropriated, manipulated, and

controlled by elites. This idea was initially established by James Brady and his colleagues who argued that caves were integral to the establishment of elite status and power (Brady 1997; Brady and Ashmore 1999; Brady and Bonor Villarejo 1993; Brady et al. 1997). Brady's work at Dos Pilas has been particularly instructive in this regard. This research brought to light a pattern, common among the Classic period Maya, of building temples and palaces directly above natural or man-made caves (see Appendix 1 for a partial list of sites with these features). As Brady and Wendy Ashmore (1999) point out, at Dos Pilas the royal palace complex was built above the Cueva de Murciélagos (Cave of the Bats). This cave served as an outlet for an entire drainage system at the site. To this day, during heavy rains water gushes from the mouth of the cave with such force that the roar can be heard half a kilometer away. They suggested that this was a sensory cue that announced the beginning of rainy season the purpose of which was to reify the power and control of the king over life giving water.

This pattern can be traced back in time to the construction of the Teotihuacan Pyramid of the Sun dating to A.D. 100. A man-made tunnel or “cave” stretches from the base of the central stairway to beneath the center of the pyramid (Manzanilla 2000:98). In antiquity, water was channeled through a system of drains into the tunnel so that it would flow out the entrance—the “cave’s mouth”—completing the image of a fertile sacred mountain (Heyden 1973; 1975; Millon 1981).

Elite use of caves has a deep history in Mesoamerica dating to the Olmec culture (1200-200 B.C.). Iconography on Olmec thrones dating to 1000 B.C.

illustrates their close connection with early rulership. A central element of many of the thrones is an individual emerging from a niche. The carving on the thrones portrays the niche as the open mouth of the jaguar or earth monster, a well-recognized cave motif. David Grove (1973) sees this statement of cave emergence as a central element in the rulers' claim to legitimacy.

Although it has been variously interpreted (Angulo 1987:133-158; Gay 1966; Grove 1984:110-111; Reilly 1994; 1995:41-42), there is consensus that the famous El Rey monument at Chalcatzingo illustrates a person sitting within a cave. The cave is depicted as the jaws of a zoomorphic deity. It is raining in the scene and plants grow above the cave. The most obvious theme in the depiction is one of rain and fertility, similar to those employed by Late Classic Maya elites. Kent Reilly (1994:85) expanded on previous interpretations suggesting that the man is an ancestral being seated on a cloud. This image equates early rulership with caves, ancestors, and rain making. The associations of caves with the earth, rain, fertility, and creation at this very early time in Mesoamerican history imply that they were important symbolic ritual spaces in the early development of political power. Schele (1987:16) argues that much Olmec iconography illustrates the king controlling the cave portal between this world and the supernatural world. She interpreted images as explanations of the ruler's power in terms of the control of this portal since all life abundance as well as death and disease emanated from it. It is quite possible that Maya kings derived these concepts from the Olmec.

The emergence of kings from caves in the ethnohistoric period was also noted by Brady (1989:58-64). The last Mixe king, Condoy, was supposed to have originally emerged from a cave and disappeared back into it following his later defeat (Bancroft 1886:532-33). The Chontal hero-king Fane Kantsini, who led his people to victory against the Zapotecs, was reputed to have been hatched from an egg in a cave (Carrasco 1960: 113).

One of the reasons that caves would have attracted elite appropriation concerns the concept that caves were places of ancestral emergence. The emergence of modern humans from caves is a major theme in creation myths found throughout Mesoamerica. In much Mexican mythology ethnic groups sprang from a cavern or series of caverns known as Chicomoztoc meaning "In the Seven Caves" (Heyden 1975:134). The event is well illustrated in the *Atlas de Durán* (1967) in which we see people emerging from the mouth of an Earth monster (Figure 1-3). A similar motif is also found in vessels from Honduras (Nielsen and Brady n.d.) in which the primordial couple sits within a cave. We know that such myths were central to the cosmology of ancient Mesoamerican peoples because the myth is materialized in the form artificial caves excavated beneath the sites of Acatzingo Viejo and Utatlan (Brady and Veni 1992). Among the Maya, it has also been argued that caves were the conduit by which the Hero Twins made their descent to the Underworld in the *Popol Vuh* story (MacLeod and Puleston 1975; Vogt and Stuart 2005).

Not only do caves represent ancestral emergence, but they are also the origins of sustenance. Among the ancient Maya this concept dates back at least to

the Preclassic period and probably earlier. The murals at San Bartolo dating to 100 B.C. illustrate a creation event occurring at the mouth of a cave (Saturno et al. 2005). The cave is depicted as the opening of the jaw of an anthropomorphic earth monster but the upper tooth is shaped like a stalactite. A symbol for stone marks the feature identifying it as such. The murals are important in understanding early ideology and the message that elites wished to convey. Their placement within an early pyramidal structure indicates that early rulers, like their Olmec predecessors, wished to associate themselves with the creation, fertility, and sustenance. The artist has clearly illustrated the role of caves within early elite symbol systems.

Patricia McAnany (1995:159) has argued that Maya lineages were intimately connected to the land they inhabited. As places of emergence caves are the topographical features that reify this ideology and directly connect lineages to the land. Ethnographically this has been demonstrated among the Tzotzil of Guatemala (Guiteras-Holmes 1947:1). Tzotzil lineages are formed into clans that are associated with particular caves. The cave represents both the place of emergence of the lineage ancestors and the place where one returns at death. Vogt (1976:99) noted a similar attachment in which lineages take their names from the cave/spring around which they live. Villa Rojas (1969:215) notes that distinguished members of each cave were buried in their respective caves.

Ethnohistoric evidence also suggests that caves were important to land rights. In his work on early Spanish land titles ethnohistorians Angel García-Zambrano (1994) researched the criteria used by immigrants to decide where to

settle. The ideal location was a watery place surrounded by four mountains with a fifth mountain protruding in the middle of the water. The configuration formed a horseshoe-shaped valley in the center of which was a natural cave containing water called a *rinconada* or *axomulli* (water-corner). The U-shape of the *rinconada* approximated the form of the cave of origin and natural caves were often excavated to enhance their resemblance to the ideal. If a cave could not be found, a large handmade clay pot could be buried in the center of town as a substitute. García-Zambrano suggested that the ideal location, a valley surrounded by mountains irrigated by water holes, rivers, lakes, and/or lagoons, mirrored the primordial landscape where earth's fundamental elements interacted. Once consecrated, caves became the heart of the new town providing "the cosmogonic referents that legitimized the settlers' rights for occupying that space or for the ruler's authority over that site" (1994:218). This helps to explain why cave symbols are often incorporated into Classic period emblem glyphs or toponyms of Maya sites (Stuart 1999; Vogt and Stuart 2005).

In her recent volume on Maya political organization, Prudence Rice (2004:280-284) suggested that the presence of caves or cenotes may have been an integral element in choosing a city for the seating of the *may*. Rice argues for a calendrical basis of Maya political organization for both intrasite and intersite relationships in the Maya lowlands beginning as early as the Middle Preclassic period. She hypothesizes that the *may* was related to k'atun (20-year) cycles. These were similar to the Postclassic calendrical cycles described by Bishop de Landa in the sixteenth century (Tozzer 1941:134-149; Taube 1988b). According

to Rice, a powerful city was chosen as a seat of the *may*. The office carried with it ritual responsibilities that required stela erection and celebrations of k'atun endings. She noted that Tikal Stela 16 refers to a k'atun ceremony occurring at the "first maw/hole" (Harris and Stearnes 1997:166-168) suggesting that caves were associated with k'atun rites.

Recent epigraphic evidence from Maya texts provides evidence that during the Classic period caves associated with particular rulers became the targets of war events (Brady and Colas 2005:156-160). On the Late Classic Tonina Monument 122 dating to A.D. 711, there is a depiction of the defeated king of Palenque K'an Joy Chitam. The text, recently interpreted by Brady and Colas, indicates that the king's cave was attacked. They suggest that the cave's destruction was a means of diminishing the king's political power. This is not a solitary instance. They also report that three seventh century looted panels, thought to come from the Piedras Negras region, record the story of the ruler Nikte Mo' who scatters fire into the cave of ruler K'ab Chante. Following this event Nikte Mo' was beheaded. The authors interpret this text as an act of war and suggest that fire scattering is a gloss for acts of desecration.

Not only were caves used by kings in war events, but some were elite pilgrimage sites as well. At the cave of Jolja' in Chiapas cave paintings and inscriptions dating to the Early Classic period refer to ritual feasting by secondary nobility who may have been on a long-distance pilgrimage (Zender et al. 2005). Barbara MacLeod and Andrea Stone (1995) suggested that Naj Tunich cave in Guatemala was an elite pilgrimage site based on the presence of multiple emblem

glyphs in the inscriptions. Stone (2005b) recently argued that the cave may have also functioned as a pilgrimage place for scribes.

The above evidence demonstrates that caves were important ritual spaces that functioned within political environments. They were not passive symbolic icons in Maya belief systems but were active resources in socio/political contests and could be used by rival factions. Their function as political entities can be traced from as early as the Olmec culture and it is apparent that Maya caves were heavily politicized by the Classic period and possibly much earlier. The enclosed space and restricted morphology of caves must have also been attractive to elite interests. Regarding her work at Xunantunich and Actuncan, Lisa Le Count (in Lucero 2003:548) stated that, "... the most highly charged political rituals occurred in restricted civic locations, spatially isolated from communal plazas where the business of state and lineage was negotiated."

Although there is a plethora of evidence for elite cave use among the Classic period Maya, there is also a sampling bias. The caves that have interested archaeologists have been those that contain paintings, petroglyphs, architecture, interesting artifacts, modifications, and signs of intense utilization. Small caves or rockshelters located in rural or remote areas are difficult to access and many have little surface material associated with them. While these may be non-elite sites, no one has developed methodology to examine this issue or has made more than cursory argument for elite vs. non-elite usage. It is often assumed that small sites are non-elite because of their size and remote locations. However, it is also possible that these caves were part of ritual circuits or boundary markers within

elite spheres. This would suggest that we are seeing are functional differences rather than class differences in cave use. What does appear to hold true is that relatively large caves, particularly those with extensive dark zones, appear to have been utilized by elites no matter how far their locations were from surface sites.

This brings up the issue that there are almost certainly differences in cave use between those who could enter dark zones and those that were able to utilize light zones. There is little doubt based on cave morphology that large open areas were used as public venues. These areas were structurally modified as large stages or balconies such as at Naj Tunich (Brady 1989) in Guatemala and at Actun Chapat (Ferguson 2000) in Belize. This argues strongly for elite-organized rituals. Large artifact scatters at cave entrances also suggests that there was increased ritual activity in these light and twilight areas. This is likely to represent either less-restricted access to these areas, people standing outside of the cave and throwing objects into the entrance, or both. We know that objects were tossed into cave shafts, as for example in Chamber C at Actun Balam, Belize (Pendergast 1969). A pile of artifacts covered the floor of the chamber directly below the shaft.

1.4 Change and Continuity in Mesoamerica

It is impossible to speak of changes in ritual practice in Mesoamerica without understanding the dynamics of cultural change in the region. Scholars have long argued for the existence of a pan-Mesoamerican culture that transcends time and space (Coe 1973; Bernal 1960; Ekholm 1973; Nicholson 1973; Seler

1902-1923; Thompson 1973). The term "Mesoamerica" was defined by Paul Kirchhoff in 1943 not as a geographic entity but as a group of cultures that shared a cultural unity and similar religious principles. It is argued that the basic unifying principles are not only temporally continuous, but are recognizable in different cultural areas.

In 1973, Gordon Willey noted that there were three assumptions operating among Mesoamericanists. The first was that all Mesoamerican Pre-Columbian cultures from 2000 B.C. to the Spanish Conquest were linked through time in space into a single cultural system. The second was that there was a unified ideology operating in the system. The third assumption was that there was integrity within the system that allowed scholars to ascribe similar meanings to similar signs or symbols found in the archaeological record throughout time and space. While Willey fundamentally agreed with these assumptions, he pointed out there was a disjunction in cultural continuity among the lowland Maya following the classic ninth century collapse.

Cultural continuity has also been noted and studied by numerous ethnographers (Hunt 1977; Bricker 1981; Reina 1966; Vogt 1969). Gary Gossen (1986:2) described Mesoamerican culture as a distinctive entity that has existed for 3,000 years of "continuity without change." Allen Christenson argued that elements of ancient Maya heritage are a reassertion of a living culture (1998:27). In some cases, such as among the Ixil, this continuity may have been due to geographical or social isolation (Colby & Colby 1981:29), but as Barbara Tedlock (1992) noted, the conservative nature of Maya belief is a salient feature of the

cognitive structure of the culture. She describes an accretionary process of ideological change caused by the reluctance to discard old beliefs. In her ethnographic study of shamanistic divination and ritual Tedlock concluded that “...current cosmological theory and practice ought to be respected as a precious living resource, providing the conceptual tools for reconstructing the meaning of the material objects that happen to have survived from the Classic and Postclassic periods of Mayan prehistory” (Ibid:197).

In her study of the Zinacantan symbolism, Eva Hunt (1977) is explicit in her discussions of symbolic continuity. She suggests that Maya ideology has an "armature" or deep structure that enables some ideas to transcend socio/political upheavals. Regarding these armatures she states:

Armatures appear quite fixed over long periods of time, across geographic, social, and culture boundaries. They may appear not to change at all. In fact they do change, but seldom in radical ways, and it is theoretically important to know this fact, and to understand why they change the way they do... therefore, the old symbols don't die out, but persist as echoes of the past in the present...sometimes they are only scattered and eroded fragments of systems and schemata shredded by history (Hunt 1977:258-259).

Gossen believes that there may be a gender-based duality which may aid in the retention of cultural knowledge. He begs the question:

Is it not plausible that the male-dominated public arena has been the active assimilator of new codes (language, economic systems, political authority systems, state religions) and, thus, seemingly able to respond quickly, even apparently capitulating to, the winds of change; while the female-dominated domestic sector, *simultaneously*, guards the older (native languages, agricultural ritual, curing knowledge, ancestor cults, shamanistic knowledge) for present and future reference and security (Gossen 1986:6)?

Gossen's model differentiates between public and domestic life and suggests that males may take on a cultural façade or dual identity based on their public and private personas. Males indisputably have more contacts outside of the home and therefore experience more demand for change or capitulation whereas females can opt to identify more strongly with traditions and maintain culturally conservative households.

1.4.1 Mesoamerican Core Concepts

Concepts are the most fundamental constructs in theories of the mind (Laurence and Margolis 1999). They are well-studied in cognitive science though their attainment is not well-understood. Although conceptualization may lead to belief, concepts are fundamental to belief. In the classical sense, concepts may be *primitive* or *atomic* such as "red" or "cat" or may be *complex* such as "dropped the accordion." Gregory Murphy and Douglas Medin (1999:453) argue that people's concepts are integrally tied to their theories about the world. These theories are based on causal knowledge, rules, theoretical consistency, and other theory-like knowledge. In other words, the acquisition of concepts is experiential. In studies based on children's abilities to acquire language, errors may occur not from faulty linguistic abilities but from an impoverished conceptual structure. For example to understand a word like "buy" may require a sophisticated understanding of money exchange (Carey 1982:374; Murphy and Medin 1999:450).

People's knowledge of the real world plays a major role in conceptual coherence. Murphy and Medin (1999:454) suggest that there is an internal logic

or structure to conceptual theories that adjusts to empirical circumstances but are also driven by expectations and hypotheses about the world. Concepts that have their features connected by functional relationships or causal schemata will be stable. Those that have no interaction with the rest of the knowledge base will be unstable and will likely be forgotten or rejected. What this suggests is that conceptualizations based on empirical evidence about the world and how it works are likely to have a tenacity that others lack. The tenacity of particular core concepts will only be understood by focusing on the fundamental aspects of cognition and the ways in which memories are reinforced (Zubrow 1994:187-190).

In Mesoamerica, ideological core concepts are thought to have survived despite discontinuities brought about by changes in internal political structures as well as the fifteenth century Spanish Conquest (Farriss 1984; Freidel et al. 1993; Gossen 1986; Hunt 1977; Bricker 1981). They are of interest precisely because of their tenacity in Mesoamerican thought, which suggests that they are the conceptual foundations of Mesoamerican cultures. They include cosmological ideas such as the cyclical nature of time, the integration of time and space, a quincuncial four-sided universe with a fifth direction in the center, a three-tiered concept of the cosmos, and the belief in a sacred natural landscape (Gossen 1986: 3-6; Hunt 1977; Moyes and Brady 2005; B.Tedlock 1992). It is interesting to note that many of these cosmological concepts that have persisted over time are based on empirical observations from nature. It is likely that these natural

elements and processes serve to reinforce the verity of the conceptualizations (Crumley 1999:271).

For instance, the quincuncial model of the universe is common throughout Mesoamerica and the American Southwest. Evidence for its presence among the Pre-Columbian Maya can be found in the Codex Madrid, in the layout of tombs at Rio Azul (Adams and Robichaux 1992:412), and in site construction typified by the twin pyramid complexes at Tikal (Ashmore 1991:201). Ethnographers report that among the modern Maya the earth is thought of as a four-sided horizontal flat plane that sits beneath the overarching dome of the sky (Gossen 1974:34; Freidel et al. 1993: 126-131; Holland 1963; Redfield and Villa Rojas 1962:114; Sosa 1985:417-423, 1989; Vogt 1976:13). Gossen's (1974:34) illustration (Figure 1-4) depicts the sun's path as it moves across the heavens in a vertical circular pattern around the flat earth plane. The sun's rising and setting on summer and winter solstices delineated the four corners of the plane, and its zenith and nadir marked the center of the square earth model. The movement of the sun across the sky is readily observed and provides a strong empirical model that reifies the cosmological concept. Eva Hunt (1977:275) noted years ago that this symbolic expression for the universe is common in numerous agrarian societies. She argued similar models found in societies that are disparate in time and space, are parallel symbolic inventions based on empirical knowledge and similar economic interests.

Maya concepts of a sacred and animate landscape have also survived over time. One of the fundamental concepts in all Mesoamerican religions is that

caves are sacred spaces that materialize cosmology (Adams and Brady 2005; Aguilar et al. 2005; Ashmore and Brady 1999; Brady 1989, 1997; Brady and Veni 1992; García-Zambrano 1994; Heyden 1973; 1975; 1981; Manzanilla 2000; Moyes 2005a; Moyes and Brady 2005; Prufer and Kindon 2005, Pugh 2005; Stone 1992, 1995:12). Not only are these concepts apparent from ethnographic accounts, but are also demonstrated in epigraphic texts and iconographic representations.

Evon Vogt and David Stuart (2005) presented a convincing argument regarding the continuity of concepts regarding caves and mountains. They compared epigraphic Classic period texts with ethnographic data from Highland Chiapas. Stuart deciphered the glyph for cave and discusses its use in texts. He noted its association with death as well as Underworld and bat symbolism.

The sign is also used in the idiom "sky-cave," which Stuart interprets as representing an entire polity or geographic political unit from the zenith to the nadir, or from the sky to the Underworld. This is bolstered by the presence of the cave glyph, *ch'een*, in the names of communities or larger polities. The authors concluded that mountains and caves represented topological and ritual boundaries for both ancient and modern communities. Caves were not only boundary markers for the corporeal world, but were also transitional spaces between the natural and supernatural planes of existence. Further, caves embody the center or "navel of the world" in the quincuncial model of the cosmos that is prevalent throughout Mesoamerica. This was also argued years ago by Barbara MacLeod and Dennis Puleston (1978) who believed that caves were the entrance to the

Maya Underworld. The work of Vogt and Stuart support the findings of ethnohistorian García-Zambrano (1994) who demonstrated that mountains and caves were foundational geographic features that provided the cosmological referents for the legitimization of leaders in almost all Mesoamerican communities.

1.4.2 Political Disjunction

So, how can changes in ritual practice be commensurate with what is thought of as a unified cultural system in which cosmological ideas and meanings tend to be conservative? This has been traditionally addressed in debates regarding the use of ethnography to interpret Classic period phenomena in iconographic studies. George Kubler (1970; 1973) argued against the use of ethnographic models for symbolic interpretation because of the temporal differences between the analogs. He invoked the "principle of disjunction" put forward by Erwin Panofsky (1944; 1960). Disjunction refers to the process by which motifs could change, separate, and rejoin independently over time, their meanings having radically changed.

The main objection to Kubler's extension of the principle of disjunction into Mesoamerican studies was that it was based on examples from the European Middle Ages. His theory did not account for presence or absence of historical factors such as immigration or catastrophe which would be likely to cause disjunction (Brady 1989:57-58; Stone 1995:11-12). Panofsky himself noted that disjunction was not automatic (1960: 82). H. B. Nicholson (1976) observed that

Kubler's argument was based on a rather extreme example in western history that has not been shown to be applicable to Mesoamerica (also see Pohl 1981).

Kubler was also influenced by art historian Henri Focillon (1942) who put forward two axioms for understanding temporal transformations in the form and meaning of iconography. The first held that a visible form is often repeated and may acquire different meanings over time. The second was that an enduring meaning may be conveyed by different visual forms. While Kubler (1970) used the first to argue for the disjunction of iconographic forms, the second proposition appears to better describe the process of disjunction found in Mesoamerica. What may be concluded here is that Kubler was right in arguing for disjunction but wrong in understanding its nature. In contexts that favor disjunction, meanings may have a tenacity that forms lack. In fact often Mesoamericanists tend to argue for continuity in conceptual meaning despite changes in form. For example Miguel Covarrubias (1957) illustrated the gradual evolution that occurred between the iconographic forms of the Olmec rain god to the Maya rain god Chac.

Despite any probable continuity in symbolic meanings, disjunctions in function of symbols or rituals within the social order were inevitable as the political system underwent radical upheavals. Continuity in the meaning of symbols is an important aspect of cultural change but practices or symbols that appear on the surface to have continuity may in fact be functionally different within the new socio/political system. Conversely, symbolic or cosmological

concepts may have considerable continuity though forms may change. In terms of ritual, these forms may take the shape of changes in ritual practice.

Robert Wyllie's (1968) work seeks to explain how ritual forms and their meanings can survive social upheavals and retain their function in the new system. In his study of the continuity and survival of a traditional Ghanaian ritual within an urban environment, he argued that any religious ritual is a sociocultural subsystem embracing cultural patterns of meaning, social patterns of interaction, and individual patterns of personal motivation. He suggests that these modes must be addressed individually when evaluating ritual continuity or discontinuity. Wyllie refers to the modes as cognitive-affective congruity, structural congruity, and functional congruity. Cognitive-affective congruity evaluates the relationship between the goals of the majority of actors and the ostensible purposes of the ritual. Structural continuity evaluates the ritual interaction and the pattern of secular interaction. This assumes that ritual is organized on a fundamental principle of the social structure of the community. Changes in the structure alter the way in which people may operate within it. Functional congruity examines the relationship between the operation of the ritual as a sociocultural subsystem and the community system of which it is a part.

In other words, the ritual operates in at least 3 modes, the individual, the political, and the cultural. Wyllie suggests that rituals may remain stable in one mode and transform in others so that their existence may continue within a particular field. Therefore in evaluating continuity and change in ritual practice it is important to examine and specify the type of change or continuity that has

occurred. In this method of evaluation one must consider whether the ritual has changed in individual or cultural meaning and examine its function within changing social systems.

Once patterns are defined, it is possible to make inferences regarding a ritual's function within a given social system. This suggests that when there are changes in social structures, particularly if they are radical, similarities in function can only be inferred when they are defined in terms of the social structure in which they serve.

Both H. B. Nicholson and Andrea Stone (1995:11) agreed that the question of cultural continuity was a "mixed bag" (Nicholson 1976:161) in that some aspects of the culture exhibit continuity whereas others do not. Nicholson argued for a set of basic interrelated "core" concepts shared between Mesoamerican cultures, but also conceded that there were possibly disjunctions. He proposed two possible breaks; the first occurring during the Classic-Postclassic transition during which he noted a break in historical record keeping as well as significant cultural changes, and the second following the Spanish Conquest (Nicholson 1974). Oliver La Farge (1973) argued that there were at least five disjunctions in the Maya culture beginning with the Conquest and continuing throughout the Colonial Period into modern times. His disjunctions were based on laws passed by the Spanish that increased or decreased the amount of intervention into Maya communities.

Disjunction in Maya culture was most likely to have occurred during or after the ninth century collapse. The nature of the collapse has most recently been

discussed and elaborated on by Arthur Demarest, Prudence Rice, and Don Rice (Demarest et al. 2004; Rice et al. 2004b). They agree with most other scholars that the civilization did not collapse *per se*, but what did come to a close was the state-level political organization that included Maya kingship along with its elite-run social, political, and administrative hierarchies. Although areas of northern Belize and Yucatan flourished in the Postclassic period, sites in the Petén, most of Belize, and Honduras were abandoned or replaced with scattered Postclassic occupations with little public architecture and no major centers.

Demarest and his colleagues (2004:569) argued that another variant of the state organization developed during or after the collapse that retained the basic core concepts, multiple gods and symbols systems "minus divine kingship." This agrees with Nancy Farriss (1984: 227-255) who contended that a variant of the Classic period political organization in the form of social ranking remained in place throughout the Colonial period until the Bourbon reforms that marked the beginning of the neo-colonial era. However, even given that a variant of the old Classic period political system may have remained in place for many years, with the demise of divine kingships a new order of public ideology was inevitable, particularly in the Southern Lowlands where kingship was most entrenched (Freidel 1986b). A new form of ritual practice would be expected to replace the old elite state rites; one that retained core concepts but performed socio/political functions that articulated with the modified structure.

Farriss (1984) is instructive regarding how core cosmological concepts were retained throughout the colonial period in Yucatan. She pointed out that

there was considerable congruency between symbolic forms in Spanish Catholicism and ancient Maya religion. Therefore it was fairly easy for the Maya to attach their own meanings to the symbols they were expected to adopt. For instance, the Christian cross is the same in form to the Maya World Tree at the center of the cosmos (Freidel et al. 1993:176-177). Allen Christenson has written extensively on the close relationship between Christian saints and ancient Maya deities, particularly the close parallels between the crucifixion of Christ and the death and rebirth of the ancient Maize God (1998; 2001).

Redfield (1956) suggested that there was a dichotomy between "little" and "great" ritual traditions that differentiate between rural and urban, peasant and non-peasant. McAnany (2002) noted that while this dichotomy may be useful in archaeological studies, ritual practice in Mesoamerica might be better thought of as "state" and "domestic" since "little" and "great" seem to have pejorative connotations. If we accept that there is a difference between the two, the implication is that the "little" or "domestic" rites were those most likely to survive radical socio/political change.

This process was similarly described by Earle Count (1960:317) who, working with Western European mythology, argued that the mythic systems of prior cultural stages of historical development become the "backyard" (little) tradition mythology of new high (state) traditions. Using this model it would follow that after the catastrophic ninth century Maya collapse in the southern lowlands, the public ideology of elite kingship was either rejected, forgotten, or

fell out of use, yet core concepts remained. These were kept alive by domestic rites--hence the observed cultural continuities noted by most Maya scholars.

There is some debate as to whether the "little" or "great" traditions actually existed in the Classic period. Lisa Lucero (2003) proposed that elite ritual began as an elaboration of pre-existing domestic rites that were transformed over time into kingly rituals. However, in the hands of elites these familiar rituals were apt to have acquired new or elaborated meanings. While this may account for the origins of some kingly rites, social theory suggests that elites needed esoteric and cryptic rites to create a chasm between themselves and commoners, thus defining their position and reifying their power (DeMarrais et al. 1996; Cohen 1974, 1979; Kertzer 1988). Lucero (2003:526) acknowledges that Maya rulers undoubtedly instituted new royal rituals and practices and suggested that once in power, rulers could then create new rituals for the public as well as private rites for other elites.

David Kertzer (1988:52) maintains that the ideology of divine kingship cannot take hold without a powerful ritual through which the ruler's supernatural power is made visible to the population. There is little doubt that Maya kings were astute in the adoption and utilization of ideology via ritual and symbol systems in the creation and maintenance of political power. The important role of ideology as a causative factor in Mesoamerican social development has been argued by numerous scholars for years (Ashmore 1986; Blanton et al. 1990; Coe 1981; Cowgill 1992; Demarest 1992; Freidel 1981, 1992; Grove and Gillespie 1992; Joyce and Winter 1990; McAnany 1995; Lopiparo 2001). What is not stressed in studies of ritual continuity is that even though royal ritual may have

developed from domestic household rites, they acquired layers of political meaning and intent beyond their original function and meaning. Therefore, as the society became more complex and stratified, rites functioned on a number of different societal levels and sent multiple messages to one or more groups.

1.5 The Origins of Elite Power and Control

I have argued that concepts regarding the natural order were aspects of the Mesoamerican worldview that have survived political upheavals. Because they are some of the most salient features of Mesoamerican ideology, it is of interest to explore their role in the rise of Maya elites. According to social theorist Abner Cohen (1974:31) the stability of political regimes is made possible via the symbolic structure which represents itself as a 'natural' part of the universe.

What better way to do this than to associate the regime with the natural order such as cyclical astronomical events, the rising and setting of the sun, the immovable mountain, or the sacred cave. Concepts of the natural environment provided "armatures" (to use Hunt's term) for the structuring of all Mesoamerican ideology. While there may be numerous armatures in the ideological structure, of interest to this study is the appropriation of the natural world and its cyclical processes by elites as one of a number of methods employed to obtain, consolidate, and maintain power.

David Freidel and Linda Schele (1993) have put forward strong arguments for the shamanistic origins and nature of Maya kingship. While the use of the term "shaman" and its various meanings is hotly debated (Klein et al. 2003), there

are few scholars who would argue that Maya rulers did not possess special or magical powers, or that one of the important functions of rulers was to communicate with powerful deities, ancestors, or animal spirits referred to by Houston and Stuart (1989) as “co-essences” or *ways*.

Many years ago David Webster stated that "...leadership and accompanying privilege must be socially validated and this may be accomplished by supernatural sanctions..." but he does not believe that ceremonialism is "...the *source* of political and economic leadership and differentials in early states..." (1976:815). However, more recently Webster suggested that the first Preclassic Maya kings merged their new royal identities with much older shamanic practices and with ancient assumptions about the nature of the world (2002:344). Webster implies that the royal identities were somehow apart from shamanic practices and needed to be "merged" whereas it is much more likely that the royal practices *emerged from* the shamanic practices as Freidel and Schele have argued.

Archaeological research on the earliest Maya kingship comes from the Belize Valley near Chechem Ha Cave (Awe 1992, Healy et al. 2004a; Garber et al. 2004; Brown 2003). Kathryn Brown (2003:116; 181) suggested that early in the Middle Preclassic period (1000-400 B.C.), communal rites and public feasting were used in the early consolidation of power and that early ritual deposits also suggested water-related rites. By the end of the period the association of elites with the supernatural world was in place as was social stratification. This is convincingly demonstrated by the presence of large stucco masks affixed to monumental architecture erected towards the end of the period.

Scholars argue that these masks express cosmological ideas of Maya creation based on large-scale astronomy that serve to legitimize the role of kingship and emphasize the role of the king as one who communicates with the supernatural (Brown 2003:136; Freidel and Schele 1988; Hansen 1992; Garber et al. 1995; Garber et al. 2000). Therefore, we see from very early political developments that Maya leaders associated themselves with the natural world, but the archaeological record has been mute in explaining how power was actually acquired during this period. Linda Schele (1987:16) suggested that shamanistic origins of kingship and political power were inherited from the Olmec and Peter Furst (1965, 1966; 1968; 1976; 1981) has long argued that shamanistic Olmec kings were using hallucinogenic rites to communicate with the supernatural world. This makes sense in light of cross-cultural models that posit that religious practitioners use their ritual power to extend control into other social fields.

Mark Aldenderfer (1991; 1993) studied the development of hierarchical relationships, inequality, and social differentiation among relatively egalitarian societies. His arguments strengthen Furst, Freidel, and Schele's claims that the origins of kingship either Maya or Olmec are founded in ritual practice. Using Boyd and Richerson's (1985) dual inheritance theory of cultural evolution, Aldenderfer argued that it is precisely in foraging groups that shamanic power arises and further, that changes in ritual practice are *causal* to the emergence of social complexity. It is based on the assumption that individuals, even in what are considered to be "egalitarian" societies will seek to increase their inclusive fitness by increasing their wealth, prestige, and status and will exploit these differences

whenever possible. In these societies, control of a ritual hierarchy is one of the more powerful and possibly one of the first effective ways in which individuals could seek to extend their prestige and status (Aldenderfer 1991:32). As a fundamental premise Aldenderfer states that "all known foraging groups have some sort of shamanic figure or ritual practitioners" (Ibid.:33). Wielders of existing forms of ritual power in these groups are those most likely to extend their control in to other social fields and therefore have a competitive advantage in accruing other types of power as well.

Individuals participate in ritual systems through a belief in rewards for behavior consistent with the system or fear of sanctions or punishments (Burns and Laughlin (1979:271-275). Boyd and Richerson (1985:229-230) demonstrate that in relatively small groups, it is never in the individual's rational self interest to punish, but is always better to find someone else to do it. Aldenderfer tentatively suggests that this line of thought provides a basis for the origins of supernatural sanctions (1991:12). Based on these models that describe the establishment of hierarchies based on ritual control of small groups, it would appear that in terms of the early Mesoamerican rulers, shamans or ritual specialists were already in a place of power by the Early Middle Preclassic period and probably much earlier.

1.6 Rain Control in the Establishment and Downfall of Kingship

Mesoamerican concepts of the natural order are core concepts that may be traced to deep antiquity. For instance, Karl Taube (1996) demonstrated that deities associated with agricultural fertility associated with Maya rulers of the

Classic period could be traced to the ancient Olmec culture and Miguel Covarrubias (1957) similarly illustrated the antiquity of Mesoamerican rain gods. Whatever their origins and whether they were appropriated, elaborated on, or developed by Maya rulers, Classic period elites made considerable effort to associate themselves with the natural order such as large-scale astronomy and fundamental ecological processes such as rain control, agricultural fertility, and the power of the sacred landscape. This is apparent in the symbolic expressions found in elite architecture, costume, art, and iconography (Ashmore 1989; Brady and Ashmore 1999; Freidel and Schele 1988:86; Freidel, Schele and Parker; Lucero 2002; Freidel and Suhler 1999; Schele and Miller 1986:103-116; Taube 1988c:351). These associations eventually allowed the elite to imbed themselves as mediators between the natural and supernatural domains (Freidel and Schele 1988:92; Webster 2002:344).

Thus Classic period data supports the notion proposed by a number of scholars who posit that the rise of kingship is fundamentally based on water control and its associated ideology (Ford 1996; Lucero 2002; 2003; Scarborough 1992; 1996; 1998). Evidence from Blackman Eddy suggests that water-related rites were in fact some of the earliest rituals performed on monumental structures. Large numbers of freshwater shells were cached in early ritual deposits suggesting their relationship to water (Brown 2003:116).

This makes sense based on the nature of the tropical environment. Anabel Ford (1996) pointed out that the weather patterns of seasonal rainfall often produced deficits in water at the height of dry season. She argued that while

agriculture was a focus of elite control, the distribution of land was not sufficiently concentrated to manage directly. It was the critical absence of drinking water during the dry season that provided the most important mechanism for control. This was accomplished by the construction and maintenance of reservoirs around site cores, many of which continue to be used today. This is also evidenced by water lily symbolism in elite iconography. Anabel Ford explains that water lilies can only grow in pure uncontaminated water. They are sometimes found in the kingly title *Nab Winik Makina* or Water Lily Lord. Lisa Lucero (2003:528-529) also argued from materialist viewpoint, that Maya elites gained power by controlling water sources and appropriating domestic water rites as part of the state ideology.

In his study of the reservoir systems at Tikal, Vernon Scarborough (1992; 1998) argued that water and its management may have been the single most important resource in the development and maintenance of Maya society. The ability to control the release of water to surrounding populations promoted the authority of those responsible for planning, constructing, maintaining the water-management system. Later Scarborough (1996) makes a case for the ritual control of water sources based on comparisons with ritually regulated Balinese water temples.

The iconography of the Classic period is also instructive. Kings were often depicted holding "Double-headed Serpent Bars" or "Manikin Scepters" that were the quintessential symbols of rulership (Schele and Miller 1986:72-73). Serpent or ceremonial bars (Figure 1-5) were staffs held by Maya rulers across the

body in both arms (Miller and Taube 1993:58-59). The sky was often depicted on the bar. These objects were frequently used in scenes of period ending rites and are found on the earliest stela at Tikal, Stela 29, which dates to A.D. 292.

According to Miller and Taube they most likely date as early as the Olmec period.

Conventional ceremonial bars had open serpent mouths at both ends from which emerged deities or ancestors. The deities included God K, Chac the rain god, the Jaguar God of the Underworld, and God N among others. In iconographic depictions God K (discussed below) as well as God N was often associated with Chac the rain deity. God N held up the sky and was a deity of mountains but also had associations with rain and maize (Taube 1992:92-99). He is thought to be the Mam or Maximon, an earth deity reported in ethnographic contexts. The Jaguar God of the Underworld has strong associations with night and caves (Miller and Taube 1992:103).

The snake heads on the bar are important clues as to their meaning. Three fundamental ideas relate to snakes throughout Mesoamerica (Miller and Taube: 148-151). The first is that the serpent represents water or a conduit for water. In fact, in Figure 1-5 water (identified by Grube and Martin 2004:11-66) is pouring from the bar. The second feature is that the serpent's mouth opens to a cave. Third, the serpent also represents the sky. Miller and Taube point out the Maya words for sky and snake are homophones. Snakes were the also conduits through which ancestors appeared in blood-letting rites. The authors suggest that these ceremonial bars represented an integrated ideology of the ruler holding up the sky and supporting the cosmos through bloodletting thereby nurturing the gods.

However, one cannot miss the connections of caves and rain in the symbolic nexus. The ceremonial bar symbol connected divine kingship directly to both rain making activities and caves. These bars depict caves as places that housed deities related to rain and water as well as to ancestors by illustrating that they emerged from the serpent mouth/cave. This suggests that a king's connection to the earth and the being that dwelled therein via a cave was an important facet of his rulership.

The Manikin Scepter (Figure 1-6) also suggests a close association of divine kings with rain making. The device is held in the hand of the ruler and is a symbol of rulership itself (Miller and Taube 1993:110). The scepter is a manifestation of God K (Taube 1992:69-78). In the Classic period the deity was characterized by a long elaborated snout, an elongated serpent leg, and a fire element in its brow. The device can be traced to the Early Classic period and was used through the Postclassic. In later manifestations the image does not have a serpent leg or the brow element. Sometimes Chac the rain god was depicted in Classic period iconography holding the Manikin Scepter, in which case, Chac represented lightening. Clemency Coggins (1988) identified the Manikin Scepter as a lightening axe. Taube (1992:76) suggested that there are clear associations between God K and Chac based on the presence of figures that possess attributes of both. Their association is Early Classic but may date to the Late Terminal Preclassic period where the composite deity is found at the site of Abaj Takelik where it occurs on a lord's belt piece.

Schellhas (1904:32) identified God K with maize which has lead Taube (1992:76) to conclude that the associations with lightening, rain, and maize clearly identifies God K with the fertile forces of life. Of note is that Schele (1976:12) considered the god to be a deity of lineage and royal descent. She noted that God K was often present at heir designations or accessions (1982:62-63, 118,169). Taube adds that the head of God K is often capped with the smoking Ahau, a sign of designating male parentage in Classic texts (Taube 1992:78). This suggests that the royal lineages were closely identified with rain making and agricultural fertility.

These two symbols of divine kingship paint a vivid picture of the ritual role and expectations of the divine king. The king essentially holds the society together by ensuring rain, which is vital for agricultural success. This was accomplished via a ritual technology that required the nurturing and propitiation of ancestors and helpful deities. Both deities and ancestors were depicted as emerging from the serpent's mouth, which Miller and Taube (1993: have identified as a cave opening. These images convey the importance of caves in relationship to the fundamental duties and responsibilities of Maya kingship. The iconography on the ceremonial bars suggests that the ancestors and deities so necessary in ensuing prosperity were located in or emerged from caves.

The association of rulers with nature or the natural order is not unique to the Maya but is a typical strategy employed by political actors interested in developing and retaining power. Examples from 20th century African chiefdoms provide fitting analogs for understanding the advantages and dangers that leaders

encounter by associating themselves with the vagaries of nature. Many African societies have a great deal in common with the ancient Maya in that they have similar environments and agricultural technologies. Like the Maya, crop success is dependent on rainfall. Another similarity is that, like the Maya their political systems are closely tied to ideology and religion. Studies of relationship between ideology and African kingship have shown that members of society defined the kings as mediators between society and the natural environment (Kuper 1947; Evans-Pritchard 1962; Beidelman 1966; Young 1966; 1974; Feierman 1972; Mworoha 1977; Packard 1981). Many kingdoms were forged with ideological power but later gave way to military power during the colonial period. According to African historian Randall Packard (1981:6-8), cosmology was crucial in shaping patterns of political action throughout Africa. He noted that kings were closely associated with the well-being of the land, the social conditions, and ecological control, which often took the form of rain making.

Packard's (1981) work among Bashu of East Africa is of particular interest because kingships were developed under similar environmental and technological conditions as the ancient Maya. The Bashu are agricultural people who live in the Mitumba Mountains, a fertile area with an average rainfall of 1300mm a year. The group is an amalgamation of forest dwellers that occupied the mountain forests and Nande agriculturists from the valleys below who moved into the mountains probably in the late sixteenth or early seventeenth centuries. Although the forces that drove the migration are not clear, scholars suggest that there may

have been a drought that forced the agriculturalists into a wetter environment or that they were driven out of the valley by Hamitic pastoralists (Ibid. 55-64).

Although the Bashu live in a rich environment, it is subject to climatic change and other natural disasters that may damage or destroy crops quickly turning times of plenty into those of famine (Packard 1981:24-33). Like the Maya, they have no irrigation and the most important variant for crop success or failure is the quantity and periodicity of rainfall. If rains do not start on time crops may not germinate, but if they start on time and last too long, crops may not ripen properly. The quality of rain is also important. Long soft rains soak the soil whereas thunderstorms may wash crops away.

As in many African societies, rain making was an important aspect of the development of chiefly authority among the Bashu (Packard 1981:67-71). Early leaders were clan chiefs that magically controlled rain, which was believed to originate from the nearby by snow-capped mountains. By the beginning of the nineteenth century, the rain chiefs begin to achieve power. Payments made to them for supplying rain permitted them to establish alliances with lineage heads and other ritual leaders. They began coordinating ritual activity and acquired an ideological association with the general condition of the land. Early rain chiefs possessed specialized individual ritual powers whereas later Bashu chiefs were primarily responsible for coordinating the ritual life of the community.

Ancestral spirits also played an important role in the development of chiefly authority and all Bashu chiefs claim that their ancestors were first occupants of the area or "clearers of the land" (Packard 1981:30-32) The

ancestral spirit's descendents have special ritual powers that are necessary for mediation between the bush and the homestead. Among the modern Bashu, sharp distinctions are made between the two. As in the Maya world (for discussion see Stone 1995:15-16), the Bashu homestead is a place of order and harmony, domestic animals and plants, ritual purity and benevolent spirits, regulated by communal cooperation, reciprocity, the cyclical passage of time. The bush is a place of chaos that contains the elements and forces of nature, such as wild plants and animals, dangerous spirits, powerful medicines, and climatic forces. Forces of the bush are essential to the well-being of the homestead, but potentially destructive. To prevent catastrophe such as drought, famine, or pestilence requires strict ritual regulation between the forces that inhabit each.

Various ritual specialists regulate the homestead/bush relationship but it is the chief, the *mwami w'embita*, who is the primary mediator. Through the *mwami*, the mediating roles of the rainmakers, healers of the land, diviners of the land, priests of earth spirits, and ancestors are consolidated and the forces of nature domesticated. Descendants of the first occupants of the land must assist the *mwami* in performing sacrifices for the land. Packard notes that, "... political authority, like ritual authority, serves to control the relationship between nature and culture" (1981:30). When the chief is strong ritual control is maintained, but when the chief is weak or dies, the ritual coordination is broken.

In catastrophic times the credibility of the chief is tested. In such circumstances, rival chiefs may be blamed for catastrophe or stories invented to shift blame away from the chief. For these diversions to be acceptable,

collaboration from other leaders is necessary. Elaborate ritual proscriptions taking long periods of time are sometimes invoked presumably in hopes that the weather will change. In these cases, chiefs with strong support from allies and other ritual specialists retain their credibility whereas those that do not often lose power and are sometimes forced to leave. Therefore environmental catastrophe is often associated with political repositioning.

Under the right conditions this repositioning could become an opportunity for expanding power. For instance, in the 1890s the region was affected by drought and jigger fleas. The people lost faith in their local leaders and began to look farther afield for any chief who could establish ritual control and bring an end to their troubles. In this case a chief from a neighboring region with a reputation for having ended a previous drought was enlisted. This chief incorporated both regions under his control and made a number of changes in the agricultural ritual cycles to accommodate both areas (Packard 1981:160-162).

Like the Maya, one of the primary roots of power in all African societies is via ancestral lineage. Among the Bashu, the ancestors are identified as the spirits of the original immigrants that cleared the land and are thus tied to the land. This suggests that spiritual power is an earth-based phenomenon similar to that of the ancient Maya religion. Bashu elites gained power via ancestral land claims and shamanic water control. Given what we know about Classic period elite imagery, the origins of ancient Maya elite power were likely to have been similarly rooted in the appropriation of the power of the earth and water control.

According to Packard, in societies in which African chiefs or kings are associated with rain making, drought poses a serious threat to the leadership. Throughout Africa, kings are considered to be "the ritual mediators between society and the forces of nature" (1981:6). Leaders with strong support from allies and other ritual specialists were often able to retain their credibility whereas those that did not possess these resources often lost power. In extreme cases such as among the Jukun of Nigeria (Young 1966) kings could even be ritually murdered. This lead Packard (1981) to conclude that environmental catastrophe was often associated with political repositioning.

African models will be used as interpretive devices for understanding the advantages and disadvantages of attaining power based on control of the natural environment and are discussed at length in Chapter 8. From these examples we may understand that when environmental circumstances are favorable, those who associate themselves with the fertility and fecundity are able to gain power through ideological credibility. When people have faith in the ritual powers of the ruler it can allow those in power to extend their control. This was probably the single most effective way to gain and consolidate ritual power in early stages of developing political systems. Conversely, environmental catastrophe has the opposite effect and a number of structural mechanisms must to be in place within the system to protect those who control the elements and avoid deposition or regicide.

1.7 Modeling Changes in Cave Use

Cave use at Chechem Ha spanned a temporal range from approximately 1,000 B.C. to as late as A.D. 960. In the Belize Valley this encompasses all major temporal periods beginning with the first known inhabitants continuing through the development of hierarchical social structures and ending with the Late Classic period collapse. Archaeological studies suggest that social disruption creates fertile contexts for individuals or groups to claim or extend power and control using ritual transformations (Aldenderfer 1993; Saitta 1997; Schachner 2001; Whiteley 1988). Existing social structures may be fractured by various causes that include climatic stress or other socio/political conditions such as war and migration. Given what we know about the symbolic and political connotations of caves, cave use would be expected to vary according to the developments and transformations of socio/political structures. Because of their close association with rain control climatic stress would also be expected to play a role in cave use.

The first goal of this dissertation is to describe and define the changes in ritual practice in cave rites and situate them temporally. This is accomplished by recording artifacts, dating modifications to the site, and evaluating the changes in ritual intensity over time. These data are vital in determining how the cave was used and by whom. Once defined, these changes are correlated with factors likely to influence ritual transformations: population fluctuations, climatic variability, and socio/political conditions. While all three factors may be interrelated and operate simultaneously, in some cases it may be possible to isolate or eliminate particular factors during specific temporal periods.

By defining ritual practice and articulating it with the existing socio/political development, it should be possible to determine how caves functioned within the existing political system and to examine the factors that correlate with ritual transformations. The study of the cave as a ritual venue focuses heavily on how cave rites contributed to the growth of political complexity and social stratification. This adds to the corpus of knowledge regarding the power of ritual in the development of social complexity in middle range societies and also demonstrates the role and importance of sacred sites or powerful places as a potential political resource.

The following are some general models developed for evaluating various aspects of cave use. First, in order to understand the kinds of inferences that can be made based on cave data, proxies for usage are compared with settlement survey data. If no settlement is present in the area then no cave use would be expected. If cave use could be demonstrated in the absence of settlements it is clear that cave users were journeying to the cave from other areas. Evidence of discontinued or sporadic cave use in the presence of local settlement suggests that there was a change in ritual practice. Conversely, changes in practice may be inferred by increased cave use in stable or declining populations. Changes in use and intensity may be attributed to socio/political disruptions or could represent the changing needs of those controlling the space.

The second factor expected to affect cave use is climate variability--specifically rainfall. Cave studies suggest that rituals conducted in caves related to agrarian concerns of the Classic Maya people that involved water rites. While

comparative data from archaeological sites suggests that there was considerable variation in types of cave ritual, no one would argue that water rites were not one of the major concerns. This has lead Richardson Gill (2001:344) to suggest that that during the years of drought preceding the eighth to ninth century Maya collapse, ritual was intensified as a technology to relieve the environmental stress. He goes as far as to argue that people lived in caves during this time in order to appease the water deities. Although Gill's evidence is sparse and the archaeological data do not suggest that people ever lived in caves even temporarily, it is possible that ritual intensity may have increased during periods of drought.

Ritual theorist Pierre Smith (1982) characterized ritual in terms of "periodic" or "occasional" rites. Periodic rites consist of rituals or groups of rituals that occur cyclically whereas occasional rites occur as needed, therefore increasing ritual frequency. In times of environmental stress ritual frequency will in fact increase as been noted ethnographically by Raphael Girard (1949; 1995) among the Chorti of Guatemala. Occasional rites are also conducted in caves in modern contexts. Gary Gossen (1999:185) has pointed out that today among the Tzotzil, cave ritual is conducted during times of duress such as drought or conflict. June Nash (1970:45) similarly reported that ritual specialists held rites in caves to ask for rain in times of drought in Chiapas. Alan Sandstrom (2005) reported that as recently as 1998, a ritual specialist organized an elaborate cave pilgrimage with a combined group of Nahua and Otomí people from northern Veracruz, Mexico to appeal for rain during a catastrophic drought.

The use of ritual as a technology to anticipate and minimize risk has been demonstrated among the modern Maya by David Freidel and Justine Shaw (2000). Based on 43 ethnographic and ethnohistoric cases they suggested that ritual investment should be linked to agricultural risk that was based on environmental factors such as temperature, rainfall, elevation, and soil types. Agricultural ritual was divided into four types--planting, field preparation, crop maintenance, and harvest. They report that where agriculture was risky, primarily because of water availability, farmers emphasized rituals concerning crop maintenance and harvest, whereas in areas that appeared more stable, they gave more precedence to rituals for planting and field preparation.

This suggests that in times of drought one would expect to find evidence of maintenance and harvest rites such as first fruit ceremonies. While planting and field preparation rites are traditionally conducted in fields, first fruit rites may have a long tradition of being conducted in caves. This is hinted at in the San Bartolo the murals from the first century B.C. The mural on the north wall illustrates a creation event in which maize tamales and gourds of water are being handed out of entrance of the cave of origin. The association suggests that both the first maize and primordial water originated in caves (Saturno et al. 2005). In practice, these beliefs could be expressed as first fruit rites. These types of rites would be recognized in the archaeological record by the presence of immature maize or fruit. Although rites may have been conducted in other venues as well, ethnobotanical material stands a better chance of preservation within caves than in surface contexts.

In terms of frequency, if we assume that periodic rites remain constant, based on ethnographic models, increased cave use would be expected in times of drought or socio/political stress due to the increased performance of occasional rites. Long periods of duress would be expected to show up in the archaeological record as an increase in use-intensity.

To examine the relationship of climatic stress to cave use, ritual intensity of the cave will be compared to rainfall proxies derived from James Webster's (2001) detailed study of a speleothem from the Vaca Plateau. Increased use-intensity during dry periods suggests that caves were used in times of stress as a ritual technology to alleviate catastrophe. Other factors in the nature of the use, such as whether rituals were conducted in dark zones or restricted areas, would suggest that elites or leaders were conducting esoteric or private rituals during stressful periods. Increased use-intensity during wetter or normal episodes suggests that the cave had a special function during these times.

Changes in ritual practice are correlated with the development of social complexity and emergence of kingship in the region. Radiocarbon dating, use-intensity, modifications to the space, and the artifact assemblage are used to evaluate not only when and how the cave was used, but also to infer the function of cave ritual within the existing social structure. If caves were appropriated by elites as is suggested by their political nature, by the Late Preclassic period we would expect to find some combination of labor-intensive modifications, elite features, and elite-style artifacts. We would also expect intensive use associated with the rise of the local elite and consolidation of their power during the

Preclassic periods. Additionally, if Chechem Ha became a venue solely for elite usage, after the ninth century political collapse cave use should cease.

Finally, changes in ritual practice and fluctuations in use-intensity are correlated with local and regional history. Although there has been a wealth of Late Classic archaeological research conducted in the Belize Valley and recently a growing body of information regarding the Early to Middle Preclassic periods. Additionally, from the Classic to the Late Classic periods, epigraphic texts provide regional histories. These non-local data document wars and changes of rulership at large regional sites surrounding the cave. Although this study does not seek to determine exactly which surface site or sites used the cave, events that influence local surrounding sites would be expected to impact ritual practice at Chechem Ha as well.

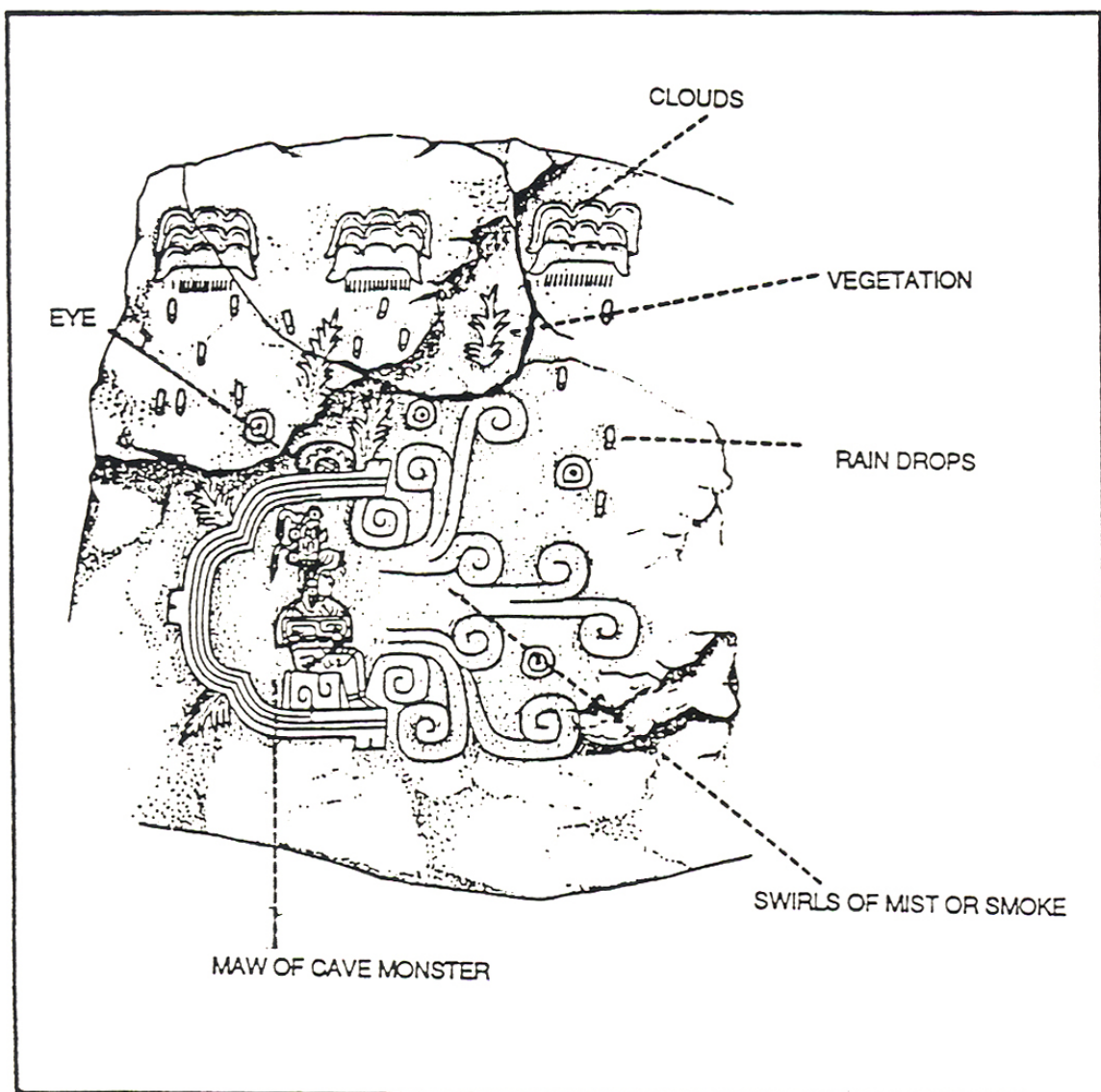


Figure 1.1. The El Rey bas-relief monument from Chalcatzingo depicts a man sitting on a cloud scroll in a cave. Rain falls on vegetation growing on top of the entrance (Reilly 1994, Figure 3.25).



Figure 1-2. Vase painting of Chac sitting in his stone cave house. Drawing by Andrea Stone (1995:35, Figure 3-31 adapted from Coe 1978:78 no.11).



Figure 1-3. Sixteenth century depiction of primordial humans emerging from an anthropomorphic cave mouth (Durán 1967; Cap III, p.32).

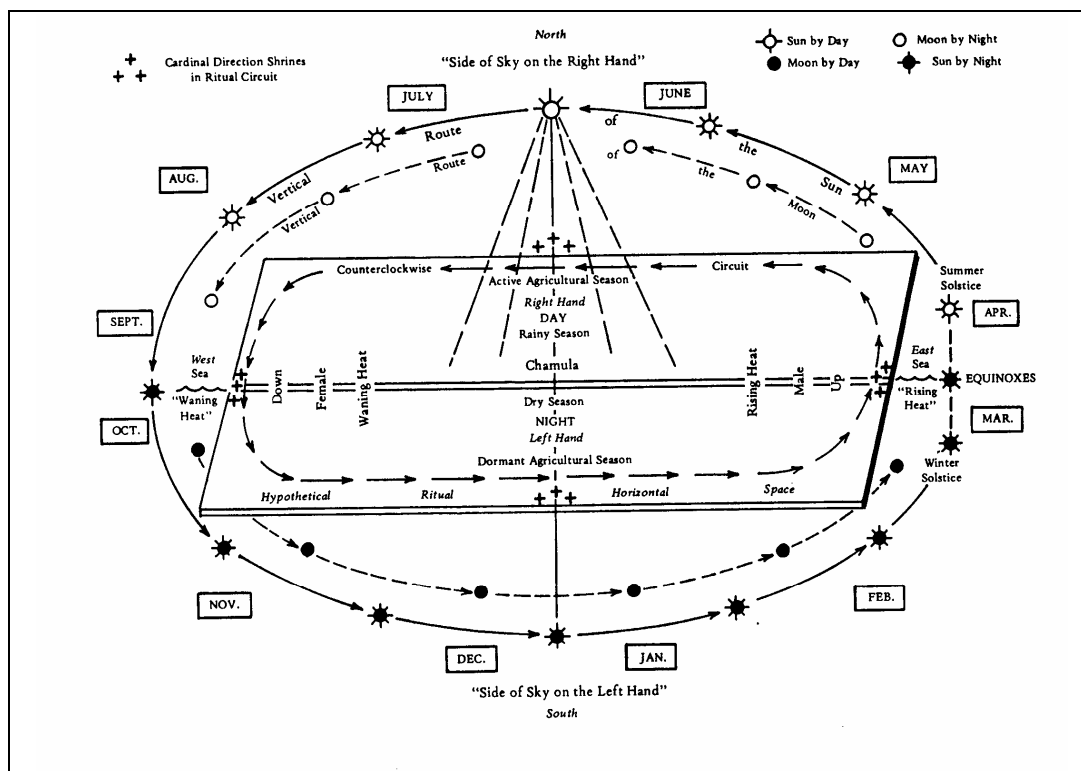


Figure 1-4. Gossen's time/space model of the cosmos (1974:34, Figure 2)

Caracol Stela 16, 6th Century A.D.

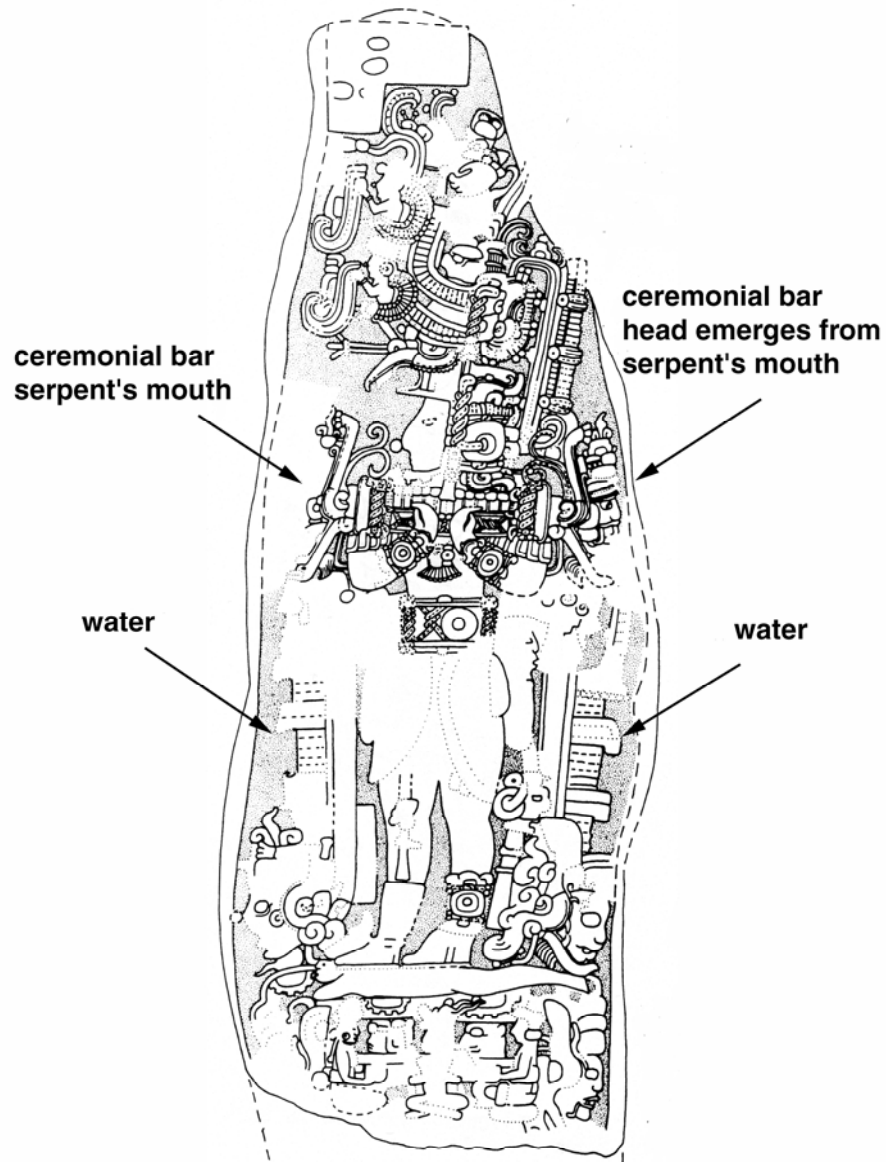
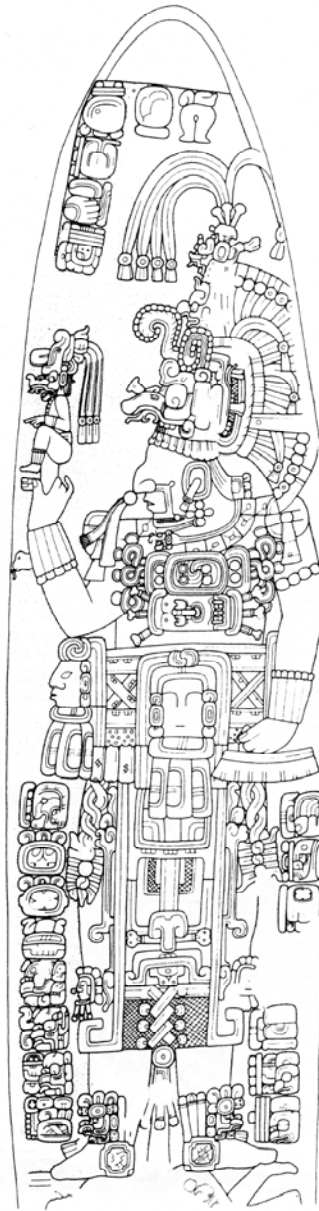


Figure 1-5. King K'an I of Caracol holds ceremonial bar in the traditional pose in the crook of his arms. A figure emerges from the serpent's mouth on the right but the left side is eroded. This image is unusual because water is shown flowing from the bar (Grube and Martin 2004:11-16, drawing by Beetz and Satherwaite 1981).

Manikin Scepter



Naranjo Stela 13, A.D. 771

Figure 1-6. Illustration of the Manikin Scepter held by kings as a staff of office. Shown as an example, on right is a drawing of Stela 13 from Naranjo dating to Jan. 20, 771 A.D. The portrait is of the ruler K'ak' Ukalaw Chan Chaak who is seen holding the staff in his right hand (Grube and Martin 2004:11-66). The image on the left is a close-up view of the Manikin Scepter identifying its features (Schele and Miller 1986:49, Figure 33).

Chapter 2

Setting

2.1 Location

Belize is a small Central American country about the size of Massachusetts. It is located between latitudes 15°53'N and 18°30'N and situated south of Mexico, east of Guatemala, north of Honduras and is bordered to the east by the Caribbean Sea (Figure 2-1). It is approximately 280km long on its north/south axis and at its widest point extends inland about 109km (Jenkins et al. 1976:17). The country encompasses a total land area of 22,966km² that includes 450 offshore cays (U. S. Dept. of State 1995). It is a former colony of the United Kingdom and was known as British Honduras prior to its independence in 1981.

Chechem Ha is located in western Belize (Figure 2-2) in the upper Belize Valley on the western side of the Macal River on the edge of the Vaca Plateau (Figure 2-3). The nearest town, Benque Viejo, is located 8 miles northwest of the site and is accessed via a road paralleling the Guatemalan border leading to the hydroelectric plant. A GPS reading collected at the cave entrance shows its position at 16Q 279082E, 1883815.6N and latitude 17°1'40" and longitude -89°4'31" at 370m above sea level. New global positioning data collected in the summer of 2006 indicates that the cave is 30km north and slightly east of Caracol and 22.5km southeast of Naranjo.

Chechem Ha is not directly associated with any ancient settlement centers. One of the closest known sites is the Postclassic/Colonial period site of Tipu located 5.8km north of the cave as the crow flies. Grant Jones, Robert Kautz, and Elizabeth Graham (1986) have investigated the Colonial period church and James Aimers (2004) researched the Postclassic ceramics. Of the local sites investigated, the two closest Classic period Maya sites to the cave are the middle-sized centers of Las Ruinas de Arenal and

Minanhá. Las Ruinas de Arenal was investigated by Joseph Ball and Jennifer Taschek in 1991-1992 and is located 5.8km to the northwest of the cave. Minanhá, located 5.8km to the southwest, is currently being investigated by the Social Archaeology Research Program directed by Gyles Iannone. The larger site of Xunantunich, located 9.7km northwest of the cave, was investigated by the Xunantunich Archaeological Project under the direction of Richard Leventhal and Wendy Ashmore from 1991-1997. The Chan site (Chan Nòohol), located between Las Ruinas de Arenal and Xunantunich 9km northwest of the cave, is a small agricultural community being investigated by Cynthia Robin. The large site of Buena Vista del Cayo is located northeast of Xunantunich and approximately 14km northwest of the cave. This site was also investigated by Ball and Taschek (2004:149-250) between 1981 and 1992.

2.2 Geology

The northern half of Belize consists primarily of coastal a plain that rises to a low plateau in the west. The Maya mountains form the core of the southern half of the country. These mountains range from 300m to over 900m in elevation. They are located at the juncture of the Yucatan Platform and the unstable mountain systems of the Guatemala Highland systems to the south. The bedrock of the Maya Mountains is comprised of younger Paleozoic meta-sediments designated the "Santa Rosa Group" by Bateson and Hall (1977:3). The Santa Rosa Group is a Paleozoic age sequence of sandstones and conglomerates grading upward into shale that make up 80% of the mountains (Donnelly et al. 1990). These include graywackes, quartzites, phyllites, slates, and shales with some gneisses and schists (Dixon 1956). The Maya mountains are

fringed by Cretaceous and Eocene limestone hills that are heavily dissected by cone tower and karst topography. In the upper Belize River area there are extensive deposits of limestone and marl of Miocene age that are referred to as Cayo Marls (Ower 1928).

Chechem Ha Cave is located at the northern edge of the Vaca Plateau, which flanks the Maya Mountains on the west. The plateau rises to an average elevation of about 460m (Webster 2000:76) and is the largest of the five major karstic areas of Belize identified by Thomas Miller (1996) (Figure 2-4). The geologic event that most influenced the karstic formation began with massive deposition of Cretaceous evaporate and marine carbonates throughout the Caribbean. At the close of the Cretaceous, the west end of the Maya mountains was submerged and covered by limestone and dolomite (Bateson 1972). O. Viniegra (1971) identified the formations as Campur Limestone and its development began an estimated 700,000 years BP (Miller 1990a). Campur Limestone is described by Vinson (1962) as a sequence of gray, gray-brown and tan limestone deposited in reef-associated environments that may contain beds of dolomite, siltstone and limestone breccia of conglomerate.

In their investigations of the Chiquibul cave system, Miller and his colleagues (1987) identified two common lithologic units. The first was a dense, micritic, often crystallized bedded, dark gray to white limestone, and the second a brecciated recrystallized rock composed of limestone clasts set in orange brown calcite. The tunnel walls at Chechem Ha Cave most closely resemble the first type.

Phillip Reeder and his colleagues (Reeder et al. 1996:129) note that on the Vaca Plateau, horizontal caves are most likely found on the sides of hills and contain phreatic tubes indicating that they were formed below the water table when the base level was

higher and contemporary valleys had not yet formed. Faulting and uplifting of the limestone bedrock increased permeability and water began to dissolve the limestone along the planes of structural weakness. At this time the water table remained fairly stable and dissolution tubes formed in the phreatic system. As the valleys deepened, the base level lowered, water level decreased and phreatic tubes were drained. Phreatic development continued deeper within the landscape and was modified by vadose flow which caused the horizontal caves to develop classic "keyhole" morphology. Caves higher in the landscape eventually switched from erosional to depositional processes and began to fill with sediment and dripstone formations. Chechem Ha morphologically fits this general pattern of horizontal cave formation in the area. Note the similarity in the morphology of Reeder's example of a keyhole shaped tunnel to a similar feature in Tunnel 2 at Chechem Ha (Figure 2-5).

2.3 Soils

The first major survey of soils in Belize was conducted by A. C. S. Wright and his colleagues in the 1950s (1959) and this classification is still in use today though it has undergone refinements by the British Government's Land Resources Development Center (LRDC). The 1959 report of the LRDC (Ballie et al.) describes the soils overlying the Cretaceous limestone of the foothills flanking the Maya mountains within the study area as shallow and stony, with black to very dark clays, as well as brown to reddish clays. They note that in some of the interkarstic basins hill wash clay accumulates causing deep soil with dark cracking tops and plastic yellowish clay sub-soils. They describe these

soils as slightly acidic and well supplied with calcium and magnesium. Soils will be discussed further in Chapter 6.

The Campur Limestone parent material consists of relatively pure calcium carbonate with minor amounts of magnesium, potassium, and sodium. James Webster (2000:104) tested 14 samples of bedrock and found that the limestone contained 35%-37.5% Ca (by weight). Thomas Miller's (1990b) bedrock sample from the area contained 68% CaO, 25.7% MgO, and 5.9% Na₂O, and the sample from Chechem Ha Cave contained 47.1% CaO, 5.89% SiO₂, 3.15% Al₂O₃, 1.08% MgO and small amounts of sodium and potassium (See Appendix V).

2.4 Modern Climate

The climate of Belize is characterized by southeast trade winds (Setzekorn 1985) and winter storms. Temperatures range from 10° to 35° C and average 26° C (Wright et al. 1959). Belize is classified as a tropical rainy climate of the tropical lowland climatic zone with the country being divided roughly north to south into two subtypes (Köppen 1936). The northern part of the country receives on average 1500mm (60in) per year and the southern half 4500mm (180in) per year. Average rainfall is variable from year to year. For instance, in 1861 Belize city received approximately 3900mm of rain but in 1867 only 660mm as estimated from a 1920 report by the British Foreign Office (Webster 2000:69). There is a distinct wet and dry season that becomes more pronounced as one moves south to the wettest areas such as Punta Gorda (Figure 2-6, Figure 2-7). Dry season is between January and May and a short dry season often occurs for three to four weeks in August. Mean daily relative humidity ranges from morning

highs of 80% to 90% during the rainy season, to morning lows of approximately 75% in the height of the dry season (Jenkin et al. 1976:19-22).

2.5 Paleoenvironmental Research

There has been a great deal of interest in paleoenvironmental conditions in Mesoamerica and particularly in the relationship between the environment to the onset of agriculture as well as its relationship to the ancient Maya 9th century collapse. Climatic reconstructions primarily employ pollen analyses, analyses of lakebed sediments, and speleothem data. Pollen is used as the primary line of evidence for models of paleoclimate conditions for the Late Pleistocene through Middle Holocene periods but is less useful for the Late Holocene when human disturbances begin to affect the pollen record (Leyden 2002).

Since the 1960s there have been many climatic reconstructions based on lake core sediments both in Yucatan and the Petén (Brenner et al. 2002; Cowgill et al 1966; Curtis et al. 1998; Dunning et al. 1997; Hodell et al 1991; Hodell et al. 1995; Rosenmeier et al. 2002; Rice 1996). Although regional patterns can be detected, there is often poor resolution in the data making it difficult to correlate with the archaeological record. Having said this, in more recent studies resolution is improving. Dating of lake sediments can be problematic particularly when comparing sequences from numerous lakes (Leyden 2002). Sedimentation can vary considerably and ages of adjacent samples in a core can differ from decades to centuries so that the interpolation of these dates can lead to poor resolution (Brenner et al. 2002). Radiocarbon ages can be affected by the incorporation of old or dead carbon leading to hard-water error so that dates are too old

(Deevey and Stuiver 1964), there are fluctuations in the atmospheric C14 that cause a late glacial to early Holocene C14 age plateau (Becker et al 1991), and shifts in ocean circulation can also affect the concentration of atmospheric C14 affecting dates (Hughen et al. 2000).

Because of problems in resolution, David Webster (2002) makes a case for a bottom-up approach. This approach evaluates local data rather than inferring local reconstructions from regional studies. Referring to the collapse, he pointed out that the effects of a long drought may have been more or less catastrophic in specific areas depending on geographic differences, microenvironments, and social circumstances such as population density and ambitions of Maya kings.

In the absence of large lakes, such as is the case in the Belize Valley, speleothem data are the best source of local paleoclimate data. The term speleothem is formally defined as “any secondary mineral deposit that is formed by water” (Gary et al. 1972:679) or more specifically as "a secondary mineral deposit formed by a physico-chemical reaction from a primary mineral within the cave environment" (Hill and Forti 1997:15). Among other types of formations, speleothems include both stalactites and stalagmites that are usually formed by calcite deposition that accumulated as bands (Ford and Williams 1989; Hill and Forti 1997). Aragonite is the second most common mineral found in speleothems followed by gypsum. In areas with annual wet and dry seasons the bands suggest yearly events much like tree rings (Baker et al. 1993; Broecker and Olson 1965; Genty and Quinif 1996; Holmgren et al. 1999; Railsbeck et al. 1994; Webster 2000:63-65). Because this is a yearly cycle, there is good potential for the recovery of fine-scaled temporal climatic data.

Bands can be dated using radiocarbon or Uranium-series (U-series) dating. Dates can be determined for specific bands by bracketing absolute dates (Schwarcz and Rink 2001). U-series dating is the most accurate form of dating rings, but is very expensive. Radiocarbon is not the most accurate dating method due to the incorporation of limestone (old carbon) into the speleothem. The old carbon comes from seepage water originating from limestone sediments above the cave. This results in dates that are too old. Accuracy can be improved when active speleothems are used for the analysis because the last depositional layer is the latest known hydrologically active year; therefore the old carbon variable is known and can be calibrated (Railsbeck et al. 1994).

Rainfall records are derived from speleothems by evaluating the thickness and frequency of bands, their color, luminescence, or by isotopic ratios ($\delta^{18}\text{O}$). Frequency is the most basic signal and is simply the presence or absence of speleothem deposition within a cave (Baker et al. 1993). Growth rate is determined primarily by the amount of water flow over the speleothem (Franke 1965; Genty and Quinif 1996); therefore, a change in water supply leads to an increase or decrease growth rates.

Changes in the color of the speleothem fabric (gray-level) can be due to variations in the crystalline fabric or from the accumulation of humic substances from overlying soils (Genty and Quinif 1996; Holmgren et al. 1999) both of which may be correlated with changes in water supply. Lighter colors represent greater porosity in the fabric, thus more impurities suggest a drier climate.

Luminescence in speleothems is also used as a proxy for paleoenvironmental signals (Baker et al. 1993; Ramseyer et al. 1997; Shopov et al. 1994). Luminescence is attributed to humic substances incorporated into the speleothem fabric due to the leaching

of overlying soils. The intensity is proportional to the concentration of these substances. While overlying soil and plant cover may affect this variable, luminescence has been shown to increase with greater hydrological activity (Baker et al. 1997; Baker et al. 1999).

Isotopic methods have been used in numerous studies (See Hellstrom et. al 1998 for discussion) and oxygen isotope ratios in carbonates are useful as geothermometers (Morse and Mackenzie 1990; Schwarcz et al. 1976). Carbonate precipitates from seepage water is incorporated into the speleothem mineral fabric. The oxygen isotopic composition ($\delta^{18}\text{O}$) of the carbonate depends upon $\delta^{18}\text{O}$ of the cave water and on the temperature of its formation, the cave temperature. Approximately every 5°C increase in temperature will bring about a 1 per mil decrease of $\delta^{18}\text{O}$. Rainfall may be inferred because in the tropics where temperature is not highly variable and the $\delta^{18}\text{O}$ of speleothem is controlled, the effect of the amount of rain is the main factor in fluctuations of the $\delta^{18}\text{O}$ value (Rozanski et al. 1992). The $\delta^{18}\text{O}$ value of rain decreases as rainfall increases and this is reflected in $\delta^{18}\text{O}$ of speleothem. Wet and dry periods can therefore be inferred from the stable isotope composition ($\delta^{18}\text{O}$) of individual speleothem layers. Therefore, at a given location speleothems formed during a wet season or wet year will have more negative $\delta^{18}\text{O}$ values. In data derived from speleothems in caves, there is virtually no significant relationship between temperature and $\delta^{18}\text{O}$ of rain.

The problem of the above method is that it assumes that carbonates were deposited in isotopic equilibrium with seepage waters, but equilibrium is affected by evaporation. In caves that are well ventilated or whose humidity is less than 100%, evaporation causes loss of $\delta^{16}\text{O}$ and therefore enrichment in the $\delta^{18}\text{O}$, which is passed on

to the precipitated calcium carbonate. This process is called kinetic fractionation and can skew isotopic analyses.

It is possible to evaluate whether fractionation occurred using the Hendy Test (Hendy 1971). Hendy discovered that there were three mechanisms responsible for speleothem deposition 1) slow degassing of CO₂ from solution, 2) rapid degassing of CO₂ from solution, and 3) evaporation of water. Only slow degassing of CO₂ from solution occurs under conditions of isotopic equilibrium. There are two ways to determine whether fractionation occurred 1) there must be constant $\delta^{18}\text{O}$ values along a single growth layer or 2) there must be no correlation between $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ along a single growth layer.

James Webster (2000:156) argued that when kinetic fractionation occurs it is influenced by warm/dry and cold/wet intervals that result in relative enrichment or depletion of spelean carbonate in ¹³C and ¹⁸O. If variations in $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ parallel each other closely they are responding similarly to changing kinetic effects. Therefore the carbon and oxygen isotope curves may be viewed as proxy curves of relative climate change.

Some additional paleoenvironmental information may also be provided by $\delta^{13}\text{C}$ values. Fractionation of carbon isotopes is associated with photosynthesis (Smith and Epstein 1971). In plant respiration, the CO₂ respired from C₃ and C₄ plants differ. These differences may be reflected in calcium carbonate precipitated from seepage waters. Calcium carbonate precipitated beneath landscapes vegetated by C₃ and C₄ plants have differing $\delta^{13}\text{C}$ values (Brook et. al 1990; Cerling 1984; Baker et al. 1997). One would

expect that during droughts there is a possibility of observing these differences under optimal conditions.

2.5.1 Paleoenvironmental Regional History

Discussion of Late Pleistocene to Holocene climate is based primarily on palynologist Barbara Leyden's synthetic 2002 article and on her work in the Petén (Leyden et al 1993; Leyden et al. 1994). Pollen records show that throughout Mesoamerica prior to 8000 B.C. the climate was cooler and drier supporting sparse temperate vegetation. Leyden states that based on Petén lake cores, during the last glacial maximum (24,000-14,000 B.P.) pollen concentrations were minimal although high pine percentages were present. She believes that the pine reflects long distance transport of pollen from outside the region and that savanna-like vegetation that included sparse thorn-scrub, grasses, and cacti occupied the Petén. Temperatures were probably colder than today, ranging between 6.5° to 8°C.

From 14,000 to 10,000 B. P. climate conditions permitted the expansion of oak and hardwood forests into the Petén though low pollen concentrations suggest that vegetation remained sparse. At this time temperatures were slightly higher, but with the onset of the Younger Dryas climatic reversal, forest expansion was curtailed and temperatures declined as much as 1.5°C.

It was not until after 10,000 B.P. that warm mesic forest taxa were present in the Maya Lowlands. Warm moist conditions prevailed from 8000 to 6000 B. C. This was the wettest period in 36,000 years. Semi-evergreen forest was established at Lake Petén-Itza by 8,000 B. C. (Islebe et al 1996). Lakes in the Petén begin to fill by approximately

6,000 B. C., on the Yucatan peninsula by approximately 6,400 B. C., and between 6,000-3,000 B. C. in northern Belize. Pollen data from the Petén lakes suggest that the climate remained moist until about 4500 B. C. when it became drier until 2000 B. C. Climatic patterns similar to those found throughout the region today were established by this time.

Data from Lake Quexil demonstrated that tropical forests dominated the Petén at least since the early Holocene (Deevey et al. 1979; Vaughan et al. 1985; Wiseman 1985) and were present for only 6,000 to 7,000 years before they were cleared for slash-and-burn agriculture (Brenner et al. 2002). Forest disturbance in Petén lake cores shows up at approximately 3,000 years B.P. when thick layers of clay overlay organic sediments (Brenner 1994; Rosenmeier et al. 2002). The clay is referred to as "Maya clay" and thought to be produced from erosion that resulted from widespread human-mediated deforestation (Binford 1983; Binford et al. 1987; Brenner 1994; Deevey and Rice 1980; Deevey et al 1979; Vaughan et al. 1985).

There is some controversy regarding this issue and some scholars argue that its presence may also be a consequence of regional drying (Brenner 2002; Covich and Stuiver 1974; Hodell et al. 1995; Curtis et al. 2001). In a well-dated core collected from Lake Chichanacanab in Yucatan that covered the last 2600-year period there was evidence of numerous dry periods that occurred over a 208-year drought cycle that correlated with solar activity (Hodell et al. 2001). This cycle is divided into smaller 50-year oscillations. The three major dry periods during this time are between 475 B.C. to 250 B.C., A.D. 125 to A.D. 210, and A.D. 750 to A.D. 1025. Reforestation occurs sometime after the classic 9th century Maya collapse but it may occur at different times from region to region so that dates have not been fixed (Brenner et al. 2002).

2.5.2 Paleoclimatic Reconstruction on the Vaca Plateau

Webster (2000) conducted a paleoclimate study using a speleothem from the Vaca Plateau in western Belize. The speleothem was collected while working with the Vaca Plateau Geoarchaeological Project under the direction of Philip Reeder, from a cave called the Macal Chasm, an ancient Maya ceremonial site. Little has been published about the archaeology of the site and its location is intentionally vague (probably to prevent looting). Webster states that it is 15km north of Caracol, which places the site very close to Chechem Ha, probably within 10km.

In his thorough study Webster applied all of the methods discussed above to a single speleothem to produce multiple lines of evidence for his paleoclimate reconstruction (Figure 2-8). He first determined that annual growth rings were present in the speleothem. He found that kinetic fractionation had occurred in his sample but that $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ values closely paralleled each other. Webster proceeded to develop a composite record based on four data sets (luminescence, gray-level, $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$) by summing the percent deviation of each data set from its respective mean. He created a time scale based on four radiocarbon dates and inferred other dates from counting growth rings. The index was then overlaid on the time scale to illustrate periods that were wetter or drier for the local area. Webster was heavily focused on evaluating the evidence for a Late Classic period drought leading to the Maya collapse, and in fact a dry phase was present from A. D. 700-1225.

A weakness in his study was that he dated the speleothem using radiocarbon rather than the more accurate U-series. In his final analysis Webster produced a chart that used a standard correction for hard water (old carbon) of -1306 years (15% carbon

derived from host rock) (Figure 2-9). He also presented an alternative solution using the known dates from the outer growth rings of the speleothem using a correction of -1205 (13.9% carbon derived from host rock) that produced slightly different dates. This correlation moved his Late Classic dry phase back 50 years to A. D. 650-1175 (Figure 2-10). Because Webster was concerned with general dates for the collapse he did not feel that this shift altered his research findings. It is curious that he emphasizes the standard correction rather than his own 13.9% derived dates since this is a more specific measure. Interestingly, dry periods from the later dates correlate almost perfectly with the dry periods derived from the well-dated Petén lake core collected at Lake Chichancanab (Hodell et al. 2001), published after Webster's work, which suggests that Webster's findings have regional correlates. Rather than relying on $\delta^{18}\text{O}$ values to infer dryness, Hodell and his colleagues used the presence of gypsum as a proxy for dry climatic periods because it was expected to precipitate as the lake evaporated. Webster evaluated other paleoclimate reconstructions for the Maya area prior to 2000 and concluded that there was general agreement on the Late Classic dry period but over some intervals, particularly in the Early Classic period, the records did not agree. This may be due to different resolutions of the data sets or possibly to local climatic fluctuations.

Despite any problems with Webster's study it is the only data available for the immediate local area and remains the most detailed climate study with the best resolution in close proximity to Chechem Ha Cave. Because of the possibility of variation in climatic effects due to microclimates (Gill 2001:380), a local record is preferred to reconstructions derived from data collected farther afield. Unfortunately Webster's

speleothem record does not commence prior to 700 B.C. In this dissertation I refer to Webster's reconstruction to discuss local climate fluctuations.

Local climate reconstruction for the Macal Valley is described thus (Webster 2000:194-198). Using Webster's -1306 hard water correction, beginning approximately 735-640 B.C. there were below average rainfall conditions. From 640-275 B.C. there were wetter than average conditions with brief dry intervals centered at 585, 439, and 435 B.C. The wettest period occurred approximately 612 B.C. There was a dry period between 275-125 B.C. that was followed by 300 years of above average precipitation. This was the wettest period of the Maya era. A slightly drier period occurred sometime between A.D. 200 and A.D. 350 but rainfall remained within the average ranges. This was followed by a lengthy wet period ending about A.D. 700 interrupted by a short dry interval about A.D. 611. Between A.D. 700 and A.D. 1225 there was a long dry period with spikes one standard deviation below the average at A. D. 809, 928, 1126, and 1206. Using the -1306 correlation Webster's data is in general agreement with the results from Lake Chichancanab (See above, Hodell et al. 2001) but using the -1205 correction with dry periods centered at 260 B.C., A.D. 150, 550, 750, 870, 1070, and 1150 they are in even closer agreement. Note that Webster's reconstruction shows at least two peaks during the Late Classic period (A.D. 700-900) suggesting that severe drought occurred in at least two episodes during this already dry period.

2.5.3. Climate and Collapse

In his exhaustive synthesis of the paleoclimate data Richardson Gill (2000) argues that the driving force behind the Late Classic Maya 9th century collapse was a prolonged

regional drought. The data for the Late Classic dry period are so robust that every paleoclimate study in the region and beyond agree on its occurrence though there is some variation on beginning and ending dates (Gill 2001:360; Webster 2000:200-204). Gill also identifies a series of droughts that he correlates with Maya social upheaval. He makes a case that these correlate with the Preclassic Abandonment (around A. D. 150-200), the Hiatus (A. D. 536-590), the Classic Collapse of the 8th and 9th centuries, and the Postclassic Abandonment (around A. D. 1450). The Preclassic Abandonment was originally identified by Richard Hansen (1990:218-220) to contextualize the fall of the site of El Mirador in Guatemala. He compiled data from 24 other sites throughout the Yucatán, Petén, highland Guatemala, Chiapas, and along the Pacific coast that showed evidence of population contraction, site abandonment, or hiatus.

The Hiatus was identified by Gordon Willey (1987:72-73) as a time of sharp reduction in stela erection and monument dedication in the Petén and served as the boundary dividing the Early and Late Classic periods. The Hiatus is highly visible at Tikal (Culbert 1991:316) but was also present at Río Azul (which was destroyed approximately A.D. 540) and throughout the Three Rivers region where populations dropped 73% (Adams et al. 1999:196). Richard Adams thought that the Hiatus was not due to a political perturbation among elites but was a more far reaching situation that affected all levels of Maya society. Gill (2000:318) relates this event to drought and notes that there is a dry period at Lake Punta Laguna in Yucatan as evidenced by lake sediments (Curtis et al. 1996). He also correlates the Hiatus with the A. D. 536 worldwide climatic aberration that brought cold and drought with it abroad.

The Classic Collapse occurred in the 8th and 9th centuries A.D. During the 8th century population densities were at their apogee in the Maya Lowlands. The Lowlands were scattered with a number of governing centers similar to city-states referred to as polities. The Classic Collapse is characterized by a decrease in population, cessation of stelae erection and monument dedication, decentralization, and site abandonment (Sharer 1994:338-341). Gill (2000:328) proposed that the Maya collapse occurred in three stages that could be divided into three geographic areas (Figure 2-11). Based on the last dated monuments at the sites, the first cities to collapse had monuments dating to between A.D. 760 and A.D. 810. These were grouped in the southwest area of the lowlands and included sites located along the Usumacinta River. The second group whose monuments dated between A.D. 811 and A.D. 860 was located in the southeast and included all of Belize and Honduras. The third group dates to between A. D. 861 to A.D. 910 and includes the Central Petén and northern Yucatán. One of the methods that he uses to achieve these results is that the two sites with the latest dated monuments are not included in the study Toniná (A.D. 906) and Uxmal (A.D. 909). He may be considering these sites to be outliers.

A recent study agrees well with Gill's staged collapse model. Geologists Larry Peterson and Gerald Haug (2005) produced data that closely echo Gill's results. They suggest that the reason that the northern Yucatan centers lasted longer was that there was easier access to groundwater. To the south, the elevation of the land increases therefore ground water was harder to reach. In their high-resolution study of sediments from the Cariaco Basin in Venezuela the authors demonstrated that there were at least four periods of drought between approximately A.D. 760 and A.D. 910. They argue that both the

Cariaco Basin and the Yucatan Peninsula experience the same general climate with distinct rainy and dry seasons because the equatorial band of high precipitation falls to the south of both areas.

The advantage to studying basin sediments is that they are undisturbed and produce annual laminated bands due to seasonal runoff and therefore high-resolution data could be obtained. Using x-ray fluorescence the authors examined titanium and iron deposits in clay bands as proxies for the amount of seasonal runoff coming into the basin and therefore as an indication of the seasonal rainfall. Four dry periods were found within the Late Classic period lasting from three to nine years and spaced 40-50 years apart. The authors caution that their radiocarbon dates are accurate only to within ± 30 years but based on these dates and counting laminated couplets they suggest that the first drought occurred approximately A.D. 760 and lasted only a few years, the second occurred approximately A.D. 810 and lasted eight years, the third about A.D. 860 lasting 3 years, and the fourth about A.D. 910 lasting six years. These dates are well in the ranges of both Chichancacab dates as well as Webster's Belize dates.

What is most interesting about these data are that when the resolution is fine-grained such as in the second Chichancacab lake core, the speleothem reconstructions, or the laminated strata of the Cariaco Basin, the cyclical nature of the Late Classic drought is evident. The drought does not appear to be one long mega-drought but rather several short episodes of intense drought in an already dry period.

Gill's study is critiqued by David Webster (2002:240-247) who, although intrigued with the argument, has some reservations about Gill's methods. Webster argues that it is difficult to infer local climate conditions from hemispheric patterns and trends

and that even a mega-drought might not uniformly affect a large region. His second point is that paleoclimatologists must reconstruct local climatic conditions using indirect lines of evidence. Finally, although Webster agrees that drought played a role in the collapse in some places, he is not willing to single it out as the driving force. He notes that it is unlikely that a megadrought would destroy the agrarian potential of the south and leave the northern Yucatan unscathed and argues that it is unlikely that major lakes and rivers would have completely dried up. Webster added from his personal experience that he was camped on the banks of the Usumacinta in 1998, one of the driest years on recent record, yet there was still plenty of water.

This final line of reasoning is questionable because even if lakes or rivers did not dry up completely, in the absence of irrigation it would not be feasible to transport water from these sources to agricultural fields. Where Webster camped the banks are high and irrigation, if present, would have necessarily needed some device to lift water as in the Near East (Barbara Voorhies, personal communication 2006). The Maya did not have such technology. Although large rivers and lakes may have retained water it is unlikely that smaller rivers and tributaries could have produced any flow during a severe drought that lasted over one year. I will counter Webster with my own anecdote. In 1997 I was working at Actun Tunichil Muknal, which is located on the Roaring Creek River that flows through agricultural lands. The rain came late that year, toward the end of July, and I witnessed the large flowing river dry up to a tiny trickle in a single season. Additionally, there is an interior spring that flows from deep within the cave whose water level also plummeted. The local crops dried up and no one attempted to water them.

Although this information is anecdotal it does suggest that the land can dry at a very rapid rate in the tropical heat.

I do agree with Webster (2002: 244) that Gill "labors mightily" to fit the archaeological record into his model. However, water, particularly rainfall, is such a fundamental requirement for tropical agriculture that drought may not be underestimated as a driving force for social change. It was not Gill's forte to explain socio/political reactions to these circumstances or the chain of socio/political events that lead to the collapse of kingship as his emphasis is on the environmental side of the argument.

It is interesting to note that Gill (2000:344) discusses his ideas of cave ritual. In a brief passage he suggests that during times of drought ancient Maya cave ritual increased and that the Maya retreated to their caves supposedly to live in them. His idea is predicated on the close relationship between caves and rain deities often stressed in the ethnographic and ethnohistoric literature, but Gill demonstrates little knowledge of the archaeology. While the archaeological record clearly attests that people did not live in caves even in the bleakest times, there is evidence to suggest that cave ritual increased but I present the first archaeological study focused directly on the issue.

2.6 Cultural History of Western Belize

Beginning with Gordon Willey's (1956) early settlement surveys, the Belize Valley has become a nexus of archaeological research over the past 50 years. It is one of the most intensively worked areas in the Maya Lowlands (Chase and Garber 2004). Studies in Belize have not focused primarily on elite life ways but, following Willey has focused on small housemounds, settlement, and minor or mid-level ceremonial centers.

The valley can be divided into two topographical sub-regions based on its waterways (Chase and Garber 2004:1-3). The first zone is located west of the convergence of the Macal and Mopan rivers and consists of upland areas of hills and steep slopes along the foothills of the Maya Mountains. This is the Upper Belize Valley and includes the Macal valley where Chechem Ha is located. The second area is the central Belize Valley located along the Belize River west of the confluence of the Macal and Mopan rivers and extends to the ruins of Coco Bank near the capital city of Belmopan. This zone referred to as the Central Belize Valley is characterized by alluvial flatlands with hills bordering the west of the river.

Using the classifications suggested by Gyles Iannone (2004), the Belize Valley is characterized by its numerous "low-level" settlements (house mounds, house mound clusters, plazuelas, patio groups), "mid-level" settlement groups (minor centers), and fewer "upper-level" sites (major centers). The differences distinguishing a mid-level as opposed to an upper level site is problematic. Iannone suggests that upper level sites are characterized by increased size, increased complexity, increased number of residential structures and vaulted buildings, and increased presence of ballcourts, stelae, altars, and causeways (*sacbeob*). The site of Xunantunich is an uncontested example of an upper-level settlement due to its large structures, architectural elaboration, and the presence of the only carved stelae with glyphic writing in the Belize Valley.

Human settlement of the Belize Valley is demonstrated at the site of Blackman Eddy as early as the Early Middle Preclassic period (1100-900 B.C.). Although almost every site in the valley was depopulated or abandoned between A.D. 800 and A.D. 950, Postclassic ceramic sherds are found throughout the region. The following is a short

review of the pre-history of the Belize Valley from the Paleoindian period to the 9th century Maya Collapse. Within this section I also discuss some of the field's current issues and place special emphasis on sites located in the vicinity of Chechem Ha that may have impacted its use.

2.6.1 Paleoindian Period

Little is known of the earliest inhabitants of Mesoamerica who were hunter-gatherers and left sparse remains. The Paleoindian period may have begun as early as 35,000 B. P. and lasted until 7,000 to 9,000 B. C. (Zeitlin and Zeitlin 2000:63-71) (Figure 2-12). Direct evidence for Paleoindian occupation in Mesoamerica can be demonstrated as early as the terminal Pleistocene, 11,000 to 13,000 years ago, based on the presence of Clovis or Clovis-like fluted points found not in excavations but in surface contexts.

Although there have been some claims for earlier occupations based on the co-occurrence of crude stone tools and Pleistocene fauna, dating of these finds has been controversial. One of the more well-accepted examples is the co-occurrence of stone and bone tools with Pleistocene animal bone found in Loltún Cave in northern Yucatan (Velázquez Valadéz 1980). Richard MacNeish has suggested that these levels date to somewhere between 40,000 and 15,000 years ago.

There may be a similar find at rockshelter in the Macal Valley near Chechem Ha. Pleistocene mammal bones have been found in Actun Halal, which may be associated with early lithics (Griffith et al. 2002; Lohse et al. in press; Lohse and Collins 2004) though this has not been authenticated. There are two possible crude tools in the deposit that are very similar to those described at other such sites.

Evidence for a Paleoindian presence has been found throughout Belize. A Clovis point was found in Ladyville, near the coast (Hester et al. 1980; Kelly 1993) and another probable fluted point in Chonona Cave in the Belize River Valley (Lohse 2005:443). Three fishtail points were found in surveys, one along the New River lagoon (Pearson and Bostrom 1998), one near Orange Walk (MacNeish and Nelken-Terner 1983), and one from site BAAR 35 at the Lowe Ranch (MacNeish et al. 1980). One was also found by a farmer in southern Belize near Big Falls along the Rio Grande and reported by Peter Dunham (Lohse 2005).

2.6.2 Archaic Period

Evidence for Archaic period occupations abound throughout Mesoamerica and several sites are found in Belize (Zeitlin and Zeitlin 2000:71-108). This period is characterized by increased exploitation of the natural environment by hunter-gatherers and the transition to agricultural subsistence. This period lasts approximately 5,000 to 7,000 years and traditionally begins at 7,000 b.c. (uncalibrated) based on the extinction of the horse in North America, but the Zeitlins argue, based on early radiocarbon dates from Oaxaca Valley sites, that the period begins as early as 8750 b.c. (uncalibrated).

Throughout Mesoamerica and American southwest much of the evidence for archaic occupations comes from "caves" and rockshelters. These deposits are always assumed to be the remains of early habitation (Flannery et al. 1981:52-63; Flannery 1986; MacNeish 1981; MacNeish and Peterson 1962; Nance 1992). Most of these sites are in fact rockshelters and do not have utilized dark zones. One exception is the previously

mentioned Loltún Cave in northern Yucatan, where lithic artifacts that attest to archaic usage (Velázquez Valadéz 1980).

In Belize early archaic or preceramic sites are characterized by Lowe or Sawmill points thought to date between 2500-1900 B.C. (Kelley 1993:215). Lowe points have been found near Ladyville, at Pulltrouser Swamp (Pohl et al. 1996), the base of the Sibun Gorge (McAnany et al. 2004:296), in subsurface contexts along the Rio Bravo escarpment in northwestern Belize (Beach and Luzzadder-Beach 2004), and recently in surface contexts in the upper Belize River Valley (Jaime Awe, personal communication 2004).

Early agriculture is found at Cob and Pulltrouser Swamps in northern Belize (Pohl et al. 1996). Pollen data from deep cores suggests that early forest disturbance occurred approximately 2500 B.C. Maize pollen is common at this early time and there is evidence of disturbance vegetation, decline of upland forest tree pollen (Moraceae), and an increase in charcoal fragments. The authors conclude that the evidence points to early agricultural practices and suggest that because they are reporting intercept radiocarbon dates that the earliest agriculture could be a few hundred years earlier or later.

Based on excavations at the site of Colha in northern Belize, Harry Iceland (1997) has defined the period from 1500 B.C. to 900 B.C. as the Late Preceramic. This is coeval with an intensification of agricultural activity at Pulltrouser Swamp from 1500-1300 B.C. as evidenced by increased burning and the presence of grinding implements (manos and metates) found in organic soils. In addition to maize, phytoliths of squash (*Curcubita* sp.), bottle gourd (*Lagenaria* sp.), and manioc were present at this time. Shortly after, there is evidence for crops of cotton and chili pepper (Jones 1994; Piperno and Pearsall

1998:300-303; Pohl et al. 1996:363). Lithic assemblages from archaic period sites in northern Belize further indicate forest clearing (Gibson 1991; Iceland 1997: 227-229; Rosenswig 2004:267-277). Constricted uniface tools constructed from macro-flakes show use-wear consistent with the cutting of wood and digging.

The lack of habitation sites in the archaic period suggests that the transition from hunting and gathering to sedentary village life was gradual with increasing modification to the environment occurring during a stable horticultural Late Archaic adaptation (Lohse 2005:449; Rosenswig 2004). In Belize, the end of this period is marked by the transition to full-time sedentism evidenced by settled villages and stone architecture, the adoption of ceramic technology, and participation in long distance trade networks (Lohse 2005:449).

One of the curious things about the archaic period in Belize is that so far there are no absolute dates for a human presence for a period of approximately 3,000 years from the end of the Paleoindian period to about 3400 B.C. when maize pollen is found at Cobweb and Pulltrouser swamps (Pohl et al. 1996). Archaic lithic artifacts are not expected to date prior to 2500 B.C. (Kelley 1993:215) and the earliest evidence for forest clearing to the same time period. While this may represent a hiatus in human occupation, Pohl and her colleagues suggest that a rising inland water table throughout the early and middle Holocene may have changed stream and river courses so that archaic deposits may be buried under deep sediments.

2.6.3 Middle Preclassic Period- Developing Complexity

The Middle Preclassic period begins at approximately 1000 B.C. and ends about 400 B.C. The Olmec civilization on the Mexican Gulf Coast, widely regarded as the "Mother Culture" of Maya society, reached its apogee during this time as did the Zapotec civilization of Oaxaca (Martin and Grube 2000:8). The first major Maya cities Nakbe and El Mirador appeared but fell by the first century B.C. Although there were no complex states such as these in the Maya lowlands, recent developments in archaeological research in the Belize Valley suggest that there is more social complexity in this early period than was once imagined.

There are few population estimates for this period, but in her survey of El Pilar, Anabel Ford (1990:171) noted substantial population growth in the valley during the Middle Preclassic. At the nearby site of Barton Ramie, 18 of the 65 housemounds investigated showed evidence of occupation during the Jenny Creek ceramic phase (Willey et al. 1965:279). Only three mounds were possibly set on low platforms and the rest were on the ground surface. There was no public architecture at the site at that time. Closer to Chechem Ha Cave, during the Middle Preclassic at the Chan site, 22 of 100 mounds surveyed were occupied (Robin et al. 2004:45) and at Xunantunich 40 of 242 were occupied (Ashmore et al. 1994:283, Table7). Figure 2-13 illustrates the results of these two surveys. The data represent the percentage of mounds containing a particular ceramic complex and therefore do not total 100%. Survey data suggests that the Belize Valley is an important location during these early periods and that the valley has much to offer in terms of Middle Preclassic research.

Ceramics became widespread in Belize about 1000 B.C. These are not the earliest examples. Mary Pohl and her colleagues (1996) report some very early and rare examples from Pulltrouser Swamp that date from 1500 B. C. to 1300 B. C. Early ceramic deposits have been found at the sites of Blackman Eddy (Kanocha phase) and Cahal Pech (Cunil phase) in the Belize Valley dating 1100-800 B. C. (Garber et al. 2004). Farther north at the sites of Colha and Cuello the respective Bolay and Swasey Bladen ceramics date a bit later from 900 B.C. to 600 B.C. (Kosakowski and Pring 1998).

At Blackman Eddy, the earliest occupations of the site, the Kanocha phase, has been radiocarbon dated to between 1100-900 B. C. but the same level also produced a single earlier date of 1395-1015 B.C. (Garber et al. 2004). The Kanocha phase ceramics are represented by two wares, a utilitarian quartzite tempered ware and a dull-slipped ash ware. The utilitarian ware shows strong parallels to unslipped Jocote type Jenny Creek complex sherds (See Gifford 1976:61-83) and appears to be a developmental precursor. The ash ware is stylistically similar to material from the Chotepe phase (1100-900 B.C.) from the site of Puerto Escondido, Honduras.

These types of ceramics come from sealed contexts and predate the Jenney Creek complex. They are also found at other Belize Valley sites: Cahal Pech (Cunil Complex) (Awe 1992; Healy et al. 2004a), Xunantunich (Strelow and LeCount 2001); Chan (Joseph Ball personal communication 2005), Pacbitun, and Floral Park (Garber et al. 2004). James Garber and his colleagues (2004:28) offer several possibilities in regards to their origins: they were developed in situ with little outside influence, were introduced by Maya or non-Maya people from neighboring groups, or ceramic technology was brought into the valley by non Maya groups. The authors argue that because the Kanocha phase

ceramics represent a well-developed technology and there is no evidence for ceramic experimentation, it is unlikely that the technology was developed in situ. Additionally, non-local exotics were encountered in Kanocha phase levels (as well as Cunil phase levels at Cahal Pech), which suggests interregional interactions.

Joseph Ball and Jennifer Taschek (2003) have challenged the notion that the early settlers of the valley were necessarily Maya. They argue that the early ceramic complex in the valley (Jenney Creek), dating 900-500 B.C., is composed of a multi-system composite that may include not only locally manufactured and used pottery but additions resulting from local exchange, long distance trade, gift giving, curation of antique vessels or heirlooms and possibly other processes (p.187). The authors identify at least two ceramic traditions within the assemblage: the Swasey-Bladen-Mamon Wares (SBM), a distinctly Maya tradition originating in northern Belize, and the earlier Kanluk-Xakal-Madgruda (KXM) tradition that may have originated with Maya groups to the south or with non-Maya, Mixe-Zoquean, groups from the Greater Isthmus region of Mexico. They suggest that the later group was replaced or incorporated into later Maya populations. The SBM tradition is characterized by slipped waxy wares and the KXM tradition includes the unslipped Jocote series, Mars Orange-Paste Ware (burnished/slipped paste wares, and slipped polished wares). The validity of their model has not been proven but further analyses are in progress.

Early Cunil ceramics excavated at Cahal Pech (Awe 1992) exhibit motifs consistent with pan-Mesoamerican motifs found during the Middle Preclassic period in Chiapas, the Pacific Coast, the Gulf Coast, El Salvador, Morelos, the Valley of Mexico, and Oaxaca (Cheetham 1998). Kanocha examples from Blackman Eddy share these

traits (Garber et al. 2004: 31). These symbols are not part of the Swasey complex in northern Belize (Kosakowski and Pring 1998), nor are they related to the Jenney Creek complex ceramics in the Belize Valley. While Cheetham believes that these motifs have been adopted and copied by local residents, he is not able to demonstrate that they were not introduced by early settlers from elsewhere in Mesoamerica, therefore the issue remains unresolved.

The best information regarding the architecture and artifacts associated with the earliest settlers comes from the sites of Cahal Pech (Awe 1992, Healy et al. 2004a) and Blackman Eddy (Garber et al. 2004; Brown 2003). Investigations of this early period were most extensive at Blackman Eddy. The site had been damaged by unauthorized bulldozing and was in danger of collapse. Permission by the Belize Department of Archaeology was granted to the San Marcos Belize Valley Archaeology Project directed by James Garber to conduct broad horizontal excavations to bedrock.

Excavations at Blackman Eddy demonstrated a growing level of complexity at early time periods that is often attributed to the Late Preclassic period. The project discovered that the earliest settlement was placed directly on top of bedrock (Kanocha phase 900-1100 B.C.). The bedrock was leveled and postholes were cut into it. The structures were round or apsidal pole and thatch domestic buildings. Two structures were built on low apsidal platforms measuring 6m-8m in diameter and .45m. in height. A piece of pole impressed daub plaster with traces of red hematite was recovered from excavations suggesting that at this early time, buildings were plastered and painted red. A contemporaneous building at Cahal Pech was similarly decorated (Awe 1992).

Midden materials from this earliest phase contained lithic debris, ceramics and freshwater shells (Garber et al. 2004; Brown 2003). There were also mano and metate fragments, bone implements, and ceramic spindle whorls, and exotic items such as obsidian, greenstone, and marine shell. Large quantities of *Strombus* shell were found in different stages of bead making along with chert drills. Chultuns were cut into four structures and contained bone needles, stone spheres, lithic debris, a stone tecomate, manos, marine shell beads, a colander vessel, and ceramic sherds.

At Cahal Pech, paleobotanical remains demonstrated an early reliance on corn, beans, and squash (Lentz 1991). Some of the earliest maize from the Maya lowlands was found Structure B-4/11-sub dating to the Cunil phase (Healy et al. 2004a:118; Lawlor et al. 1995:157,160). There was also evidence for the use of cotton, Coyol palm, pine, and wild fig (Wiesen and Lentz 1999). Later in the Late Middle Preclassic ramon may have also contributed to the diet.

At both Cahal Pech and Blackman Eddy the early ritual assemblage included numerous figurines (Garber et al. 2004; Healy et al. 2004a:114). The use of figurines appears to be a pan-Mesoamerican trait and Joyce Marcus (1998) argues that in Oaxaca they are used by women in household level rituals. At Pacbitun, a cache of marine shell disc beads were found at the base of a posthole (Healy et al. 2004b: 216), and freshwater shells were found in postholes at Blackman Eddy along with lithic debris and ceramics (Garber et al 2004:33). Also at Blackman Eddy, large number of quartz crystals and flakes were found in early deposits. Brown (2003:105,107) suggests that these may have been related to divinatory rites. Several obsidian blades were found in association with

red mineral pigment on the plastered floor on one building, which suggests a ritual function.

During the Early Jenny Creek phase at Blackman Eddy, low rectangular platforms were erected over the early domestic apsidal platforms and perishable structures (Garber et al. 2004). These structures were larger, trimmed with block masonry and covered in limestone plaster. Public architecture was constructed and there was increased evidence for feasting, as well as dedicatory and termination rites. A dense midden deposit cut into basin-shaped depressions in the bedrock associated with the initial construction of structure B1-7th, described by Garber and his colleagues (2004:37) was attributed to ritual feasting. It contained 10,000 freshwater shells including bivalves, jute, and *Pomacea*. Also in the deposit were animal bones and lithic material including a mano and metate, flakes, chips, four unusual elongated stones, and 15 smooth river cobbles. Basin-shaped depressions were also cut into bedrock. These were lined with thousands of riverine and marine shells, which Brown (2003:116) argues are ritual deposits reflecting water symbolism.

Structure B1-5th was a three-structure complex constructed during this time period consisting of a central platform flanked by two lower platforms. The central component was 1.48m in height and the building measured approximately 5.5m x 5.5m. A similar construction was excavated at Cahal Pech that Paul Healy and his colleagues suggest may have been an early E-group (2004a:109). At Blackman Eddy the platforms were covered by limestone plaster and the southern frontal wall of the central structure was constructed of small trimmed limestone blocks. Ritual debris associated with feasting as well as dedication (Garber et al 2004:38-39), were placed at the basal level of the platform.

Objects included sherds, lithics, marine shell fragments, obsidian blades, mano fragments, riverine shells, carbon, and animal bone. A later deposit containing a similar assemblage also attributed to feasting was located in the alley between the central and eastern components.

Garber et al. (2004:42) noted an increase in social complexity during the Early Jenny Creek facet evidenced by an increase in labor in use of coursed stone masonry and lime plaster. They argue that increased building size, associated plazas, artifacts, and ritual activity are indicative of public functions and the emergence of monumental public architecture implies social stratification. Brown (2003) suggests that deposits associated with public spaces are the remains of feasting and communal rituals.

In the late facet Jenny Creek phase (700-350 B.C.), the Late Middle Preclassic, there is further increase in architectural complexity and symbolic elaboration. At Cahal Pech there is evidence for increased social stratification. Here, at the Tolok and Zotz groups, round "stage-like" raised platforms contained sub-floor burials dating to this period (Aimers et al. 2000). Copal residues were found on the floor of the Zotz structure. James Aimers and his colleagues argue that these open-air platforms with no superstructures functioned as ritual spaces. This may point to one of the seminal acts of an ancestral cult and if so, is one of the first instances in the valley in which social stratification is manifest.

Isotopic data from skeletal remains from the Tokol group indicated that maize had become a staple crop by this time. However, the variable nature of the isotopic data suggested that distinct social classes had appeared and that the distribution of maize and

imported foods such as marine fish was limited (Healy et al. 2004a:119-120; Powis et al 1999; White 1999).

At Blackman Eddy the first evidence for warfare appears at this time. Structure B1-4th was a 9.74m x 16.4m, single-tiered, rectangular platform, 1.58m in height, oriented 8° west of true north with an inset stairway and basal platform. A fragmented mask armature flanked the staircase. The nose armature of the mask was still in place and rested on the basal platform. This is the earliest recorded sculptural façade mask found in the Maya lowlands to date (Brown and Garber 1998; Garber et al 2004). This is particularly intriguing as the masks are thought to accompany the development of Maya kingship (Freidel and Schele 1988; Hansen 1992).

One of the most compelling characteristics of this structure was that the summit surface was severely burned and the mask pulled from the front of the platform. The burning and desecration suggests probable warfare during this period and is the earliest indication of warfare in the valley (Brown and Garber 2003; Brown 2003). Garber and his colleagues (2004:42-43) suggest that this may be an ethnic conflict related to the "Mayanization" of a non-Maya settled population postulated by Ball and Taschek (2003). Shortly afterward Structure B1-3rd was placed on top of the burned Structure B1-4th. The later structure represented a change in architecture, which also tentatively suggests a change in the ethnicity of the group. The building was 1.74m in height, measured 11m x 20.8m, and was oriented 8° west of north. Flanking the stairway the structure had outset platforms constructed with tightly fitting large stone blocks. Additionally, Mamon style ceramics appear at this time.

2.6.4 Late Preclassic- The Rise of Elites

The Late Preclassic period (400 B.C.-A.D. 250) is the time during which elite rulership is thought to emerge. The overall picture of the Belize Valley is one of competitive chiefs overseeing small polities and there is no evidence to suggest that one exerted political hegemony over the others (Cheetham 2004:138). Though no palace structures or elite burials have been found in the Belize Valley, the presence of monumental architecture and an elite symbol system suggest that the institution of kingship was in place during this time. Large Late Preclassic temples are reported at the sites of Blackman Eddy (Brown 2003), El Pilar (Ford 2004), and Actuncan (see Cheetham 2004:138). One of the earliest ballcourts known from the Maya lowlands was erected at Pacbitun (Healy et al. 2004b:211)

Though inherited, political power was thought to be exercised and demonstrated by means of religious ritual (Freidel and Schele 1988). Leaders were beginning to combine personal and supernatural power as evidenced by an early stela excavated from Terminus Group Structure A1 at the terminus group of Zopilote at Cahal Pech (Awe and Grube 2001; Cheetham 2004:134-136). The stela depicts a zoomorphic being framing a human and was set in front of the largest temple at the site at that time.

By comparing deposits from progressive temporal phases at Blackman Eddy, one of the observations that can be made is that between Middle Preclassic and Late Preclassic times there is a change in ritual behavior from communal ritual deposits (feasting) located on top, between and in front of platforms to a more restricted form of ritual caching featuring ceramic vessels as the primary offerings (Brown 2003:141). This is found at other sites as well. For example at Las Ruinas de Arenal a plaza dedicatory

cache dating to this period found beneath the plaza floor in front of Structure 1-3rd contained 19 ceramic dishes (Taschek and Ball 1999).

Settlement surveys from both the Chan site (Robin et al. 2004:45) and Xunantunich (Ashmore et al. 1994:283, Table7) indicate population drops during this period. Only 10 of 100 of the mounds surveyed at Chan were occupied and at Xunantunich, only 7 of 242. . Although we know little about this time period in the Belize Valley, A.D. 150 to A.D. 200 marks the Preclassic Abandonment throughout the Maya Lowlands. This period of hiatus was recently discussed by Richardson Gill (2000: 314-318) but originally proposed by Richard Hansen to explain the collapse of El Mirador (1990). Hansen compiled a list of sites throughout the Maya area that showed abandonment, population decrease, or hiatus during this time.

One explanation for the phenomenon derives from paleoclimate information that suggests a period of drought (Dahlin 1983; Gill 2000:314-315; Hodell et al. 2001). In Webster's local speleothem data there are two dry peaks that correspond to the Late Preclassic and the first coincides with the Preclassic Abandonment. Using the standard -1306 correction it occurs at A.D 214 and using the more accurate -1205 correction, it dates to A.D.150. The second dry peak is a very severe dry period that occurred earlier in the period peaking at 260 B.C. or 182 B.C. respectively depending on the correction. This episode was drier than the later dry periods that correlate with collapse though not as prolonged.

Preclassic activities in the upper Belize Valley near Chechem Ha are documented at Las Ruinas de Arenal (Taschek and Ball 1999:218). An elaborate patio group or

plazuela was noted at this time. Public monumental construction at the site was underway by the terminal Late Preclassic at Structures 2-4th and 1-3rd.

2.6.5 Early Classic

The florescence of the ancient Maya civilization occurs during the Early Classic period (250 A.D. to 600 A.D.) By this time the Maya lowlands had become a landscape of city-state-like kingdoms or polities that were allied to and influenced by large and powerful sites (Martin and Grube 2000:20). Polities were theocracies ruled by divine kings. Elite histories were recorded on public monuments and portable objects using hieroglyphic writing. By A. D. 250 the Maya calendar had been developed and was in use.

Given that there is a written history for this period one would think that archaeologists would know a great deal but as Lisa LeCount (2004:27-28) has noted, "...the Early Classic is one of the least understood time periods in the Maya lowlands." The period is known primarily from tombs or other elite contexts at large sites such as Tikal, Copan, Holmul or Uaxactun, and in the Belize Valley Early Classic contexts are often identified and defined by diagnostic Petén-centric-style ceramic vessels (Audet and Awe 2000:52; Awe and Helmke 2005:39). There is currently a debate as to whether western Belize was depopulated at this time with people moving from the rural to the urban areas (Ford 1990:171; LeCount 2004:27) or whether it was "one of the most dynamic periods of western Belizean history" (Awe and Helmke 2005:30).

There may be two simultaneous phenomena creating these observations. First, surveys from the westernmost areas of Belize, such as El Pilar, Xunantunich, and Chan

may be illustrating a pattern common only to these areas, whereas in the central Belize Valley (Barton Ramie) the pattern may vary. The other problem lies with survey methodology because ceramic chronologies are almost always used to infer temporal periods during which mounds are occupied. While the chronology is generally accurate, there are problems with the Early Classic Hermitage complex in the type-variety system developed by James Gifford (1976). What many researchers have long suspected is that Late Preclassic assemblages, particularly unslipped wares, are still in use after the 3rd of 4th centuries A.D. (Awe 1992; Awe and Helmke 1995; Audet and Awe 1994; Brady et al. 1998; Demarest 1992; Ford 1990; Lincoln 1985; Joseph Ball personal communication 2005). The presence of these types causes chronology estimates to be weighted more heavily to the Preclassic period though the context may in fact date to the Early Classic. I discuss this issue further in Chapter 3.

In the central Belize Valley, at the site of Barton Ramie, there is considerable population growth. Willey et al. (1965:350-50) reported that 50 of the 60 mounds tested showed evidence of occupation and platform construction was noted. There is also construction activity at the sites of Pacbitun (Healy et al. 2004), Buenavista (Ball and Taschek 2004), Cahal Pech (Awe and Helmke 2005), and Baking Pot (Audet 2004; Audet and Awe 2004). A possible sweatbath was found within an Early Classic construction (B5-sub) at Cahal Pech (Awe and Helmke 2005:45, Table 1), which would be one of the earliest in the Belize Valley to date. At the site of Baking Pot, a small uncarved stela with a sub-stela cache that included modeled censur vessels was found in association with Str. 190/1st (Audet 2004; Awe and Audet 2004). The stela is thought to

be either Late Preclassic or Early Classic. Additionally, vessels making reference to royal patrons begin to show up in the valley at this time.

In the immediate vicinity of Chechem Ha cave, populations at both Xunantunich and Chan increased but did not surpass levels of the Middle Preclassic period (See Figure 2-13). A major building episode began at the site of Las Ruinas de Arenal, located approximately 6 km from Chechem Ha, at the end of the Early Classic period approximately A.D. 420-540. In Group A, Structure 30-4th was built as a burial place incorporating a slab-vaulted burial chamber. In Group B, a new plaza floor was laid down. Structures 1-2nd and 2-2nd were constructed, a ballcourt was added, and 2 uncarved stela were erected (Taschek and Ball 1999:28-29). An elite interment of an adult male in a slab-lined crypt was found in Structure 1-2nd. It contained numerous grave goods including obsidian blades, hematite mirrors, shell ear ornaments, and vessels. The vessels included four lip-to-lip caches containing exotic materials. In one, human figurines carved from red and yellow *Spondylus* shell, white shell, and obsidian were arranged in the four cardinal directions surrounding a central greenstone image. These rested on a bed of beach sand containing shell, coral, polished jadeite pebbles, and a disintegrated mosaic Tlaloc war emblem (Ibid.: 21). The caches clearly represented cosmograms, which Taschek and Ball compare to the Río Azul Tomb 12.

On a regional scale there is a phenomenon that occurs in the southern lowlands described by Gordon Willey (1987:72-73) as lasting approximately 60 years from A.D. 534 to A.D. 593, dividing the Early and Late Classic periods. Termed the "Classic Hiatus Phenomenon," it is characterized by a marked drop-off in stela carving and dedication. Curiously, it is not found in the northern Maya areas or at Palenque. In fact, some

northern Maya sites flourished at this time. Although Willey offers no explanation for the occurrence, Richardson Gill (2000:318) struggles to argue that the hiatus is caused by aberrations in the world climate around A.D. 536. Gill mentions that Curtis et al. (1996) record a drought at Punta Laguna in Quintana Roo. The problem is that the northern areas were not the ones affected by the phenomenon, which weakens Gill's argument.

Although the Belize Valley is not noted for its epigraphic texts, there are written histories that begin in the Early Classic period from or involving the site of Caracol located in the Mountain Pine Ridge. Caracol was a very large site that may have influenced the smaller polities in the valley although few sites show clear evidence of Caracol-style influence such as similar burial patterns, ceramics, or architectural layouts. The one exception is found at the site of Minanhá where site layout and mortuary patterns show parallels with the larger site (Iannone 1999). The discovery of numerous Pedregal Modeled incensario fragments during in Late Classic contexts is used to bolster the argument (Kersey and Gray 2001). It is highly likely that, due to their spatial location, sites in the upper Belize Valley were significantly affected by the Early to Late Classic wars between Caracol and Naranjo (discussed below).

Table 12.1 is a brief outline of epigraphic texts from the eastern Maya lowlands dating from A.D. 459 to A.D. 859. There data were compiled from the Notebook for the 28th Hieroglyphic Forum at the University of Texas at Austin (Grube and Martin 2004) and from Martin and Grube 2000. War events, skirmishes, births, and kingly accessions are included in the table. Note that early stela erection, the hallmark of kingship, occurred at the site of Pacbitun in A.D. 485. The stela depicts a ruler on a throne.

At Caracol there are some of the earliest examples of rulership. The progenitor of the site Te' K'ab' Chaak is named in later texts and associated with a date of either A.D. 331 or 349. Caracol's first named ruler, K'ak' Ujol K'inich probably ruled about A.D. 479. Yajaw Te' K'inich I acceded the throne in A.D. 484. Stela 20 illustrates the ruler possibly sitting in a cave, which provides evidence that local rulers associated themselves with caves as places of political power.

Wars between Tikal, Caracol, Calakmul, and Naranjo began at the end of the Early Classic period and continued from A.D. 556 to A.D. 680 and these events are well-recorded in epigraphic texts. This period is highlighted in gray in Table 12.1. Ruler III at Caracol, Yajaw Te' K'inich II acceded the throne in A.D. 553 under the supervision and sponsorship of Tikal's king Wak Chan K'awiil. The relationship between the two sites deteriorated when Tikal inflicted an "axe" event, possibly involving a lordly execution, on Caracol in A.D. 562. Tikal's king was later defeated in A.D. 562 by an unknown site, possibly Calakmul. This event began the 130 year Tikal hiatus. Clearly Caracol was allied with Calakmul as evidenced in Stela 4, probably dating to A.D. 583, depicting the Calakmul king supervising some unknown event at Caracol. The history continues into the Late Classic period.

2.6.6 Late Classic- Apogee and Abandonment

The Late Classic period begins at A.D. 600 and ends approximately A.D. 900-950. The Terminal Classic period is the end of the Late Classic from approximately A.D. 800-950 immediately prior to the Classic Maya Collapse discussed above. The year A.D. 600 roughly coincides with the collapse of Teotihuacan the influential city located in the

Basin of Mexico. The Late Classic Maya civilization is characterized by the largest populations, greatest social complexity, and its intellectual highpoint (Martin and Grube 2000:9).

In the central Belize Valley at the site of Barton Ramie, populations are at their highest. During the early part of the Late Classic (A.D. 600-700), 55 of 65 mounds were occupied and by the later part (A.D. 700-900), all 65 were occupied. At nearby Baking Pot, the Late Classic represented the period of greatest architectural activity much of which dates to the early part of the period or Tiger Run phase lasting from A.D. 580 - A.D. 680. Elite burials and uncarved stelae were also noted at the site (Audet and Awe 2004).

In the upper Belize Valley population estimates are also high. At Xunantunich (Ashmore et al. 2004:267), 87% of the surveyed mounds showed evidence of Late Classic occupation and similarly, at the Chan site (Robin et al 2004::45), 89% were occupied. Oddly, an uncarved 2-m-high stela was found at the Chan site near the end of the period. Cynthia Robin and her colleagues (2005:344) suggest that this late stela at such a small community shrine indicates that by the end of the Classic period as the power of the Maya elites was waning, the trappings of power--such as stela erection--were being co-opted by leaders of smaller communities.

Near Chechem Ha, at the site of Las Ruinas de Arenal, the last of the major building episodes occurred approximately from A.D. 730 to A.D. 900 (Taschek and Ball 1999). In Group A, Structures 1, 2, 9, and 10 were enlarged; Structures 3, 4, 5, and 6 were added; and a new stucco plaza floor was completed. In Structure 30, one of the sites largest pyramids, a termination deposit was located in the rear room of the summit

building (Str. 30-1st). The termination contained eight vessels grouped in four pairs oriented to the cardinal directions. In the east pair was a Pedregal Modeled cylindrical censer stand. The deposit, dated from carbonized resin incense, produced a calibrated 2-sigma date of A.D. 780-1030 (OxCal 3.9).

According to GPS readings taken in 2006, the nearby site of Minanhá is located approximately 5.8 km southwest of Chechem Ha. This site fluoresced during the Late Classic period between A.D. 675 and A.D. 810 in a period of rapid growth and swift demise (Iannone et al. 2004a). Little is known about earlier periods at the site, but both Middle and Terminal Preclassic sherds have been found in the fill of later structures. The site is comparable in size and complexity to Xunantunich and El Pilar and its medial position between warring Caracol and Naranjo suggests that it was a strategic borderland community. Iannone and his colleagues argue that during the Late Classic a full-fledged royal court was established at the site at a time that correlates with a hiatus at Caracol (discussed below). The royal court was exemplified by an elevated, restricted-access, royal residential courtyard. The court flourished for approximately a century and the buildings were then buried sometime between A.D. 810 and A.D. 900. The manner of infilling was peculiar because it appeared to be hurried using boulder-sized materials, but carefully executed (Iannone et al. 2004b). Later in the Terminal Classic, an impoverished group of low-lying platforms with perishable structures was erected in their place.

Three monuments associated with the eastern shrine complex were destroyed at what appears to be the same time as the palace structure was covered. Iannone (2001:131) suspects that Minanhá may in fact be the site of B'ital mentioned in epigraphic texts but this has yet to be borne out (See Table 12-1). B'ital was attacked by

Naranjo in A.D. 693 and again in A.D. 775, and is purported to lie somewhere between Caracol and Naranjo (Grube 1994: 86). The later date roughly coincides with the destruction of the Minanhá monuments and burial of the royal palace structures.

The epigraphic record indicates that there was a war between Caracol and Naranjo during this period. Following Tikal's defeat in A.D. 562, Caracol and Calakmul went to war with Naranjo. Naranjo suffered a number of defeats until eventually it defeated Caracol in a "star war" event in A.D. 680. Soon after, Caracol began a hiatus that lasted until almost A.D. 800. At Naranjo the royal lineage was invigorated by the arrival of a princess of Dos Pilas, Lady Six Sky. She was the daughter of Dos Pilas king B'laj Chan K'awiil who was a vassal of Calakmul. Lady Six Sky was a warrior queen who was depicted on stelae administering kingly duties such as performing calendrical rituals and standing atop captives (Martin and Grube 2000:74-6). Her son, K'ak Tiliw Chan Chaak acceded the throne in A.D. 693 and, like his grandfather, was a declared vassal of Calakmul.

Naranjo continued its campaigns through the early part of the 8th century but there did not appear to be any more attacks on Caracol. It enters a short hiatus after being attacked by Tikal in a "star war" in A.D. 744, which lasts until A.D. 780. Naranjo's last ruler Waxaklajuun Ub'aah K'awiil acceded the throne in A.D. 820. The event occurred not at Naranjo but at Ucanal (Martin and Grube 2000:83). By approximately A.D. 815, texts at the site of Xunantunich near Chechem Ha Cave suggest alliance building with Naranjo. Xunantunich is one of the only sites in the Belize Valley with hieroglyphic writing on its carved stelae. Stela 8, as interpreted by Christophe Helmke, carries a depiction of the last Naranjo king and exhibits a Naranjo emblem glyph (Grube and

Martin 2004; Houston et al. 1992:507; Martin and Grube 2000:83). Evidence based primarily on ceramic assemblages suggests that Naranjo extended its political power to other sites in the Belize Valley as well (Ball 1993, Reents-Budet 1994). At the site of Baking Pot, evidence of a Late Classic relationship with the larger site is suggested by Naranjo-style vessels found in burials (Audet and Awe 2004:57-58).

Although the site of Xunantunich was probably founded in the Middle Preclassic period no monumental architecture was present prior to the early part of the Late Classic (LeCount et al. 2002). Investigations determined that its growth was rapid and was likely to have been the result of an alliance with Naranjo since Xunantunich's architectural layout mirrored that of Group B at larger site (Ashmore 1999). The royal palace structure was abandoned in what appeared to be an orderly fashion or possible termination event (Yaeger 1997:36) by the end of the 9th century. Floors were swept clean and some areas were carefully filled in. The method of abandonment appears to be very similar to that discovered in the royal palace at nearby Minanhá. LeCount and her colleagues (2002:45) point out that there was no evidence for warfare or violence at the site. The last text found in Belize is from Caracol. It celebrates a half-k'atun ending occurring in A.D. 859.

In the 9th century, while the civilization did not collapse per se, what did come to a close was the state-level political organization that included Maya kingship along with its elite-run social, political, and administrative hierarchies (Demarest et al. 2004:569). In Belize, the political structure limped on post-collapse in northeastern part where settlement was characterized as dispersed and decentralized hamlets, villages, and small-scale political centers (Masson and Mock 2004:400-401).

In his study of the Postclassic occupations of the Belize Valley, Aimers (2004:67) compiled ceramic data from the major sites. He noted ample evidence for Postclassic occupations but that populations reduced and settlement was much less concentrated. The only two known nucleated village settlements in the area were at Barton Ramie and Tipu. According to Aimers, Tipu produced evidence of Late Classic and Postclassic occupation suggesting that occupation continued through the Terminal Classic-Early Postclassic transition.

Table 2.1 Compilation of events recorded in epigraphic texts. Gray area highlights Caracol's military campaigns (Grube and Martin 2004; Martin and Grube 2000).

Date	Place	Monument	Event				
AD 485	Pacbitun	Stela 6	only date is legible but depicts person on throne				
AD 514	Caracol	Stela 13	accession of king Yajaw Te K'inich I				
AD 531	Caracol	Stela 15	accession of king K'an I				
AD 546	Naranjo	Stela 25	accession of Aj Wosal-supervised by ruler of "snake"				
AD 556	Caracol	Altar 21	Tikal inflicts axe event on Caracol				
AD 562	Caracol	Altar 21	Starwar defeat of Tikal by Caracol?probably Calakmul?				
AD 562-692	Tikal		Tikal Hiatus				
AD 596	Naranjo	Altar 1	War event with Caracol				
AD 599	Caracol	Stelae 5,6	New boy king				
AD 619	Caracol	Stela 3	Calakmul mentioned				
AD 621	Caracol	Stela 22	Calakmul mentioned				
AD 622	Caracol	Stela 3	Present of deity figure? From Calakmul King				
AD 626-680	Naranjo		Naranjo Hiatus				
AD 627	Caracol	Stela 3	Calakmul attacks Naranjo				
AD 631	Naranjo	HS1, StepVI	Calakmul conquers Naranjo in star war				
AD ?	Caracol	Stela 3	Calakmul conquers Naranjo in star war				
AD 680	Caracol	B16 Stucco	Starwar defeat Caracol by Naranjo				
AD 680-798	Caracol		Caracol Hiatus-only Stela 21 erected around 700				
AD 682	Naranjo	Stelae3,18,24,29	Arrival Lady Six Sky of Dos Pilas-links to				
			Calakmul-daughter of warrior king				
AD 692	Naj Tunich		mention of Caracol king				
AD 693	Naranjo	Stela 22	Burning of B'ital-unknown site between				
			Naranjo and Caracol				
AD693-698	Naranjo	Stela 22, 29	Skirmishes				
AD 700@	Caracol	Stela 21	Captive taken				
AD 710	Naranjo	Stela 23	Naranjo attacks Yaxha				
AD 713	Naranjo	Stela 30	Naranjo burns Sakha				
AD 716	Naranjo	Stela 28	Naranjo attacks unknow ch' een (cave?)				
AD 741	Dos Pilas	Throne 1	Death of Lady Six Sky				
AD 744	Tikal	Temple IV Lintel 2	Tikal defeats Naranjo in star war-				
			captures Naranjo's patron god effigy-JGUW				
AD 775	Naranjo	Stela 13	Naranjo attacks B'ital				
AD 799	Naranjo	Stela 12	Naranjo involved in series of skirmishes				
AD 800	Caracol	Stela 11	Stela erected - period ending				
?	Caracol	Altar 23	Caracol takes captives- King of Ucanal, person of B'ital				
AD 815@	Xunantunich	Panel 2	"Ka-ta-wi-tzi" (Maya toponym of Xunan)				
			in Naranjo political sphere				
AD 820	Caracol	Stela 19, Altar 12	Possible alliance of Caracol with Ucanal,				
			Naranjo with Ucanal-Alliance building?				
AD 830@	Xunantunich	Stela 8	Alliance building with Naranjo				
?	Ucanal	Stela 4	Ucanal leading power in eastern Peten				
AD 859	Caracol	Stela 10	Period ending-last monument				
			(10.1.10.0.0 4Ajaw 13K'ank'in)				

Location of Belize



Figure 2-1. Location of Belize is southeast of Mexico and east of Guatemala bordered by the Caribbean Sea.

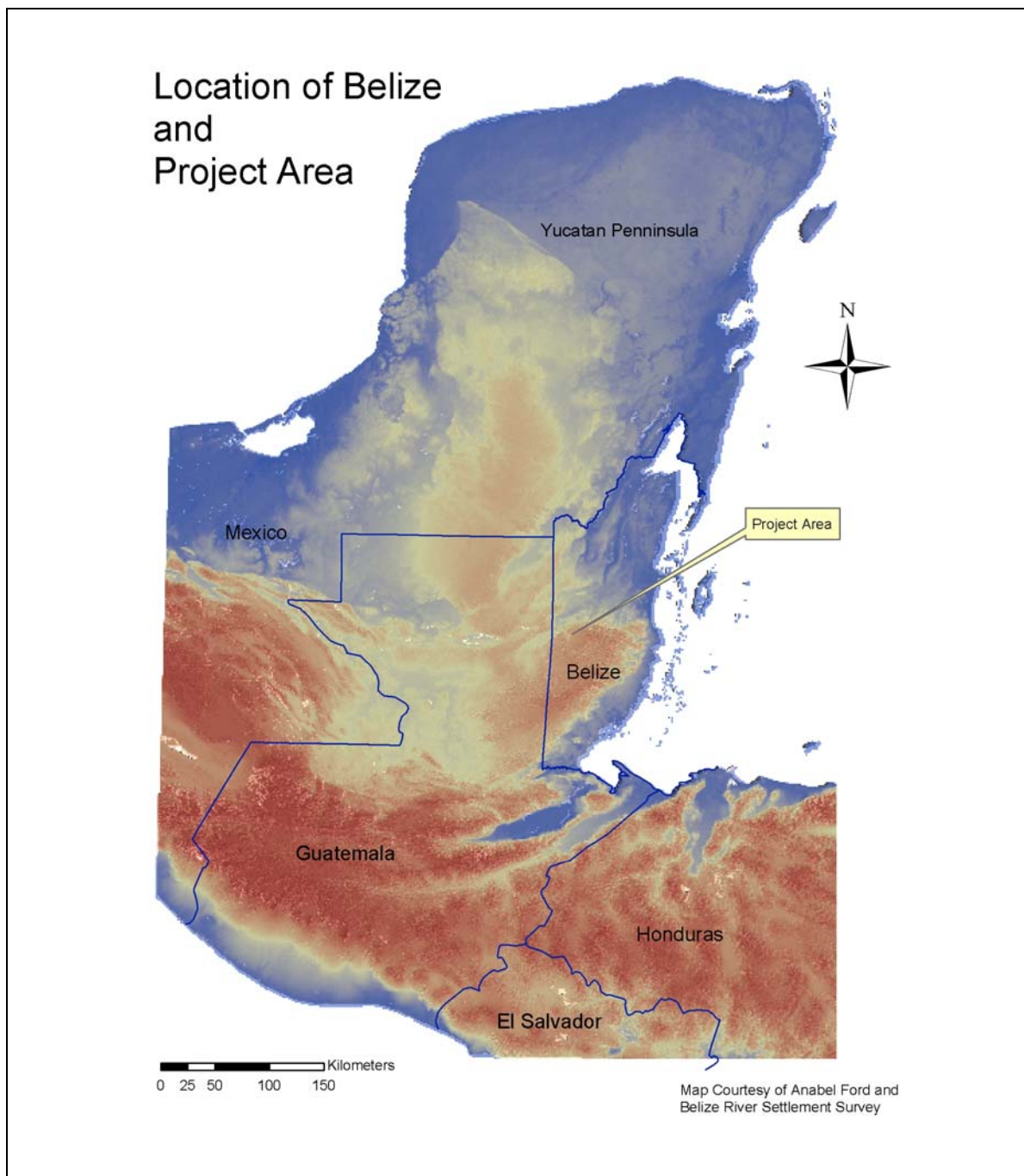


Figure 2-2. Digital Elevation Map showing project area is in western Belize near the Guatemalan border.

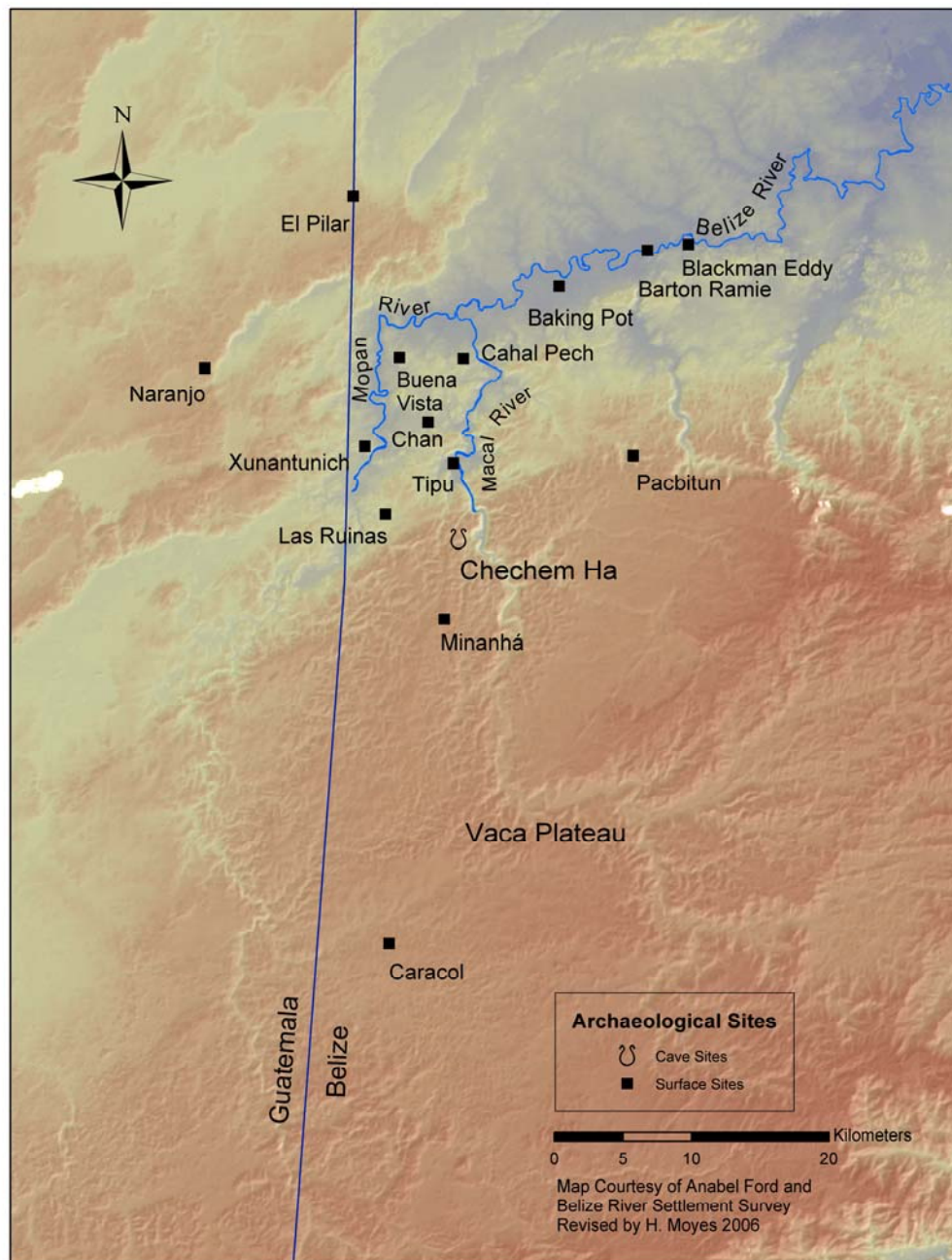


Figure 2-3. Digital Elevation Map of Belize showing location of sites discussed in text. Chechem Ha Cave is located on the edge of the Vaca Plateau.

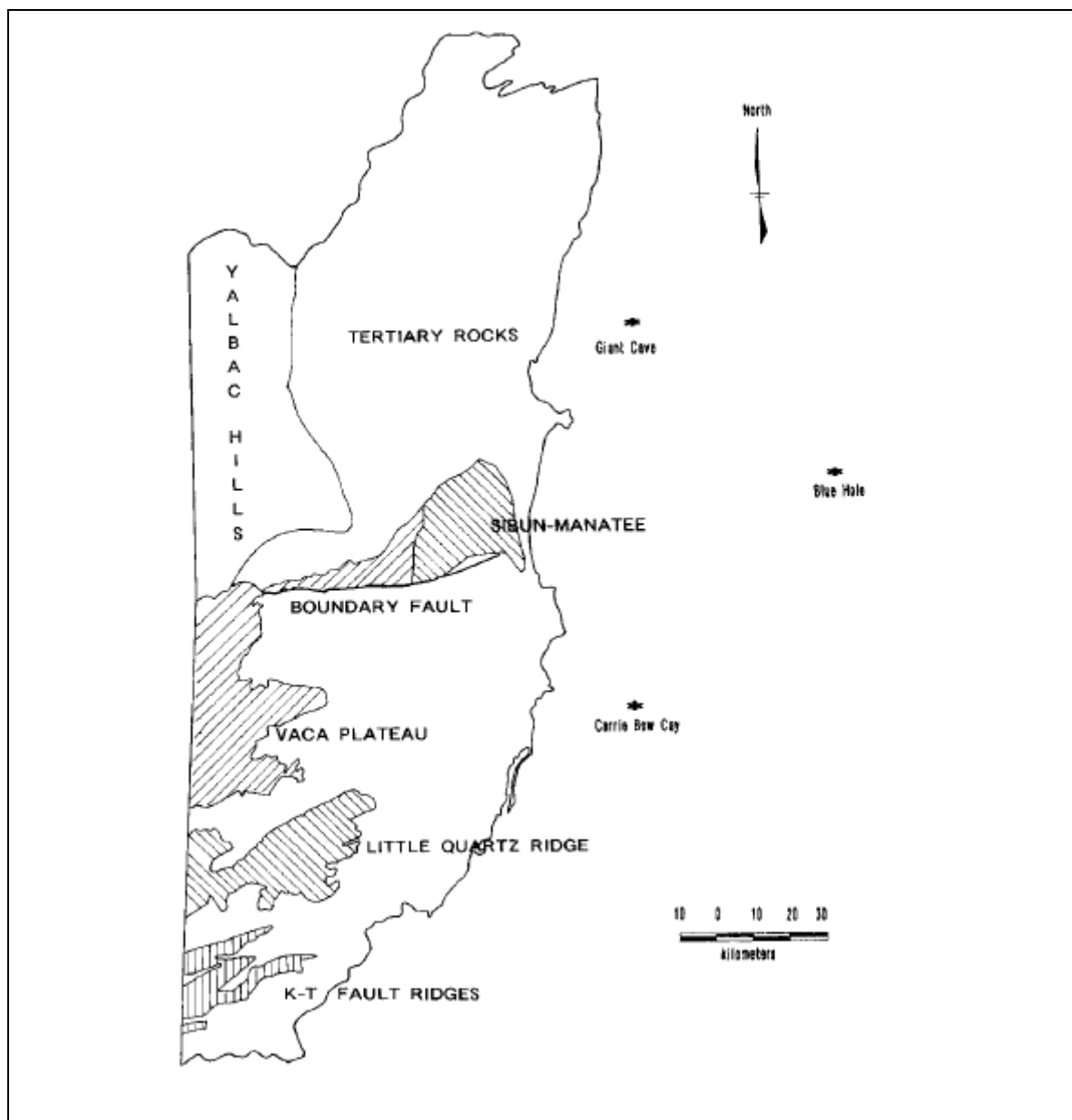


Figure 2-4. Major karstic areas of Belize (Miller 1996:103).



Figure 2-5. Top- Keyhole passage in Bushman Cave on the Vaca Plateau formed under phreatic conditions (Reeder et al. 1996:129, Figure 8). Bottom- Keyhole formation in Tunnel 2 in Chechem Ha cave was likely to have formed under similar conditions.

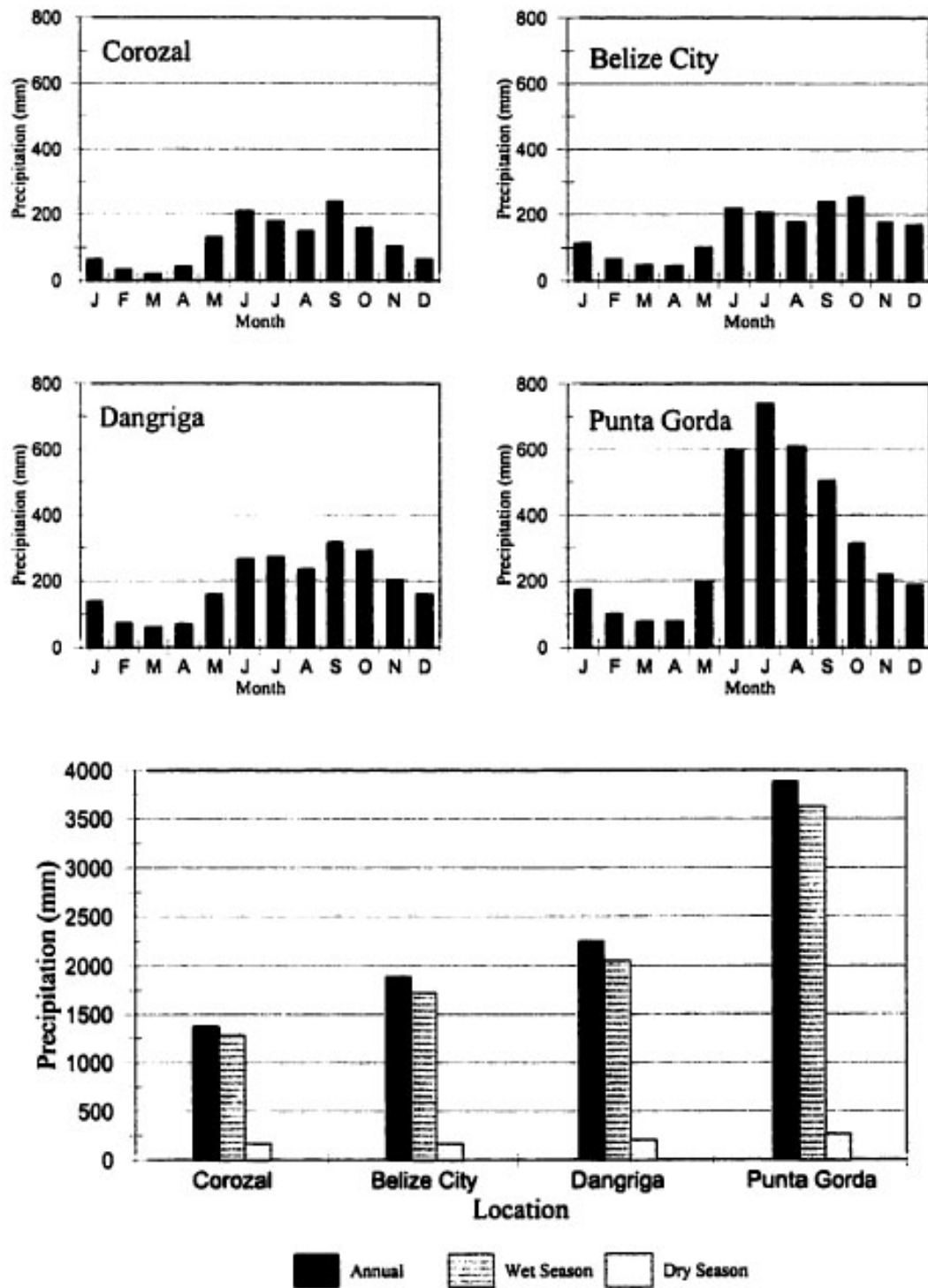


Figure 2-6. Average monthly annual and seasonal rainfall for Corozal, Belize City, Dangriga, and Punta Gorda, Belize (Belize National Meteorological Service 1999, compiled by Webster 2000:70, Figure 4.3).

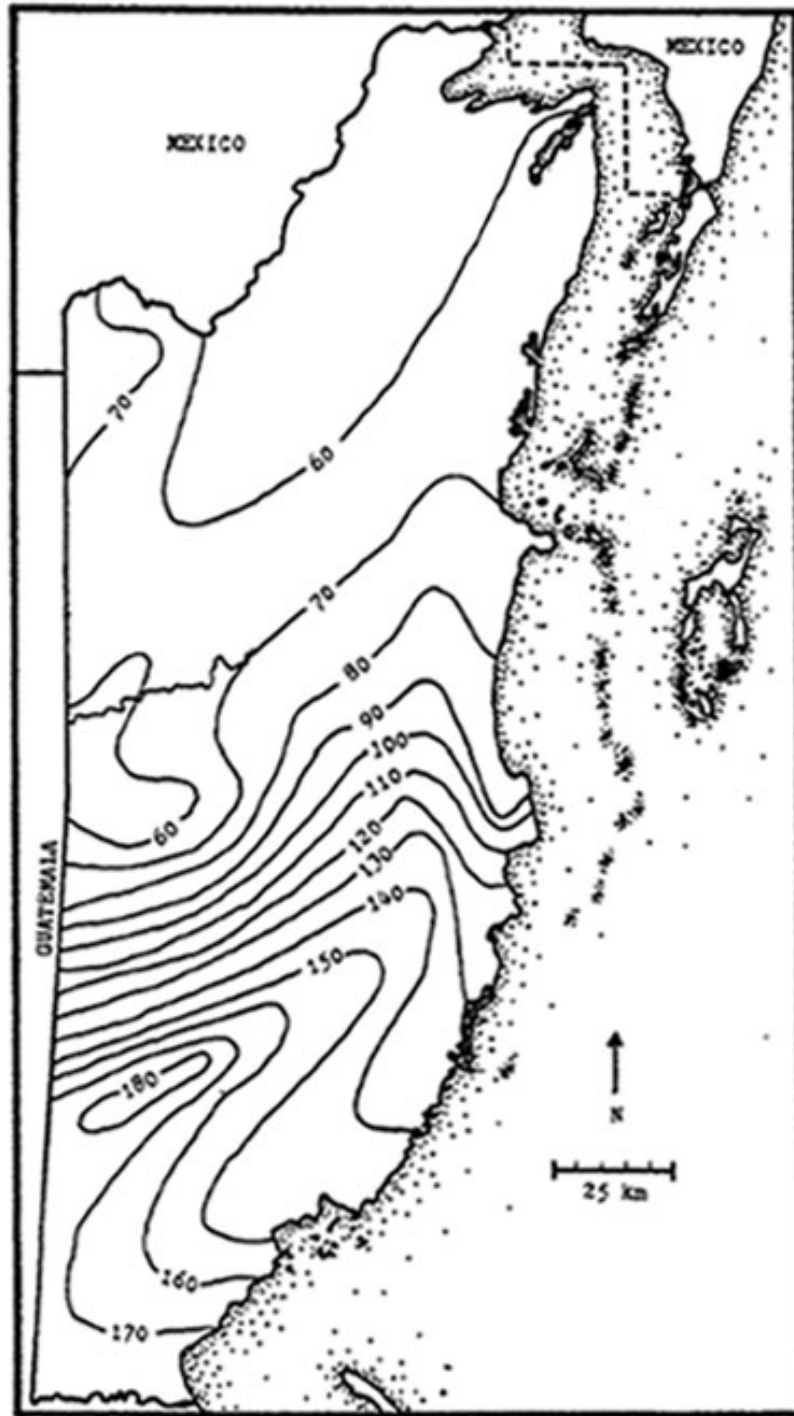


Figure 2-7. Mean annual rainfall pattern of Belize (Wright et. al 1959, Figure2).

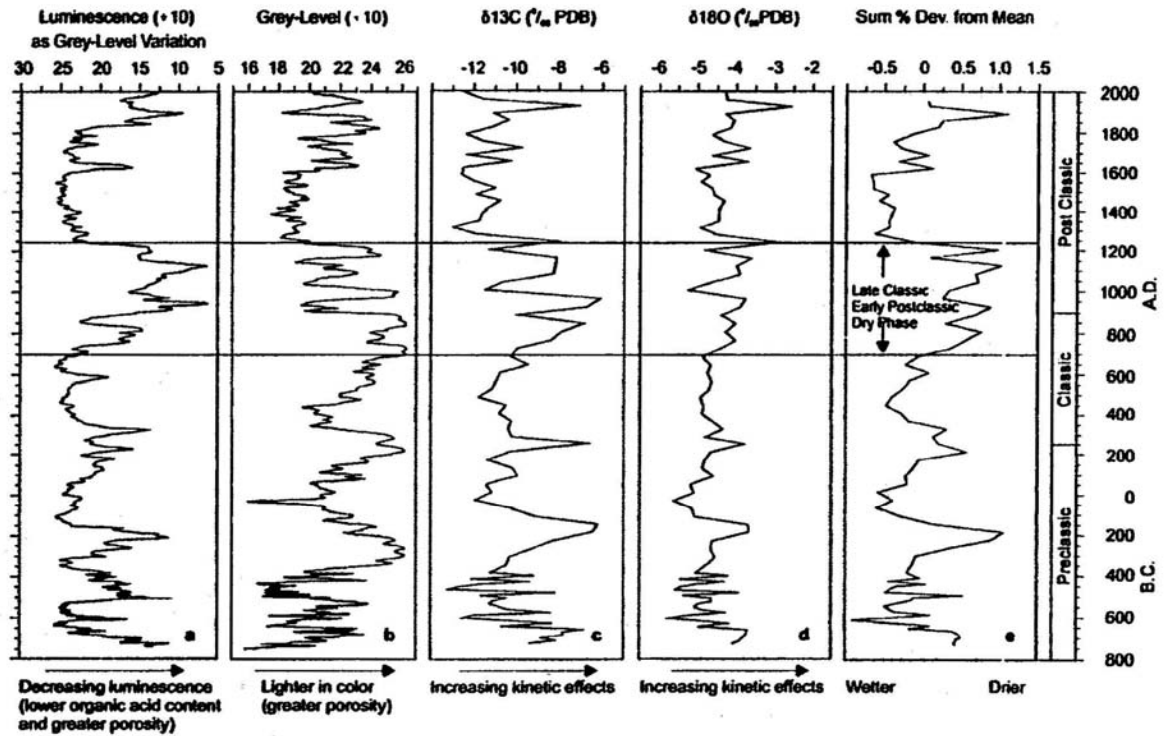


Figure 2-8. James Webster's four sets of climate proxies a)luminescence, b)gray-level, c) $\delta^{13}\text{C}$ and d) $\delta^{18}\text{O}$ compiled by summing the percent deviation of each data set from its respective mean to produce e) a binary wet/dry rainfall reconstruction. Time scale to the right (2000:195, Fig. 8-1).

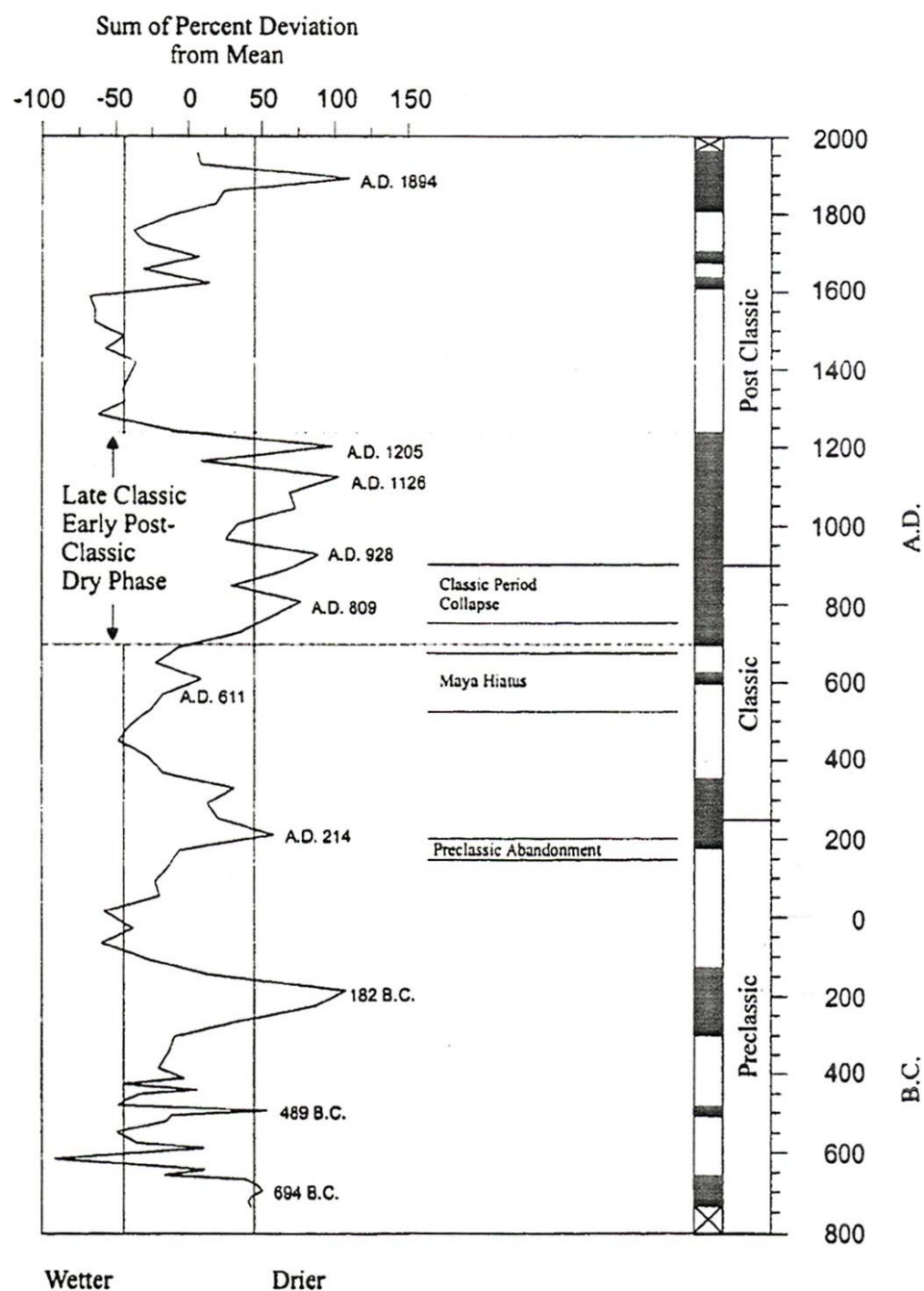


Figure 2-9. Webster's (2000:197, fig. 8.2) paleoclimate reconstruction based on a speleothem from the Vaca Plateau. This chart is based on radiocarbon dates using a 15% hard water correction -1306 years.

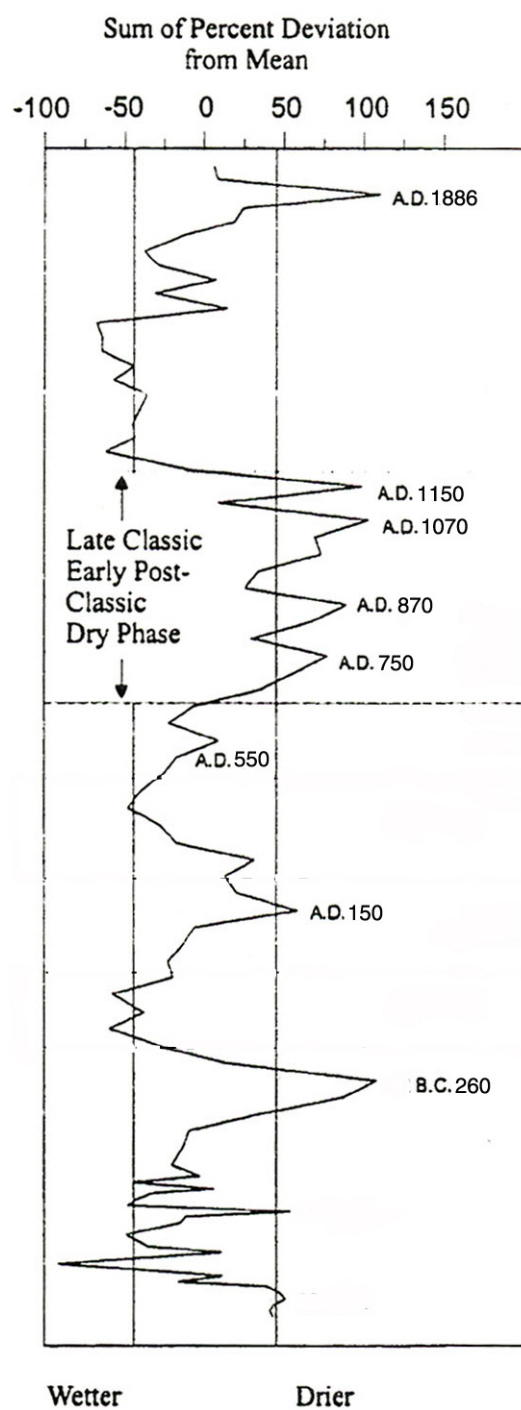


Figure 2-10. Chart derived from Webster (2000:199) showing dating using 13.9% hard water correction.

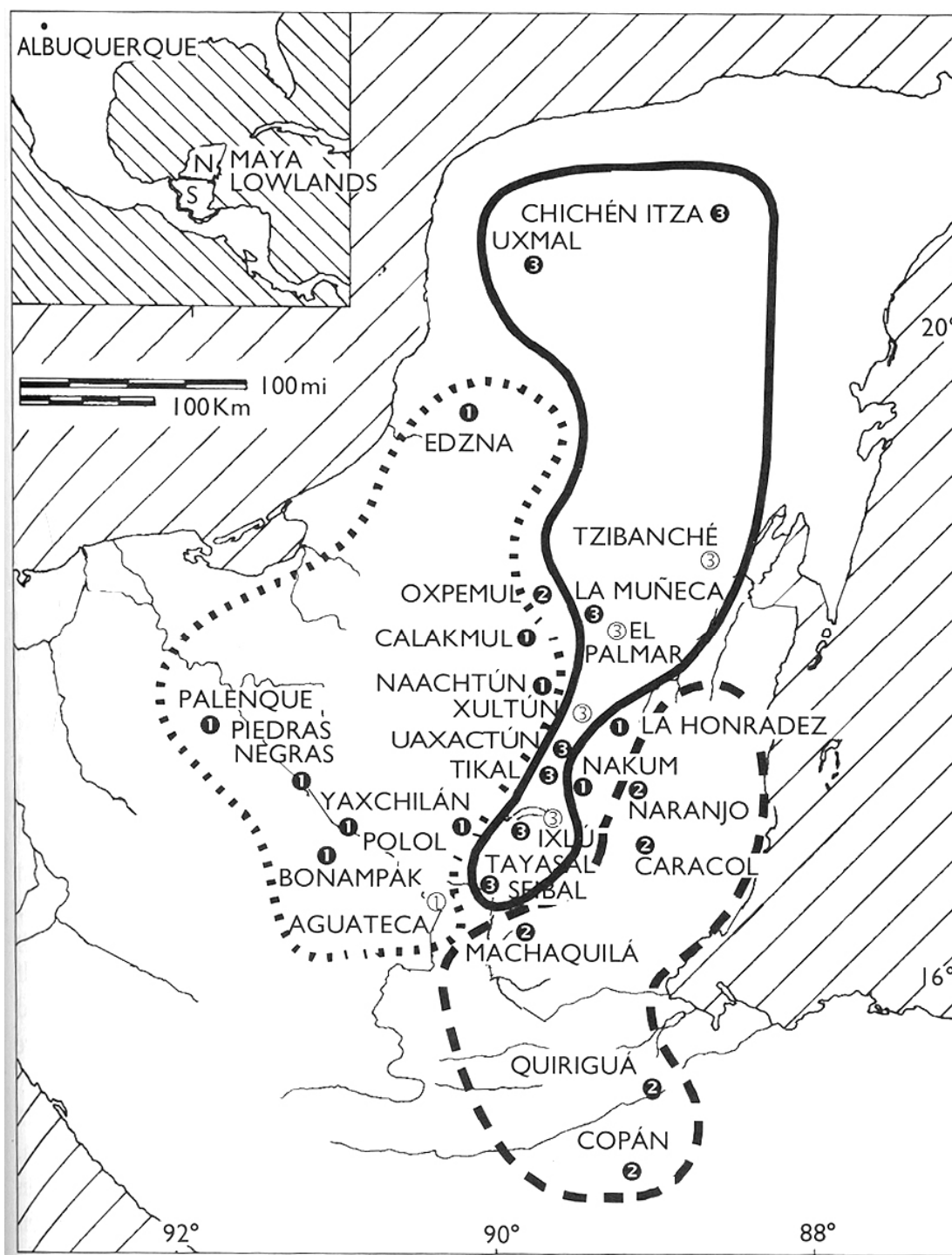


Figure 2-11. Gill's three phases of collapse based on the last dated monuments. Sites circled by the dotted line fall between A.D. 760-810. Those with the dashed line between A. D. 811-860 and those within the solid line from A. D. 861-910 (2000:329, fig. 96).

Date	Period
	Formative/Preclassic
2000 b.c.	
	Late Archaic
3000 b.c.	
	Middle Archaic
5000 b.c.	
	Early Archaic
7000 b.c./ 9000 b.c.	
	Late Paleoindian
10,000 b.c. 12,000 yrs B.P.	
	Early Paleoindian
35,000 yrs B.P. or earlier?	

Figure 2-12. Temporal framework for the Paleoindian and Archaic periods (Zeitlin and Zeitlin 2000:48, Figure 2.1).

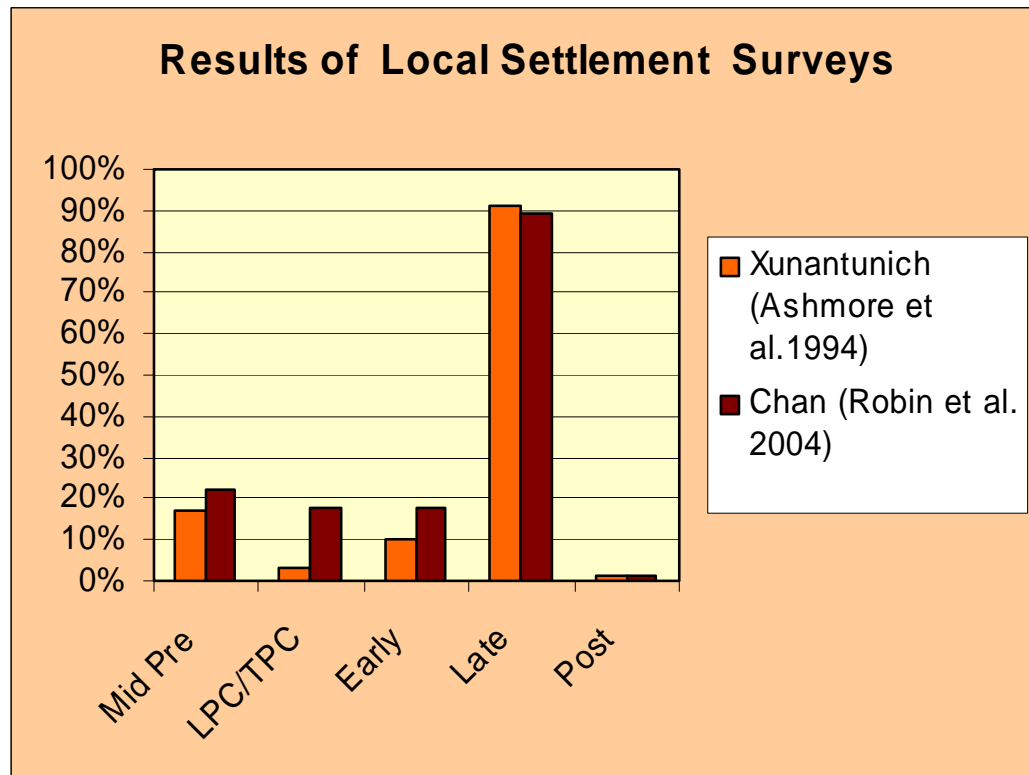


Figure 2-13. Graph of local settlement survey data sets from sites near Chechem Ha Cave, Xunantunich (Ashmore et al. 1994:283) and Chan (Robin et al. 2004:45).

Chapter 3

Methods

3.1 Introduction

To describe ritual practice in the cave and its changes over time required the collection and analysis of both temporal and spatial data. Changes and continuities in ritual practice were identified by global changes in the use of the cave, defining areas that fell in or out of usage, dating and evaluating modifications to the cave, defining differences in the artifact assemblages and features in discrete areas, and evaluating changes in the intensity of usage both globally and locally. By identifying and dating these changes it was then possible to articulate them with local and regional socio/political history using archaeological and epigraphic data. Evaluation of the artifact assemblage was also an important step in determining which groups may have used the space as well as the social class to which they belong. It is only by this type of detailed analyses that caves can be integrated into larger socio/political contexts. The following is a review the overall project goals how they were operationalized.

Mapping was the first step in understanding the spatial components of the site. Preliminary analyses, while somewhat inaccurate, indicated that there was a spatial component associated with the site's chronology (Ishihara 2000; Moyes 2002b, 2004). It was apparent from our field observations of the ceramic assemblages that different areas of the cave were used during at different time periods and that some were for a limited duration while others appeared to exhibit more continuous usage. This aspect of the project included an inventory of surface finds and features.

Because the site's chronology was such a crucial component of the research design, the implementation of a robust program of radiocarbon dating from both surface and subsurface deposits was carried out as well. To integrate these data, a Geographic

Information System (GIS) was created to organize the large database of chronological and spatial information and to visualize both local and global patterning within the cave.

Ceramics, the most common artifacts at the site, provided information on numerous aspects of the research. Vessels and sherds were evaluated by their forms, condition, relative chronology, and spatial distributions. Most importantly, by parsing the assemblage into temporal periods using the type-variety system (Gifford 1976), they provided an independent proxy to assess the intensity of usage of the cave as well as temporal changes in ritual practice. This facilitated counting the number of ceramic entities present during discrete temporal phases. It also made it possible to view the spatial layout of the assemblage at different time periods and to understand their accretion. Additionally, the ceramic assemblage provided information on the nature of cave assemblages in terms of what was brought into the cave and in what condition. Finally, ceramic types were integral for making inferences regarding the social status of those using the site.

Modifications to the cave suggested that specialized practices or ritual events could be dated using a combination of ceramic chronologies and absolute dates from surface and subsurface contexts. A program of test excavations was implemented to date the initial placement of these features.

One of the most important methodological contributions of this dissertation is the use of charcoal deposits as an anthropogenic signature. These deposits both define activity areas and serve as a proxy for the intensity of use. This makes it possible to determine not only which areas of the cave received the most use but which temporal periods are associated with more or less use.

3.2 Charcoal as a Proxy for *Use-Intensity*

Evidence that the Maya used wood torches to light their way in caves is abundant (Morehart 2002a, 2002b, 2005). Charcoal flecks from torches are found in virtually every cave dark zone and fragments of wood torches were recovered from numerous caves in southern Belize (Prufer 2002:614). Thomas Gann (1925:111) reported finding a bundle of split sticks in a cave near Benque Viejo and this study has recorded a partially charred wood fragment on Ledge 10 (See Chapter 4). Ceramic torch-holders have been found at several cave sites as well (Brady 1989; Graham et al. 1980; Reents-Budet 1980, Prufer 2002:614) (Figure 3-1).

Iconographic renderings illustrate the size and shape of ancient Maya torches. The most prominent example is from Lintel 24 at Yaxchitlan (Figure 3-2). The carving depicts the ruler Shield Jaguar I bearing a torch while his wife, Lady Xoc, conducts a blood-letting rite (Schele and Miller 1986:186). Also, a painting within the Cueva de Jolja' in Chiapas illustrates a person holding a torch during what was interpreted as a Period Ending Ceremony (Bassie et al. 2000).

In his study of plant remains at Chechem Ha, Morehart (2002a) reported that all charcoal flecks collected from surface deposits were *Pinus* species. This agrees well with ethnographic data that suggests that pine is the wood of choice used in torch construction. Sol Tax reported the modern use of pine torches in the man-made caves at the site of Utatlan, Guatemala (in Tedlock 1992:149; Tax 1947:471). Feliciano Panti also reported torch use during this time at the nearby village of Succotz, Belize (Graham et al. 1980:171).

Ethnographic data collected in the 2003 field season indicates that torches made from local pine are still used today to save money on fuel costs and locals store cut pine logs for emergencies (Antonio Morales personal communication 2003). Morales explained that local pine called *ocote* was commonly used as a light source prior to the 1950s by people living in the area and was readily available. Stands of pine dot the local landscape located within a half hour walk to the cave.

Keith Prufer (2002:614) suggested that among the ancient Maya there were three major uses of wood in caves: as torches for light, as material for fire hearths, and as burning of incense on the ground or in censers. I would add that each of these activities would be expected to leave very different signatures in the artifact record. Hearths placed on the ground should be easily recognized as intense concentrations of charcoal in small often roughly circular areas often bounded by rocks, speleothems, spalls or potsherds. Even ephemeral and less formal hearths can be recognized by the charred soil surrounding the charcoal concentrations. One would not expect that charcoal used in censers or other containers to create a strong or even perceptible signature on floors because it is burned within the containers. If incense is burned on floor surfaces as Prufer has suggested, it would appear as a hearth-type feature.

Charcoal originating from torches leaves a distinct signature. In an experiment aimed at reproducing ancient torches using *ocote* pine sticks from gathered from the vicinity of Chechem Ha Cave, I observed that torches produce a constant rain of charcoal that drops from the flaming ends of the individual sticks used in the construction of the torch. Therefore, even if one is stationary, the charcoal rain is relatively diffuse as compared with a hearth construction which is heavily concentrated. Standing in one

place produces a circular pattern of deposit whereas walking produces a random pattern within 2m of the torch held aloft. These flecks are very hot and can fall on the hand of the torch bearer if not held at an optimal angle. This may account for the out-flared lips observed on ancient Maya torch holders. Often the flecks falling from torches are not burned throughout and are easily recognized as wood. Other than the spatial distribution, the primary indication that anthropogenic charcoal flecks are from torches rather than other processes is that they do not visibly char the cave sediments (except perhaps at a microscopic scale).

A problem with using charcoal flecks as anthropogenic signals in caves or rockshelters is that there may be background charcoal from natural fires introduced by allogenic processes. It is impossible to distinguish natural charcoal from torch flecks (Balme and Beck 2002:158) except by the contextual parameters of the site and by investigating site formation processes. In ancient Maya cave sites the species of wood may also offer some information in this regard. The ancient Maya were known to favor the *Pinus* species in ritual contexts (Morehart et al.2005) but were known to use hardwoods as well (Morehart 2000a). Additionally, deep cave passages and those that are hydrologically abandoned would not be expected to contain background charcoal.

The amount of charcoal found in excavation units in Chamber 2, a central locus in the dark zone of the tunnel system, was used as a proxy measure for cave *use-intensity*. Charcoal flecks were recorded using the *photomapping* technique pioneered by Nathan Craig and Mark Aldenderfer (Aldenderfer 2002; Aldenderfer in press; Craig 2000; Craig and Aldenderfer in press). This is a technique designed for rapid piece-plotting of small

artifacts and was adapted to the cave environment (Craig et al. 2004) and is described in detail in Chapter 5.

3.3 Project History

Chechem Ha Cave has been under investigation by the Western Belize Regional Cave Project (WBRCP) under the direction of Dr. Jaime Awe since 1998. I supervised all project operations with the exception of the 1998/1999 excavations. Although an early map by spelunkers Erin Hardy and Dave Arveschoug, had been completed in 1991, it was designed primarily for navigation and lacked the detail necessary for archaeological analyses. Therefore, a new survey of the site was initiated by the WBRCP under my supervision. The walls and large morphological features were completed during the 1998 field season that lasted for three months from June to August. Jennifer Erhet assisted and Allan Moore was also gracious enough to help us out when needed. The data were collected primarily by field school students whose work was checked and drawn onto the base map by myself. The Stela Chamber area was first surveyed by Christophe Helmke, Cameron Griffith, and James Conlon and was later drawn by Helmke.

Five units were completed during 1998 field season and were supervised by various individuals working with the WBRCP: Dr. Howard Hecker, Cameron Griffith, Christophe Helmke, Reiko Ishihara, Amelia Jacobs, Ranju Song, and Jon Spenard. Dr. Hecker was conducting faunal analyses for the project but sadly died before writing up his reports. I have been unable to find his notes so it is difficult to comment on his data. Comments on the 1998 excavation units are based on field notes provided by the WBRCP.

During the 1999 season, which lasted from June until mid July, surface finds were catalogued and mapped. This included adding details of morphological features to the base map and point plotting artifacts. Artifact attributes were also recorded during this season. Mike Mirro was kind enough to assist in recording Ledge 5. Ceramic recording was done by Reiko Ishihara and assisted by field school students. This included: in situ refitting of ceramic sherds, illustrating vessel designs, drawing rim profiles, and assigning type-variety for relative chronology. Ethnobotanical samples were collected but other artifacts were photographed in situ and left in place for tourists to see them as well as for future study.

In 2000 Christopher Morehart collected additional samples of the ethnobotanical remains for identification and analyses. He sampled the hearth in Crawl 3, collected charcoal from surface deposits, and took samples for starch grain analyses from vessel interiors in Elevated Passage 1, Elevated Passage 3, Crawl 3, Ledge 6, Ledge 8, and Tunnel 2. A number of additional samples collected from the 2002 and 2003 field seasons were sent to Morehart and are reported in Chapter 4.

Test excavations were conducted in the six-week field season of 2002, which lasted from June through late July. The crew consisted of Mark Aldenderfer, Kay Sunahara and me, as well as local field assistants Jesús and Armando Morales. Small samples from 99 ceramic vessels were collected by Kay Sunahara for petrographic analyses but are not reported in this work.

Based on results of the 2002 test pits, in the 2003 field season a large horizontal excavation was conducted in Chamber 2. This will be discussed in detail in Chapter 5. Also, ceramics from surface contexts were reevaluated, Chamber 2 was remapped using a

total station, and the extension of Tunnel 1 was continued. In addition to me, the crew consisted of Mark Aldenderfer, Nathan Craig, Grant Polley, Constance Price, Tony Menoa, James Aimers. We were once again joined by our workmen Jesús and Armando Morales who continued the trenching of the Tunnel 1 extension.

A number of people worked on the ceramics from the site. Jaime Awe was the first to identify Preclassic types in the cave. In 1998, Joseph Ball was kind enough to help to identify some of the problematic ceramic sherds found in the Crawl 3 area, and in 2005 he and Jennifer Taschek identified problem sherds from other areas and provided comparative data. They also evaluated sherds from the 2003 excavations.

The first systematic work on the ceramics was carried out by Reiko Ishihara during the 1999 field season. Jaime Awe assisted with these early classification efforts as did Christophe Helmke and myself. Kay Sunahara classified and drew sherds excavated in the 2002 field season. In 2003, James Aimers evaluated the earlier work and classified additional pieces of the surface assemblage. During this season, the incensario fragments from the Stela Chamber were illustrated by Constance Price.

3.4 Mapping Survey

Mapping of the cave occurred over two seasons. The method involved mapping small or bounded areas individually and then entered these data onto a large paper base map using a plan view. Elevations were recorded and ceiling heights noted. Profiles from the original 1991 Hardy and Arveschoug map were sufficient for the project purposes and were not re-mapped.

Using tape and compass, base lines were erected down cave passages or across ledges and measurements collected relative to the base line. North arrows on all maps indicate magnetic north and true north as there was no declination for the area in 1999 when the main structures in the cave were mapped. The cave was plotted every 25-50cm. and drawn at a 1:50m scale to preserve detail. When completed the map was approximately 3m in length. This map was scanned on a drum scanner and saved as a digital image that was used in the creation of a Geographic Information System for the site.

3.5 Recording Surface Finds

Because Chechem Ha is a tourist cave and artifacts could not be collected, all recording of surface finds had to be done in situ. Artifacts and ceramics were recorded using methods I had developed in 1997 while working in a similar situation at Actun Tunichil Muknal. Using tracing paper, 1m squares were drawn over the base map on north/south and east/west axes. These were designated by a number/letter system. Numbers were used on the north/south axis and letters on the east/west. These squares could then be precisely located in the cave so that there was no need to erect a physical grid system at the site.

Recording was accomplished using data sheets that I had originally designed with help from Kay Sunahara for an earlier project at Actun Tunichil Muknal (See Appendix II). Artifacts were piece-plotted on individual 1m square maps and numbers were assigned to ceramic sherds and special finds. A sketch was drawn of the 1m area. These drawings were then transferred to the larger base map. The 1m detail maps encoded a

great deal of information about the area itself such as the amount of burning present, the type of sedimentation, the presence/absence of speleothems, and other observations. In the event that artifacts were stacked, such as when stacks of ceramics were found, stack locations were indicated on the sketch map and stacks drawn on the back of the data sheet. Rocks and special features were measured and recorded on these sheets as well.

Numbers were assigned to each artifact and recorded on the sketch maps. The artifact received an eight-digit identification number that encoded information about the piece. The first two digits indicated the broad artifact class such as "ceramic," "speleothem," "shell," "animal bone," but cobbles and pebbles were not numbered. The next four digits were consecutively assigned so that each artifact had a unique number. The last two digits were reserved for information on breakage. In instances where more than one piece refitted to a single artifact, the largest piece was assigned the number 01 and sherds of the same piece (having the same four digit number) became 02, 03, 04, and so on. This applied primarily to ceramic vessels. An accompanying data sheet was filled out for individual artifacts that included information about the object such as measurements, colors, materials, charring, and other attributes.

Artifact classes included ceramics, speleothems, spalls, shell, animal bone, ethnobotanical remains, cobbles, pebbles and special finds. Ceramic sherds were assigned numbers and recorded in detail on separate data sheets when they measured >.10m., were rim fragments, or were placed in unusual contexts such as inside of other vessels. Ceramic scatters were noted on the 1m square grid maps and extent of the scatter was recorded. When possible, ceramic sherds within the scatters were counted.

Surface deposits of charcoal or ash also were recorded on the grid maps and the extent of concentrations noted. Charring on walls was noted as well.

Speleothems are one of the most common artifacts found in caves and speleothem breakage, caching and removal are well-documented practices in Maya ritual (Brady et al. 1997). Hill and Forti (1997) describe 38 types of speleothems that include stalagmites (cylindrical or conical speleothems that grow up from the cave floor below a drip), stalactites (cylindrical or conical speleothems that hang from a cave ceiling), soda straws (speleothems in early formation morphologically resemble thin hollow straws), draperies or bacon (formed as water trickles down inclined cave ceilings or walls), flowstone (flat layered crystals deposited in sheets), and dog-toothed spars (large crystals that grow in standing water).

Most of the 38 forms are morphologically dissimilar, so much so that the term is somewhat useless except in the most general sense. Intense studies of these objects have reached the point that it is necessary to classify them as specific types or at least to provide an explanation of how the term is used within a particular study. At Chechem Ha, stalactites, stalagmites, and soda straws were the only types of speleothems recorded as cultural deposits in the cave. It was sometimes unclear as to whether formations were stalactites or stalagmites depending on the size and condition of the artifact (all soda straws are incipient stalactites). When possible the distinction was specified. Speleothems were only recorded as artifacts in instances in which they could not have arrived at their current positions by natural causes.

A spall is defined as "a chip or fragment removed from a rock surface by weathering; especially a small thin, relatively commonly curved and sharp-edged slab or

other piece of rock produced by exfoliation" (Gary et al. 1972:677). These commonly accompany other artifacts in cave assemblages. They are sometimes stacked with potsherds strongly suggesting that they may be regarded as potsherd-like offerings. As with speleothems, spalls were only recorded in instances in which they could not have arrived at their current positions by natural causes.

Natural rock was noted in sketch maps and cobbles were measured. It was clear from their positions within and around caches or pottery stacks that some rocks were intended as part of ritual deposits while some served utilitarian functions such as supports beneath vessels to anchor them onto steep ledges. Because there was ambiguity in many cases as to whether the rock was part of the ritual assemblage or not, all rocks associated with artifacts were drawn, mapped, measured, and noted in cases in which they are obviously part of the ritual assemblage.

Rocks were divided into three categories based on size following geological definitions-- boulders, cobbles, and pebbles (Gary et. al.: 1972:137, 521). A boulder is a detached rock mass about the size of volleyball or greater (diameter>25.6cm). Cobbles and pebbles may be easily carried. Cobbles are smaller than boulders and larger than pebbles (diameter>6.4cm and <26.6cm). Their size is between that of a tennis ball and that of volleyball. Pebbles are smaller than cobbles and their sizes range from that of a pea to the size of a tennis ball (diameter>4mm and >6.4cm).

3.6 Quantifying Ceramic Sherds

One of the difficulties surrounding quantitative ceramic studies is breakage. In ancient Maya caves ritual breakage is very common and easily demonstrated. Cave

assemblages are noteworthy for their prevalence of extensive surface deposits found on high ledges or other areas of little or no sedimentation. Most ceramics found in caves have been broken and the pieces stacked or scattered within a small area. This has been well-documented at Actun Tunichil Muknal (Moyes 2001), a cave with little subsurface sedimentation. In this study, an in situ refitting was done on the ceramic assemblage and the farthest a sherd fell from its associated sherds was 5m distant. In many cases, sherds from the same vessel were stacked together and placed in niches or small alcoves (Moyes 2001:73-75; 2005a, Figure 11.5).

Additionally, sherds may be removed from the site following ritual breakage or single sherds may be brought into the cave as an offering in and of themselves. Excellent examples of this are found at Actun Tunichil Muknal in Belize (Moyes 2001:73-75).

Because there was little subsurface sedimentation in the study area unusual single sherds of distinctive ceramic types found on the surface were easily identified. Additionally, in situ refitting never produced the entire object at Actun Tunichil Muknal even in instances in which sherds from the same vessel were stacked together. Brady (1989:86) also noted that in refitting vessels at Naj Tunich, some portion of the vessel was invariably missing.

Methods of quantifying ceramics must be closely related to the questions posed. My goal was to evaluate changes in the assemblage over time so that it could be used as an independent variable to evaluate the amount of ritual usage the cave received at different time periods and to access any changes in vessel types or forms that might indicate temporal changes in ritual practice. In order for ceramic data to be useful as a quantitative unit, it was important to understand how many individual vessels were represented by the assemblage. This problem has long plagued faunal analysts. Michael

Schiffer (1995:183) suggested that in ceramic studies, the whole vessel is an important unit of analysis and that methodology to address the issue of breakage could be borrowed from faunal studies. The idea of the minimum number of individuals (MNI) was originally developed for paleoecology studies by Arnold J. Shotwell (1955). He observed that when there were few or no articulated skeletons in a sample, it was impossible to determine the number of species represented. This led him to propose that a useful indication could be found by determining the smallest number of individuals that could have produced the material present. He examined all the material present however fragmentary and determined which skeletal element was most frequent. The number of these elements determined the MNI.

Clive Orton (1975) suggested a similar method for counting ceramics that estimates the maximum number of vessels ("number of vessels represented"). This method calculates the number of sherds once all adjacent fragments have been joined. The problem with this method is that it has the tendency to overestimate the number of vessels. Martin Millett (1979:77-80) used a method he referred to as the "minimum number of vessels." This method grouped all the rims and sherds that might be from the same vessel and calculated the number of groups. This method tends to underestimate vessels represented. The method that I am using was developed specifically to deal with cave assemblages and combines characteristics of both of these methods.

This method was adapted for an artifact analysis conducted at Actun Tunichil Muknal (Moyes 2001:68) and later employed at Chechem Ha. Rather than a minimum number of individuals, the minimum number of artifacts (MNA) was sought. In the field objects, particularly potsherds were refitted in situ so that counts more accurately

reflected the number of objects imported into the site. One advantage of this technique when working with Maya vessels is that they are hand built and therefore exhibit considerable variation in manufacture. As suggested by Alan Sullivan (1980:265), by evaluating type, size, thickness, temper, surface treatment, etc, it is fairly easy to distinguish like sherds particularly if we are dealing with relatively small collections in bounded areas. The MNA was determined by the number of rims or bases of discrete vessels or distinctive body sherds. Following Vince (1977:63), sherds that do not directly refit but feasibly come from the same vessel were counted as part of that vessel. Some sherds were so unique that they were obviously not part of other vessels located in the cave whereas others were differentiated by a combination of paste, thickness, temper, and surface treatment. While this method had the potential to create a maximum number of vessels (See Orton 1982:1), efforts were made to eliminate non-diagnostic sherds from these counts. In these cases, the non-diagnostics were included in the overall sherd counts but not in the MNA or vessel form counts. Although this method underestimates the number of vessels represented, what it primarily underestimates is the number of vessels represented by small (<10cm) single sherds brought into the cave. It is still providing a great deal of useful information on a non-random sample that represents the majority of the surface material.

Ceramic counts are reported by area in Appendix III, part 1. The appendix provides total sherd counts, MNA, vessels broken in situ, and quantities of form types for each area. Vessels broken in situ were determined by the number of vessels that could be refitted in situ. In other words, if there were more than one sherd present that could be refitted it was assumed that the vessel may have been smashed in situ even if it could not

be completely reconstructed. In such a case it suggests that either large sherds or partial vessels were imported into the cave and smashed or that a whole or partial vessel was smashed in the cave and some sherds removed.

3.7 Dating Methods

Chronology in caves is typically difficult to establish because major artifacts and features are often surface deposits that become co-mingled. Although ceramic chronologies can provide estimates of when a cave was used, the palimpsest nature of these deposits also interferes with the determination of absolute dates from preserved or charred organic remains. In other words, charcoal from a variety of time periods can sit on the same exposed surface. In some cases the investigation of sub-surface deposits and radiocarbon dating may help sort out chronologies, but unlike surface sites, the enclosed cave environment often prevents a thick sediment buildup.

The deep sub-floor deposits in Chechem Ha Cave are exceptional and provide a rare opportunity to evaluate sealed deposits in a cave context. Both relative dating of ceramics and absolute dating of organics are used together to determine the cave's chronology. Absolute dates were very helpful in determining cave early usage not addressed by the ceramic data and in illustrating cessations or hiatuses in cave use. For this reason charcoal samples collected from the deepest deposits found in test pits were radiocarbon dated. Ceramic dating was valuable in estimating the latest use of an area and determining relative dates for areas in which charcoal could not be obtained, for small areas that did not warrant spending finite funds on a radiocarbon dates, and those that radiocarbon dates proved problematic.

3.7.1 Relative Dating

Relative chronology was determined by the ceramic assemblage using a modified version of James Gifford's (1976) ceramic sequence from Barton Ramie (Figure 3-3). These data are reported in Appendix III, part 2. Although it is generally reliable, some problems with the sequence have come up and are being addressed by myself and other scholars. Recently, Lisa LeCount (2004:28) noted that there are problems in identifying Early Classic ceramics that were not part of elite or ritual assemblages. The problem she addresses is that most archaeologists are unsure as to what most Early Classic jars look like and tend to assign chronology based on painted vessels, disregarding the unslipped wares. A number of scholars have proposed that the Early Classic domestic assemblages contain mostly long-lived Preclassic types and regional styles that have not been identified as such (Awe 1992; Awe and Helmke 1995; Audet and Awe 1994; Demarest 1992; Ford 1990, 1991; Lincoln 1985; Joseph Ball personal communication 2005). As LeCount points out, if this is true, the current typological scheme artificially inflates the number of Late Preclassic sites and falsely exaggerates the decline in Early Classic sites (See Chapter 2 for discussion).

The issue is addressed by James Brady and his colleagues in their 1998 article. Using dated material collected throughout the Maya lowlands Gifford's Protoclassic Floral Park complex, which he considered to be an intrusive phenomenon is modified and redefined. Working at Las Ruinas one of the closest surface sites to Chechem Ha Cave, Joseph Ball and Jennifer Taschek (in Brady et al. 1998:26-27; Taschek and Ball 1999:218) have delineated the Madrugada complex to replace Gifford's Floral Park. This complex begins at around A.D. 150 and extends into the Early Classic period. Ball notes

that the Chan Pond unslipped jar type, a member of the Floral Park complex, is introduced at this time and is coeval with Early Classic horizon markers such as the Hermitage complex Dos Arroyos Orange-polychrome dishes and Balanza Black bowls, an observation that mimics their co-occurrence at Chechem Ha.

In the cave, on the surface, of the 55 ceramics attributed to the Hermitage complex, 71% are within 50cm of Floral Park typed jars, whereas only 29% are within 50cm of the more abundant Late Classic Spanish Lookout complex ceramics. In such a large cave, this co-occurrence can hardly be accidental. Data collected from Ledge 10 is instructive as well. This isolated ledge elevated 7m above the tunnel floor contains the greatest number of ceramics from any one area in the cave (See Chapter 4). Of the 58 typed vessels, 32 were placed in the Late Preclassic Floral Park complex and 24 in the Early Classic Hermitage complex. In many cases, sherds from these two complexes were commingled or stacked together. Two AMS dates from below sherd stacks suggest that this ledge was used between A.D. 240 and A.D. 540 ranging squarely into the Early Classic period. Additionally, most of the Floral Park style jar types located in the Chamber 2 excavations were discovered in levels postdating A.D. 210 (See Chapter 5). It is also interesting to note that no other Floral Park style ceramic types were found in surface or subsurface contexts within the site. Given these data as well as the observations made by other researchers, like Ball I have elected to consider the Floral Park complex jars as belonging to the initial part of the Early Classic period and refer to them as Terminal Preclassic/Early Classic.

3.7.2 Absolute Dating

A total of 44 Accelerator Mass Spectrometry (AMS) dates were run at the NSF-Arizona Facility at the University of Arizona in Tucson. These are reported in Appendix IV. Dates were calibrated using OxCal 3.9 and are reported as the 2-sigma probability unless otherwise specified. In the interest of obtaining a finer grained chronology some alternative probabilities are presented when appropriate. Forty-two dates were obtained from wood charcoal and two from preserved corn cobs. When possible, dates were collected from sealed subsurface contexts. In areas lacking sedimentation or lacking subsurface charcoal deposits, samples collected from surface contexts were dated.

3.8 Test Pitting

Six test units were placed near features and 22 shovel test pits were positioned throughout the tunnel system (Figure 3-4). Four of the test units were placed in or near features in order to discover when modifications began. Two test units were placed in the Entrance Passage, one in Chamber 1, one in Chamber 2, one in Tunnel 1, and one at the Dead End terminus of Tunnel 1. At the Dead End terminus of Tunnel 1, a trench was excavated into an extension of the tunnel that was blocked off by a mud plug.

Shovel test pits were strategically placed in the main passages, elevated passages, and on ledges to evaluate the depths of deposits, collect charcoal samples for radiocarbon dating, and to remove column samples to be used in micromorphology analyses. This material is still being analyzed and will be reported elsewhere. All excavations were terminated either at bedrock or in areas in which the depth or sediments was unknown and expected to be quite extensive, at sterile levels. When possible, charcoal samples

were collected from multiple strata within each pit. Charcoal samples from accessible surface contexts were collected as well.

3.9 Geographic Information System (GIS)

Archaeological studies using GIS have most often been employed in regional analyses (Petrie et al. 1995) and intrasite analyses are a relatively new application for the software (Aldenderfer 2002; Aldenderfer in press; Branting 2003; Craig 2000; Craig and Aldenderfer in press, Levy et al. 2001; Moyes 2001). One explanation for this is that the original GIS were designed by government planners to solve regional planning problems on large tracts of land. However, the general spatial infrastructure of GIS is not scale dependent (Aldenderfer 1996), and the flexibility of the system allows it to be used in smaller geographic spaces.

Some problems exist in using GIS to record and evaluate cave sites (Moyes 2002a). Most existing software for GIS does not handle 3-dimensional data effectively. In caves, there are inevitably instances in which artifacts and features are located in tunnels that may wind back upon themselves creating a situation in which one area sits directly on top of another. To illustrate this problem, imagine a winding stairway the steps of which are vertically separated but horizontally overlapping. Problems arise in creating a GIS in these cases because units of analysis are not horizontally oriented layers but continuous surfaces. Additionally, caves may contain complex topology in which objects share subsets of each other's volumes. For instance, along the same wall, artifacts may sit on overhanging shelves positioned directly on top of undercut niches containing objects of interest.

These types of spaces are difficult to model because they are three-dimensional. The commercially available GIS software cannot not yet account for these real world situations since it is not designed to both display and conduct quantitative analyses in truly three dimensional space. But, despite some of the problems of dimensionality in caves, a GIS is still the most powerful tool available for geo-referencing objects, visualizing the space, and conducting two-dimensional spatial analyses. Most of the Chechem Ha spaces could be represented by horizontal planes and were particularly good candidates for the creation of the GIS because they required minimal adaptations.

The GIS was created with ESRI ArcGIS 8.1 software using a two-dimensional vector data model. Paper maps were scanned on a drum scanner and imported into ArcMap as TIFF files. These were digitized on screen using lines and polygons.

Because of the Chechem Ha spaces could be adequately represented by horizontal planes a two-dimensional data model was used in the database design. In places that entailed high elevation features overlapping lower features, areas were illustrated by laterally moving the higher feature from its original position so that the lower features were revealed. The original position of the displaced feature is indicated by arrows pointing to the hollow boundary of its actual placement.

There is no standard typology for representing cave features in a GIS. My strategy was to use as many of the standard cave symbols traditionally used by cavers as possible. This was accomplished by coding the objects within the layer files, originally called "coverages." Lines were used to represent cave walls, underhangs, overhangs, ledges, pits, holes, elevated features (such as benches), ledges, light boundary zones and slopes. Other entities such as rocks, boulders, stone columns, stalagmites, stalactites,

intermittent pools, units, test pits, areas of unique sediments, concentrations of charcoal, and artifact scatters were classified as polygons and coded appropriately. Artifacts were drawn individually as polygons as a visual cue to the reader that imparts information about their sizes and shapes and were also represented as points for analyses. The information on shapes and sizes had been painstakingly recorded onto base maps as well as grid maps and therefore was readily available. Artifact attributes recorded in the field were entered into tables linked to the individual entities.

Accuracy in a GIS is always an issue particularly the data was not collected digitally. Digitizing from a paper map is problematic because the paper has a tendency to warp. When the paper map has been drawn using tape and compass the errors no doubt increase no matter how carefully measurements were collected. To determine the level of accuracy in the Chechem Ha map, the surface of Chamber 2 was remapped using a total station in 2003 prior to excavation. The new data, considered to be more accurate, were compared with the paper maps. By comparing large features, the paper map was not off by more than 50cm which suggests that GIS is accurate to within .5m. This does not account for propagated errors but does suggest good intra-area accuracy.

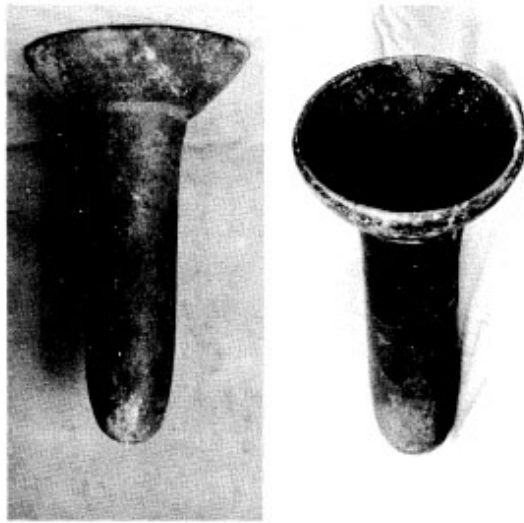


Figure 3.1. Ceramic torch holders found at St Margaret's Cave (left) and Petroglyph Cave (Right) (Graham et al. 1980:168).



Figure 3.2. Yaxchilan Lintel 24 illustrating ruler bearing torch (Schele and Miller 1986:198, Plate 62).

MAJOR PERIODS	11.16.0.0.0 correlation	TIME	BARTON RAMIE	UAXACTUN	Las Ruinas Buenavista Cahal Pech	Xunantunich
P O L S S I C	from Quirigua after Morley	1400			?????	
		1300	late facet			
		1200	New Town -?-			
		1100				
		1000	early facet		Jirones	
C L A S S I C	terminal	900			Sacbalam	Tsak'
	late	800	Spanish Lookout	Tepeu 3	Paloverde	Hats' Chaak
		700			Mills	
		600	Tiger Run	1	Gadsen	Samal
	early	500		3	Ahcabnal	Ak'ab
		400	Hermitage	Tzakol 2		
		300		1	Madrugada	
	proto-classic	200	Floral Park			Pek'kat
	late	100	Mount Hope	Chicanel	Xakal	
		200	Barton Creek			Ok'inal
P R E C L A S S I C	middle	300				
		400	late facet	Mamom	Umbral	
		500				
		600	Jenney Creek			Nohol
		700			Kanluk	
		800	early facet ?			
		900			Cunil (Cahal Pech) Kanocha (Blackman Eddy)	Muyal
	from Copan after Catherwood	1000				
		1200				

Figure 3-3. Ceramic chronologies for Western Belize (compiled after Gifford 1976:46, Figure 8; Tascheck and Ball 1999:218, Figure 3; and LeCount 2002:45, Figure 3).

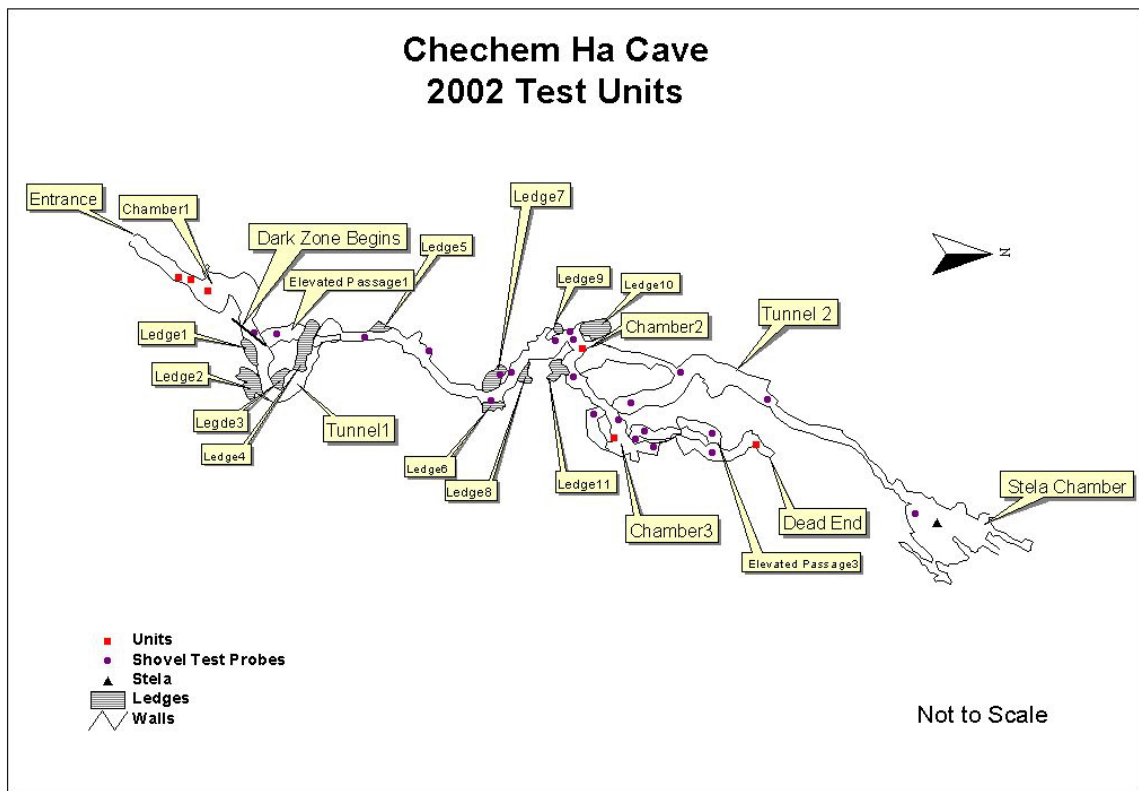


Figure 3-4. Test pits placed in the 2002 field season.

Chapter 4

The Cave

4.1 Introduction

Chechem Ha Cave is a popular modern tourist destination. Its name means Cave of the Poisonwood Spring and was originally known as Vaca Falls Cave (Awe 1998; Awe et al. 2005:233). It is an unlooted ancient ceremonial site that is potentially one of the most remarkable finds in Maya cave archaeology. Because the cave was opened for tourism before being investigated archaeologically many archaeologists have underestimated its research value. Perhaps the cave's greatest attribute is that at the time it was discovered (rediscovered) the entire cave system was intact. This is unique because undisturbed material from other caves in the Maya area has been found in partial systems or single chambers (Andrews 1970; Brady et al. 1992; Awe et al. 1996, Miller 1989, 1990; Moyes 2001b; Moyes and Awe 1998). The discovery of an entire intact cave system has provided us with the opportunity to examine patterns of overall cave use as opposed to evaluating the usage of only a single area or chamber.

The most important feature of this site is its deep subsurface deposits and excellent stratigraphy. Many tropical caves utilized by the ancient Maya exhibit little sedimentation. In this situation the development of chronology is often difficult. Chechen Ha offers a rare opportunity to evaluate sealed deposits in a cave context. Therefore, much of this research relies less on surface deposition and more heavily on subsurface data.

4.2 Geographic Location

Chechem Ha is located in Western Belize in the Macal River Valley on the western side of the river on the edge of the Vaca Plateau (See Figure 2-3). The nearest town, Benque Viejo, is located 8 miles northwest of the site and is accessed via a road paralleling the

Guatemalan border leading to the hydroelectric plant. A GPS reading collected at the cave entrance shows its position at 16Q 279082E, 1883815.6N and latitude 17°1'40" and longitude -89°4'31" at 370m above sea level. The cave is approximately 26km north of Caracol and 25km southeast of Naranjo. It is not directly associated with any ancient settlement centers but is located in a peripheral area between two middle-sized Maya sites, Las Ruinas to the north and Minanhá to the south. The larger site of Xunantunich lies to the far north and its associated Chan site, a small well-studied agricultural community, is located between Las Ruinas and Xunantunich.

4.3 Early Visitors

The property on which the cave is located belongs to a local farmer, Antonio Morales. The site is under the family's curation and they personally conduct and supervise tours. Antonio and his son William Plytez are the family members primarily responsible for tour operations. Licensed, government trained tour guides occasionally also escort tours. During the summers that I worked at Chechem Ha I noted that 30-50 tourists per week visited the site.

Tourists are not allowed to climb on to ledges (although they could view artifacts while standing on a ladder), and are not taken into confined spaces. Consequently, movement of artifacts, particularly sherds, has most often occurred in the cave's largest passage, Tunnel 1. Between the 1998 and 1999 field seasons, the project noted that three sherds in the tunnel were moved, one of which exhibited a fresh break. In light of the fact that tourists traffic this area daily, artifact movement was surprisingly minimal. By comparing early photographs taken in 1991 by Maya scholar Karen Bassie-Sweet and some

shots taken by local Mike Green with those taken by the author during the 1998/1999 field seasons, it is clear that artifacts on high ledges have been handled and some movement has occurred. However, this movement does not appear to be the wholesale transportation of objects from one ledge or area to another but rather the rearrangement of vessels within a particular area. Fortunately, most of the early visitors to the cave that had access to the more sensitive archaeological areas were spelunkers, archaeologists, or conservationists who possessed a high level of awareness regarding the movement of archeological material. The owners have also shown a great deal of concern in maintaining the cave in the most pristine state possible, which adds to the project's confidence that the material is in relatively good spatial context, particularly when compared with sites in the area that have not been curated and are continually looted.

William Plytez, the owner's son, discovered the cave in 1989. According to Plytez, he was looking for palm leaves in the forest when his dog chased a gibbon (*Agouti paca*), which is a large rodent, into a hole. Looking for his dog, Plytez squeezed through the hole and found the cave entrance. At this time, the entrance was covered by foliage and medium sized boulders. Plytez returned to the cave the next day with lights, broke through the rock and entered the first chamber. On this visit he explored the entire cave and made his way to the northern end where he reports discovering the stela. He explored the cave in future visits for approximately one month. The next people to visit the cave were Sharon Matola, director of the Belize Zoo, and Logan McNatt a spelunker involved in cave research. The cave was surveyed and mapped by British caving team Erin Hardy and David Arveschoug in 1991. Maya scholar Karen Bassie-Sweet also visited the cave and took photographs during the early years postdating the survey team. At a later date local Mick Fleming visited with a

group of photographers using pine torch lighting to simulate the ancient Maya experience (Mick Fleming, personal communication, 2003). Antonio Morales also mentioned exploring the cave using pine torches.

Approximately six months following the cave's discovery members of the Department of Archaeology visited the site. The team included among others, Alan Moore, Harriet Topsey, and Richard Foster a local documentary film maker. After the visit, the Department elected to remove nine well-preserved vessels from the cave.

In 1993 a road leading past the farm to the hydroelectric plant was constructed. Until this time access to the cave had been very limited. In 1995 the owners were given permission to open the cave for tourism and since then tours have operated continuously. A stairway from the cave entrance to the first chamber was constructed to make access easier for tourists. Boulders were cleared from the outside of the entrance and in the interior entrance passage. Rock from the interior was piled on either side of the tunnel walls in the area (Figure 4-1).

A gate was erected over the cave entrance (Figure 4-2) to prevent looting, which is a continual problem with all cave sites in remote areas. Although the gate is a deterrent, the entrance is difficult to monitor as it is on a hillside far away from the resort buildings and family houses. Sadly, even with precautions in place, between our 1998 and 1999 field seasons the cave was robbed and 18 vessels in good condition were stolen. Thankfully there was no other damage or vandalism.

4.4 Tunnel System

The cave has over 300m of tunnels (Figure 4-3). The entrance is south facing and the two main tunnels are oriented on a north/south axis. The system is approximately 237m long (or 198m as the crow flies) and bifurcates 134m from the cave entrance. The entrance passage and Chamber 1 are the only twilight areas of the cave. The dark zone begins approximately 30m from the cave entrance adjacent to the entrance to Elevated Passage 1 (Figure 4-4).

The system is divided into discrete areas as a heuristic for describing the space. Cave terms are often architectural analogs and there are a number of conventional usages that have been compiled by the U. S. Environmental Protection Agency (See Field 2002). I use conventional terms where they are appropriate and in other cases have taken pains to describe these frustratingly complicated three dimensional spaces and illustrate important complex morphological features. The major areas at Chechem Ha are classified as tunnels, chambers, crawls, elevated passages, and ledges (Figure 4-5).

Tunnels technically are horizontal passages open at both ends (Field 2002). Here the term is loosely applied and is more closely related to "passages" which is a general term to describe conduits between rooms or chambers that tend to be longer than they are wide. At Chechem Ha, there are two major tunnels that form a Y-shape. Tunnel 1 runs on a roughly east/west axis and terminates at a dead end plugged with sediment, and Tunnel 2 extends from the center of the cave to a second terminus, the Stela Chamber. These tunnels are the backbone of the system and provide a reference structure from which to describe the other areas. The cave is generally horizontal with occasional 6°-12° slopes, but the western third

of Tunnel 2 sharply descends at a 40° angle into the Stela Chamber located 20m below the ground surface.

Chambers also referred to as "rooms" are enlargements in a cave passage or tunnel and are commonly (but not necessarily) formed at the junction of passages. They are the largest order of cavity in a cave (Field 2002). Chechem Ha has five areas that have been classified as rooms. In Tunnel 1 there is Chamber 1 near the entrance, Chamber 2 in the center, Chamber 3 and the Dead End at the terminus of the tunnel. In Tunnel 2 there is the Stela Chamber.

Elevated passages are short tunnels that are located above the two main tunnels. One can stand up or at least walk in a stooped position in these areas which differentiates them from crawls. Crawls or crawlways are types of cave passages that are large enough to be negotiated on hands and knees or that require one to squeeze through the area (Field 2002). There are four in Chechem Ha all of which are located above the Tunnel 1 floors. Ledges or shelves follow general dictionary definitions as horizontal projections from vertical surfaces. There are 11 utilized ledges that range from 3-7m in height above the Tunnel 1 floor.

Within the major areas there are smaller features that include alcoves and niches. These features are of analytical importance because they often contain artifacts. Alcoves are a recessed or partially enclosed area, accessible for human entry, opening onto a room, passageway, tunnel or ledge. Niches are similar features but smaller in size and do not permit a person to enter the space. Typically, niches are small holes in walls or located under small overhangs. These features may be on floor levels, sub-floor levels, or elevated above floors.

4.5 Connectivity of Passages

The morphology of the cave constrains movement throughout the system and offers few alternative pathways or routes to the deeper areas of the system (Figure 4-6). The first constraining factor is that there is a single entrance to the cave at the eastern end of Tunnel 1. As one moves from east to west there are four areas at which other passages connect with Tunnel 1 thus providing route choices. Beginning at the entrance to the cave, moving north through Tunnel 1 the first possible detour is Elevated Passage 1. This passage is located above the tunnel floor and does not rejoin Tunnel 1 although it can be viewed from above through holes in the passage floor.

Continuing east through Tunnel 1, the next bifurcation is in Chamber 2. In the northwest area of the chamber, an elevated side passage provides a conduit between Tunnel 1 and Tunnel 2. Tunnel 2 continues north and descends to the Stela Chamber, where the cave terminates. Alternatively, Tunnel 1 passes through Chamber 2 and continues in a northeasterly direction terminating at the Dead End.

Tunnel 2 directly contacts Tunnel 1 17m north of Chamber 2. Moving further north in Tunnel 1, the entrance to Crawl 3 is located on the east side of the tunnel. Although Crawl 3 is open at both ends into Tunnel 1, the eastern entrance is the most accessible and most heavily utilized by the ancient Maya, which suggests that the crawl was accessed from this side.

Across Tunnel 1 from the eastern entrance to Crawl 3 is one of the entrances to Elevated Passage 3. This passage is roughly parallel to Tunnel 1 and connects with it again 28m to the north. However, access to this area is easiest from the northern entrance. Finally Crawl 4 forms a conduit between Elevated Passage 3 and Tunnel 1. This is a short east/west

facing passage that branches off of the elevated passage and terminates in a sheer drop off into Tunnel 1. Although it could have been accessed from the tunnel by ladder, the easiest route into the crawl is to enter via Elevated Passage 3.

4.6 Modifications

Modifications are present in three areas. The first is at the entrance to the cave. According to reports by William Plytez who discovered the site, the entrance was initially blocked with large boulders and sediment. It was highly unlikely that the blockage could have occurred naturally. The second is a deposit of mud and artifacts located at Dead End terminus of the eastern bifurcation of the Tunnel 1. The deposit fills a small tunnel and terminates a cache of artifacts and evidence of intense burning. Although the tunnel continues, it is filled with thick sterile clay. The third modification is located in Crawl 3. A 3m long area was excavated in antiquity to produce a center trench with low walls lining both sides of the passage.

4.7 Cave Sediments and Floor Surfaces

The tunnel floors are covered by clay or clay-like sediment and in some areas, cobble sized rocks or volley ball-sized boulders. Subsurface testing throughout the tunnel system demonstrated that deposits were deeper in some areas than others. The deepest deposits ranging from 1m and greater depths were located in Chamber 1, Chamber 2, and the Stela Chamber, whereas ledges and elevated passages had considerably less sedimentation ranging between 8cm to 40cm.

Some interesting features on the floor surface of the cave were noted. For instance, beneath low overhangs along the walls we frequently noted a white powdery crust (Figure 4-7). Cave powder is a speleothem or secondary mineral growth that can be associated with bat guano deposits in dry caves. Gypsum crystals or other phosphate minerals derived from the guano gravitate to the top of the deposit by capillary action (Forti 1989; Hill and Forti 1997:87). These powders are very fragile and I strongly suspect that they survive under overhangs because these areas are not trampled.

Another interesting feature of the floor sediments was that in many areas, there were bumps on the surface (Figure 4-8). These features were very hard packed. They may have been caused by trampling but were more likely to be the result of uplift during wetting and drying of shrinking and swelling clays.

4.8 Temperature

Temperature and humidity readings for the cave were collected in July of 2003. Temperatures at the cave entrance ranged from 23°C (74°F) to 24.7°C (76.4°F) and humidity levels from 97% to 99%. In Chamber 2, temperatures ranged from 23.6°C (74.5°F) to 30°C (86°F) with a constant 99% humidity. In the farthest area from the entrance, the Stela Chamber, a single temperature reading taken at the entrance to the chamber was 31.1°C (80.8°F) with humidity of 84% and on the same day, at back of the chamber, the temperature was 24.1°C (75.4°F) with 95% humidity.

4.9 Hydrology

George Crowthers and Patty Jo Watson have suggested that the hydrological energy systems in caves can fall into a spectrum ranging from wet "active or dynamic" passages, to dry "abandoned or arrested" passages (1993:53). Chechem Ha Cave is positioned on a steep hill and the site has been generally classified as a "dry" because it does not contain an interior water source (Awe et al. 1997). At Chechem Ha "wet" or "dry" classifications do not adequately describe the existing hydrological system. Some areas of the cave are somewhat active during heavy rains while other passages are completely abandoned. All of Tunnel 2, the Stela Chamber, all ledges with the exception of Ledge 10, and the passages connecting with from Tunnel 1 hydrologically abandoned. This is also true of the areas of Tunnel 1 north of Chamber 2. Active drip formations are present in only two areas: immediately inside the entrance in Chamber 1 and in Chamber 2. Chamber 2 is located near the center of the tunnel system 134m from the entrance. These areas become active during heavy rains and pooling occurs under drip formations. We were unable to observe water flowing into Tunnel 1 during the 1998/1999 field seasons but in 2001 a forest fire burned off much of the secondary growth above the cave causing a change in the hydrology. During rainstorms in the years previous to 2001 we had witnessed as a slow drip from stalactites located in the center of Chamber 1 but when we returned in 2003 much more water flowed from these same formations filling the chamber with pools of water (Figure 4-9). A slow-moving, low-intensity, stream began to trickle down slope through a water eroded channel running along the west wall of Tunnel 1 and culminating in the center of Chamber 2 beneath a broken stalactite fragment. Although the cave is classified as horizontal there is a subtle slope allows the water to flow into Chamber 2 via the channel. The low lying area in the center of

Chamber 2 functions as a drain. This process must have occurred quite often in prehistory to have eroded the channel which is approximately .15m in width and 10cm deep. Water does not travel beyond the chamber into any of the deeper parts of the cave system and there is no evidence for presence of the channel in areas of Tunnel 1 north of Chamber 2.

It must be stressed that the water moving through the channel was an extremely low-energy flow that took literally hours to cover the 134m of winding tunnel that leads to Chamber 2. There was not enough velocity to move even small ceramic artifacts had there been any in its path, nor was there any evidence to indicate that artifacts had been carried by water as no artifacts were located within the channel. Interestingly, artifacts deposited along its route were placed in high areas of the floor and in niches or alcoves along the walls clearly avoiding the channel itself.

It is clear that the cave was wetter in the remote past but became drier over time. This is evidenced by great deal of ancient speleothem breakage and removal that was noted throughout the cave system. No re-growth occurred in most areas indicating that these formations were no longer active when removed (Figure 4-10). As noted above, the only remaining stalactites in the entire cave are presently located in Chambers 1 and 2, in a niche near the back wall of Ledge 10, and in Elevated Passage 2 where there is a single small active drip. The only active stalagmites are located beneath the drip formation in Chamber 2 and are quite small (<16cm).

The largest of the active stalagmites in Chamber 2 was harvested for purposes of study and the inner growth ring from the base was radiocarbon dated and corrected for old carbon using the 15% correction. The calibrated two-sigma date (Oxcal3) indicated that the speleothem began to grow between A.D. 881 and A.D. 903 with the most probable date of

A.D. 940 (personal communication, Henry Schwarcz 2003). Other than the large formation in Chamber 1, this is the largest and therefore the oldest remaining stalagmite in the cave. It did not begin to grow until the Terminal Classic period, about the time that the cave was blocked up. This has a number of interesting implications. First because there has been so little speleothem activity in the cave since the Terminal Classic period, it suggests that since then the current hydrology has not changed considerably. Second, because there are so few stalagmites found in the cave today but ample evidence of speleothem breakage, it suggests the cave was completely denuded of these formations during the Maya era. This is discussed further in Chapter 5.

4.10 Flora and Fauna

During summer field seasons plants and animals observed within the cave were noted. As in most caves, there were marked differences in adaptations between animals capable of inhabiting dark zones and those that can inhabit light or twilight areas (Goldberg and Sherwood 2006:20; Juberthie 2000:29; Sherwood and Goldberg 2001:152). Cave species can be very sensitive not only to light, but to temperature, humidity and substrate conditions. For this reason, at cave entrances there is typically more biodiversity compared with deeper areas (Howarth 1983; Goldberg and Sherwood 2006:20; Sherwood and Goldberg 2001:152). Species can be divided into three types: 1) troglaphiles that are cave-loving species that can live within or outside of caves (e.g. spiders and crickets), 2) troglaxenes that are temporary residents (e.g. bats, cave nesting birds), and 3) troglodytes (troglabites) that are adapted to live solely in cave environments (Sherwood and Goldberg 2001:152; Reddell and Veni 1996). In their study of the Chiquibul cave system in Belize, James Reddell and

George Veni (1996) noted that many species were present near cave entrances, but only troglophiles and troglodytes were present in the deep areas of the caves. Troglobites were rare and found only in the farthest areas from the entrance.

In the twilight zones in Chechem Ha, we noted swallows that were nesting, snakes, lizards, a tarantula, and tailless whip-scorpions. Whip-scorpions are from the Family Tarantulidae, Order Pedipalpida or sometimes Order Amblypygi. Those found at Chechem Ha are likely to be *Paraphrynus mexicanus* common to Mexico (Figure 4-11). While the other species inhabiting the light zone of the cave were not found in dark zones, whip-scorpions are a cave dwelling species and are present throughout the tunnel system. Occasionally swallows followed our lights into deeper areas of the cave but they are not adapted to these areas and became quickly disoriented.

In dark zones we also observed "cave" or camel crickets of the family Gryllacrididae. Cave crickets are troglonexes that are adapted to survive in total darkness and thrive in moist environments (Lewis 2005). Few burrowing insects were found in the cave although on one occasion a single gray beetle was noticed deep within the dark zone in an elevated passage off of Tunnel 1. The only other instance was the presence of a small (1-2mm) albino scorpion-like creature observed in an excavation unit in Chamber 2.

As mentioned in the recent cave history, Chechem Ha was discovered when a gibnut ran into a hole in the blocked cave entrance. Gibnuts also called tepesquintles are large members of the Rodentia order and are the species *Agouti paca*. These large rodents are a local delicacy. They can reach over two feet in length and typically weigh approximately 18 lbs. Gibnuts feed on leaves, fruits, seeds, and tubers. They are nocturnal and are more active on dark nights. During the day they sleep in burrows that may have several entrances and

may be plugged by leaves (Reid 1997:244-245). Local knowledge suggests that gibnuts are known to be troglaxenes. This became clear to me when on a visit to the Belize zoo where I noted that an artificial cave had been constructed in the gibnut habitat. Additionally, according to locals, hunters often search for or trap gibnuts in caves (Antonio Morales, personal communication, 2003).

Although our crew never actually saw a gibnut within Chechem Ha, 55 nests were recorded throughout the tunnel system and fresh scats composed of fruit were found in Chamber 2 on two occasions. The nests are round or ovoid depressions measuring approximately 50cm across. They contain pieces of leaves and trigs and occasionally chewed pot sherds. All gibnut nests were located against walls or under overhangs. Also, scratch marks that could be attributed to gibnuts were found on the cave wall at the entrance to Tunnel 2, 2.16m above the Tunnel 1 floor, suggesting that gibnuts entered Tunnel 2 via this route. A large number of nests were located in Tunnel 2 in the deepest recesses of the cave system. Additionally a large number of bones identified as gibnut were found in subsurface excavations in the Stela Chamber (Howard Hecker, personal communication, 1998).

The most common troglaxenes inhabiting the cave are bats. Bat roosts were noted on Ledge 4, Ledge 10, and in Alcove 4 adjacent to Chamber 2. On a recent expedition to Belize to investigate tropical bats, naturalist Fiona Reid visited Chechem Ha and identified the current bat population as *Mimon bennettii*, or Golden Bats, a carnivorous leaf-nosed species (personal communication, 2004). According to Reid, these bats typically roost in caves and often found together with *Carollia perspicillata*, a species that eat fruit and insects. Golden

Bats are not well-studied, but are also known to consume fruit and insects as well as lizards, birds, and mice (Gardner 1977:305; Reid 1997:86-88, 99; Whitaker and Findley 1980).

Plants occasionally sprout in the dark zone of the cave. In 1998, we noted that sprouts were coming up near the Dead End and also on Ledge 10 above Chamber 2. The most parsimonious explanation is that seeds excreted by bats grew for short periods of time before succumbing to lack of sunlight. Mold or fungus was also noted in the cave. A few rice grains were accidentally dropped on the tunnel floor and the next day a white silky growth was observed on them.

4.11 Artifact Assemblage

Artifacts are located on the tunnel floors, in elevated side passages, and on ledges in every major area of the cave. The artifact assemblage consists primarily of ceramics, rocks, speleothems, shells, animal bone, ethnobotanical remains, and charcoal. There was one groundstone artifact, a mano, found in Chamber 1, chipped-stone flakes found in the Chamber 1 excavation conducted by the WBRCP in 1998, and one shell ring found in the Chamber 1 test unit 02-03. Two spalls used as crude bowls were found in the 2001 Chamber 2 test excavations and one obsidian blade fragment in the 2004 Chamber 2 excavations. No human remains have been found on the surface or in excavations. Below is a discussion of the major artifact classes-- ceramics, rock, shell, and speleothems-- that includes general observations regarding previous work advanced by cave archaeologists that sheds light on the possible meanings of the artifact class.

4.11.1 Ceramics

Many ceramic fragments as well as whole or partial vessels were distributed on the site's surface (Appendix III). . A total of 470 were typed for chronology (See Appendix III, part 2). They dated from the early part of the Middle Preclassic to the Late/Terminal Classic periods. There were no Postclassic sherds found on the surface or in subsurface contexts. A total of 1901 sherds were recorded as surface finds. If sherd scatters are included the total comes to approximately 2074. The large sherd scatters were not excavated and therefore these counts are only rough approximations. Of the total assemblage 1326 ceramic vessels, partial vessels or fragments were numbered, refitted in situ, and analyzed. Of these there were 51 fully intact vessels in the cave which all dated to the Late Classic period.

Vessel forms included in order of frequency are jars, bowls, dishes, incensarios and vases (See Appendix III, part 1). Tempering agents included calcite, quartzites, magnetic nodules (hematite), mica and rarely-volcanic ash. Of note is the lack of ash tempered ware at the site despite a large Late Classic assemblage. This phenomenon was also noted in the Terminal Classic assemblage at Actun Tunichil Muknal where out of a total number of 1103 ceramic sherds there was not a single ash tempered example (Moyes 2001).

At Chechem Ha, a minimum of 563 ceramic vessels, partial vessels or sherds were imported into the cave. Of these, 113 could be refitted as partial vessels suggesting that they were smashed in situ. There were a large number ceramic sherds found in surface contexts that did not refit with other vessels suggesting that they were offerings in and of themselves. This is discussed at length in Chapter 3.

4.11.2 Unmodified Stone

Within Chechem Ha unmodified stone was used extensively. With the exception of specific cases, these were limestone cobble-sized rocks originating within the cave, which were opportunistically utilized. A few examples were clearly imported from outside: water-worn pebbles used as votive offerings and five river cobbles used as hearthstones may have been collected from the nearby Macal River. Unmodified limestone cobbles functioned both as votive offerings and in the construction of special features such as stone circles. Piles of stone were located in niches or on shelves throughout the cave. In many instances rocks were found among stacked offerings placed between sherds. This suggested that a rock could "substitute" for a sherd within the offering. At times rocks were positioned on top of stacked deposits indicating that the rock was intentionally placed on top of the stack.

They are found in other caves as well. Mike Mirro (n.d.) noted the presence of imported manuports at Barton Creek Cave, Belize. At La Cueva los Andasolos in Chiapas (Navarrete and Martinez 1977) pebbles and limestone fragments were cached inside of three lidded ceramic vessels.

Archaeologically the use of unmodified pebbles and cobbles is difficult to identify, particularly in excavation contexts. It is unclear as to whether pebbles and cobbles are largely ignored as cultural artifacts or whether they occur rarely at surface sites. At Copan, within group 9N-8, the Early Classic burial VIII-36 contained five unmodified quartzite stones found inside of two Usulután Ware mammiform tetrapod bowls (Fash 2001:90-94). These could easily have gone unnoticed had they not been inside of containers. As it was, the stones were crucial in identifying the burial as that of a shaman.

At Chan Nòohol, a Late Classic Maya farmstead in western Belize, Cynthia Robin (2002:255-266) identified a configuration of cobbles laid out as a quincunx. Four river cobbles and a fragment of a greenstone ax were buried in a small *chultun* (subterranean chamber) at the corner of an early building. The color of the stones correlated with the colors associated with the quincuncial model of the universe in Maya cosmology and the deposit was interpreted as a house dedication cache. Francisco Estrada-Belli and his colleagues (2003) reported a sub-stela cache of 112 jade pebbles at Cival in the Petén.

The Mesoamerican ethnographic literature is replete with examples of the use of stone in ritual or sacred contexts. Although it is difficult to directly correlate the ethnographic data with the archaeological record, at the very least cognitive associations and patterns of use demonstrate the importance of unmodified rocks as sacred objects. The use of unmodified stone is suggested as early as the sixteenth century. Bishop de Landa (Tozzer 1941: 78,130) reported that "sorcerers" used stones as instruments of their profession. Additionally, in his notes Tozzer (1941:77,note 340) mentions a letter written in 1805 by a Yucatecan Jesuit priest, D. Domingo Rodriguez, in which there was an account of the destruction of ritual objects that included codices, vases, 13 altar stones, and 22 small stones "of various shapes and sizes."

It is widely reported throughout the Mesoamerican region that found objects collected by ritual practitioners that include unmodified stones are commonly used in divination, curing, and other rituals (Brown 2000). Stones with unusual shapes are frequently kept on altars. Quiche ritual practitioners also collect stone concretions in the shape of animals, vegetables and fruits. These are usually kept in boxes and displayed every 260 days (Tedlock 1993:81). Similarly, in the Cakchiquel village of San Lucas Toliman, small rocks

of various shapes and sizes are found on priest-shaman tables (Woods 1968:129). These found objects enhance the practitioner's supernatural powers by demonstrating his or her *suerte* or luck. The stones are considered to be power objects because they are sent from the sky by deities. Among the Tz'utujil Maya of Santiago Atitlan prayermakers collect rocks with special properties to be used as special ritual objects (Douglas 1969:138).

In the town of Nuyoo in Oaxaca, the Mixtec place unusually shaped rocks on household altars (Monaghan 1995:34, 98-101). The rocks often resemble human faces. They are called *nu ñu' un*, translated "face of the earth" or "place of the earth," and are identified as a kind of *ndiosi* or god. They are closely tied to place and are distinguished by the locale that they occupy. There are *nu ñu' un* of dry lands, ponds, lakes, swamps, sweatbaths, rivers, hearths, ovens, and forests.

In the Nahua village of Amatlán in Veracruz, Mexico, stones with holes in them are power objects valued by shamans (Sandstrom 1991:248). It is believed that in the night, stones may turn into wild carnivorous animals and that stars intercede to protect human beings. The stones are the remains of these animals that have been shot with arrows in the form of meteors.

There are examples of sacred stones originating from the sky and falling to earth. In a recent religious movement among the Mayo of Northwest Mexico, small stones were purported to have fallen from the sky on at least two occasions (Crumrie 1975). The stones were believed to have come from God. In Yucatan, villagers believe that fragments of Precolumbian obsidian or flint found in the bush or in fields are weapons hurled from the sky by *balams* or earth deities to drive away evil winds or animals (Redfield and Villa Rojas 1967:113-114). When people find these fragments, called *toks*, they know that the balams

have been protecting the village. Because of their magical protective properties, to drive away evil winds *h'men* (priest-shamans) bury toks at the four entrances of the village during the *Loh* (meaning redeem or free) ceremony. These stones may also be placed above the door of a house when it is dedicated.

Stones are not only fortuitously encountered but may be deliberately collected from special or sacred places. In a renewal ritual conducted at the beginning of the agricultural year, the Chorti constructed a quincuncial model of the universe using five round, flat, palm-sized, river cobbles (Girard 1966:17-18). The stones were carefully selected for their morphological characteristics and were gathered from a sacred pool from which the rain gods were thought to drink. In rituals conducted by the Lacandon Maya, unmodified stones collected from sacred venues such as archaeological sites or sacred caves are placed in incensarios or *god pots* (Boremanse 1997:327-328, 1998:28-29; Bruce 1975:80; Davis 1978:73-74; McGee 1990:52; Soustelle 1961:59; Tozzer 1907:87-89).

Stones in Lacandon god pots perform special functions. Although Tozzer (1907:87) described the stones as "idols," others describe the stones intermediaries between men and gods (Boremanse 1997:328). Virginia Davis (1978:74) reported that the Lacandon compare them to "radios" that function as transmitters to conduct man's prayers to the intended deities. Alternatively, Robert Bruce (1975:80) argued that these stones were the most sacred of all ritual objects and were referred to *k'anché k'uh*, which translates to "the seat of the god" or "the holy seat." According to both Bruce and Jon McGee (1990:52), they function as a place on which a god could sit in the fire of the burning incense during ceremonies. Both Bruce (1975:80) and Boremanse (1997:328) report that the stones are originally taken from a shrine

related to the god in question and Bruce notes that the stones are considered to be a possession of the deity.

Unmodified stones may function as objects used as payment for favorable results of prayers. A person may vow to carry stones or other objects for several miles in order to place them at the base of a wayside cross if their prayers are answered (Wisdom 1940: 382, 417). It is not unusual for pebbles to be used as "money." Bishop de Landa also mentions that stones were placed in burials to be used for money by the deceased (Tozzer 1941:130). Among the Zapotec of Mitla, Oaxaca, a ceremony performed on New Year's Eve, a ritual exchange takes place at cross at the town boundary or in a cave. People bargain with each other for things that they want in the upcoming year using pebbles for payment, which they call "the money of God" (Leslie 1960:75).

There is only one example that I know of that directly links stones with caves and the instance also involves a type of payment. Victoria Bricker (1973:114) reported that as part of the Festival of Games in Chamula, a cave referred to as a "sweatbath" is visited and jokes with sexual connotations are made regarding the sweatbath/cave. Participants are expected to offer three "tortillas" at the entrance of the cave as a tribute, but the "tortillas" are actually rocks or potsherds. According to Bricker, informants believed that the cave was evil and they would die if they did not offer a tribute.

Based on this brief survey of ethnographic literature, stones appear to have a number of ritual functions. Various types of stone such as obsidian or flint may have ritual meanings that relate to their function as raw materials for weapons or tools. Stones with interesting morphological properties appear to be favored as curated objects. Ordinary river cobbles or pebbles are most likely either tied to place or function as ritual "money." They may serve as

ritual links tying powerful or sacred places to each other, places to events, or one event to another event. They may also be considered to be the possessions of deities or may function as offerings or payments to deities. The offerings to the sweatbath/cave in Chamula are likely addressing the Earth Lord (Mam or Maximon) who, reported elsewhere, is reputed to live in a sweatbath/cave (Tarn and Prechtel 1997:283-284). This deity has been linked by Taube (1992: 92-99) to the Classic period God N. This god holds up the sky and is associated with mountains, rain, and fertility.

4.11.3 Speleothems

Speleothems are found at surface sites in ballcourts (Ferguson 1999), middens (Buttles 2002:314), shrines (Lorenzen 1999:102; Peterson et al. 2005), and commonly in burials (Coe 1959: fig.64; Longyear 1952:43; Pendergast 1990:150; Peterson et al. in press). They are also frequently used as offerings in caves. At the cave site of Actun Tunichil Muknal, following ceramics, they were the most common ritual object to be deposited in caches representing 16% of the MNA of all artifacts in the Main Chamber (Moyes 2000; 2001).

Speleothems have been demonstrated to be sacred objects (Brady et al 1997; Moyes 2000c; Moyes 2001) and Brady and his colleagues have proposed that they are akin to polynesian *mana* in that they have spiritual power. They stress that their connection to the earth imparts these objects with special meaning. There are no doubt layers of meanings as well as nuances in the use of these objects.

One avenue of understanding speleothems is to understand concepts of how people think they are formed. Aside from western scientific explanations, which are largely

irrelevant to this discussion, Hill and Forti (1997:30-39) proposed that cross-culturally throughout history there are three prevailing folk theories of speleothem growth:

- 1) those in which the material grows as a living substance
- 2) those in which it is deposited in some way from underground vapors
- 3) and the most common- those in which dripping water is either congealed into stone or deposits stony material that is carried with it

It is interesting to note that the idea of rocks growing like plants prevailed in Europe in the seventeenth to early eighteenth centuries and that it is not completely dead today. Hill and Forti (1997:34) report that early twentieth century Malays, although aware of the mechanisms of speleothem growth, still believed that they would continue to grow well even if transferred to their gardens. On a recent visit to Oaxaca, on a visit to San Sebastián de las Grutas, a tourist cave south of Oaxaca City, I asked my local guide what he thought of a large stalagmite. I was told that it symbolized a tree because it grew up from the ground like a tree.

The Yucatec Maya terms for stalactite are *ch'ak xix,xix ha' tunich* or *yach kak* (Barrera Vasquez et al. 1980:946). All the definitions indicate that they are entities composed of petrified dripping or distilled water hanging from the ceilings of caves. Karen Bassie-Sweet (1991:82-83) translates *xix ha tunich* (sic) as "drip-water stone." This lexical evidence suggests that the ancient Maya probably fell into Hill and Forti's third category of folk theories of speleothem formation.

This may give us an additional clue as to why they are sacred objects. Water found in caves was considered sacred. It was used in ritual throughout Mesoamerica during pre-Hispanic times (Anderson 1982:82; Duran 1971:131; Sahagun 1981:141). In his summary of

Maya cave use, Thompson (1959:124-127; in Mercer 1975:xv-xxii) suggested that among the Maya, jars found in caves were meant for the collection of *zuhuy ha* or “virgin water” to be used in rituals. While the archaeological record does not support that this was a common practice, it is important to note that the sacred water was thought to originate in caves. In a personal communication, Barbara Tedlock (2000) suggested that the correct spelling is *suhuy*, which translates as “pure” as opposed to “virgin.”

Barrera Vásquez (1980:741) defines *suhuy haa'* as water springing from a hole. According to Tedlock, in practice pure water used for ritual purposes is that which is caught and does not touch the ground. For instance it can be rainwater or dew, may come from a spring, or may be collected from the drips in caves. Water from the center of a spring of a lake source is particularly desirable for ritual purposes since water from the banks or edges of the source is considered to be polluted. One of Tedlock's informants, while collecting water from a spring for rituals, stood on a stone so that she could reach into the middle of the pool and avoid drawing water from the edge for this reason. The concept is also present in central Mexico. Aramoni (in Heyden 2005) notes that in Tzinacapan, water coming from caves in the area is believed to be pure because it originated in the Underworld. Therefore, the creation of stone from pure water dripping within caves is also likely to imbue speleothems with special meaning. Speleothems are not just drip water stones, but *pure* drip water stones.

I have argued elsewhere that at the cave site of Actun Tunichil Muknal three speleothems have been modified and configured to represent the Three-Stone-Hearth feature of the Maya creation event (Moyes 2000c; 2001; 2005a:286-289). The 3-speleothem-cluster located in center of the Main Chamber. It is notable because of its odd configuration of deposition. There is a high degree of confidence that the stones are in their original context

because they have been firmly cemented to the floor with calcite. The three speleothems are stacked together with two on the bottom of the stack and the third on top. Taube (1998:433) notes this specific arrangement in epigraphic representations of the 3-Stone-Hearth (Figure 4-12). Of the 116 speleothems deposited in the Main Chamber, this is the only instance in which the particular configuration occurred. Additionally, the clustered speleothems were modified from their natural cone shapes to a more rounded appearance, closely resembling hearthstones in size and shape. It is hardly surprising that speleothems would be used to represent the primordial hearth stones.

Ethnographic sources paint yet another picture of the meaning that may incorporate the themes of both earth and water. Brady and his colleagues (2002), working in Balam Na Cave near Poptun in Guatemala report that one informant has expressed this notion. Regarding stalactites and stalagmites he states, "they are part of Mother Earth and are sacred because they are made with water."

Additionally, Sergio Garza gathered other ethnographic information from a Q'eqchi' Maya informant that suggests that stalactites and stalagmites have sexual connotations related to fertility. This is hardly surprising given the phallic shapes observed in many stalactites and stalagmites. His informant states:

Stalactites, some people call them *chi-chis* (breasts) because they come out and grow from the body of the earth; just like women's breasts. Also, when water drips from them to the ground they feed the earth just like when a mother breastfeeds her baby. Stalagmites are different. Men call them *picos* (penises) because they look like a man's thing and like our things grow when we want our women. They also grow upward because they want to touch and be with the female from whom the *chi-chis* are growing. When they grow big and reach them it is like a man and a woman mating and the two are one because now they are just one column or wall (*muro*) that touches the ceiling and the earth." (in Burnett et al. 2002; Brady et al. 2005)

This account is important not just for its content but from a theoretical point of view as well. In the informant's mind, the types of speleothem, where, and how it grows all have their own separate but related meanings. It also suggests that there is a male/female dichotomy between stalactites and stalagmites. This poses the question that, in the case of breakage and caching, could the offerings be gendered?

Breakage may also be an important factor in the meaning of speleothems. For instance, Brady and his colleagues (Brady et al. 1997; Brady et al 2002) have argued that speleothems are closely connected to deities or idols based on ethnographic instances. Many of his examples appear to be large in situ stalactites or stalagmites some of which are carved or sculpted. In some cases the destruction of these formations has had major effects on indigenous people such as in the example of the Chocho in the Mixteca Alta in northern Oaxaca. Fray Geronimo Abrego destroyed a stalactite in a cave that was considered to be the local deity. It was not until after this that he was able to successfully accomplish the evangelization in the community (Hoppe and Weitlaner 1969:506).

Although their explicit functions and meanings in the archaeological record have remained obscure, by contextualizing these offerings more specifically, it may be possible to further discern the meaning implied by the ancient users. There is also much to be gained by understanding *how* they were being used. The one conclusion that can be drawn from research to date is that stalactites and stalagmites have a strong connection with water and fertility.

4.11.4 Shell

Jute is the common southern Maya name for the *Pachychilus* species of fresh water gastropods. They are often found as ritual deposits in caves. They also appear as mortuary deposits and have been discovered at surface sites- primarily in ball courts. They are also found in shrines and in middens associated with administrative and ceremonial structures. Working in Guatemala, Sergio Garza (in Halperin et al. 2003:214-215), acquired some interesting data concerning modern ritual usage. According to his informant, because *jute* live in water and are especially associated with springs, which are considered to be sacred water that never goes dry, the snail is considered to be a gift from Mother Earth. Because of this these snails are considered to be sacred food. It is a tradition in the community to cut off the top of the shell and cook them in water. People eat the meat, drink the water, and save the shells. The shells are buried with the dead to provide the deceased with food for their journey or are deposited in caves as offerings to the earth. This suggests that the shells associated with both water and earth but that their depositional environment relates to the earth.

At Chechem Ha, *jute* is found both as surface deposits and in subsurface excavations in the Entrance Passage, Chamber 1 and Chamber 2. The artifact or ecofact appears to be most abundant in the light and twilight zones of the cave although a few shells were found in the Chamber 2 excavations. Halperin and her colleagues (2003:211) have erroneously reported that *jute* at Chechem Ha is primarily associated with water or flowstone activity. This is in fact not the case. Four shells were located in an intermittent pool in Chamber 1, near the entrance, but most were found between boulders in the Entrance Passage excavations and in the WBRCP excavations long the east wall of Chamber 1. In fact there

does not seem to be any patterning at Chechem Ha or elsewhere that associates *jute* with water features as a preferred place of deposition.

What archaeological data from caves does suggest is that, aside from being a common mortuary deposit, *jute* are most commonly (but not exclusively) found in light or twilight zones- in other words, near entrances or at the base of vertical drops. For instance, at Petroglyph Cave an estimated hundreds of thousands of *jute* were found lining a trail around Nohoch Tunich, a large limestone block located in the twilight zone of the cave (Reents-Budet and MacLeod 1997:31-32). A large *jute* cache (457 shells) was located in the twilight area of the entrance chamber at Actun Tunichil Muknal, but none was present deep within the cave in the Main Chamber (Moyes 2001; Griffith 1998:47). At Actun Balam, several thousand "hute" were found in Chamber C at the base of a chimney near the cave entrance (Pendergast 1969:9, 57-58). Artifacts were thought to be cast into the chamber from above.

The prevalence of *jute* in entrances and light zones suggests that they are often either tossed into the cave from outside of the entrance or deposited in caches in light zones. This suggests that they may be associated with people who lack the authority or agency to enter the cave's dark zone (e.g. ritual expertise, political prestige, possibly gender).

4.12 Description of the Tunnel System by Area

To give the reader a sense of moving through the cave, the site will be described area by area beginning at the entrance and moving from south to north in its natural progression. To aid the reader in understanding the chronology and content of each area, I will also synthesize data that have been collected from both surface observations and excavations within the area's description. (A thorough treatment of the Chamber 2

excavations is presented in Chapter 5). My aim is to describe the relationship of an area to its adjacent areas, provide measurement of the space, describe natural features, cultural modifications, and artifact assemblages, discuss relative and absolute chronology, describe subsurface deposits, evaluate usage of the area, and discuss the implications of these data. Maps of both the general area and its relationship to the tunnel system are provided, as well as detailed maps of each area.

4.12.1 The Entrance

Because the cave has a single entrance, this area is particularly important in understanding the history of the site. Anyone using the cave's dark zones must necessarily have passed through Chamber 1. According to the cave's owners, when the cave was discovered the entrance was blocked by limestone boulders. These were cleared from the entrance to permit tourist access. Unfortunately there are no early photos of the original configuration. There are, however, a large number of medium sized boulders found on either side of the gated entrance and on top of the cave (Figure 4-13).

Medium sized limestone boulders and cobbles are also found inside the cave in the entrance passage (Figure 4-14). This area is 14m long, 2.7m at its widest point. It descends at a 16° to 18° slope into Chamber 1 where the floor levels off. A large stalacto-stalagmitic column is located at the base of the slope (Figure 4-15). The center of the passage has been cleared of rock and stairs have been constructed for tourists. According to William Plytez, during the stair construction, boulders blocking the passage were stacked on either side of the wall to increase headroom. These modifications have created a ceiling height of 80cm to 2.5m.

A large number of broken potsherds are located between the rocks. Most of these were non-diagnostic but those recognizable dated to the Late Classic Spanish Lookout period. Of note is that a jar rim sits in a niche in the wall on the east side of the passage and a Mount Maloney style Late Classic bowl sits at the foot of the stairway.

Excavations

Excavation Units were placed at the base of the slope to ascertain whether the rubble inside of the cave was a cultural deposit, and if so, date its initial placement, find the original floor, and determine the original slope. By placing the excavation at the base of the slope, we intended to cut into the boulder jumble from the modern floor surface and follow the original surface.

Unit 02-01 measured 0.80m x 3m. Level one consisted of loose cobbles from the stairway construction interspersed with dark brown silt. A large number of sherds (113) were present throughout and were deposited at various angles. All diagnostic sherds (18) dated to the Late Classic period. Types included Mt. Maloney Black and Dolphin Head Red bowls, as well as Alexander's, Tu-Tu Camp Striated, and Cayo unslipped jars.

Level 2 was defined by a change in the matrix. The sediment color was similar to Level 1, but the matrix was more compact and smooth with no angular or sub-angular cobbles or pebbles present. Six sherds were horizontally embedded in the top of the level suggesting that they were trampled. Two of the embedded sherds were from red-slipped, flat-based bowls identified respectively as Sierra Red: Society Hall Variety, and a Sierra Red: Variety Unspecified (Jaime Awe personal communication 2002) dating to the Late Preclassic Barton Creek phase (Figure 4-16). A small body sherd of an unslipped jar with impressed

filleting was also present on this level consistent with Late Preclassic styles. The unit was closed when sterile clay was reached below the embedded sherds at 20cm below the surface.

What is of interest about this unit is that the ceramics date to two distinct time periods at least 600 years apart. Level 2 is clearly a Late Preclassic use-surface as evidenced by the horizontally embedded sherds. Although the rock on the surface of Level 1 may have been recently deposited, it contained Late Classic material as would be expected in later deposits and is clearly derived from a surface context. It appears that the bulk of the rock was deposited in the area sometime between these two periods.

The second unit, Unit 02-04 was a salvage excavation that was undertaken during a repair to the bottom step of the entrance passage. While clearing small boulders and cobbles at the base, William Plytez discovered what he believed to be "bedrock." Unit 02-04 was established in the center of the pathway adjacent to Unit 02-01. The unit measured 1.5m x 1m and was oriented north/south. The "bedrock" was in reality a compacted clay surface located 10cm to 12cm below the modern use-surface. The surface was designated Level 1. Two non-diagnostic jar sherds were horizontally embedded in the surface. The surface was 1-2cm. thick. The clay was bluish gray (10B3/1) in color and coated with a white crystalline powder crust (Figure 4-17). This crust looked very similar to crusts observed on the cave floor under un-trampled overhangs (See Figure 4-7) suggesting that it is a similar cave powder deposited or precipitated in situ that has remained undisturbed. These crusts are very fragile and any trampling immediately destroys them, therefore this sediment could only have been preserved had it been covered over- in this case by soil and stone. A piece of wood charcoal was removed from the surface of Level 2 and was radiocarbon dated to A.D.

250 to A.D. 430, the Early Classic Period. In order to preserve the surface for future study, only the south half of the unit was continued.

Level 2 was initiated following the removal of the blue hued surface. The matrix was composed of small to medium sized boulders, cobbles, and dark loose silty sediment. The level produced carbon, three speleothems, 10 jute, one fresh water bivalve, and 52 non-diagnostic sherds. The material was jumbled between rocks and no flat surfaces were present. The rocks were lifted and at the base of the unit 45cm below the surface, there was a change in compaction that was designated Level 3. Figure 4-18 shows a profile of the unit.

Level 3 consisted of well-compacted clay and very little cultural material. A single bowl sherd, two jute shells, and a speleothem were found. The sherd was horizontally embedded in the clay and directly beneath it was a large piece of charcoal. The sherd had a Savanna Orange type paste, dark red well-burnished slip, and was post-slip incised (Figure 4-19). It was identified as Reforma Incised bowl from the Jenny Creek phase. This agrees well with the AMS date 770 B.C. to 400 B.C. from the charcoal beneath the sherd, which also falls into the Middle Preclassic Period.

Another layer of rock was lifted and sterile sediment was encountered. To remove more rock would have entailed significantly expanding the unit, which for crew safety would have required structural supports. Because there was no indication of how deep the deposit could be, in the interest of time, the unit was abandoned and material left intact for future excavations.

This unit was interesting because we encountered two distinct use-surfaces the first dating to the Early Classic period and the second the Middle Preclassic. Rock was deposited on both surfaces indicating at least two episodes of deposition--one after the Middle

Preclassic period and another following the Early Classic. The crust on the Early Classic floor suggests that the cave sat dormant for some time beginning no earlier than A.D. 210 and, based on the ceramics, ending by the Late Classic period, at approximately A.D. 600 to A.D. 700. This scenario agrees well with the data from Unit 02-01.

Discussion

Beginning with the artifacts, shell and ceramic deposits located this close to the entrance of the cave suggest two possible ritual behavior patterns. None of the deposits was cached or stacked but were scattered over the area. This suggests that items may have been either tossed into the entrance passage from outside of the cave entrance or they may have been scattered over the area while passing through the entrance.

The condition in which the owners discovered the outside entrance strongly suggests that the cave was ultimately blocked by its ancient Maya users. This is believable because it is likely that the cave would have been heavily looted had the entrance been easy to find. This is an especially compelling argument because all of the known caves in the area that have not been curated have been stripped of most surface artifacts.

The rubble concentrated in the interior of the entrance provides a surprising amount of stratigraphic information from the test excavations despite the fact that much more rock would have had to be cleared to arrive at definitive results. To begin, if the stone was introduced into the cave as a single event we would have expected to find a use-surface associated with the Late to Terminal Classic material beneath rocks or boulders. It appears that much of the stone was already in place by the Late Classic period as evidenced by the surface finds and Level 1 materials produced by both units. What is interesting is that between the rock layers in Unit 02-04 a Middle Preclassic, a Late Preclassic, and a clear

Early Classic surface were encountered. The Early Classic surface was topped by a mineral crust that did not show signs of trampling and was covered by rock and sediment. Unit 01-02 produced one Late Classic and one Late Preclassic surface.

These data suggest that the stones were deposited in multiple individual events. Based on the excavations, it appears that the cave was blocked and unblocked several times over the course of its history to prevent access to the site. This is not unprecedented among the Maya. Blocked cave entrances were also noted at Dos Pilas by Brady and his colleagues (1997a:360) at the Cueva de Los Quetzales, Cueva de Río Murciélagos, and Cueva de Sangre and are thought to be evidence of termination rituals. This is discussed further in Chapter 7.

4.12.2 Chamber 1

Chamber 1 is a flat kidney shaped area located at the base of the Entrance Passage (Figure 4-20). It is in the twilight zone of the cave although there is a small dark zone northwest of the boulder in the northernmost area of the chamber. The chamber measures 14.5m on the north/south axis and is 7.2m at its widest point (Figure 4-21). It constricts in the northeast area at the entrance of Tunnel 1. Much of the floor on the east side is covered by cobble sized rocks.

A stalactite hangs above a large stalagmite that measures 2m in diameter and dominates the center of the room (Figure 4-22). During rain storms the stalactite is active and introduces a great deal of water into the chamber. Half a meter to the southwest of the stalagmite is a pit measuring 1.4m x 1m that forms an intermittent pool during heavy rains. The pit is lined with cut stone boulders on the west side (Figure 4-23). Two jute shells were noted in the clay matrix at its base.

On the west side of the chamber a mano fragment rests in a crevice in the wall 1m above the floor surface (Figure 4-24). The fragment measures 14cm x 9cm x 5cm and is flat and smoothed on one surface indicating that the object was used before it was deposited in the cave. This is the only groundstone object that has been located in the cave to date.

Moving north along the west wall there is an alcove that measure 1.5m x 2m. Within the alcove is a niche in the north wall 1.3m above the floor. A flat stone is wedged in the niche and 26 cobble-sized stones are piled on top of the stone platform (Figure 4-25). Although this feature was not taken apart, there is no apparent evidence of burning or the presence of other artifacts.

Also located in this area is a small niche within the wall measuring 37cm x 51cm. A calcified object sits between five cobble-sized rocks within the niche. The object is shaped like a small stick and is 14cm long and 1cm in diameter. It is covered by a calcite crust and is pocked with holes (Figure 4-26). Below the niche is a small hole containing two small rocks covered in calcite. There is no calcite inside or surrounding the hole suggesting that the rocks were placed intentionally.

Toward the rear of the chamber on the north end is a large boulder that blocks light to the area away from the entrance. A large piece of a broken Late Classic wide-mouth jar is located in the overhang beneath the boulder (Figure 4-27). A stack of sherds belonging to the jar sits adjacent to the partially intact vessel and a spall has been placed on top of the stack. This suggests that the jar was smashed in situ.

On the north wall of the chamber is an overhang. The floor under the overhang is covered with cobble-sized limestone rocks that are probably a natural feature. At the northeast side of the overhang is a rim sherd from a Late Preclassic/Early Classic jar.

On the east wall of the chamber is a natural stone bench located near the entrance passage. Moving north the chamber wall begins to slope upward exposing bedrock. A large scatter of cobble-sized limestone rocks is located between the east wall and the large stalagmite in the chamber's center. A Middle Preclassic sherd was found on top of the surface scatter (Figure 4-28) beside a sherd from an Early Classic dish.

Excavations

In 1998, the WBRCP placed Unit 5, a 1m x 3m unit with a 1m x 1.25m extension adjacent to the east wall. Ceramics were typed by Reiko Ishihara. The unit was dug in 10cm arbitrary levels. Sherds from this area were surface collected and several jute were found during removal of surface cobbles. Level 1 produced charcoal, a gibbon tooth, bat bone, and potsherds. One chert core and four chert flakes were found in this level. These and the flaked stone from Level 2 were the only stone tools located in the entire site in surface or subsurface contexts aside from the mano fragment found in Chamber 1. Potsherds from this level were non-diagnostic. At least half of the unit reached bedrock in the first level. A charcoal scatter was noted in a depression in the bedrock.

Level 2 produced jute, sherds, shell, two speleothems, possible chert cores, flakes, a slate fragment, and a large piece of granite. Sherds in this level dated primarily to the Middle Preclassic but were mixed with those from the Early and Late Classic periods. A light gray clay-like deposit overlaid the limestone bedrock. The limestone exhibited a blue tinge suggesting that it was burned and that the clay-like deposit was ash. Two additional levels were dug in this unit. Level 3 contained a Middle Preclassic sherd and little other material and Level 4 produced only charcoal. At this point the excavation was terminated.

The extension unit produced similar results. Level 1 produced sherds, lithics, and a speleothem. Middle Preclassic potsherds were found alongside Late Classic examples. Level 2 contained non-diagnostic ceramics, jute, a speleothem and a fragment of slate. Level 3 was sterile and the unit was terminated.

In 2002 my crew placed Unit 02-03 measuring 1m x 1m in the center of Chamber 1 south of the intermittent pool. The goal of this excavation was to test for stratigraphy and deep deposits in an area located away from the chamber walls which tend to curve inward. The unit was placed in an obvious pathway in hopes that the sediments would produce a useful chronology for the entire site as it is necessary for anyone entering the cave to pass through the area.

We had hoped to dig the unit in cultural levels, but it proved impossible. The Level 1 matrix consisted of hard compact clay with marl and pebble inclusions. Gray chert-like pebbles were noted throughout the unit which may in fact be mudstone. Substantial amounts of carbon were present throughout the layer. The level produced charcoal, 44 non-diagnostic ceramic sherds, one jute, one speleothem, and a fragment of shell ring (Figure 4-29). Potsherds were small and highly weathered. The ring measured 3cm in diameter and the color of the shell suggests that it may have been carved from spondylus. This artifact is not typical of cave deposits.

As there was no apparent stratigraphy, Level 2 was opened as an arbitrary 10cm. layer. The matrix remained the same but cultural material diminished in this level. A tree root ran through the northwest quadrant. The level produced charcoal, 35 non-diagnostic ceramic sherds, one jute fragment, and three unidentified bone fragments. The excavation was discontinued when sterile clay was encountered at 18cm below surface. Although we

hoped to find good stratigraphy in this area, the matrix of the unit was homogenous. What may account for the problem is that this is the wettest area of the cave. Trampling in this area, particularly after a rain, may have disrupted any possible stratigraphic layering.

Discussion

Ceramics in Chamber 1 are present in both surface and subsurface contexts. Higher concentrations of artifacts were found in subsurface contexts than in surface contexts. There were 20 sherds recorded on the surface deriving from at least eight vessels- two dishes, two bowls and two jars. All are from different time periods ranging from the Middle Preclassic to the Late Classic. One Early Classic dish and one Late Classic jar may have been broken in situ.

Based on the artifact record and particularly on subsurface investigations, it is apparent that Chamber 1 was an important ritual venue. Much of the ceramic material dates to the Middle Preclassic and to the Late Classic but little subsurface or surface material suggest intense Early Classic or Preclassic usage.

Another distinguishing feature of this area is the variety of artifact types present in the Chamber. Some types are found exclusively in this area such as the groundstone mano, the shell ring, and the chert flakes reported by the WBRCP. Additionally, jute is more prevalent in both the Entrance Passage and Chamber 1 than in other cave areas in either surface or subsurface contexts.

4.12.3 Elevated Passage 1

Elevated Passage 1 is located just inside Tunnel 1 at the beginning of the dark zone on the west side (Figure 4-30). The passage is located 3.4m-4m above the tunnel floor and is

currently accessed via a metal ladder (Figure 4-31). It is oriented on a north/south axis and is entered via the southern end. The passage runs over the top of Ledge 4 and the northernmost terminus re-connects with Tunnel 1 4m above the tunnel floor culminating in a sheer drop off. There are two holes in the floor of the passage that look onto Tunnel 1. The passage is 17.5m long, 3.5m at its widest, 1.3m at its narrowest point and headroom is approximately 1.5m. Non-active stalactite stumps are located on the ceiling at the south entrance (See Figure 4-10). Fresh bat bone was noted in the passage in 1999 suggesting that it is an area of bat activity.

The area is noted for the number of large Late Classic style jars deposited in the passage (Figure 4-32). There are at least five jars and two dishes that are 100% complete and another five jars that are partially intact. Rim diameters of jars range between 18cm and 52cm (Figure 4-33). A total of 140 sherds were recorded in the passage representing at least 42 individual vessels. Four were dish forms, seven bowls, and 28 jars. Of these whole or partial vessels, 14 jars, two bowls and one dish appear to have been broken in situ.

Thirty-five were typed and with one exception were identified as belonging to the Late Classic Spanish Lookout complex. Positioned on the west wall of the passage near the south entrance among a group of small cobbles and spalls are two fragments of a Middle Preclassic Alta Mira Fluted bowl. We located this vessel in the 1999 field season but were unable to find it in 2003. This early type is distinctive so it is doubtful that there was an identification error. However, this sherd may have been deposited in the passage at a later date or moved by tourists.

Ceramic artifacts in this area were deposited in groups and stacks in the central area of the passage (Figure 4-34). One jar sits in an inverted position. Two dishes are now

missing from the assemblage. The first is located at the Institute of Archaeology (IOA) in Belmopan. It is an intact Late Classic, red slipped, tripod, vessel with rattle feet typed as a Cameron Incised of the Tinaha group (Figure 4-35). The other is a similar red dish that was stolen in 1998. It is pictured in a 1997 photograph I took while on a tour of the cave (Figure 4-36).

Starch grain analysis was conducted on matrices collected from six intact jars in this area (Morehart 2002a: 173-175). Only one produced starch grains and these were consistent with starch of *Zea Mays*. It is possible that this jar may have been a storage jar for maize or have contained *balche*, a corn based alcoholic drink.

Dating the Passage

A 40cm x 40cm shovel test pit was placed in the central passageway. Bedrock was encountered at 16cm below the modern surface. The sediment was a red/brown (Munsell #10YR5/3) heavily compacted clay containing bands of white limestone marl at the base of the pit. With the exception of a few very tiny charcoal flecks located 3cm below the surface, there was no other cultural material in the deposit. This suggests that the area was not intensively used despite the number of vessels in the area.

Charcoal scatters were located on the floor around vessels. Three samples were collected for dating. All three were returned with post bomb dates. Although these results were disappointing, the owner reported that torches were used in an early photo shoot and in early explorations. This area of the cave is easily accessible and highly photogenic so it is likely that the original deposit was contaminated. Despite the radiocarbon results, the ceramics in this area indicate that this area was used exclusively in the Late Classic period.

4.12.4 Ledges 1, 2, 3, Niches 1, 2, 3, 4, and Crawl 1

Below Ledge 1 at the entrance to Tunnel 1 adjacent to the southwest wall is Shovel Test Pit 001. The unit measures 50cm x 50cm and is 35cm in depth. There was no obvious stratigraphy and the matrix in the top 32cm consisted of heavy dark brown clay with marl inclusions and charcoal flecks. The base of the deposit was sterile light brown clay.

Near the entrance to Tunnel 1, located along the southeast wall, are four stumps that are the remains of harvested stalagmites. They measure 6cm to 8cm in diameter and appear to have been collected in antiquity. No re-growth has occurred and there is no evidence of water dripping from overhead in the area at this time. This suggests that wetter conditions existed in the cave in the past prior to Maya usage.

Located on the southeast wall is Niche 1, a small shelf located 1.5m above the tunnel floor. It measures 7cm x 3cm. The niche contains 15 sherds. Of these nine were non-diagnostic and six were fragments from two Late Classic Jars.

Ledge 1

Ledge 1 and 2 could be considered as one large ledge although it is physically difficult to move from one to the other. Ledge 1 is located on the southeast side of Tunnel 1 directly across from Elevated Passage 1 (Figure 4-37) and can be viewed from the south entrance of the passage (Figure 4-38). The ledge is 2.8m above the tunnel floor, is oriented on an east/west axis, measures 5.6m in length, 1.36m at its widest, and .6m at its narrowest point (Figure 4-39). The shelf slopes 12° from the back wall to the edge and cobble sized limestone rocks are wedged beneath three vessels to prevent them from rolling off. There was no subsurface deposit on the ledge and no charcoal was noted.

A total of 14 jar sherds representing nine vessels are found on the ledge. Of these, four were typed to the Late Classic Spanish Lookout complex. Three partial jars were most likely broken in situ. Jars were medium to large in size with rim diameters were between 26cm and 37cm. Three jars were almost completely intact and one sits in an inverted position. A large sherd serves as a container for six smaller sherds. This ledge exhibits relatively little utilization and use appears to be limited to the Late Classic period.

Ledge 2

Ledge 2 is east of Ledge 1 (Figure 4-40). It measures 6.5m length and 2.5m in width and is located 3.1m above the tunnel floor. Along the back wall of the ledge there is a pit or depression. A partially intact Late Classic jar sits in an inverted position within the pit and beneath it are five sherds from the same vessel. This instance strongly suggests that the entire vessel was broken in situ.

Two holes in the floor of Ledge 2 contact Crawl 1, which may also be accessed via Tunnel 1. This area measures 5.7m in length, 5.3m at its widest and 2.7m at its narrowest point and could also be considered a large alcove. The ceiling height in this area is approximately 75cm, thus its designation as a crawl space. Radiating from the crawl are three unexplored passages too small to be negotiated. The crawl contains two non-diagnostic sherds.

Niche 2

Moving east along Tunnel 1 there is an oxbow or elbow in the tunnel where it turns northward. On the east side on the tunnel floor beneath an overhanging wall is Niche 2, measuring 2m in length and 6cm in width and 4cm in height. Flanking both ends of the crescent-shaped niche are piles of cobble-sized rocks, a typical pattern in these types of

spaces at Chechem Ha. Against the back wall of the niche is a rodent nest. The area contains a speleothem, a spall, and eleven sherds representing at least four vessels. Two were probably broken in situ. There is no possible mechanism for the speleothem or the spall to have arrived at this location by natural processes so it is safe to say that these objects are part of the ritual deposit. Three of the sherds are diagnostic and date to the Terminal Preclassic/Early Classic period.

Niche 3

Also located on the east tunnel wall 3m from Niche 2 is Niche 3. It is also formed by an overhanging wall on the floor of the tunnel. It measures 36cm in length and 20cm in width. Within the niche are a rodent nest and four ceramic sherds. One sherd is a fragment of a deep sided bowl and the others are dishes, one of which dates to the Middle Preclassic period. There are two fragments of the undated dish suggesting that it may have undergone some form of ritual breakage.

Niche 4

There are no other artifacts in this leg of the tunnel with the exception of a small speleothem placed in a niche in the wall (See Figure 4-41). Niche 4 is located 1.2m above the tunnel floor beneath Ledge 4. The speleothem has a phallic shape and measures 10cm in length and 3cm in diameter. This artifact disappeared sometime between the 1999 and 2002 field seasons.

Ledge 3

Ledge 3 is located at the elbow of Tunnel 1 on the west side of the tunnel. The ledge is oriented on a southwest axis and measures 3.7m in length and 2.4m at its widest point (Figure 4-42). A drop in ceiling height in the northwest half forms a small circular alcove

roughly 2.3m in diameter and 55cm high. Within the alcove is a pit that appears to have been excavated through layers of flowstone in antiquity (Figure 4-43). It is lined with cobble sized rocks and small boulders. At the base of the pit is a large broken speleothem that could not have arrived at its current position by natural processes. The pit contains charcoal and a fragment of disintegrated wood. Another small speleothem sits among the rocks lining the pit along with three non-diagnostic sherds. An additional sherd is found in a depression to the southeast. One of the most interesting features in this area is a hole forming a window-like feature in the wall to the east of the pit (Figure 4-44). The hole has been blocked with small boulders and cobble-sized rock.

4.12.5 Ledge 4

In this area Tunnel 1 doubles back on itself and turns westward. Ledge 4 is located on the south side of the tunnel beneath Elevated Passage 1, 2.41m above the tunnel floor (See Figure 4-45). It can be approached from Tunnel 1 anywhere along the east side. The ledge is 10.7m long and 3.2m in width. Bats roost in the area today. There are 27 ceramic sherds located on the ledge that include eight jars and two bowls. Only one was diagnostic, a Late Classic, Spanish Lookout, style jar. Five of the jars and one bowl appear to have undergone ritual breakage.

The ledge is distinctive because of the presence of four stone circles sit adjacent to the west wall. The wall curves inward and a raised area of bedrock juts out from the back wall (Figure 4-46). Stone Circle 1 is constructed of six cobble-sized rocks set in a circular pattern and butted to a semi-circular area of bedrock that completes the circle (Figure 4-47). It measures roughly 47cm in diameter. Within the circle were a Late Classic Cayo Unslipped

jar sherd and a few charcoal flecks. Although there is little sediment on the ledge, within the circle there is reddish brown silt containing the remains of insects indicating that it is bat guano.

Stone Circle 2 located 1.8m east of the first circle was similarly constructed from six cobble-sized rocks arranged in a circular pattern and abutting a semi-circular area that is a natural feature of the bedrock (Figure 4-48). It measures 58cm in diameter. The circle contained charcoal and a sample was collected for dating. The date returned as A.D. 690 to A.D. 900 with an 85.4% chance of falling in the later part of the range A.D. 760 to A.D. 900

Stone Circle 3 is located 1.2m south of Stone Circle 2. It is composed of ten cobble-sized rocks placed loosely in a circular pattern abutting the back wall of the cave. It measures 45cm in diameter. Charcoal flecks were noted within the feature and two non-diagnostic sherds were associated with it. Stone Circle 4 is .70m east of Stone Circle 3. Two cobble-sized rocks line a shallow depression in the cave floor. The crude circle measures approximately 48cm in diameter. The cobbles are intentionally placed on the edges of the pit, but there are no visible artifact deposits in association with the feature.

The function of the circles is unclear although the presence of charcoal flecks within them suggests that they may have been hearths. However, there was no intensive burning and the charcoal flecks could easily have fallen from torches. Stone circles are found in other caves as well. Two similar circles fashioned from limestone cobbles were found in a small cave, Actun Isabella, near the nearby site of Minanhá (Birch and Philpot 2002). This is not however an entirely local phenomenon. In a 2002 reconnaissance, a stone circle was found in Rice Mill Cave in Northern Belize near the site of Blue Creek (Figure 4-49). A

similar stone circle was also reported in Cueva II at Teotihuacan (Seguras 1998:183). This cave is south of the Pyramid of the Sun and dates to A.D. 300 to A.D. 350 (Figure 4-50).

Dating

This ledge does not appear to be heavily utilized. The ritual function of the stone circles is unclear and the lack of heavy charring precludes their functioning as hearths. The Late Classic date derived from the diagnostic sherd and the AMS dates are in agreement that this area was used during the Late to Terminal Classic Period.

4.12.6 Ledge 5, Alcove 1, Niche 6

Tunnel 1 makes a sharp turn and this area and continues in a north/south trajectory for 16m and then to the northeast for 15m (Figure 4-51). Niche 5 is a small hole in the wall 1.05m above the tunnel floor, measuring 45cm x 12cm that contains two small sherds. One is non-diagnostic and the other from the Late Classic Spanish Lookout period. Shovel test pit 003 was placed in the tunnel south of Ledge 5. The pit measured 25cm x 25cm and was 32cm in depth. It was excavated to bedrock. The top 28cm of the sediment was dark clay that contained charcoal and the basal sediment was sterile lighter colored heavy clay containing siltstone.

Niche 6 is found in the area in which Tunnel 1 veers to the southeast. The niche located on the tunnel floor beneath an overhang on the south side. It measures 2.8m in length and .6m in width. Five cobbles are clustered on the north side and a rodent nest is located on the south. The nest contains a single unidentified sherd and there is a sherd from a bichrome dish lying against the back wall. Alcove 1 is a concavity on the west side of the tunnel wall.

There is a rodent nest in the back of the alcove. A single unidentified sherd sits adjacent to the nest suggesting that it may have been transported to its current location by rodents.

Ledge 5

Ledge 5 is located on the west side of the tunnel 5m above the tunnel floor slightly overhanging the tunnel wall. Consequently, visibility to the ledge is limited and it can be viewed best in the area surrounding Shovel Test Pit 003. The ledge is 5.3m in length and 1.8m in width from the back of the cave wall to the edge (Figure 4-52). It can be approached from Tunnel 1 anywhere along its length via a ladder. There are 21 ceramic sherds, one intact bowl, and two partially intact dishes on the ledge. Sixteen of the 21 sherds belong to a single jar suggesting it was smashed in situ.

On the south end of the ledge is a circular depression measuring 5cm in diameter. The east side of the pit is lined with six cobble-sized spalls. Toward the center of the ledge is a circular depression in the bedrock 45cm in diameter. Within the depression are two bichrome dishes in a lip-to-lip position (Figure 4-53). They are very similar to one another in form as they both have basal ridges and have rim diameters of 32cm. They are almost completely intact but have chinks removed from the lips. Both are polychrome vessels that have been assigned to the Tiger Run complex of the Late Classic period. The bottom dish is slightly charred on the exterior and has an abstract motif possibly of a shell on the interior of the vessel. Starch grains consistent with those of *Zea mays* were found in the matrix collected from the dish (Morehart 2002:173-175). The top vessel is heavily charred on the exterior and has a drawing of a frog on the interior (Figure 4-54). The dish was coated with a brown greasy residue that has not as yet been identified.

An intact bowl sits between the lip-to-lip cache and the wall. The bowl is deep-sided and measures 17cm in diameter and 9cm in height. The exterior is heavily charred but appears to have a brown paste and an incised line surrounding the base (also see Figure 4-53). It has been typed by Ishihara as Pucte Brown: Variety Unspecified dating to the Early Classic Hermitage Complex but this is suspect as this type is a Petén Gloss Ware that is noted for its glossy exterior finish. In form, the vessel most resembles those of the Tiger Run complex Sotero Ceramic Group noted in Gifford (1976:212, Figure 127g). Joseph Ball and Jennifer Taschek concur with this reassignment (personal communication 2005).

Dating

This ledge does not appear to be heavily utilized. Although sherds and vessels exhibited charring, there is little charcoal on the ledge indicating that they were not burned in situ. In the absence of radiocarbon dates and because there is so little cultural material, it is difficult to assign a date of usage to this area. Although the ledge may have been used as early as the Early Classic period, it is more likely that it was a single utilization occurring during the early part of the Late Classic period consistent with the majority of the identifiable ceramic vessels.

4.12.7 Ledge 6, 7, 8 and Alcove 2 & 3

Alcove 2 is located on the east side of Tunnel 1 beneath an overhang measuring 2.5m in length and 95cm in width and 1.45m in height (Figure 4-55). There are eight cobble-sized rocks and three small boulders in this area. The top half of a Late Terminal Preclassic/Early Classic, Chan Pond unslipped jar rests against a rock (Figure 4-56). Adjacent to the jar is a concentration of charcoal and a non-diagnostic sherd.

At this point there is an elbow in the tunnel and it turns northwest. At the elbow, on the west side, Ledge 7 creates an overhang forming Niche 7. The niche measures 1.25m in length and 50cm wide with a 50cm ceiling height. There are 11 cobble-sized rocks, a spall and a sherd scatter of 24 small sherds as well as an unidentified dish sherd, a Late Classic, Spanish Lookout Complex bowl sherd, and two jar sherds, one of which is from the Late Terminal Preclassic/Early Classic period. One of the jar sherds refits with a vessel located in Alcove 3 beneath Ledge 6.

On the wall above the alcove are two places where there are small holes in the limestone. Above these holes is black charring (Figure 4-57). Although marks are often found on cave walls presumably from hitting torches against them to knock off excess embers, this appears to be something different. Because the charring occurs directly above the crevice, it is possible that splinters of wood from torches were placed in the holes to provide extra light to the area or that small pieces of sap or incense were placed in these very small niches.

Alcove 3

Alcove 3 is located beneath Ledge 6, which forms an overhang measuring approximately 3m in length and 1m in width (Figure 4-58). This area contains a great deal of ceramic material dating from the Middle Preclassic to the Terminal Classic periods. There are no complete vessels in the assemblage but two pieces from an entire heavily charred Early Classic polychrome dish sit in the south end of the alcove (Figure 4-59). Parts of two Late Classic bowls, an additional Early Classic dish and a Terminal Preclassic/Early Classic jar have undergone some form of ritual breakage as well. There are at least 75 sherds from a minimum of 15 vessels, which include nine jars, five bowls, and one dish. A niche

containing charcoal and measuring 44cm in length and 27cm in width is located in the rear wall 21cm above the chamber floor.

Shovel Test Pit 005 is located in front of the alcove below Ledge 6. The pit measured 5cm x 5cm and reached between 20cm and 30cm in depth before encountering bedrock. The sediment was mottled dark brown and reddish brown clays containing marl. The basal layer was the same lighter brown colored clay encountered at the base of other test pits. AMS dates were obtained from a sample collected 27cm below surface and one from a sample located 5cm below surface. The first dated to A.D. 260 to A.D. 540, the Early Classic period and the second from 360 B.C. to 60 B.C., the Late Preclassic period. This data suggests that there may have been a good deal of mixing of the sediments in this area. The combination of ceramic complexes present in Alcove 3 together with the AMS dates suggests that the area was used as from as early as the Late Preclassic period to the Late Classic. Although there is one sherd on the surface that suggests a Middle Preclassic usage, it may have been moved to its current position from another area of the site at a later date.

Ledge 6

Ledge 6 is located at an elbow in the tunnel on the east side. It is 4.56m above the tunnel floor and measures approximately 5m in length and 1.5m in width. It can be accessed by ladder from Tunnel 1 anywhere along its west side. There is little or no sedimentation on the ledge. The floor of the ledge slopes and rocks were placed beneath several jars to prevent them from rolling off. There are 19 ceramic entities on the ledge representing at least 13 vessels. The assemblage consists of eight jar sherds, four bowls and a dish. These include eight vessels that are fully intact and one that is partially intact. There does not appear to be

any ritual breakage on this ledge. All typed vessels fell into the Spanish Lookout complex dating to the Late Classic period.

Beginning at the south end of the ledge, an intact jar sits within a pit. There are no visible residues in the jar. Three jar sherds are found in a pit to the west of the jar. Moving north there is another intact jar held on the ledge by fist-sized cobbles wedged beneath its base on the down-slope side (Figure 4-60). The jar was lidded with a red slipped bowl that was stolen from the cave. There are no visible residues within the jar.

Adjacent to the jar is a similar intact, wide-mouthed jar containing corn (Figure 4-61). The vessel is lidded with a large Mt. Maloney bowl that fits within the rim of the jar. The vessel is approximately 1/3 full of a grainy reddish brown matrix that has been identified as corn. When discovered, four small partially intact cobs were resting on top. These were sampled in 1998 and analyzed by Morehart (2005, 2002a:168-172). The cobs were not carbonized and identified as *Zea mays*. Morehart accounted for shrinkage and determined that the cobs are underdeveloped ears of ten-rowed corn.

A red Late Classic style tripod vessel with rattle feet sat down slope of the jar containing corn. This vessel was almost completely intact, but was stolen in 1998. It is pictured in the foreground in Figure 4-60. On the northernmost end of the ledge, nestled within a wall curvature is a wide-mouthed, Late Classic lidded jar similar to the vessel configuration containing corn, but it is empty (Figure 4-62). The lid is a Mt. Maloney bowl that sits within the rim of the jar. The vessel is supported by a number of stones and there is heavy charring both on its base and beneath the jar. A spall sits between the jar and the wall. A radiocarbon date was obtained from a charcoal sample collected from beneath the jar. The

charcoal dated to 720-960 A.D. with an 83.3% chance of it dating between A.D. 770 and A.D.960. This date agrees well with the ceramics.

Ledge 7

Moving north past the bend in Tunnel 1, Ledge 7 is located on the west side 6m above the tunnel floor (Figure 4-63). The ledge overhangs the Tunnel 1 wall on the north side and measures 6.5m x 2.5m. The ledge can best be approached from the east side of the north end by ladder. A stone column is located near the center of the east edge and blocks access in the center and the south side of the ledge slopes dramatically. There is little sedimentation on the ledge in most areas, but Shovel Test Pit 021 collected from a pit near the northeast edge suggested a 7cm depth of the deposit in that area. No subsurface charcoal was noted in the sample.

On the north wall near the eastern edge of the ledge, there are two charred marks on the wall. These are generally considered to be the results of tapping pine torches against the wall to remove excess charcoal. However, if this is true one would expect to find charcoal scatters beneath the marks which, is not the case. In this same area, a small black bowl sat in a niche in the wall but was stolen in 1998.

Ceramics were concentrated in the center of the ledge and along the west wall (Figure 4-64). A small partially intact jar sits precariously in a crevice in the wall 1m above the ledge floor (Figure 4-65). Approximately 75cm southeast of the crevice, a Late Classic wide-mouthed jar sits in an inverted position on a raised area of the ledge. The jar has a kill hole at the base and below it are five small sherds one of which is from a Mt. Maloney Late Classic bowl. A cluster of vessels is located in the central area of the ledge including an intact Late Classic, Spanish Lookout complex jar containing the articulated bones of a bat. It

is unclear as to whether the bat was placed in the jar or crawled into the jar and died.

Additionally there is a Late Classic lidded vessel similar to those located on Ledge 6. Sitting to the east of this vessel is an intact large-sized Late Classic jar found to contain starch grains (Morehart 2002a:168-172).

To the north of the jar is a bowl typed as a Sotero Red Brown: Sotero Variety (Figure 4-66). Although Gifford places these vessels in the Tiger Run phase that dates to the early part of the Late Classic period, at the nearby site of Las Ruinas, they are found in the Mills phase, which correlates to the Spanish Lookout period (personal communication, Joseph Ball and Jennifer Taschek 2005). Additionally, they were often founding ball courts and five of these vessels were located in the termination/dedication cache of Structure 25 1st dating to A.D. 682.

Ten of the 94 ceramic entities were intact vessels of which two were stolen in 1998. One was a Late Classic style red tripod dish and the other a small black bowl that sat in a niche in the north wall. A picture of the bowl was taken by Karen Bassie-Sweet during her early visit to the cave (Figure 4-67). Of the 94 ceramics at least 24 vessels were represented that include 15 jars, six bowls, and three dishes. Sixty-three small fragments were not typed. At least four whole or partial vessels were broken in situ.

Dating Ledge 7

Most of the 21 ceramics on the ledge typed for chronology dated to the Late Classic period. Fifteen samples dated to the Late Classic Spanish Lookout complex and two to the slightly earlier Late Classic Tiger Run. Although it cannot be typed specifically, based on early photographs the stolen red tripod vessel can be dated to the Late Classic period as well. Two sherds from a single polychrome dish sitting on top of a rock dated to the Early Classic

Hermitage complex. Two jar sherds were typed as Chan Pond Late Terminal Preclassic/Early Classic vessels. The first was located within the sherd scatter in the northern part of the ledge and the other sits on top of later material.

A single AMS date was obtained from a charcoal sample collected from beneath the rock supporting nine bichrome sherds. The charcoal produced a date range of A.D. 680 to A.D. 890 consistent with the majority of the ceramic types found on the ledge. Although three small sherds dated to earlier periods, it is interesting that one Early Preclassic jar sherd was placed on top of sherds dating to the Late Classic period. Also, the single polychrome Early Classic sherd was placed on top of a rock and another jar sherd was found in a surface scatter. This suggests that the early sherds were placed on the ledge during its Late Classic usage.

4.12.9 Ledge 8, Niche 7.5, 8, 8.5, 9, 10

Below Ledge 7 on the west side of the tunnel lying on the floor next to the wall are three sherds surrounded by a charcoal scatter (Figure 4-68). One sherd is a bowl fragment and another a jar tentatively typed as a Terminal Preclassic Aguacate Orange.

Moving along the west wall of the tunnel north of Ledge 7 is a small round concavity measuring 47cm in diameter. On the floor nicely fitted within the concavity is a rim from a Late Classic Cayo Unslipped wide-mouth jar. Beneath the rim is a scatter of 16 small sherds.

Niche 8.5 is located 1m north along the same wall 1.04m above the chamber floor. It is a small hole in the wall barely large enough to contain 2 small sherds. Both sherds are jar fragments and one is Late Classic.

Niche 8 is located on the west wall of the tunnel directly below Ledge 8. The niche measures 3.2m in length and 97cm wide. It contains 7 sherds one of which was identified as a Late Classic Cayo Unslipped jar. There is a rodent nest containing one sherd in the back of the niche. Further north along the east wall is a concentration of charcoal and two sherds, of which one is a jar fragment.

Ledge 8 is located 5.1m above the tunnel floor (See Figure 4-68). It measures 2m in length and 2.6m wide with a low ceiling height of 70cm. The ledge consists of an upper and a lower shelf. Artifacts are located on the upper level. There are several charcoal concentrations on the floor and the ceiling is heavily charred. Twenty ceramic sherds representing at least seven vessels are located on the ledge including one jar and six bowls. Ceramics were very tentatively typed in this area. Three appeared to be Late Classic bowl forms and one was typed as a Middle Preclassic Jenny Creek complex bowl. The sherd was heavily charred and it was difficult to determine the slip color, but the form does suggest an early type (Figure 4-68). Two of the possible Late Classic bowls and the un-typed jar underwent some form of ritual breakage.

Near the back of the upper shelf on the south side is a stack of pottery. There are two unidentified bowl sherds from a deep-sided bowl at the base of the stack. Above the sherds is a cobble, two small jar sherds sit on top of the cobble, the Middle Preclassic sherd sits on top of the jar sherds, and on the top of the stack is a body sherd from a Late Classic Mt. Maloney black bowl (Figure 4-69). This stack is of interest for two reasons. First, the Middle Preclassic sherd is not on the bottom of the stack as one might expect but placed near the top beneath a Late Classic sherd. This suggests that the earlier dated sherd was introduced onto the ledge at a later date. The second feature of note is that a cobble-sized

rock is placed within the stack. This suggests that the rock is functioning as part of the offering.

In the north part of the upper shelf are four sherds sitting adjacent to a concentration of charcoal. Two of the sherds may be pieces of Late Classic bowls. Additionally, there is a natural pit in the floor of the shelf containing charcoal. Although it is difficult in the absence of an AMS date to assign a date for this ledge, the ceramic types as well as their arrangement suggests Late Classic usage.

Niche 9 is located on the tunnel floor beneath an overhang north of Ledge 8. It measures 3m in length, 70cm wide with a 26cm ceiling height. The niche contains 67 ceramic sherds representing a minimum of seven vessels and one spall. No charcoal was noted in this area. Many of the sherds were small non-diagnostic body sherds, but of the identifiable material there were 4 jars, 1 bowl, and 2 dishes. The jars dated to the Terminal Preclassic/Early Classic period, the bowl to the Late Preclassic Barton Creek complex, and the dishes to the Early Classic Hermitage complex. It is unlikely that this area was utilized after the Early Classic Period.

Niche 10 is found on the west side of the tunnel across from Niche 9. The niche is 2.8m in length, 76cm wide, and 92cm in height. Artifacts are clustered in the north and south ends of the space. There are 46 ceramic sherds representing at least 13 vessels: seven jars, one bowl, and five dishes. One un-typed jar sherd may have been broken in situ. On the south end of the niche there are three jar sherds that date to the Terminal Preclassic/Early Classic period, a scatter of small non-diagnostic sherds, and a rodent nest. In the north cluster there are three jar sherds dating to the Terminal Preclassic/Early Classic period and one dating to the Late Classic, five dishes dating to the Early Classic and one bowl dating to

the Late Classic. There is a rodent nest against the back wall of the niche and a spall situated among the potsherds. There are also two scatters, one containing 20 small sherds and the other is a scatter of 12. This area appears to have been utilized over a long period of time but the heaviest utilization appears to have been in the Early Classic period.

Adjacent to the south end of Niche 10 is Shovel Test Pit #006. This pit was initiated in an effort to determine whether people were standing beneath Ledge 7 while activities were conducted above. The location of the pit was in the area of greatest visibility to the ledge. Artifacts in Niche 10 suggested at least minor Late Classic usage of the area. The pit measured 40cm x 50cm and was excavated to 35cm below the surface. The basal layer of the pit was sterile white chalky sediment that was probably disintegrating limestone rock. Just below the compacted modern clay surface covered by cave powder, the upper portion of the pit consisted of lightly compacted dark brown sediment (10yr3/3) containing large pieces of charcoal. This matrix extended 8cm to 10cm below the surface where there was a distinct color change to a lighter brown (10yr6/6) matrix. Potsherds were embedded in base of the darker sediment and appeared to be function as the lining of a hearth (Figure 4-71). An AMS date range of A.D. 260 to A.D. 540 was obtained from a charcoal sample collected within the hearth adjacent to the large potsherd. An additional date of 360 B.C. to 60 B. C. was obtained from near the base of the unit. This suggests that the hearth was constructed in the Early Classic period but the area was utilized as early as the Late to Terminal Preclassic. This agrees well with relative dates of the ceramics located in Niche 10. It does not suggest that rituals occurred below Ledge 7 during its Late Classic usage.

4.12.10 Niches 11, 12, 13, 14

Moving northeast through Tunnel 1, the passage widens and a large boulder positioned in the center of the path splits the tunnel (Figure 4-72). A rim of a Late Classic jar and three cobble-sized rocks are piled adjacent to the west wall. Within a concavity of this same wall are four non-diagnostic sherds and a spall. Additionally, a large number of sherds many of which were non-diagnostic were located under overhangs.

Niche 11

Niche 11 is located on the tunnel floor beneath the boulder. An overhang creates a space approximately 1m in length, 50cm in width and 33cm in height. Within the niche are four ceramic sherds and a spall surrounded by a scatter of charcoal. A rodent nest is located at the back of the niche. None of the sherds was gnawed or in direct association with the nest. Of the sherds, two are jar fragments, one is a bowl fragment and one is unidentified. The bowl dates to the Late Preclassic Barton Creek complex and one jar sherd to the Terminal Preclassic/Early Classic period.

Niche 12

Niche 12 is located beneath an overhang on the north side of the boulder (Figure 4-73). The niche measures 1.10m in length, 80cm wide, and is 30cm in height. In this area is a scatter of 37 small sherds as well as nine typed sherds representing at least 11 vessels: six jars, two bowls and three dishes. These vessels were evenly distributed from different complexes (Floral Park, Hermitage, Tiger Run, Spanish Lookout) dating from the end of the Preclassic to the Late Classic period.

Shovel Test Pit 007

Shovel Test Pit 007 was placed between a group of medium-sized boulders that forms a natural step. The water channel running from Chamber 1 flows over this area toward the center of Chamber 2. The test pit was very small as the area was quite restricted. The pit measured 15cm in length, 2cm in width and reached bedrock at 11cm in depth. Upon inspection of the profile wall, beneath the top compacted, dark, clay layer, six bands of variously colored silty clays and a lens of sand were noted. At the base of the deposit was a layer of hard calcite or other mineral suggesting that this area may have been considerably wetter in antiquity.

Niche 13

Niche 13 is located beneath an overhang on the north wall. It measures 1m in length, 2cm wide and has a ceiling height of 25cm. There is a rodent nest adjacent to the back wall of the niche. In this area is a sizable sherd scatter of 66 small sherds. They represent at least six vessels: five jars and one dish. Six sherds were diagnostic dating to the Terminal Preclassic/Early Classic and Early Classic periods. A single bowl sherd dated to the Late Classic. A speleothem as well as two cobbles accompany this assemblage. There is no doubt that the speleothem was intentionally placed in the niche.

Niche 14

Niche 14 is located on the east wall of the area on the floor beneath an overhang. The niche measures 1.4m in length, 36cm in width, and has a ceiling height of 32cm. Within the niche are three cobble-sized rocks, a sherd scatter containing 25 small non-diagnostic fragments as well as a larger fragment of Terminal Preclassic/Early Classic jar. There is some charcoal in the sediment matrix beneath the overhang and a large charcoal scatter is

found in the tunnel passage adjacent to the niche. Above Niche 14 is Niche 15, composed of a small shelf in the rock wall. It is roughly circular measuring 35cm in diameter and is 36cm above the tunnel. The shelf contains a spall, 28 small non-diagnostic sherds as well as sherds from one jar, two bowls, and a dish. The jar is Terminal Preclassic/Early Classic, the dish Early Classic, and the bowl Late Classic.

4.12.11 Ledge 9, Alcove 4

Chamber 2 is the geographic center of the tunnel system (Figure 4-74). Tunnel 1 bifurcates in this area. It splits off to the north merging with Elevated Passage 2 that connects with Tunnel 2 leading to the Stela Chamber. Tunnel 1 continues in a northeast direction eventually terminating at the Dead End. This central area was a heavily utilized and contains almost 30% of the artifact surface assemblage. Three ledges are associated with this area Ledges 9, 10, and 11.

Alcove 4

Alcove 4 is located beneath Ledge 9 and is access from Tunnel 1 northwest of the large boulder. The area measured approximately 3m in length and 1m at its widest point (Figure 4-75). The ceiling height diminishes toward the back of the alcove so that the rear half becomes a crawl space. There are two large cobbles in this area and a rodent nest located toward the back against the eastern wall. There are eighteen small non-diagnostic sherds in the alcove. Seven are located in a depression in the bedrock and are probably in situ whereas five are associated with the rodent nest so they may not be in their original positions. Currently there is an active bat roost at the back of the alcove.

Ledge 9

Ledge 9 is located below the southernmost end of Ledge 10. It is accessed by ladder on its eastern side from Chamber 2. The ledge is 6m above the chamber and the shelf forms a half circle 2m x 2m (See Figure 4-75). Due to its small size and sloping floor, it is difficult to climb onto the ledge. There is little or no sediment on the surface. The ledge contains 25 sherds representing at least seven vessels: four jars, two bowls, and a cylindrical vase. These include two vessels that are completely intact and two that are partially intact. Only one partial jar appears to have been broken in situ. Five pieces were typed and all were dated to the Late Classic Spanish Lookout Phase.

At the edge of the ledge is a circular depression in the rock containing 14 small non-diagnostic sherds. Perched along the edge of the depression are two cobble-sized rocks and a large speleothem. It is apparent that the speleothem could not have arrived at its current position by natural causes and that the configuration with the cobbles was constructed.

To the west of the depression is a stack of three potsherds (Figure 4-76). On the bottom are two jar sherds from the same vessel and on top is a Late Classic red tripod dish. The hollow feet of the dish have been broken. Adjacent to the stack is a pile of five large cobbles. Pieces of charcoal were found between the cobbles and there is a large charcoal scatter beneath the stack. West of the stack is an intact Late Classic jar surrounded by charcoal. Two large cobbles are placed beneath the base of the jar.

To the south of the jar is another Late Classic jar that is lidded, similar to those found on Ledges 6 and 7. A large Mt. Maloney style incurving bowl sits in the top of the jar. Interestingly the jar has a large kill hole in the base. In other cases of lidded jars are intact, which suggests that they could have contained perishable offerings. However, this

configuration indicates that the "lid" did not actually function as such and was probably symbolic. Adjacent to the lidded vessel is the base of cylinder vase and small hearth (Figure 4-77).

4.12.12 Ledge 10

Ledge 10 is a shelf located 7m above Chamber 2 on the southwest side. It sits above Ledge 9 which can be seen below the southern end but cannot be easily accessed from the ledge. It is oriented north/south, measures 6.5m on its north/south axis, and 3.7m east to west. The ledge is approached from the west side via a ladder and rope. There is a steep slope 12° slope on the western edge of the ledge that makes access with a ladder difficult. A rope is used to negotiate access to the level areas of the ledge adjacent to the east wall. Ceiling height is roughly a meter, which permits sitting but not standing.

Movement in the area is severely restricted due to the number of ceramic sherds deposited in the area (Figure 4-78). There is more material on this ledge than in any other area of the cave. There are over 421 sherds on the ledge representing at least 152 discrete vessels that includes 129 jars, 11 bowls, and 12 dishes. A minimum of twenty-four vessels were broken in situ. Although the material appears at first glance to be jumbled, the deposit is structured and many of the sherds have been arranged into 14 stacks (Figure 4-79).

A total of 58 vessels on the ledge were typed. With the exception of one large Garbutt Creek style bowl with incurving sides, one Tiger Run complex bowl and one jar possibly from the Late Classic Spanish Lookout period, all other material on the ledge dated to the Terminal Preclassic/Early Classic periods. Note the Early Classic polychrome dishes in Figure 4-78. Twenty-four vessels fell into Gifford's Hermitage complex and 32 into the

Floral Park complex. I have argued in Chapter 3 that these types fall into the Madrugada period defined at Las Ruinas by Joseph Ball as an extended Floral Park phase that ends in the Early Classic period. Two radiocarbon dates confirmed this assessment. The first was collected from beneath sherd Stack #11 (Figure 4-80). This stack contained no diagnostic ceramics (note the fist-sized cobble in the center of the stack). This date ranges from A.D. 240 to A.D. 420. The second sample was collected from the interior of a jar sherd located at the base of Stack #12. The date is later but statistically overlapping ranging from A.D. 390 to A.D. 540. This stack contained a number of diagnostic ceramics jar sherds that were typed to the Tumbac Group dating to the Floral Park complex (Figure 4-81). Although Gifford (1976:46) has a cut off date for this type by A. D. 300, this data suggests that these types were used well into the Early Classic period and are therefore are not strictly diagnostic to the Late to Terminal Preclassic (See discussion in Chapter 3). Alternatively, these sherds may have been deposited a bit earlier but were stacked together at a later date. However, evidence presented in Chapter 7 suggests that this deposit dates no earlier than A.D. 210 and no later than A.D. 560.

As one approaches the ledge, the first feature is located on the north end on the right hand side. It is a small natural platform or raised altar-like area forming a flat surface. Sitting on top of the platform is a concentrated scatter of 11 non-diagnostic sherds and 15 soda straws. Although there are a large number of soda straws growing on the ledge, none was directly over the cache and therefore these had to have been transported to their current location (Figure 4-82). Elsewhere on the platform are a number of larger sherds and a spall. There is a depression in the rock containing a con concentration of charcoal suggesting that the pit functioned as a small hearth.

Adjacent to the platform is a large niche with low headroom. The ceiling of the niche is decorated with numerous active soda straws and small stalactites forming a drip line and the floor is covered with loosely compacted bat guano. Although a number of sherds can be seen beneath the guano deposit this area was not excavated due to the fragility of the soda straws and constricted space.

South of the drip line at the edge of the niche is a large concentration of pottery much of which is stacked and surrounded by charcoal deposits. This includes stacks #7-#14. There is one partially intact Terminal Preclassic/Early Classic, Negroman Punctated-Incised jar, sitting upright adjacent to Stack #14 (Figure 4-83). Although the jar appears to be intact in the photo, the base is missing. It is the most intact example of this style of jar in the cave. In the center of the ledge south of the pottery stacks is a group of sherds containing fragments of at least seven Early Classic polychrome dishes (Figure 4-84).

Stack #5 located against the western back wall of the cave is particularly interesting because the sherd at the top of the stack is coated in calcite and a speleothem formation protrudes from its surface (Figure 4-85). It is clear that this formation did not form in situ as it is the only sherd affected in the stack and the speleothem is tipped onto its side. This strongly suggests that the sherd was moved from elsewhere, probably from beneath the drip line. Also, note in the photo that a large cobble is placed on top of several sherds. Moving south along the west wall rocks are placed on top of sherds in other areas as well (Figure 4-86).

Near the southern end of the ledge adjacent to the southwest wall is a large non-diagnostic jar fragment beneath which are splinters of wood that are partially charred on one end (Figure 4-87). Because it is burned on one side, this suggests that the fragment was

likely to have fallen from a torch. Also in this area is a large Late Classic Garbutt Creek-style incurving bowl. It one of three vessels from the ledge belonging to the Late Classic period.

Dating and Summary Ledge 10

In summary, both the ceramics and radiocarbon dates suggest that this ledge was used almost exclusively in the Early Classic period. The presence of at least one and possibly two Spanish Lookout-style ceramics and one Tiger Run vessel indicates that the ledge may have been infrequently visited in the Late Classic though use during this period is ephemeral. Of the eleven utilized ledges, this is the only one that pre-dates the Late Classic. The number of vessels on the ledge indicates that this ledge has the heaviest or most frequent use compared with all other activity areas of the cave.

Ritual activities on the ledge included smashing of vessels, movement of speleothems, burning, and deposition of jars and Petén-style polychrome sherds. Artifact distributions suggest that fist-sized limestone cobbles were used in ritual contexts. This is evidenced by a cobble placed into center of pottery Stack #11 as well as others positioned on top of sherds in other areas of the ledge. This is clear evidence that unmodified cobbles were integrated into ritual caches.

4.12.13 Chamber 2 and Alcove 5

Chamber 2 is located in the center of the tunnel system 134m from the cave entrance. It is roughly rectangular in shape, measures 3m x 8m, and is oriented on an east/west axis. Tunnels 1 and 2 converge at this point. Figure 4-88 is a detailed map of this complex area of the tunnel system. Two pathways lead to the deeper cave passages from this area. The first

path follows Tunnel one through Chamber 2 navigating around a large outcrop of limestone that forms the northeast wall of the chamber. In this case the room is entered at the southwest corner and the exited at the northeast corner so that the natural pathway forms a U-shape around the outcrop. Tunnel 1 continues east in this area and eventually terminates at the Dead End. To access Tunnel 2 from Chamber 2, the chamber is exited via a climb up a muddy slope west of the large stalactite "chandelier" (Figure 4-89). There is an ascent via the elevated bedrock balcony that provides access to Elevated Passage 2, which connects with Tunnel 2 leading to the Stela Chamber. The balcony ranges between 1m to 3m above the chamber floor. This route does not appear to be heavily utilized as there are few artifacts in the passage.

In the center of the chamber on the modern surface, a large broken stalactite sat on top of a roughly circular depression measuring 70cm across (See Figure 4-89). An intermittent pool forms in the pit during heavy rains and quickly drains. Here is where the low energy stream originating at the cave entrance drains as noted in section 4.9 above.

The limestone bedrock outcrop that serves as the south wall of the chamber contains several features (Figure 4-90). Across Tunnel 1 from Ledge 9, 1.91m above the tunnel floor, a clear prismatic crystal was wedged into a crevice in the wall (Figure 4-91). The crevice measured approximately 6cm in length and 2cm in width. The wall appeared to have grown over the crystal trapping it in the crevice. Although the crystal was loose, it was impossible to dislodge it from its position. The crystal was looted from the cave sometime between 1999 and 2002. The limestone fragment of the wall holding it in place was broken as well. At the time it was assumed that the crystal was a cultural deposit, but it was probably a natural formation, which would explain why it could not be dislodged without breaking the

wall. Hill and Forti (1997:354) picture a similar natural specimen from a cave in Turkmenistan.

To the north of the crystal are three crevices in the wall showing fire blackening above the holes similar to the ones found in Tunnel 1 above Niche 7 and on Ledge 8 (Figure 4-92). Also on this wall is a depression in the bedrock that forms a natural "seat." It may have been used as such during the Early-Late Classic periods. Excavations suggest the chamber floor was lower during the Middle Preclassic usage so that sitting in the depression would have been difficult at that time. Cameron Griffith (personal communication 2003) noticed that the rock has an unusual shape resembling an old man in profile (Figure 4-93).

Ledge 9 was accessed from the south end of Chamber 2 as was Ledge 10. On the west wall, beneath the ledges under an overhang is a group of 20 sherds at least two of which are Late Classic, one large Mt. Maloney style incurving bowl and one Cayo Unslipped jar. None of the sherds in this area appears to have been broken in situ. There are also seven spalls, and six cobbles accompanying the sherds. A rodent nest containing one sherd is located adjacent to the deposit.

Alcove 5 juts out from the southwest corner underneath Ledge 10. A cluster of 13 spalls is located adjacent to the southwest wall of the alcove and two rodent nests are found at the terminus. A large sherd scatter of at least 31 sherds lines the northeast wall. Although most were non-diagnostic, there were at least three Late Classic Jars and one large incurving Mt. Maloney bowl that may have been smashed in situ (although it can only be partially reconstructed).

The stalactite "chandelier" is located on the north end of the chamber adjacent to the balcony wall. It measures approximately 2m across and is currently active (Figure 4-94).

During rains, an intermittent pool below the formation fills with water. The dripping water has eroded the area beneath the formation which plunges below the modern surface. The erosion uncovered a large sherd scatter of over 100 sherds that can be seen in the mud at the base of the intermittent pool. There are a number of small active stalagmites located on the balcony wall below the stalactite. The largest was sampled and dated. It was determined that it began to grow in the Terminal Classic period (See above section 4-9).

Adjacent to the stalactite against the north wall is a pile of speleothems measuring almost a meter in diameter and half a meter in height (See Figure 4-94). This pile was not excavated but several large speleothems rest on the top and can be seen in the matrix. I wondered if this was the result of some sort of cleanup operation for the tourists, but according to the cave owners, the speleothem pile was in place when they discovered the cave. Beneath the east wall of the chamber adjacent to the speleothem pile is an overhang formed by the bedrock balcony. The area contained at least 59 sherds dating to the Terminal Preclassic/Early Classic and Late Classic periods as well as four speleothems and two cobbles. At least 2 large incurving Mt. Maloney Late Classic bowls appear to have been broken in situ. Above the overhang is a crevice in the wall that contains a fragment of a soda straw.

Excavations

Shovel Test Pit 008 was placed beneath Ledge 10. The pit measured 50cm x 50cm was dug to 40cm before a boulder prevented further exploration. Charcoal was encountered to a depth of 35cm. Shovel Test Pit 009 is a 35cm x 35cm pit that was initiated to attempt to reach sterile clay or bedrock. A speleothem was encountered 35cm below surface and

charcoal was present at this depth. At 40cm below the surface hard packed clay was encountered that appeared to be sterile. Both test pits suggested that there was good stratigraphy and considerable depth to the deposit.

Because obstacles were encountered in both small pits, a 1m x 1m unit was opened in the center of the chamber to the west of the intermittent pool located beneath the stalactite chandelier. The number of sherds observed below the surface beneath the stalactite suggested that this area would be productive in terms of cultural material. Additionally, the unit was placed near the center of the chamber, which was thought to be the area of deepest sedimentation. Levels 1 & 2 of the unit were wet screened, but only tiny ceramic sherd fragments small carbon flecks were recovered. Levels 3, 4, 5, and were dry screened. Tiny sherds and carbon were recovered but not collected. Table 4-1 below shows results of the excavations.

Level 1 was <1-3cm thick and composed of dark (5yr3/2) heavily plastic clay and marl. The clay had an interesting quality in that in many areas, it could be peeled away from the surface below. The level produced carbon, 14 ceramic body sherds and 3 soda straws. In the areas that the Level 1 clay matrix could be peeled away, it revealed a smooth, shiny, pearl-like clay surface sticky to the touch designated Level 2. Level 2 was roughly 3cm thick. Pebbles, charcoal flecks, a soda straw, and 5 non-diagnostic sherds and were horizontally embedded in the top of the matrix suggesting that it was a use-surface.

Level 3 was identified by a change in matrix. The sediment was less compacted and composed of a light colored (7.5yr4/6) silt, sandy loam, and marl on top of darker clay. The layer thickness ranged from 1-6cm. The top of the level was a slightly more compacted than below the surface. A non diagnostic ceramic sherd was horizontally embedded in the matrix

along with charcoal flecks. A depression or water channel containing pebbles ran through the south side of the unit. The unit produced 13 non-diagnostic sherds and 5 speleothems, 2 of which were soda straws.

Level 4 was defined by matrix compaction. The thickness of the layer ranged between 3cm and 6cm. Ceramic sherds and carbon were embedded in the matrix at the top of the level. Eleven non-diagnostic ceramic sherds were collected one of which was a bowl rim with external fire-clouding. Level 5 was approximately 1cm thick and the matrix consisted of dark (5yr3/2) looser drier clay as compared with Level 4. Sherds and large amounts of carbon were embedded in a compacted surface at the top of the level. Level 6 was defined by compaction of the matrix as well. Numerous sherds and charcoal flecks were embedded in the same dark clay as described in Level 5 and there was small lens of reddish sandy loam. Thirty ceramic sherds and 5 speleothems, which included 4 soda straws, were present in this 1-3cm layer. A large number of carbon fragments were also noted. The amount of material in the level suggested a period of heavy utilization. Due to time constraints, the unit was divided into half and the west half was continued to Level 7.

There was a very clear and distinct depositional break between Level 6 and Level 7. The Level 7 matrix consisted of a light yellow/red (7.5yr4/6) silty loam mixed with marl. In some areas it was quite loose. This level was 1-3cm thick. It was almost devoid of cultural material and very little charcoal was present. Three soda straws and two ceramic sherds, one of which was a shoulder fragment of a jar were present. The jar sherd was Sotero-like, post-incised with a dark brown to black exterior slip.

Level 8 was defined by a change in matrix and layer of compaction. The matrix consisted of dark clay, 2-3cm thick that was compacted on the surface and looser below.

Three ceramic sherds and carbon were embedded in the surface. Ten non-diagnostic sherds were collected from the level. This was the last level in which sherds were present.

Levels 9-12 were all defined by surface compaction. All contained carbon flecks but no ceramics. Level 9 was a 1-2cm level of dark brown clay containing a speleothem and a large amount of charcoal. Level 10 was a 3-6cm level containing few charcoal flecks. A channel of sand ran through the north end of the level. Level 11 was 2-3cm in thickness and contained a larger amount of charcoal as well as. Two spalls were sitting top of the compacted use-surface in upright positions (Figure 4-95). They both had a sticky resinous substance adhering to their interiors and appeared to function as bowls. One was located in the SW quadrant and the other in the NW quadrant. The first spall was round and measured 6cm in diameter and 3cm in height. It is pictured on the left in Figure 4-96. The second spall, pictured on the right, was triangular in shape measuring 5cm x 4cm and 2.5cm in height.

Level 12 was the deepest surface to contain cultural material. A few charcoal flecks were embedded into the surface at 32cm below the modern use-surface. Level 13 consisted of sterile clay and sand. Since this was consistent with findings from Shovel Test Pits 008 and 009, the unit was terminated at this level.

Dating Chamber 2

Two AMS dates were derived from wood charcoal in the sub-surface deposits. Both were run at Beta Analytic in Miami, Florida. The first was from Level 1 near the surface and dated to the Early Classic period. It produced a date range of A.D. 250 to A.D. 540 (Beta-170074). This date agrees well with those from Ledge 10 that suggest the area was heavily utilized during the Early Classic period. It was interesting because this evidence suggested

that there was considerable sedimentation throughout the Preclassic and Classic periods but little or no sedimentation in the Late Classic. What was also puzzling was that there was Late Classic material in the chamber both on the surface and on Ledge 9.

The second date was obtained from Level 11 and calibrated to 1010-820 B.C. (Beta-170518). This early date is contemporaneous with the early Kanocha phase (1200-850 B.C.) at Blackman Eddy (Garber et al. 2004a; Garber et al 2004b) and the Cunil phase at Cahal Pech (Awe 1992; Healy 2004). Other than the Pleistocene levels at Loltun cave in Yucatan, this was the earliest radiometric evidence of cave use in the Maya Lowlands. Further excavations demonstrated even earlier usage. The richness of the data in this unit and clear presence of compacted use-surfaces encouraged future study and a much larger excavation was conducted in 2003 to confirm the findings from test excavations, to further investigate use of the chamber, and to refine the chronology. These data are reported in detail in Chapter 5.

Discussion

Of all the areas of usage at Chechem Ha, Chamber 2 clearly exhibits the heaviest utilization. There can be at least two known factors that could explain why this area was chosen as the cave's most important venue for ritual activity. First, spatial data from other cave sites suggests that areas in and around water features are also common venues of ritual activity (Andrews 1970; Moyes 2001, 2002; Moyes and Awe 2000). The large stalactite chandelier with its intermittent pool beneath almost certainly would have been a desirable venue to conduct water-related rites. Additionally, Chamber 2 the sink or drain for water entering the cave from the mouth. Second, Chamber 2 is in the geographic center of the cave. Spatial analyses conducted in the Main Chamber at Actun Tunichil Muknal

demonstrated that the center of the chamber received the heaviest utilization based on artifact counts as well as the variety of types (Moyes 2001:19, 2002:14).

4.12.14 Ledge11, Niche16, Alcove 6

Exiting Chamber 2 via the Tunnel 1, the passage turns east. On the south side of the passage in view of Chamber 2 is Ledge 11 (Figure 4-97). The ledge measures 2.5m on its north south axis and 3.3m from east to west and is easily accessed. Its highest point is approximately 2.5m above the tunnel floor and it easily accessed by climbing the rock below. The ledge contains 14 sherds from at least nine vessels that include: six jars, two dishes and one flat sherd that may be a fragment of a jar lid or a *comal*. There were no whole or partial vessels in this area. Two sherds belonged to an Early Classic Polychrome dish and one to a Terminal Preclassic/Early Classic jar. Three other sherds including the jar lid were tentatively as Late Classic.

There are two areas of artifact deposition; one is on the west side of the ledge and the other in a small circular niche that cuts into the back wall. The deposit on the west side is located in a flat area that forms a small shelf. A natural depression in the bedrock is lined with cobble-sized rocks and there is charcoal in the pit (Figure 4-98). The two sherds belonging to the Early Classic polychrome dish are deposited in the depression along with the jar lid and the Terminal Preclassic/Early Classic jar sherd. Other artifacts line a depression in the niche in the back wall. These include jar sherds that are tentatively dated to the Late Classic period and a spall.

Niche 16

Across Tunnel 1 on the north side adjacent to the wall is Niche 16, created by an overhanging wall (See Figure 4-97). The niche contains a cluster of six sherds from at least five vessels- three jars, one bowl, and one dish. The jar dates to the Terminal Preclassic/Early Classic Floral Park complex and the dish to the Early Classic. There is also one Late Classic Mt. Maloney style incurving bowl and one possibly Late Classic jar.

Balcony

On the floor of the balcony above the niche is a small active stalactite. Four non-diagnostic sherds are located in a natural depression adjacent to this feature. Also on the balcony is a small alcove similar to the one located in Chamber 1. Three limestone cobbles are sitting on a natural shelf within the alcove.

Alcove 6

Moving east in Tunnel 1 on the south side is Alcove 6. The alcove is formed by an overhanging wall and measures 3.1m in length and 75cm in width (Figure 4-99). It is usually roped off to prevent tourists from touching the artifacts. The alcove contains two speleothems, three cobbles, and 18 sherds representing at least eight vessels: seven jars and one bowl. All dated to the Late Classic period with the exception of one possible Middle Preclassic sherd. The large jar rim pictured on the right in Figure 4-98 is a Late Classic Alexander's unslipped vessel with a figure resembling a monkey appliquéd on the neck (Figure 4-100). The figure is curious in that its head floats above the rest of the body. A vessel with a similar motif was found at Actun Tunichil Muknal (Figure 4-101) and another is pictured on a Vaca Falls Red jar in Gifford (1976:237). Karl Taube (personal communication 1999) has suggested that jars with this motif may be containers for *balche*.

4.12.15 Crawl 2, Chamber 3

Continuing in a northeast direction in Tunnel 1, there is a crawl space on the south side of the tunnel (Figure 4-102). It is very small measuring only 1.3m in width and 1.5m to the back wall. The space could be considered a niche or squeeze because of the low ceiling height of the entrance which is only 35cm. Inside of the crawl is a stalactite fragment, two cobbles, eight sherds and a rodent nest. Of the eight sherds, seven were identified as jars and of these four were typed to the Late Classic period. Although it could be argued that the material was brought into the space by rodents, this is unlikely because there is only one sherd directly associated with the nest and others are located on the opposite side of the space. Also, speleothems do not appear to be associated with other rodent nests throughout the cave.

On the north side of the tunnel opposite the crawl is a small shelf located 75cm above the floor. It contains four sherds one of which is a jar dating to the Late Classic period. On the northwest side of the tunnel, 1.5m from the shelf, is an entrance to Tunnel 2. Currently there is a wooden ladder to facilitate negotiating the 2.16m climb to the Tunnel 2 entrance. This must be a favored route for rodents as well because there are claw marks on the rock face under the ladder. The western entrance to Crawl 3 can be viewed from the Tunnel 2 entrance. Shovel Test Pit #012 was placed in the pathway 1m northeast of the entrance. The pit measured 35cm x 35cm and was 35cm in depth. It showed little stratigraphy and was unremarkable except for a stalagmite found in the profile wall 14cm below the surface.

Chamber 3

Chamber 3 provides another point of connectivity from which to reach other areas of the cave (See Figure 1-102). Entrances to Crawl 3 and Elevated Passage 3 are located in this

area and Tunnel 1 continues from the north end of the chamber. The area is roughly circular with a diameter of approximately 6m. There are a total of 67 ceramic sherds in the chamber representing 12 vessels that include eight jars and four bowls. One jar located adjacent to the northeast wall may have been broken in situ and there is one intact Late Classic bowl. A scatter of twenty small non-diagnostic sherds is strewn along the south wall near the southern entrance to the chamber. On the north wall is an alcove measuring 2m in length and 1m in width. The alcove contains six sherds that include one Mt. Maloney Late Classic bowl and a Late Classic jar. A spall and two cobbles accompany the deposit.

Elevated Passage 3 branches off from the center of the north wall. The passage is located 3.5m above the floor. A basin shaped shelf provides a step to access the opening. There is an accumulation of sediment on the floor of the shelf and a test pit was placed there. Shovel Test Pit #011 measured 35cm x 35cm and was 25cm in depth. The sample collected showed good stratigraphy with fine layers and several gray lenses containing charcoal at the top of the profile.

In the center of Chamber 3 is a stone column that forms an archway 2.36m above the chamber floor between the column and the south wall. Artifacts are located on top of the arch. Sixteen small non-diagnostic sherds were found in a pile on top of the column and three non-diagnostic jar sherds were located near the center of the arch. On the north side of the arch is a niche containing two Late Classic bowls and one jar sherd. One of the bowls is a fully intact Garbutt Creek Red vessel (Figure 4-103). There is a charcoal scatter beneath the bowl.

Moving along the south wall is the entrance to Crawl 3, 2.5m above the tunnel floor. Adjacent to the entrance on the east side is a niche measuring 86cm x 43cm. It contains a

Late Classic jar that is partially intact except for the missing base (Figure 4-104). Three unclassified sherds were placed in a small hole in the wall next to the jar but do not appear to belong to the base. Directly below the Crawl 3 entrance is a small niche containing two sherds of a large Middle Preclassic fluted bowl (Figure 4-105). The bowl was identified by Aimers as either a Flores Waxy Ware (Joventud Group) or a Paso Caballo Waxy Ware (Sierra Group). However, Joseph Ball (personal communication 2005) suggests that these sherds are Yesoso Orange Paste-Ware, a group that mimics both the Joventud and Sierra groups. Despite the type designations, these groups all date to early phases of the Middle Preclassic period. The sherds are most likely not in situ as I have noted their movement within the chamber on at least two occasions. Having said this, their current position is the original niche in which they were mapped in 1998.

Crawl 3 is most easily approached by climbing onto a bedrock shelf located on the east wall of the chamber. There are nine non-diagnostic sherds sitting on the shelf and a Late Preclassic/Early Classic jar sherd in a small niche in the wall above it. Three sherds from an unidentified jar are piled together on the tunnel floor at the base of the shelf on the northernmost side.

Sediment Pile

Loose sediment is piled below Crawl 3 against the south wall (Figure 4-106). The mound measures roughly 3m x 6m, is approximately 1.5m in height, and slopes from the wall to the modern floor at a 20° angle. Crawl 3 was excavated in antiquity and it is fairly evident that the pile beneath the eastern entrance is sediment from that activity. An excavation unit was placed in Chamber 2 at the base of the sediment pile to confirm that this was the case and to date the deposit. Unit 02-05 was placed against the north wall of the chamber aligned

in a northeast/southwest direction following the wall (See Figure 4-102). There was an open crack was between the wall and the sediment. The unit originated at the base of the deposit cutting into the pile. It measured 70cm in length and 50cm in width. The unit was excavated to a depth of 45cm on the northeast side and 29cm on the southwest. Beneath the modern surface there were three subsurface levels each determined by changes in the sediment color. Bulk matrix samples were collected from each sub-surface level.

Excavations Chamber 3

A schematic of the north wall of the Unit 02-05 is shown in profile in Figure 4-107. The modern surface at the top of the pile consists of highly compacted yellowish brown clay (10yr4/6), 2cm to 4m thick. It was heavily trampled and was a slightly darker color than Level 1 below. Near the cave wall where no trampling occurred, the matrix was loose and silty. Level 1 consisted of loose, brown (7.5yr5/6) loam. A wood fragment identified as a hardwood (Morehart personal communication 2005) was the only artifact present in this level. Level 2 was a lighter, brownish-yellow (10yr6/6 and 7.5yr5/6), mottled matrix. It contained marl whereas the Level 1 deposit did not. A stalactite fragment was found in the matrix, but otherwise it contained no artifacts. Level 3 was compact, red/brown (7.5yr4/3) clay identical to that found on the modern use-surface throughout Tunnel 1. Four non-diagnostic ceramic sherds and half of a well-preserved *Cucurbita* species squash seed (Morehart, 2005 personal communication) were found in this level in the crack abutting the cave wall (Figure 4-108). The top of Level 3 was likely to correspond with the Tunnel 2 modern use-surface. The base of the level was sterile clay and the unit was discontinued when we realized that it had gone below the modern surface of Tunnel 1. A piece of charcoal was collected from the top of Level 3 just below the brownish yellow matrix of

Level 2. It dated to the Middle Preclassic period (770 B.C. to 400 B.C.) which indicates that the Crawl was excavated some time after that date. Because the charcoal could have been sitting on the Tunnel 1 surface for years, it does not provide a good date for the initial modification to the crawl.

Unit 02-05 further confirmed that the sediment pile was back dirt from ancient Crawl 3 excavations. Level 1 was most likely to be a deposit that accumulated after the ancient Crawl 3 excavations and would therefore not be expected to correlate well with deposits from the crawl. Level 2 was a distinctive brownish yellow color, an almost identical color as the subsurface sediment found in Crawl 3. The color of this sediment was not noted in any other areas of the tunnel system so it was easy to recognize. Elemental analyses conducted on bulk samples from Crawl 3 and the Level 2 matrix samples suggested that there are strong similarities between the deposits (See Chapter 6, Appendix V, part 3). All have very high levels of both phosphates and copper suggesting that they are primarily guano deposits. Both Level 2 and the basal matrix of Crawl 3 also show almost identical amounts of all other elements tested. Additionally, the fact that no artifacts were present in either Level 2 or 3 supports the conclusion that this deposit is back dirt from the ancient modification to the crawl.

4.12.16 Crawl 3

Crawl 3 is located 2.5m above the tunnel floor and is an L-shaped space oriented on an east/west axis and running roughly parallel to the Main Tunnel. It opens into the tunnel system on both ends (See Figure 4-102). The western end of the crawl makes a sharp turn, and culminates in a vertical drop. The easiest access to the crawl is via the eastern entrance.

The space measures 9m in length, and its width ranges between 55cm and 2.75m. The ceiling height is between 70cm and 1.2m.

The 3m long area was modified to produce low walls or benches lining both sides of a central trench in the Crawl 3 passage (Figure 4-109). The width of the trench is 50cm at its narrowest and 1m at the widest point. The walls on both sides of the trench measure between 35cm and 1m in width with an average height of 45cm. The top surfaces are flat. The floor of the entire passage is covered with well-compacted brownish-yellow sediment, white marl, and charcoal. The low walls consist of the same brownish-yellow sediment but are loosely compacted. Vertical cuts in the sediment matrix along the side of the walls are most likely the result of the excavation of the central trench. As mentioned above, results of elemental analysis suggested that the sediment from the crawl is very similar to that of sediment from the pile located on the floor of Chamber 3 below the crawl's eastern entrance. This confirmed that the pile was the result of the ancient excavation.

The area contains a large number of artifacts that include pebbles, cobbles, spalls, ceramics, and dense charcoal and ash deposits. There are 142 ceramic sherds representing at least 35 individual vessels that included: 17 jars, 11 bowls, 5 dishes, 1 vase and one censer bowl. Eight vessels or partial vessels appear to have been broken in situ. Of these, 32 were diagnostic. Twenty seven of the diagnostic examples were from the Late Classic Spanish Lookout complex, three from the Early Classic Hermitage, and one from the Middle Preclassic Barton Creek complex. Of note is that there were two sherds of the same vessel, identified by Joe Ball (personal communication 1998). These dated to the Mt. Hope complex. Ceramics from this time period are very rare within the cave.

Artifact deposits are concentrated at the eastern entrance and in the center of the passage. The portion of the tunnel lined with the low walls or benches separates these two areas. Adjacent to the eastern entrance on the north side, ceramic vessels and sherds are found in and around fist-sized stones arranged a circle abutting the wall (Figure 4-110). A Late Classic jar with a kill hole at the base and exterior charring sits in the center of the circle. Charcoal flecks are present in the sediment matrix. Resting on top of the stones is a heavily charred censer bowl, a jar sherd exhibiting a fire-blackened exterior surface, and a large potsherd. Censer bowls are small crude vessels used for burning that fit inside of larger appliquéd incensarios (James Aimers personal communication 2003). Adhering to the interior of the jar sherd was a caked, hardened, black, greasy, resin containing starch grains of *Zea mays* (Morehart 2002:174). The censor bowl may have belonged to one of the incensarios that were smashed, stacked, and left in the Stela Chamber.

The accompanying large sherd was identified as an Early Classic deep sided bowl (Joseph Ball personal communication, 1998). Several cobbles, small sherds and a limestone spall were located against the wall and three charred jar sherds were stacked on a large rock on the east edge of the stone circle. To the east of the circle is a stack of spalls interspersed with sherds.

On the south wall adjacent to the eastern entrance is a small natural shelf. Clustered at the east end are thirty pebbles and a number of small sherds (Figure 4-111). The pebbles were probably collected from a river or streambed. They are not limestone, are similar in size (2cm-3cm), and are water-worn. To the west of the stones are 15 small sherds and a spall. Next to the cluster of sherds is a stack of seven Late Classic jar sherds sitting on top of a scatter of charcoal and ash. Half of a Late Classic charred, bichrome, tecomate (gourd-shaped vessel),

and a pile of fist-sized stones are adjacent to the shelf. The tecomate was typed as a Late Classic Xunantunich Black on Orange: Variety Unspecified. A Late Classic jar in an inverted position with a kill-hole and charring at the base sits next to the wall along with a pile of cobbles and a spall. A Late Classic, Zacatel Cream Polychrome, tripod, dish that sat below the shelf was removed by the former Belize Department of Archaeology (now the Belize Institute of Archaeology) and is curated in the vault at Belmopan. The geometric design on the interior of the vessel is faded, and all three feet are missing (See Figure 4-111).

In the mid-section of the tunnel adjacent to the western end of the low walls or benches, there is a dome in the ceiling that creates an area with enough head room to sit upright. A hearth is situated on the north wall. It consists of a fully intact, Late Classic Mt. Maloney jar resting on five smooth river cobbles (Figure 4-112). The exterior base of the jar is heavily charred as are the cobbles upon which it rests. The interior surface of the jar exhibits no apparent traces of residue. Beneath the vessel is a concentration of charcoal and ash 8cm to 10cm thick. The deposit contained kernels of *Zea mays* (Morehart 2002:174). The limestone floor of the cave is discolored exhibiting a bluish cast, which is typical of the changes that occur when limestone is exposed to fire. The ceiling in the west area of the crawl is also heavily charred, which attests to the intense use of the hearth. Charcoal obtained from below the hearth vessel produced a date range of A.D. 250 to A.D. 430, which falls within the Early Classic period.

Next to the hearth is the top-half of a charred, Late Classic, narrow-necked Mt. Maloney jar. Several jar sherds are located beneath the vessel. The base of the jar is located on the west side of the hearth. Three volleyball-sized stones with cobbles placed between them are stacked

west of the jar. A scatter of 20 sherds and several cobbles lies between the vessel base and the wall.

On the south side of the mid-section of the passage, at the western end of the bench is a stack of five fist-sized stones. These stones are charred and the artifacts in this area are surrounded by a heavy concentration of charcoal. Two polychrome vessels from the area were removed by the former Department of Archaeology (Figure 4-113). Both are almost completely intact, exhibit no signs of charring, and have been dated to the end of the Late Classic period. Neither contained visible residues suggesting that they either held perishable substances or functioned as offerings themselves. The first, a tripod dish with rattle feet, typed as a Palmar Orange Polychrome: Danta Variety, displays a water-bird motif. It was originally positioned on top of the stack of stones. The second vessel, which was positioned on the north side of the rocks, displays a caiman motif. It is a cylindrical, ash-tempered, tau-footed, tripod bowl, typed by Joseph Ball and Jennifer Taschek (personal communication 2005) as an Anonal Polychrome. They have excavated a number of similar vessels at the site of Buenavista del Cayo. A similar vessel was also found in a Late Classic elite burial at Blackman Eddy. The vessel type was originally identified at Uaxactún by Robert E. Smith and James C. Gifford (1966:148, figure 62a10) and dates to the Tepeu II or Late Classic period.

Adjacent to the tau-footed vessel is a stack of seven sherds. A sherd from an Early Classic dish is sandwiched between Late Classic jar sherds and a large cobble sits on top of the stack. This stack is interesting because the Early Classic sherd sits between Late Classic examples suggesting that it was stacked together in the later period. Although the practice of stacking sherds in caves is not well-understood, in this instance it suggests repeated usage of the area, reminiscent of stacking of sherds when cleaning shrine sites, a common practice among

the Quiché of Guatemala (Tedlock 1992). Three sherds dating to the Late Preclassic Period (Jaime Awe 1998, personal comm.) sit adjacent to the stack.

To the west, adjacent to the south wall, is the bottom half of a Late Classic, flat-based, cylindrical, polychrome vase typed by Ball and Taschek (personal communication 2005) as a Cabrito Cream-Polychrome: Guajiro variety (Figure 4-114). This type, identified by Joseph Ball (1993:250-251) occurs very late in the Terminal Classic period in the palace structures at nearby Buenavista del Cayo. Ball notes that it is best represented at the major regal-ritual center and is almost absent from lower-order settlement units suggesting that these vessels were high-status items. The Chechem Ha vessel exhibits either fire clouding or light charring on both the interior and exterior surfaces. The polychrome design on the vessel is divided into three panels. Occupying each panel is a seated figure with the oddly rendered right arm extended. A bird-like creature hovers over an *akbal* vase in the center panel and oblong device lies on either side of each figure. These oddly rendered figures are also found on examples from Buenavista (Figure 4-115). It is of note that the unusually styled arms are found on Holmul dancer figures from Naranjo vessels (1994:182-184, figures 5.18, 5.19, 5.20) (Figure 4-116). This is not surprising considering that pottery workshops at Buenavista produced vessels stylistically similar to Holmul-style pieces from Naranjo during the Late Classic period (Reents-Budet 1994: 96-99). Though this is a very tentative suggestion, this vessel implies that the cave may have had ties to Buenavista in the Late Classic.

Placed inside of the vase were a spall and two sherds. One of these, from the Sierra Red group, dated to the early part of the Late Preclassic period (Jaime Awe personal communication, 1998). Two additional Late Preclassic sherds, typed as Quacco Creek Red: Quacco Variety (Joseph Ball personal communication 1998), lie on the ground adjacent to the vase. At the

elbow of the passage, also along the southern wall is a stack of eight sherds positioned beneath a rock. West of the stack a Late Classic jar with a kill hole sits in an inverted position. Sitting next to the jar adjacent to the wall near the west opening is a cluster of 36 small sherds.

Excavation

Shovel Test Pit #016 was placed in the center of the crawl in the area of most intense activity to determine the depth of sediment and the date of initial usage. It was not possible to excavate directly between the benches as there was little sediment above the bedrock. The pit was small measuring 25cm x 25cm and bedrock was encountered at a depth of 7cm. A sample of wood charcoal was collected from the base of the pit that produced a date range of 120 B.C. to A.D. 250, the Terminal Preclassic period. This was the only radiocarbon date in the cave that fell into this time period. It is also of interest to note that this area also contained Mt. Hope phase pottery that dated to this same time period although it was rare in the rest of the cave.

A Ritual Sweatbath

I have argued elsewhere that based on size, morphology, and the artifact assemblage, Crawl 3 was used as a ritual sweatbath (Moyes 2005b). The dimensions of the crawl and low ceiling height are within the ranges of sweatbaths found in other archaeological contexts and are most similar to the underground sweatbath located at San Antonio in Chiapas (Houston 1996:143; Agrinier 1969:16-27). The two low walls or benches in the crawl bear a striking resemblance to the walls and central trenches of Classic Period masonry sweatbaths. Note their similarity to the reconstructed sweatbath at Piedras Negras (Figure 4-17). Additionally, the working hearth, which was used extensively, would have produced the environment appropriate to a functional sweatbath. The Late Classic wide-mouthed jar sitting on top the hearthstones showed no evidence of residue, which suggests that it contained water to create steam.

The artifacts within the area are commensurate with what might be expected in a ritual sweatbath. Of particular interest is the tau-footed vessel with the caiman motif found on the south side of the crawl across the passage from the hearth. The caiman motif or Earth Monster is also present on the Temple of the Cross at Palenque that has been identified by Houston (1996) as a cosmological sweatbath that functioned as a birth place for the gods. Additionally, Mark Child (2005) reported finding a vessel with a similar motif at a Classic Period Piedras Negras sweatbath. Karl Taube (1989:9) suggested that among the Classic Maya, there was an earth/caiman metaphor. He described Itzam Cab, the earth caiman, as the *axis mundi* par excellence and has identified the creature as the god of creation and sustenance in both highland Mexico and Postclassic Yucatan (1998:437). Taube notes that in the iconography of Copan, the deity is depicted with three stones in its mouth. This motif is identified as the *k'oben* or kitchen hearth fire that is described in *The Ritual of the Bacabs* as a *pib* or sweatbath (Roys 1965:61). The cave/sweatbath association is strengthened because the mouth of the deity may also be symbolized as a cave. It is also found in architectural metaphor where the mouth of the *witz* monster, a similar entity, is located on temple pyramids and has generally been interpreted as a symbolic cave opening (Gendrop 1980; Schávelzon 1980; Stuart 1997:15-16).

One final clue to the function of the crawl is the cluster of pebbles and sherds found on the natural shelf on the south side of the eastern entrance and the cluster of potsherds located at the western entrance. The pebbles are clearly water worn. No other stones of this nature are found inside of the cave other than the river cobbles used to support the jar in the hearth feature. The arrangement and clustering of the pebbles as well as their uniform size suggest that they are a unique offering. The location of the clusters of sherds and pebbles near entrances suggests that these offerings are analogous to the pebbles and sherds offered as a tribute to earth deities at

the entrance of the "sweatbath/cave," at the Festival of Games in Chamula reported ethnographically by Bricker (1973:114). As part of this yearly renewal festival, villagers visit a small cave with water emerging from it. The feature is referred to as a "sweatbath" because of its morphology, which is long and narrow like a steam bath. Those who participate in the festival deposit three stones or potsherds at the entrance as tribute to earth deities, for as Bricker notes, "if they do not offer three stones to the cave, they will die." The association of the sweatbath with earth deities among the Maya suggests that offerings to the cave/sweatbath propitiate these beings.

Dating

Because the majority of ceramics found in the crawl date to the Late Classic Period, it is tempting to assign a Late Classic date of usage to the area, but this is clearly not the case based on radiocarbon dating. The test pit indicates that the crawl was initially excavated in the Late Preclassic period and the hearth confirms Early Classic usage. The hearth stones and Late Classic vessel sitting on top of the charcoal appear to be a later edition although the vessel may have replaced an earlier one. There appears to be a change in ritual practice during the Late Classic period usage. Although the space probably underwent modification and intense utilization prior to this time, the number of ceramics deposited in the area increased dramatically in the Late Classic. Additionally, all of the partially intact or whole vessels dated to this time period. The remaining the ceramic assemblage of earlier material was much more fragmentary.

A third date that is perhaps less reliable but still of interest was collected from the excavation unit placed in the sediment pile in Chamber 3. Although this suggests possible Middle Preclassic usage, caution is observed because the charcoal fragment may have been

resting on the tunnel floor for a long period of time before the sediment was piled on top.

Therefore it is safer to assign the Late Preclassic date to the initial use of the area.

There are at least two known Preclassic sweatbath structures at surface sites. One is from the northern Belize site of Cuello (Hammond and Bauer 2001:683-684). Structure 342 is a small sub-circular room with a floor channel and exterior firebox. Hammond has dated this structure to 900 B.C. Further afield, another Preclassic sweatbath was reported at Dzibilchaltun in Northern Yucatan dating to between 450 B.C and 275 B.C. (Andrews and Andrews 1980:31, 287). This was a circular room with a plaster floor containing a large fire pit lined with rocks and sherds.

I have suggested that the cave may have had ties to the Buenavista del Cayo site. It is of interest that Mark Child (2005) has suggested that sweatbaths represent an elite religious cult originating at Piedras Negras that swept the Maya lowlands beginning in the Early Classic Period. In fact, a sweatbath adjoining an elite residence at the nearby site of Buenavista del Cayo was excavated by Joseph Ball and Jennifer Taschek (Ball 1993:56). Other than the cave sweatbath, it is the one of the only known examples of such a structure in the Belize Valley. Recently one was discovered by Christophe Helmke in the Roaring Creek area at the site of Pook's Hill near Teakettle Village (Jaime J. Awe, personal communication 2005). While the number of sweatbaths at Piedras Negras suggests that it may have become a cult practice in the Early Classic, my data indicate that ritual sweat-bathing was a ritual practice in the Preclassic period in Belize and possibly a precursor to the later cult.

4.12.17 Tunnel 1, Elevated Passage 3, Crawl 4, Elevated Passage 4

Tunnel 1 exits from Chamber 3 at the north end of the chamber and continues north beneath Elevated Passage 3 (Figure 4-118). On the east side of the tunnel are two side passages that become so constricted that they do not allow access. It is impossible to understand if they continue on or terminate. Four sherds and two cobbles sit adjacent to the wall on the east side of the passage in this area. Two sherds are the broken fragments of an Early Classic polychrome dish, one from an unidentified dish, and one from a red bowl with a ring base.

Excavation

The tunnel constricts 5.1m north of Chamber 3 and descends approximately 2m via a series of drops. Shovel Test Pit #020 was placed in the hallway adjacent to the entrance to the descent on the east side. The pit measured 60cm x 40cm and was 25cm in depth. Two hearths and a small stone mesa or table were encountered in the subsurface deposit although there was no evidence of their presence on the surface which was covered by 2cm to 3cm of dark brown compacted clay much like the rest of Tunnel 1. The first hearth area was located 2cm to 3 cm below surface on the north side of the pit (Figure 4-119). It was roughly circular and measured approximately 40cm in diameter. Like the hearth found in Shovel Test Pit #006, the burned area was partially lined with large non-diagnostic pottery sherds creating a bowl shaped area 20cm deep. Evidence of burning was recognized by the density and size of charcoal flecks within the clay matrix and by the bright orange/red (7.5yr5/8) mottling of the clay. At the base of the deposit, 20cm below surface, 2 charred seeds were recovered. They were round and measured approximately 1cm in diameter.

The second hearth was located in the southeast corner of the pit. It also measured roughly 40cm in diameter and was 20cm deep. No sherds were located in this area but charred

seeds were mixed in with the red clay at the base of the feature. A total of 30 were recovered from the deposit. These were identified by Christopher Morehart (personal communication 2005) as *Brosimum alicastru*, a tree commonly called ramon (Figure 4-120). The burned area extended to the east of the unit and was left in situ for future study.

Adjacent to the hearth feature in the northwest wall of the pit were three stacked stones. All three were limestone and white in color. They did not appear to be imported into the cave. Two were roughly circular with diameters of 5cm and the other was oblong measuring 15cm in length. The two smaller stones supported the larger one. The configuration was oriented in an east/west direction. The soil below this feature was stained the same orange/red color present in the hearths and heavy charcoal deposits were found in and around the feature. This feature may be small *mesa* or altar similar to those reported at other cave sites by Brady (2003).

Finally, along the south wall of the probe, two dark stains were encountered whose shape resembled postholes. They were 8cm apart and measured 5cm in width and were 12cm deep. Charcoal flecks were noted in and around these features.

Dating

There are two dates from this area. The first was from charcoal collected from Hearth 1, 5cm below the surface and fell into the Early Classic period with a date range of A.D. 240 to A.D. 410. The second was from beneath the base of Hearth 1, 28cm below the surface. At the two sigma range this date falls between 800 B.C. and 200 B.C., the Middle to Late Preclassic periods. However, there is an 81% probability that the date falls between 550 B.C. and 350 B.C. This suggests that burning in the area began in the late facet of the Middle Preclassic period and that it was re-utilized in the Early Classic when the sherd lined hearth was

constructed. The hearths may have been covered over after their usage. The rock feature occurs at the same level as the Early Classic hearth base suggesting that it was constructed at this time.

Elevated Passage 3

Elevated Passage 3 can be approached either via the north side of Chamber 3 or from Elevated Passage 4, which is entered from Tunnel 1 further into the interior of the cave. The Chamber 3 entrance is 3.5m above the chamber floor and can be accessed via a shelf positioned below the passage. Elevated Passage 3 is positioned above Tunnel 1 and runs parallel with the tunnel on a north/south axis (See Figure 4-118). It measures 9m in length, 5m at its widest and 1.7m at its narrowest point. The eastern half of the passage ascends to an alcove with a low ceiling height. The passage contains 24 ceramic sherds, two cobbles, and 20 spalls. Of the ceramics, there are at least 13 individual vessels that include: 11 jars, one bowl and one polychrome dish. Two Late Classic jars are completely intact and one contains well-preserved maize. There are only two possible instances of ritual breakage. Ceramics date primarily to the Late Classic period, but there is at least one Terminal Preclassic/Early Classic jar sherd, one Early Classic polychrome dish sherd and a sherd from a fluted bowl. The bowl is similar to the Middle Preclassic, Yesoso Orange Paste-Ware, sherd located in the niche below Crawl 3. The two earlier-dated sherds are located in the upper alcove area and the Late Classic vessels are found in the passage.

From the south entrance, 3.8m into the passage adjacent to the east wall are two Late Classic Spanish Lookout complex jars. One is the top half of a black-slipped, narrow-necked, Mt. Maloney vessel, and the other is an intact, medium-sized, Cayo Unslipped jar containing grainy reddish brown sediment with two small cobs resting on top (Figure 4-121). These were

sampled in 1998 and analyzed by Morehart (2002:168-172), who identified them as uncarbonized, under-developed cobs of ten-rowed *Zea Mays*. A single cob fragment dated to the Late Classic period, A.D. 680 to A.D. 890. This configuration of the Late Classic Cayo style jar containing corn and dating to the end of the Late Classic period is almost identical to the offering left on Ledge 6 described above.

To the east of the vessels is another small cluster of artifacts including a small intact Late Classic jar (see Figure 4-121 top photo), two cobbles, and five jar sherds. One whole or partial jar appears to have been broken in situ. There are no visible residues on the intact vessel. On the westernmost edge of the alcove are two natural depressions in the bedrock. The first contains four potsherds one of which is a fragment of a Terminal Preclassic/Early Classic Chan Pond Unslipped jar. The second contains two non-diagnostic jar sherds and charcoal.

The low ceiling in the alcove exhibits signs of charring (Figure 4-122) and the sediment matrix contains a great deal of charcoal. At the back of the alcove in the easternmost area is a niche measuring 1m in length and 80cm from front to back. It contains 17 spalls, two possibly Late Classic jar sherds, and a great deal of charcoal suggesting a burning event. In front of the niche moving west is a fluted Middle Preclassic bowl sherd and an Early Classic polychrome sherd. At the edge of the alcove on the north wall is a small natural depression containing a small non-diagnostic ceramic sherd, four spalls, a wood fragment, and charcoal.

Crawl 4

Crawl 4 is located above both Tunnel 1 and Elevated Passage 4 and runs parallel to Tunnel 1 in a northeast/southwest orientation (Figure 4-123). It measures 6.1m in length and 2.1 in width, and headroom averages approximately 75cm. The crawl is most easily accessed from the southwest opening in Elevated Passage 3. The northeast opening culminates in a 24°

slope leading to a sheer drop that rejoins Tunnel 1 2.56m below. There is a natural raised bench-like bedrock formation approximately 50cm to 80cm in width that runs along the northwest wall (Figure 4-124). The crawl contains 19 sherds, 12 spalls, two cobbles, and charcoal. The sherds represent at least three vessels all of which are jars. Two exhibited breakage. Eight sherds refit with a Terminal Preclassic/Early Classic jar rim sherd located in Elevated Passage 4.

There are four clusters of artifacts in the area three of which are located 1m apart on the crawl floor adjacent to the bench-like feature. The first cluster is located on the north side of the southwest entrance within a natural depression in the bedrock. It contains a dense charcoal scatter and four non-diagnostic sherds. The next cluster of eight sherds is found one meter northeast on the floor. One of these belongs to a Terminal Preclassic/Early Classic Chan Pond style jar located in Elevated Passage 4. Charcoal surrounds the sherds and some are burned. One meter northeast of the sherds is a cluster of 12 burned spalls surrounded by a dense charcoal scatter. Moving one meter northeast is a scatter of sherds belonging to the same jar in Crawl 4 previously mentioned and two cobbles. Although there are seven sherds recorded they exhibit a number of fresh breaks and it is likely that there were originally only two sherds present. There is a charcoal scatter in and around the sherds and both cobbles are charred.

Elevated Passage 4

Elevated Passage 4 is an extension of Elevated Passage 3 (See Figure 4-123). The passage is 12.2m in length and is oriented on a north/south axis. It may be accessed via a 2m descent from Elevated Passage 3 on the south end or from an entrance 1.24m above Tunnel 1 on the north end. Discrete clusters of artifacts line the walls of the passage (Figure 4-125). The area contains 45 ceramic sherds, 77 cobbles, 17 pea-sized limestone pebbles, and six charcoal

scatters. Of the 45 sherds, there are at least five vessels represented: four jars and one bowl. The bowl sherds are found in three separate clusters within the crawl and sherds from one Terminal Preclassic/Early Classic Chan Pond style jar has been deposited both in the passage and in the adjacent Crawl 4 area. A second jar is distributed in the passage. Although two jar sherds from the area were tentatively identified as Late Classic, this is somewhat speculative and other material has been more confidently identified from earlier time periods.

Beginning at the descent into Elevated Passage 4 from Elevated Passage 3, there is a small circular alcove. On the south wall 50cm above the floor is a small shelf or niche containing four non-diagnostic sherds. On the alcove floor is a small circular depression 20cm in diameter containing four non-diagnostic sherds and charcoal. On the north wall of the chamber 1.05m above the floor is a small crevice or niche measuring 4cm x.4cm containing charcoal. There is charring above the hole, similar to the charred areas in Tunnel 1 below Ledge 6 and on Ledge 7.

On the east wall of the passage is a small alcove formed by an overhang. Within this constricted space are three groups of artifacts. The first group consists of a fragment of a large, fluted bowl, as well as three non-diagnostic sherds and six cobbles surrounded by a charcoal scatter. The second group is a cluster of cobbles, pebbles and a charcoal scatter. The third group contains a second sherd from the fluted bowl, three jar sherds, cobbles, a spall and charcoal scatter. The fluted bowl is similar to the Middle Preclassic sherds found in the niche below Crawl 3 that have been typed by Joseph Ball as a Joventud Red mimic of the Yesoso group. One of the jar sherds refits with the vessel located 1.3m north of the cluster. This vessel is a Terminal Preclassic/Early Classic Chan Pond style jar that has been smashed and distributed in Crawl 4 as well.

On the west wall of the passage starting on the south end, adjacent to the wall is a large group of cobbles and pebbles as well as six ceramic sherds. One of the sherds is a fragment of a Terminal Preclassic/Early Classic Chan Pond style jar. There is a scatter of charcoal north of the rocks. One meter to the north is a second cluster of artifacts which includes cobbles, charcoal, and seven sherds. Six are jar sherds and one is a fragment of the same fluted bowl also located across the passage on the east wall. The easternmost artifact group consists of eight non-diagnostic jar sherds and two cobbles.

Shovel Test Pit #015 was collected from the center of the passage 4m from the Tunnel 1 entrance. It measured 37cm x 20cm and was 13cm in depth on the south side and 2cm on the north side due to the slope of the cave wall in the area. The sample exhibited several strata and lenses of dark brown, light brown, reddish, and gray clays. The basal layer consisted of compact fine white silt that may be disintegrated limestone bedrock. A charcoal sample was collected from 7cm below the surface and dated to the Middle to Late Preclassic period with a date range of 400 B.C. to 200 B. C.

Dating the Areas

The data from the three areas suggests that the initial use was in the Middle to Late Preclassic period but that only one ceramic sherd was deposited in the area at that time. Early Classic usage is indicated by the polychrome sherd in the alcove of Elevated Passage 3 and by the Terminal Preclassic/Early Classic jar sherds present throughout. Ceramic deposition in the three areas suggests that they were somewhat integrated at least in the Early Classic Period and that sherds from the same vessel were utilized between Elevated Passage 4 and Crawl 4. Late Classic usage appears to be localized at the south entrance of Elevated Passage 3 and consists of offerings of young maize as well as whole or partial vessels.

4.12.18 Dead End Chamber, Dead End Trench

This chamber is located at the terminus of Tunnel 1 (Figure 4-126). It is an hour-glass shaped area oriented on a northeast/southwest axis. It is 4.8m in length, 2.4m at its widest and 1.6m at its narrowest point. The area contained 53 ceramic sherds, three snail shells, and charcoal. The three shells were placed on a shelf on the west side of the chamber 1.41m above the floor. Accompanying them were three small fragments of a broken jar and a scatter of charcoal. Many sherds in the area were placed in small holes or niches in the wall, and most were located on the floor in the center of the chamber adjacent to a large sediment pile located against the east wall of the chamber. Almost all of the ceramic material was non-diagnostic but there were at least two bowls and two jars represented. One jar exhibited breakage. The only sherd that was typed for chronology was Balanza Black bowl belonging to the Early Classic period.

The most compelling feature of this area was the mud-covered floor itself. Throughout the tunnel system the floor was flat or gently sloped, but at the end of the tunnel along the back or east wall of this area, the floor began to slope upwards at a sharp 20° angle as the ceiling height descended (Figure 4-127). A small opening 1.3m in wide and 26cm high was noted in the east wall suggesting that the tunnel continued to the east. The sediment in the pile was very hard and cracked. Embedded ceramic sherds could be seen through the cracks in the matrix. A dark brown stain covered the walls of the chamber to a height of 25cm to 45cm above the modern floor. The ceiling at the terminus above the sediment appeared to be charred. These observations suggested that this area could have been intentionally plugged.

Excavation

Unit 02-02 was undertaken to determine the nature of the deposit (Figure 4-128). The unit measure 1.5m x 60cm and was oriented northeast/southwest. It began at the base of the sediment and extended to the back or east wall. It was dug in arbitrary levels as there was no stratigraphy. The matrix was dark brown, plastic, heavily compacted, clay interspersed with marl and mudstones. Mudstones (probably claystones to be more specific) are naturally occurring indurated clay that have the texture and compositions of shale, but lack the fine lamination or fissility (Gary et al. 1972). The matrix was very dry on the top of the pile but wetter below. The sediment contained charcoal, four non-diagnostic ceramic sherds, three land snails, and seven animal bone fragments. The unit continued to 10cm below the modern floor surface but no artifacts were encountered in the lowest level. A column sample was collected from the eastern wall for future study. A date obtained from a charcoal sample collected 46cm below the surface fell into the Middle to Late Preclassic period with a range of 410 B.C. to 200 B.C. Results from the excavation suggested that this was a cultural deposit possibly produced by a single event.

Due to the lack of stratigraphy the unit was abandoned and a trench was initiated to extend the tunnel through the eastern opening. Workers Armando and Jesús Morales were hired for the task of excavating through the heavy clay deposit. The opening observed in the Dead End Chamber was an extension of Tunnel 1 that continued through a low arch in the northeast wall and into a crawl space that led deeper into the cave. It continued in a northeast direction that sloped downward between 5°-20°. The crawl is 12m in total length, 75cm to 1m wide with a variable ceiling height from 45cm to 1.22m. It was completely filled with

mud but the nature of the deposit changed dramatically as it progressed deeper into the tunnel transitioning from what was clearly an anthropogenic to a non-anthropogenic deposit.

In 2002 the team was able to excavate 5.6m of tunnel. The trench in this area produced 30 sherds, one jute, one *Pomacea flagellata*, six additional land snails and 16 unidentified bone fragments (Figure 4-129). None of the sherds refit and some were heavily charred. Ceramics from this area were tentatively identified in the 1999 field season but have been reevaluated. Charcoal flecks were present throughout and there were a number of large chunks that were clearly identified as charred wood. Samples were collected for dating and species identification.

The Cache

At 3.1m into the crawl a void in the top of the sediment was encountered beneath a dome in the ceiling (Figure 4-130). This area was completely sealed off by the clay-filled tunnel. The void was located directly under the dome and was roughly circular measuring 70cm in diameter. The ceiling height was 30cm to 40cm in height. There was a thin crack in the ceiling of the dome, but no light penetrated. Condensation was present on the ceiling and the clay matrix was damp on the surface.

Located on the surface was a cache of small objects deposited in two groupings. Heavy burning had taken place over the entire area. On the north side of the shelf, in Group 1, there were 10 sherds, eight land snails, and 30 disarticulated small bone fragments (Figure 4-131). A dense concentration of charcoal was located between the two groups and was closely associated with the Group 1 bone fragments. Sherds were located beneath the charcoal adjacent to the wall. Group 2, located on the south side of the shelf, consisted of four sherds, three land snails, two animal teeth (probably gibnut), and some tiny bone

fragments. Additionally there was a green kidney bean-shaped object that is probably a fresh seed. The sherds were covered by burned sediment. A charcoal sample collected from Group 1 produced a date range of 410 B.C. to 200 B.C., identical to the date from Unit 02-02.

Because the cache area was so wet, it was fairly evident that the dome was in contact with the surface though it is unclear how the fresh seed made its way into the cave. This casts some doubt as to whether the animal bones or snails were part of the cache or were naturally occurring. However, it was impossible for the sherds to have arrived at their location by any means but intentional placement. Two vessels from Group 1 were diagnostic. The first sherd is similar to a Laguna Verde Incised tripod dish (Brady et al. 1998:23) and the second consists of two co-joining sherds from a Sierra Red dish dating to the Barton Creek phase (Figure 4-132). The tripod dish is somewhat problematic as the type is known to be Late Preclassic. However, because of the nature of the deposit it is extremely unlikely that the sherds could date later than B. C. 200. The second sherd dates to the same time period as the charcoal. The data suggests that this cache represents a single event that included the deposition and breakage of ceramic sherds accompanied by burning.

The trench continued due north another 2.5m and was discontinued when the season ended. It was noted that fewer artifacts were found in the section of the trench north of the cache. There were a diminishing number of charcoal flecks and no ceramic sherds.

The trench was continued in 2003. A human tooth--a shovel-shaped maxillary left incisor with considerable edge wear--was encountered on the first day of excavation (Figure 4-133). It was located west of a second conical-shaped chimney in the tunnel ceiling. This was the last artifact encountered in the deposit. From the chimney to the end of the trench

there was no evidence that the deposit was anthropogenic. East of the chimney the tunnel turned northeast and continued 5.5m. In this area the clay deposit no longer reached the ceiling but had to be cleared to allow for enough space to crawl through. The clay was very wet and had numerous mudstone or claystone inclusions but otherwise resembled modeling clay. The clay on the surface of the deposit was clumped in bead-sized aggregates and the surface had a wavy appearance perhaps due to shrinkage and swelling over time. At the end of this leg of the tunnel was another conical chimney with cracks, but like the others no light penetrated. There was a cool breeze coming from this area. Although the tunnel appears to turn southeast excavations were halted at this point. Elemental analysis of the back deposit showed a high copper (120ppm) and high phosphate content, which suggests that the clays were derived from bat guano. It is interesting to note that as soon as this back passage was opened up, bats began to fly into the area almost immediately.

The entire deposit was not removed by the excavation which left walls of clay on either side of the trench as well as deposits on the floor. In 2005 two small jade beads were collected from the floor of the tunnel that may have eroded from deposits in the clay walls (Cameron Griffith personal communication 2005). Griffith suggested that there may be a surface site in the vicinity of the tunnel and that artifacts may be infiltrating through cracks in the tunnel ceiling. The clay in the tunnel is very moist so water is clearly leaching into the sediments and as mentioned above, recent floral material was found in the cache. Additionally, a small fragment of a soda bottle was found on the first day of excavation in 2003. I did not see the fragment in situ but it was brought to me by the workers so I immediately thought that they were playing a practical joke. In view of the fact that the beads appeared well after the field season and there are no other beads found in any of the

cave surface or subsurface deposits, it is possible that they may have fallen into the tunnel from above the dome. What is puzzling is that none of the observed cracks in the domes or elsewhere appear large enough for this material to have penetrated them.

Dating

The entire Dead End area is quite curious. It is clear from the excavations that the back of Tunnel 1 was blocked off between 410 B.C. and 200 B.C. Both the radiocarbon date collected from the trench, the date collected from the cache, and most ceramics agree in this date range. The lack of stratigraphy and identical dates suggest that the cache and infilling of the area occurred as a single event. The dark brown stain on the Dead End Chamber walls suggests that the fill for the blockage may have come from the immediate area. The blockage was accompanied by a ritual that included offerings of ceramic sherds and burning. In the Dead End Chamber the only diagnostic sherd dates to the Early Classic suggesting that visitation to this area continued in this period.

4.12.19 Elevated Passage 2

Elevated Passage 2 connects Chamber 2 with Tunnel 2 (Figure 4-134). The passage is 15m in length. The south entrance is accessed from the balcony in Chamber 2 and north from Tunnel 2. The south section of the passage is 2m to 2.5m in width narrowing in the north section to 1m to 60cm. Headroom is low in the south section, approximately 1.3m but increases in the north area. The passage slopes downward from the north side and the northern section slopes steeply (18°) where it connects with Tunnel 2. There is a heavy charcoal scatter in the center of the pathway at the southern entrance, but all of the passage's other artifacts are located in the central area and along the walls. There are 21 sherds in the

passage representing at least three vessels: one dish, one Late Classic jar, and one Early Classic bowl. The dish sherd was broken into two pieces.

On the west wall 1.3m from the southern entrance is a group of artifacts that include four cobbles, four small non-diagnostic sherds, and two spalls, surrounded by a charcoal scatter. Four meters north of the cluster is a very small active stalacto-stalagmitic column surrounded by cobbles and small speleothems that are probably natural features. The only evidence of ritual activity in this area is the presence of two very small non-diagnostic sherds. Moving north 2.4m adjacent to the base of the northern slope are six cobbles, a spall, a speleothem, and three ceramic sherds. One sherd was identified as belonging to an Early Classic Balanza Black bowl and another is a fragment of an unidentified dish. A second sherd from the same dish is located in the cluster of artifacts 2.5m east in a niche containing a rodent nest adjacent to the east wall. Rodents may have carried the sherd to its current location. Also found in this cluster is a cobble, two spalls, a speleothem, five small probable jar sherds, and a rim from a Cayo Unslipped Late Classic jar. Finally, in the central area of the passage is a small depression adjacent to the east wall. is a cluster of objects that includes five cobbles, a spall, two soda straws, and five non-diagnostic sherds.

The area was clearly used in the Early and Late Classic periods, but was probably negotiated in earlier periods as well although use appeared to be sparse. Shovel Test Pit #018 was placed at the north entrance at the top of the slope in Tunnel 2. The pit measured 50cm x 50cm and was 26cm in depth. It is of interest to note that no charcoal was found in the excavation further evidencing that the passage was never heavily utilized. No radiocarbon dates were submitted for the passage mainly because it appears to have

functioned primarily as a conduit between Chamber 2 and Tunnel 2 and not as an area of intense ritual utilization.

4.12.20 Tunnel 2 South

Tunnel 2 branches off of Tunnel 1 at the Chamber 2 juncture (Figure 4-135). It can be accessed via Chamber 2 from Elevated Passage 2 or from another entrance farther along Tunnel 1. The Tunnel 1 entrance is on the north side, 17.6m from Chamber 2 and is accessed today via a ladder ascending the 2.16m climb. The tunnel is L-shaped. The shorter 22.6m south leg is oriented northwest/southeast. The longer 63m leg, oriented on a northeast/southwest axis, descends to the Stela Chamber. All of the artifacts located on the surface of the tunnel are placed adjacent to or within niches in walls.

Most of the artifacts are found in the area of the south leg of the tunnel located in two groups: Group 1 to the east and Group 2 to the west (Figure 4-136). There are 82 ceramic entities in the south area which represent at least 38 vessels: 23 jars, nine bowls and six dishes. All of the 28 identifiable types date to the Late Classic Spanish Lookout period. Although the area contains many ceramic sherds as well as whole and partial vessels, there are no hearths and there is very little charcoal or evidence of in situ burning.

There are 18 complete vessels in the assemblage of which, eight are medium to large jars, nine bowls and one dish. Six of the eight jars are completely intact and two have small "kill" holes. Three of the jars are covered by large incurving Mt. Maloney style bowls in inverted positions (Figure 4-137). Two of the jars are sitting upright and the third is inverted and has two inverted bowls over its base. The crew nick-named this area "The Mushroom Forest" due to the resemblance of the three vessel configurations to mushrooms (Figure 4-

138). Although the analogy is striking, this may have nothing to do with their use or symbolic meaning.

Group 1

From the Tunnel 1 entrance, Group 1 is located in both sides of Tunnel 2, 7.2m to the northwest (Figure 4-139). On the west side of the tunnel is a large whole jar with a heavily charred exterior sits in an inverted position. It was typed as a Tu-tu Camp Striated (Figure 4-140). There is a small niche in the wall above the vessel 1.2m above the tunnel floor. The niche held a well-preserved tecomate or gourd-shaped vessel that was removed by the former Belizean Department of Archaeology (Figure 4-141). The vessel has a crack but it otherwise completely intact. It has been typed by Joseph Ball (personal communication 2005) as a Tinaha Red: Tinaha Variety, which dates to the Tepeu III period at Uaxactún (Smith and Gifford 1966: 145) correlating with the end of the Spanish Lookout period in Belize, A.D. 850-900.

On the tunnel floor beneath the shelf is an overhang containing a rodent nest. Two cobbles, two spalls and three small sherds are associated with the nest. It is unlikely that the rodent was responsible for transporting the sherds to their current location because they are stacked and the one on the bottom is charred. Adjacent to the wall is a partial Cayo Unslipped jar and 12 small sherds. The jar is heavily charred on both the interior and exterior. Four of the sherds belong to a similar but distinct Cayo Unslipped jar.

Two large fragments of a Cayo Unslipped jar are nestled in a shallow depression in the floor of the tunnel adjacent to the wall 75cm to the north (Figure 4-142). The depression is 60cm in diameter. It appears that the depression was excavated to contain the jar base. The interior of one partial vessel is heavily charred. Moving north 1.5m is one of the most

curious configurations in the cave. A medium-sized Cayo Unslipped jar sits in an inverted position and is topped by two large Mt. Maloney style incurving bowls inverted over its base (Figure 4-143). The exterior base of the jar is charred but neither bowl exhibits charring.

On the east wall starting on the southernmost end, there is a large Cayo Unslipped jar with a smashed base. Beneath the jar are several non-diagnostic sherds none of which belong to the broken jar. To the north of the jar sitting in an upright position, is an intact medium-sized Cayo Unslipped jar with a small circular hole or "kill hole" in the body (Figure 4-144). A large Mt. Maloney incurving bowl was placed in an inverted position over the jar rim.

The jar was sampled for residues by Christopher Morehart and found to contain starch grains (2002: 173-175). There was no visible residue in the jar and the exterior was charred. The kill hole in the jar precluded any possible function for containing liquids. Unlike the similar styled jars containing corn offerings found on Ledge 6 and Elevated Passage 3, this jar did not appear to contain plant remains. The exterior charring suggests that the jar was used as a cooking vessel and later imported into the site at the end of its use life. The lid on the jar suggests that this is a symbolic configuration as does the similar feature located on Ledge 9.

A Mt. Maloney bowl sat on the floor to the north of the vessel but has since been removed for curation by the former Department of Archaeology (Figure 4-145). Adjacent to the wall is a depression that once contained a small bowl stolen from the cave in 1998. A medium-sized, intact, Cayo Unslipped jar sits next to the wall north of where the vessel was stolen. The jar exhibits exterior charring. It was tested for residues with negative results. To the east of the vessel is a similar intact, large, Cayo Unslipped jar sitting in an upright position. A Mt. Maloney bowl is sits on top of it in an inverted position covering the jar rim

(Figure 4-146). The exteriors of both of these jars are charred suggesting that they were used prior to their deposition in the cave.

Shovel Test Pit #017 was placed in the center of the passage. The pit measured 45cm x 50cm and reached bedrock at 21cm. The pit exhibited a number of stratigraphic layers but little of the dark brown clays typical of the sediments collected from the floor areas of Tunnel 1. No charcoal was found in the pit suggesting that the area was used only for a short period of time during the Late Classic period as the ceramics suggest.

Group 2

Group 2 is located 5m northwest of Group 1 adjacent to the south wall of Tunnel 2 (Figure 4-147). All ceramics in the group date to the Late Classic Spanish Lookout period. There are at least 10 jars, two of which are intact, as well as three bowls, and five dishes. On the north side of this area is a stone archway that extends the width of the tunnel. A niche in the arch once contained a small reddish brown bowl tripod dish with nubbin feet which was stolen in 1998. I photographed this vessel on a cave tour in 1997 (Figure 4-148).

Beginning on the south end of the group, adjacent to the wall is a shallow depression containing eight non-diagnostic sherds and large fragments of three Cayo Unslipped jars. One fragment exhibits both interior and exterior charring whereas the others do not. The top half of a medium sized Cayo Unslipped vessel is located adjacent to the depression. The jar is charred on the interior and exterior strongly suggesting that it was used prior to its deposition in the cave. To the east of the depression is a large Alexander's Unslipped jar with a hole in the base. A rodent nest containing three non-diagnostic sherds is located beneath the vessel. The vessel interior has sediment encrusted onto the same side as the hole suggesting that it once sat on its side and has since been up righted. This is verified in an

early photograph taken by Mike Green (Figure 4-149). The jar had been up-righted by 1997 when I photographed it (Figure 4-150).

Next to the large jar, between two cobbles, is half of a tripod dish with a water-bird motif, typed as a Palmar Orange: Danta Variety (Figure 4-151). Adjacent to the dish are three sherds from an unidentified red dish and one from a Cayo Unslipped jar. West of the dish, also located between two cobbles was a brown tripod dish which was stolen from the cave in 1998 (See Figures 4-149, 4-150). To the north, adjacent to the vessel within a depression containing charcoal was a Mt. Maloney bowl. The vessel was removed by the former Dept. of Archaeology and is curated in Belmopan (Figure 4-152). It is completely intact but the slip is highly weathered. Within a depression adjacent to the wall west of the spot where the vessel sat, is a medium-sized Cayo Unslipped jar. The jar is intact except for a hole in the base. The exterior is either charred or was intentionally smudged.

North of the vessel, also adjacent to the cave wall, is a partially intact medium-sized Cayo Unslipped jar with exterior charring. Four cobbles are stacked against the wall next to it. To the west, adjacent to the jar are two medium-sized Cayo Unslipped jars that lay on their sides with their rims facing one another. The easternmost jar is completely intact and the westernmost is almost complete with the exception of a hole at the base. A cluster of sherds is located at the north end of Group 2. They consist of seven sherds from a single Dolphin Head Red: Dolphin Head Variety bowl, four sherds from a Vaca Falls Red dish, one body sherd from a non-diagnostic bowl, and a non-diagnostic jar sherd (Figure 4-153).

Discussion

Some interesting points can be made about this area. The ceramics in this entire south area of Tunnel 2 suggest that it was used exclusively in the Late Classic period. The

sparse amount of charcoal located either on the surface or subsurface indicates that although the passage was necessarily traversed to gain access to the Stela Chamber, it must have only been used sporadically and activities would not have involved lingering for long periods of time. Test pits from both ingresses support this conclusion.

The discovery of starch grains in a jar with a kill-hole indicates that vessels were likely to have been used prior to their deposition in the cave. This argument is supported by the charring patterns on vessels in this area which also suggest that these vessels were used in other contexts. This is a very important point in attempting to understand the nature of cave assemblages.

Finally, the unique vessel configurations found in this area suggest that the area was used in a special or unique way. Not only were there a large number of lidded jars, but bowls were placed on top of inverted jars as well, suggesting that they were not functioning as lids but in some other way. The positioning of the Mt. Maloney bowl over the rim of a jar with a kill hole precluded it functioning as a container for liquid. This suggests that the configuration itself carried symbolic meaning.

4.12.21 Tunnel 2 North

Middle Section

Tunnel 2 turns northeast at this point and descends to the Stela Chamber (Figure 4-154). Moving from the south leg of the tunnel through the archway, the ceiling height drops and one is forced to crawl or stoop to pass through the middle section of Tunnel 2 (Figure 4-155). This part of the tunnel passes over a hollow area beneath the floor. One's footsteps

reverberate making a drum-like sound and the floor shakes when walking through the passage.

There are a large number of rodent nests (22) located adjacent to walls and under overhangs in this part of the tunnel. Although the tunnel is long, there are few artifacts located in the descent. There are 35 ceramic sherds representing at least 11 vessels: six jars, four bowls and one dish. One bowl and one jar were broken in situ. All of the sherds or partial vessels dated to the Spanish Lookout period with the exception of one large jar sherd that was not typed but appears to be Preclassic in age.

Beginning at the southern end, on the western wall there is a rodent nest containing four small non-diagnostic sherds perhaps moved by the rodent. Across the passage are two additional rodent nests and at the back of a small alcove, two large sherds of a single Cayo Unslipped jar. Moving north 1.5m to 2m there are two stacks of cobbles located across the passage from one another (Figure 4-156). Although the cobbles are limestone and originate from within the site, they have clearly been intentionally stacked.

Moving north on along the western wall is a cluster of sherds that include one fragment of a Silver Creek Impressed: Silver Creek Variety dish and a Mount Maloney bowl. A cluster of seventeen small cobbles abuts the wall. There is a rodent nest in a crawl space north of the cobbles. Adjacent to the western tunnel wall 4.7m north of these artifacts are 12 cobbles arranged in a circular pattern. Inside the circle is the top half of a Cayo Unslipped jar with external charring. There is a charcoal scatter adjacent to the jar. It is unclear as to whether the jar was burned in situ since the charcoal is not located beneath the sherd. Two meters north of this grouping is a small alcove containing two large fragments of a Mt. Maloney bowl sitting upright between four cobbles (Figure 4-157). Although the fragments

can be refitted, pieces of the vessel are missing and were not found in the area. The bowl is highly weathered and shows no signs of charring.

North of the alcove, the tunnel ceiling opens up and it becomes possible to stand throughout the northern areas of the tunnel. A cluster of jar sherds and cobbles sits adjacent to the eastern wall in this area. Moving northeast along the tunnel 9.8m, 24 cobbles are clustered beneath a small overhang. Because there are no ceramics or charcoal associated with the rocks, it is unclear as to whether this is a cultural feature.

Shovel Test Pit #019 was placed in the center of the pathway adjacent to the overhang. This pit measured 40cm x 40cm and was 18cm deep to bedrock (See Figure 4-154). A single charcoal fleck was collected 11cm below the surface. The radiocarbon date range was from 360 B.C. to 40 B.C. at the 2 σ probability, but there is an 84.3% chance that it dates from 240 B.C. to 40 B.C.

Moving 2.4m northeast along the eastern wall is an alcove located 1.5m above the tunnel floor measuring 1.4m in width and 1.6m in depth. In the back of the alcove is a large wood fragment that is partially rotted. The fragment is too large to have been part of a pine torch and I assumed that it was modern but may be in error as William Plytez (personal communication 1999) attested to its antiquity. Half a meter north on the eastern wall fragments from two Mt. Maloney bowls and a non-diagnostic sherd are located on the tunnel floor beneath an overhang.

Northernmost Section Tunnel 2

The northernmost section of the tunnel consists of a series of drops that descend to the Stela Chamber. The most dramatic drop is the final descent, a 20° slope currently assisted by a rope entered via a natural restriction in the passage (Figure 4-158). There are

even fewer artifacts in this part of Tunnel 2 than in the middle section (Figure 4-159). Of note is a jar fragment located beneath an overhang on the eastern side of the tunnel (Figure 4-160). The jar is unslipped, has a wide mouth with a 20cm rim diameter, is decorated with a lug handle, and has a hard red paste with calcite and large quartzite inclusions. When the jar was recorded it was found sitting in an upright position, but on inspection it was noted that the interior of the sherd was caked with ash. Charcoal flecks are scattered next to the sherd. A sample was collected and dated to the Middle Preclassic period, 800 B.C. to 510 B.C. James Aimers (personal communication 2003) was not able to type this jar and but it may be contemporaneous with the dated charcoal.

On the western side of the tunnel are a cluster of four cobbles and a scatter of animal bone. The bone has not been identified and it is unclear as to whether it is natural or cultural. Directly across the tunnel from the jar fragment is a crawl space with loose sediment around the entrance. It appears that someone made a half-hearted attempt to excavate the area probably to see if the cave continued through the crawl. Two meters northeast of the back dirt the passage is restricted by a natural elliptically shaped entrance that requires ducking as one steps through it. On the north side of the restriction is a small circular space where the floor is flat. It serves as a preparation area for the final descent into the Stela Chamber. The only possible cultural remains in this area are 9 cobbles clustered within a small niche created by an irregularity in the wall. A column of rock hangs down in the center of the area. At this point the tunnel descends 8.7m to a sheer 3.7m drop into the chamber below. There is currently a ladder placed at the drop to facilitate the climb down to the Stela Chamber.

Dating

Tunnel 2 exhibits little usage and on the surface it appears to date to the Late Classic period based on the ceramics in the passage. However, the radiocarbon dates suggest that the passage was explored in the late facet of the Middle Preclassic period and was used in the Late Preclassic as well.

4.12.20 Stela Chamber

The Stela Chamber is the most remote and deepest area of the cave (Figure 4-161). It is also the most problematic due to its disturbed contexts. However, lest we throw out the baby with the bathwater, the material within the area deserves consideration as the radiocarbon dates indicate that it was used as early as the Late Preclassic period bolstering the authenticity of the features and associated artifacts. In this section I will present some arguments to aid in its evaluation.

The chamber is large and cathedral-like with excellent acoustics. It is oriented on a northeast/southwest axis and the largest area forms an open room that measures 9m northwest to southeast and 15m northeast to southwest with a ceiling height of over 20m (Figure 4-162). A large stone pendulum hangs from the center of the ceiling of the room. There is a small ledge high above the floor near the entrance that which contains a jar. In the jar there was *Solanum* sp. (nightshade) seeds that were probably deposited naturally by bats (Morehart 2002:172-173). Currently no water enters the chamber but there is high humidity that prevents the sediments from completely drying out. The presence of flowstone at the north end of the area suggests that it may have been wetter in the past.

There are a number of crawls, alcoves and small rooms that adjoin the larger area. On the easternmost side of the chamber is a crawl space that contacts a long narrow room that parallels the main part of the chamber on a northeast/southwest axis. It is 12m in length and between 80cm and 1.6m in width. The only artifacts in the area are two non-diagnostic sherds placed on a shelf in a small circular alcove approximately 1m above the floor.

In the northeastern area the ceiling height drops and tapers to the end of the cave. This area is more restricted and is partitioned by a large flowstone column. There is a single jar sherd exhibiting modification southeast wall of this area. Although there are two possible passages that suggest that the cave may continue, they are blocked and would have required extensive excavation.

There are few artifacts in the chamber. These consist of a small stela and few non-diagnostic ceramic sherds. Placed in "front" of the stela is a speleothem fragment, approximately 40cm in height and sitting in an upright position. An indentation at the top of the speleothem contains ashes and charcoal suggesting that it was used as an incensario.

Censer Fragments

Near the entrance to the chamber adjacent to the north wall, the owners of the cave reported finding a stack of 16 effigy censer fragments, which they have curated. All family members are in agreement that they were collected from the chamber although there seems to be some discrepancy regarding their original location. William Plytez indicated to me that they were found on the west wall, so I have placed them there on the map though the reader should be advised that this is an arbitrary placement. Jamie Awe (personal communication 2005) was told that they were found in an alcove in the north area of the chamber.

There are at least three vessels represented by the sherds. Drawings of the fragments are found in Appendix VI. The fragmentary nature of the sherds coupled with the lack of comparative whole vessels made it difficult to reconstruct the original censers. Several of the censer fragments from the cave refit but none represented an entire vessel. Three sherds were refitted to reconstruct the elaborately decorated rim of one censer. Its rim diameter was 18cm. These vessels have been typed as Pedregal Modeled (Adams 1971:57; Awe 1985:263-267; Sabloff 1975:114-116), and date to the Terminal Classic period (Awe et al. 2005:237).

Typically, these vessels are cylindrical and have protruding wings or flanges on either side. The vessels clearly functioned as incense burners but the term "censer" is a bit of a misnomer as they are in fact censer *stands* that contained small bowls in which the incense was actually burned (Awe 1985:267). One of these censer bowls was found as in Crawl 3.

Prudence Rice (1999:36-38) pointed out that Late Classic censers commonly depict the Jaguar god of the Underworld (JGU). This god is identified by a shock of twisted hair over the forehead, a twisted cruller-like element between the nose and under the eyes, a beak-like nose, projecting lips, jaguar ears, and Tau-shaped incisors (Coggins 1975:280; Miller and Taube 1993:104; and Schele and Miller 1986:50). The flanges are decorated with appliquéd ear spools and geometric designs. The Chechem Ha censer fragments are somewhat unusual in their decoration in that the flange of one of the vessels has an appliqué of a bird head. Rice notes that on censers from Tikal, a diving bird with a hooked beak often accompanies the Jaguar god of the Underworld.

Although there are many examples of effigy censers discovered in caves in other parts of the Maya area, they are uncommon in the caves in western and central Belize. For

instance, censer fragments were completely absent from the unlooted Terminal Classic assemblage in the Main Chamber of Actun Tunichil Muknal (Moyes 2001:176, Appendix F). Despite the large ceramic assemblage at Petroglyph Cave, there was not one censer fragment (Reents-Budet and MacLeod 1997:50-59). None was located at Actun Polbiche (Pendergast 1974) but a single lid fragment was found at Eduardo Quiroz cave (Pendergast 1971: 62-63, Plate 8) and a fragment from a similar styled vessel came from Awe Cave (Digby 1958, Figure 3).

Effigy censers depicting JGU are strongly associated with the site of Caracol where they are found in mortuary contexts and in eastern shrines. A number of these censer fragments were found at the nearby surface site of Minanhá in Late to Terminal Classic contexts in Structures 3A and 4A- the eastern shrine group (Kersey and Gray 2000; Schwake 2000) as well as in mortuary contexts (Iannone 1999:109-112). In structure 3A Iannone argues that they were termination offerings. He also suggests that the vessels directly tie Minanhá to Caracol due their similar usage in mortuary patterns as well as their similar iconographic styles. The use of censers in termination appears to be a pattern. An effigy censer was also found as a termination offering at the nearby site of Las Ruinas as well (Taschek and Ball 1999:229).

Over time, these types of censers have primarily functioned in ritual contexts (Rice 1999:38). In the Late Classic period, they tended to be associated with funerary rites as well as termination events that included stela terminations. A stela termination ritual reconstructed by Lisa Ferree (1972:14, reported in Rice 1999:38) indicated that the stela was removed from its seat and interred in a temple floor pit or altar. This act was accompanied by burning and smashing of censers which were then scattered in the vicinity. Rice notes

that it is unclear whether the censers were existing temple furniture or were brought in for the occasion.

Rice argues that these censers are associated specifically with elite/kingly ritual, though the Chases (1994:60) contend that the Caracol censers are part of a "cult of the dead" accessed by all levels of society. Because there are no burials or human remains at Chechem Ha, it is unlikely that censer fragments found in the cave relate to a mortuary cult and suggests other aspects of ritual use. Of note is that the Stela Chamber is the only area of the cave that contains fragments of censer stands. This can hardly be accidental and is therefore an important element in understanding their function in this context.

The Stela

Today in the center of the main area of the chamber is a small, uncarved limestone slab surrounded by a circle of medium to large-sized cobbles (Figure 4-163). A pile of cobble-sized limestone rock and small boulders are stacked against back of the slab which leans backwards. On first appearance, the stones seem to be supporting the slab but this is not the case.

Evidence has revealed that circle of stones is not an ancient feature but were placed around the stela by the owners of the cave. Reports from spelunkers David Arveschoug, Erin Hardy, and Logan McNatt, some of the first people to have visited the cave after its discovery, all agreed that the circle of stones was not present previous to 1991 (personal communications 2005). The cave was initially mapped by Hardy and Arveschoug who consulted their field notes but found no indication of such a feature and there is no feature plotted on the original map although other cultural features were. In his field notes of the original survey Arveschoug does note an "awkward stone" in the center of the chamber used

as a datum (personal communication 2005). Carol and Richard Foster, documentary photographers who visited the cave prior to its opening as a tourist venue, were also unaware of the stone circle and have no photographs of it. They re-visited the cave in 2005 but did not recall having ever previously seen the feature (Carol Foster personal communication 2005). Logan McNatt, who specializes in cave archaeology, remembers the limestone stela specifically but after viewing my photos of the area, reports that it has probably been reset (personal communication 2005). He provided photocopies from photographs of the area, in which the stone is visible but is not in a standing position (Figure 4-164).

Investigations in and around the Chechem Ha stela were carried out in 1998, supervised by James Brady. The excavations were limited because at the time we believed that the stela was in primary context and therefore did not wish to remove it from its position. A surface sweep of the matrix within the stone circle was conducted using whisk brooms. In his informal report Brady noted that the matrix within the circle appeared to have been recently disrupted (James Brady personal communication 1998). A number of animal bones all of which were discolored and exhibited a bluish tint were located in the loose matrix. The first impression was that they were burned, but this was puzzling since there was little charcoal present in the matrix of the area. The bones were examined by both Jennifer Piehl, one of the biological anthropologists working with the project, as well as Howard Hecker, the faunal analyst, who agreed that the color was likely due to uptake of minerals in the soil and not charring (personal communication 1998). Jon Spenard noted that many of the bones were either rodent or paca-sized or appeared to be bird. An intact vertebral column of a paca-sized animal was also mentioned in the field notes.

A small 15cm x 15cm pit was placed beneath the center of the base of the stela to determine whether a sub-stela cache was present. The pit was excavated to 50cm below the floor surface. No charcoal or other clearly anthropogenic material was present and animal bone exhibiting the same bluish gray hue was recovered. Although Brady reports that these were burned, they were the same color as the bones reported in the surface sweep so this is unlikely. The excavations determined that the stela was shallowly set into the ground 8.5cm (Figure 4-165).

Upon removal of the rocks placed behind the stela it became apparent that they were not supporting the slab. A piece of red tape in the shape of an arrow was recovered from beneath the bottommost stone. This confirmed that the rocks had been stacked recently.

Lest we throw out the baby with the bathwater, a review of the evidence is in order. Although the stone circle is clearly modern, the entire feature may not have been made up of whole cloth. It is likely that the limestone slab was in fact a stela that had been toppled or terminated in prehistory. The spelunkers all remember a large stone in the chamber and McNatt identified the slab as a stela. It is probable that the limestone slab was in fact found on the ground in the chamber. This would not be very exciting to show tourists, so from an entrepreneurial perspective one can understand up righting the stone. Because the slab was shallowly set it makes sense that the pile of rock was placed behind it to keep it from falling and a circle placed around the feature to keep tourists from touching it. The speleothem incensario may have been found in the chamber or elsewhere and conveniently placed in "front" of the erected stone. Additionally, the type of incensario vessel fragments that were reported to have come from this chamber is identical to those found elsewhere at surface sites often accompanying stela terminations.

There are some good reasons to think that the stone was in fact an ancient stela. First of all, the slab is cut from limestone. It measures 78cm in height and between 8cm and 10cm in thickness. It is 40cm in width at the base and 47cm at the center, tapering to 22cm at the top (Awe et al. 2005:234). There are numerous examples of small stela at surface sites elsewhere.

The example most similar to the Chechem Ha stela was excavated by Norman Hammond at Cuello in Northern Belize (1982:396-403). Feature 135 was an upright stone slab 80cm long, 50cm wide and 20cm thick (Figure 4-166). Hammond noted that the top corner of the slab was "broken off" but I suspect it was modified in a fashion much like the Chechem Ha stela. The Cuello stela was uncarved, unpainted, and found in association with Sierra Red ceramic vessels. Another very similar example was found at the Belize Valley site of Baking Pot (Audet 2004; Awe and Helmke 2005:44). Two small uncarved limestone stela were excavated at structure 190. Based on the ceramic caches surrounding the stelae they both probably date to the Early Classic period

There are numerous examples found on the Pacific coast of Guatemala where there is a tradition of using uncarved stela beginning in the Middle Preclassic period and lasting throughout the Late Preclassic (Bove n.d.) Many of these stela are basalt. Some are quite small (57cm high) and the largest is 2m in height. Most range between 1m and 1.4m high.

Two small uncarved stela were found at the nearby site of Minanhá in front of Structure 9a, part of the eastern shrine group. Uncarved monuments were also found at Caracol (Houston 1987:95), and at other Vaca Plateau sites such as Cahal Pichuk and Hatzcab Ceel within the group of Mountain Cow sites (Morris 2004: 132-133; Thompson 1931:238-248). A Preclassic stela was excavated from Terminus Group Structure A1 at the

site of Zopilote (Cheetham 2004:134-136). This stela is small, approximately 1m in height, and is carved. It depicts a human figure with feline mouth and bifurcated tongue.

Erected stones such as speleothems and carved slate monuments are found in caves in Belize and elsewhere (Awe et al. 2005) and there is at least one cut limestone slab found in a Belizean cave. At Actun Tunichil Muknal there is a cut limestone odalisque-shaped stone in the entrance to the Main Chamber, an area which was utilized solely in the Terminal Classic period (Figure 4-167). The monument measures 33cm in length, 28cm in width, and 1.08m in height. The top one-third of the stone tapers to a point. It stood vertically at one time, but appears to have fallen over and leans on the boulder behind it. It sits on an elevated rimstone dam may have functioned as an altar. Sitting atop the dam is a mano and metate as well as the top half of a wide-necked jar. At the base of the stone are the sherds of a smashed Late Classic narrow-necked red-slipped jar and a red-slipped bowl.

Farther afield, at Teotihuacan there is a miniature basalt stela erected in the Cueva Astronómica south of the Pyramid of the Sun (Segura 1991) that dates to A.D. 100 to A.D. 200. The stela is considered to be a calendrical marker since the sun shines through the cave entrance onto the stela on the summer solstice.

One further note is that a stone slab that is very similar to the Chechem Ha stela is found at Balankanche Cave in Yucatan (Andrews 1970:12). Awe and his colleagues (2005: 238) have argued that the slab, found in the remote Group IV area of the cave, is a small stela that has toppled. A hearth is located adjacent to the slab and there are a number of effigy censers distributed throughout the area around the stone. This is a very similar artifact configuration as the one proposed at Chechem Ha: a stela that has been terminated by toppling associated with effigy censers.

WBRCP Excavations

In 1998 and 1999, the WBRCP placed five units in the chamber. Units 1 and 2 were initiated in 1998 and the remaining units in 1999 under the supervision of Dr. Howard Hecker, the project faunal analyst. The first two units placed in 1998 were essentially exploratory test pits. The other four units placed in 1999 were for the purpose of determining if the faunal remains in the chamber were naturally occurring or cultural deposits. As mentioned in Chapter 3, Dr. Hecker died before completing either his analysis or report. The faunal collections exported by Dr. Hecker to University of New Hampshire have been located and are currently being reassessed. I did not supervise or participate in any of the excavations in the chamber and the following observations are based on field notes written by Dr. Hecker and his field school students.

Unit 1 abutted the west wall of the flowstone column 6m north of the stela. Although it was irregular, it measured roughly 2m north/south and 1.25m at it's widest and was excavated to a depth of 75cm. Field notes report that the north end of the unit appeared to be disturbed. A few charcoal flecks were collected from the Level 1 matrix 6.5cm below the surface. Bone and charcoal flecks were collected from depths as low as 51cm. Hecker identified the bone as bat and paca and noted that it exhibited dark discoloration. Additionally, a single bone identified in the field as white tailed deer came from Level 4 in this unit. Hecker also noted that the sediment was dry and poorly compacted which caused the unit to collapse at least twice. Throughout the unit, the bone was coming from a dark matrix adjacent to the cave wall.

Jon Spenard noted finding a piece of plastic in the screened material from Level 3, 32cm to 44cm below the surface. He also noted in previous levels that the bone in the unit

appeared to be jumbled. This suggests to me that this unit was placed in an area of disturbance as noted by the appearance of the surface matrix. I am therefore uncomfortable using the observations made in this unit or material derived from it for analyses.

Unit 2 was placed within an alcove abutting the western wall in the north part of the chamber. Although it abutted the wall and was therefore irregular, it roughly measured 2m x 2m. The sediment was reported to be loose and dry. A tapir rib bone was reported as a surface find in Level 1 and charcoal was present in the matrix. There is little other information on this unit.

Unit 3 was placed 1.9m southeast of the stela near the south wall of the main area chamber. It measured 1m x 1m and was excavated to 40cm below the surface. Charcoal was noted on the surface and 2 non-diagnostic sherds were collected from Level 1. Although a few animal bones were collected from the subsurface strata, there are no field descriptions or identifications. It was noted that this unit produced good stratigraphy.

Unit 4 was also placed in the main area of the chamber 1.9m northeast of the stela. The unit measured 1m x 1m and was excavated to a depth of 57cm. On Level 2, 32cm to 34cm below the surface, an *Agouti paca* or gibbon skeleton was encountered. Although the remains were fragmentary, their spatial arrangement suggested that this was likely an entire animal. No cultural remains were noted in this unit whatsoever.

Unit 6 abutted the northeast wall at the terminus of the chamber. The unit was irregular, but roughly measured 1m x 1m and was excavated to a depth of 69cm. In the upper level there were one or two sherds and a few charcoal flecks accompanied by bones identified in the field as bat, paca, and perhaps bird. In Level 2, 33cm to 47cm below the surface some teeth were found adjacent to the north wall. In the southwest corner a feature

was encountered that consisted of bones and charcoal within a gravel matrix. Animal bones were present throughout the remainder of the unit, but no cultural material accompanied them. On Level 5 at the base of the unit 59cm to 69cm below the surface, the crew reported finding a fully articulated paca skeleton.

Howard Hecker also reported that a jaguar bone was collected from the chamber in a personal communication to Jaime Awe in 1999 (See Awe et al. 2005:237). Even if this is added to the list of faunal remains, the only species represented that are not cave denizens are the tapir and the deer. In fact, the presence of a jaguar suggests that prey animals might be expected natural finds. Although my information is limited, the bulk of the data indicates that this area is a trap for animals unlucky enough to enter the chamber. Caves are well-known sediment traps that are pit-falls for fauna (Shipman 1981) and it is not an unreasonable to assume that animals making their way into the chamber cannot get out. The large number of rodent nests found throughout Tunnel 2 demonstrates that animals, particularly *Agouti paca*, frequent the nethermost regions of the cave and can easily venture in too far. The 3.7m drop leading into the area would be difficult to negotiate going the other direction. It may be that the older or infirm ones are unable to negotiate the steep climb back to the tunnel. This is the most parsimonious explanation for the occurrence of the articulated paca skeletons in Units 4 and 6 coupled with the absence of cultural material associated with these finds.

A number of bones from both surface and subsurface deposits were discolored and exhibited a bluish tint. This may have been due to copper uptake from within the sediment. This taphonomic phenomenon was also noted on bones at San Josecito Cave in Nuevo Leon, Mexico (Robles et al. 2002). Elemental analysis of blue-stained bones from that cave

demonstrated that copper was the most abundant trace mineral in their samples. In addition to copper, bone coloration may also be caused by a number of trace minerals in soils that include: Cr, Mn, Fe, Co and Ni. Although the sediments in the Stela Chamber were not analyzed, copper uptake is the most likely explanation due to the high copper content in tested areas throughout the site.

Dating Chamber Usage

I was unable to locate the WBRCF charcoal samples in storage collected from sub-surface deposits in the chamber. Therefore in 2003, due to its reportedly good stratigraphy, Unit 3 was reopened to collect a column sample of the sediments and hopefully to excavate a charcoal sample from the profile wall. The unit was easily located, reopened, and west wall cleaned. A column sample was collected, but no charcoal encountered.

In order to date the chamber, charcoal samples were collected from surface deposits found on the west wall between the entrance and the purported location of incensario fragments. The results of the two radiocarbon date ranges are overlapping- 200 B.C. to 0 B.C. and 360 B.C. to 50 B.C. The first date calibrated to 94% probability is 200 B.C. to 40 B.C., and the second calibrated to 89.9% probability is 240 B.C. to 50 B.C. Both of these dates fall into the Late Preclassic period. This Late Preclassic usage agrees with the subsurface charcoal collected in Tunnel 2.

Artifact distributions in Tunnel 2 suggest sparse Late Classic usage of the area and the Late Classic use of the Stela Chamber appears limited to the deposition of the censor fragments during the Terminal Classic period. Stylistic cross dating of the stela supports a Late Preclassic date for its initial placement as well.

As previously noted, Norman Hammond excavated a very similar limestone slab at the site of Cuello in Northern Belize (1982:396-403). Based on the stratigraphic profile, he dates the Cuello stela no later than A.D. 250 ± 50 , and assigns the feature's most likely date as A.D. 100 ± 50 . This would make it roughly contemporaneous with the Chechem Ha stela, which according to the radiocarbon from the area, may date somewhere between 360 B. C. and 0 A. D., with a higher probability of dating 240 B. C. to 40 B. C. Although Awe and his colleagues (2005:245) have suggested a Late Classic date for the Chechem Ha stela based on comparative data from other cave sites, particularly Actun Tunichil Muknal, their work was in press before the radiocarbon dates for the area became available.

Discussion

The lack of ceramic material in this remote area and the presence of the probable stela suggest that this is the most esoteric space in the cave. As Awe and his colleagues (2005:243) note, stela in caves are often placed in areas that are difficult to access. A similar spatial pattern was observed at Actun Tunichil Muknal (Moyes and Gibbs 2000) where an erected speleothem was placed on a high shelf far into the dark zone, and a more formal limestone stela was found at the entrance to the Main Chamber, the cave's most remote area. In this chamber there were fewer artifacts found in the remote western areas than in the entrance or central areas, but many of the human sacrifices, which were clearly the most important offerings in the cave, were discovered in these remote places.

The two primary features of the secluded Chamber 3 at Chechem Ha are the stela and the censer sherds found stacked next to the wall in the central area. Unfortunately, these items may not be in their original contexts but their presence is suggestive. Although it is impossible with current technology to directly date the stela, I have argued that, based on

radiocarbon dating and the stylistic similarities to the Cuello stela, the most parsimonious date for its erection falls within the Late Preclassic period. The Terminal Classic censur stand sherds were clearly placed in the chamber at a much later date. Because these censers are so often found in termination contexts and more specifically in stela terminations, it is likely that there were part of the overall termination of the cave in the Late Classic period as well as the termination of the stela itself.

Chamber 2 Unit 02-06									
Level	AMS Date	Period	Thickness	Color	Ceramic	Speleo-	Shell	Special	Charcoal
	2 Sigma		(cm)	(in field)	sherds	them		Finds	
1	AD 250-540	NA	<1-3	5yr3/2	14	3	0	0	yes
2	NA	EC	3	5yr3/2	5	1	land snail	0	yes
3	NA	NA	1-6	7.5yr4/6	13	5	0	0	yes
4	NA	NA	3-6	7.5yr4/6	11	0	0	0	yes
5	NA	NA	1	5yr3/2	4	1	0	0	yes
6	NA	NA	1-3	5yr3/2	30	5	0	0	yes
7	NA	NA	1-3	7.5yr4/6	2	3	0	0	very little
8	NA	NA	2-3	5yr3/2	10	1	1	6 bones	yes
9	NA	NA	1-2	5yr3/2	0	0	0	0	yes
10	NA	NA	3-6	5yr3/2	0	0	0	0	yes
11	1010-820 BC	EPC	2-3	5yr3/2	0	0	0	2 spalls	yes
								w/residue	
12	NA	NA	1-3	5yr3/2	0	0	0	0	yes
13	sterile	sterile	?	5yr3/2	sterile	sterile	sterile	sterile	sterile

Table 4-1. Data table Chamber 2, Unit 02-06 excavation findings.



Figure 4-1. Modified interior entrance passage (photo by author).



Figure 4-2. Exterior gated entrance (photo by author).

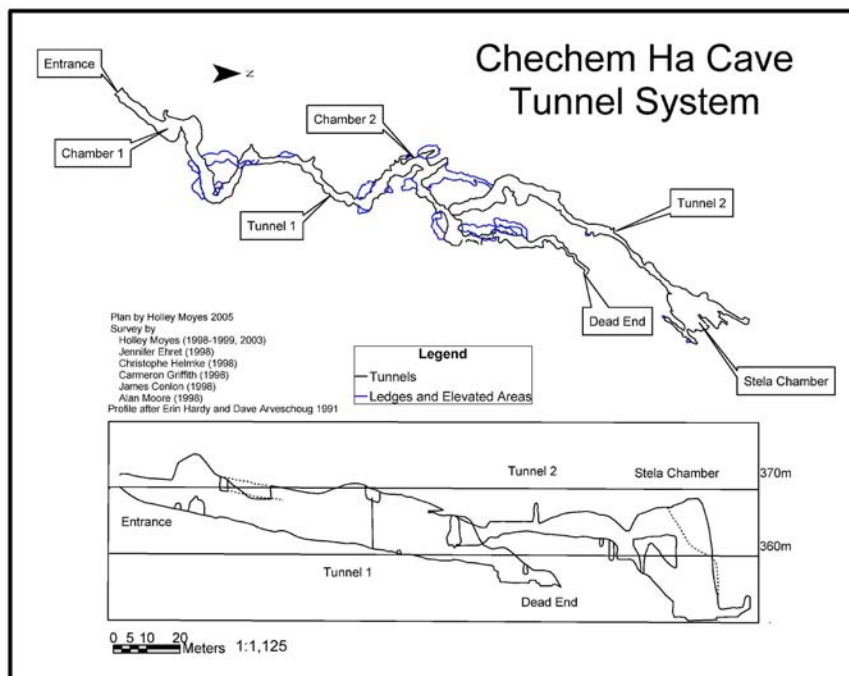


Figure 4-3. Map of Chechem Ha tunnel system.

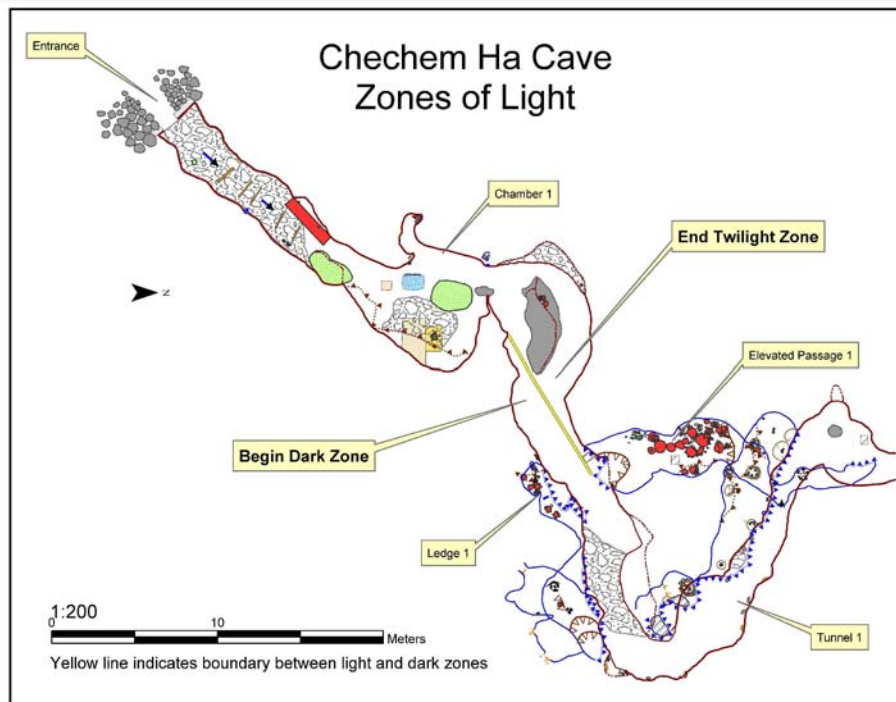


Figure 4-4. Map illustrating light zone boundaries.

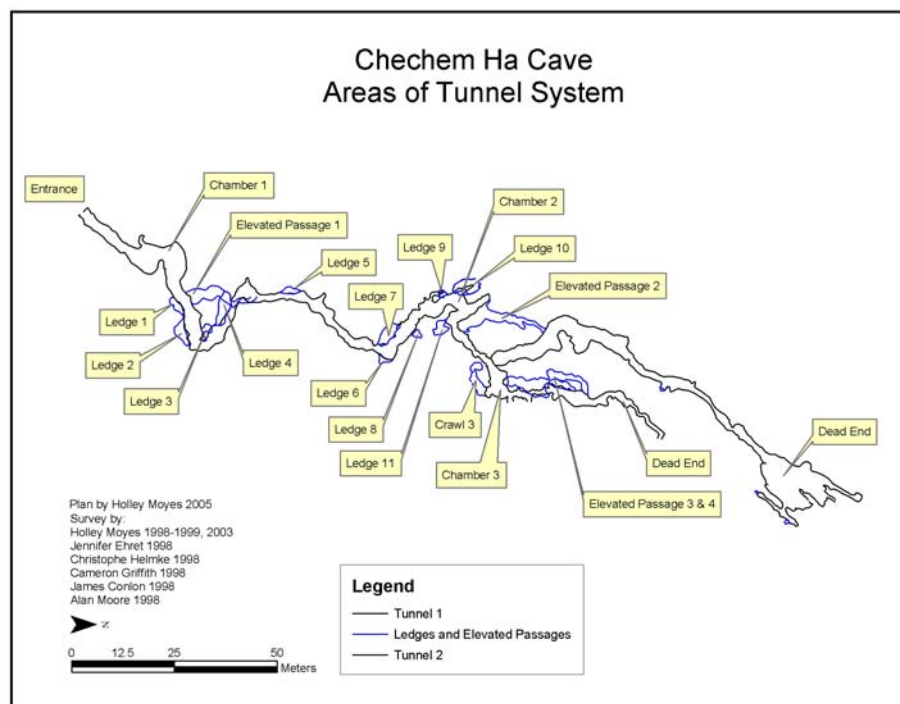


Figure 4-5. Map of tunnel system showing area divisions.

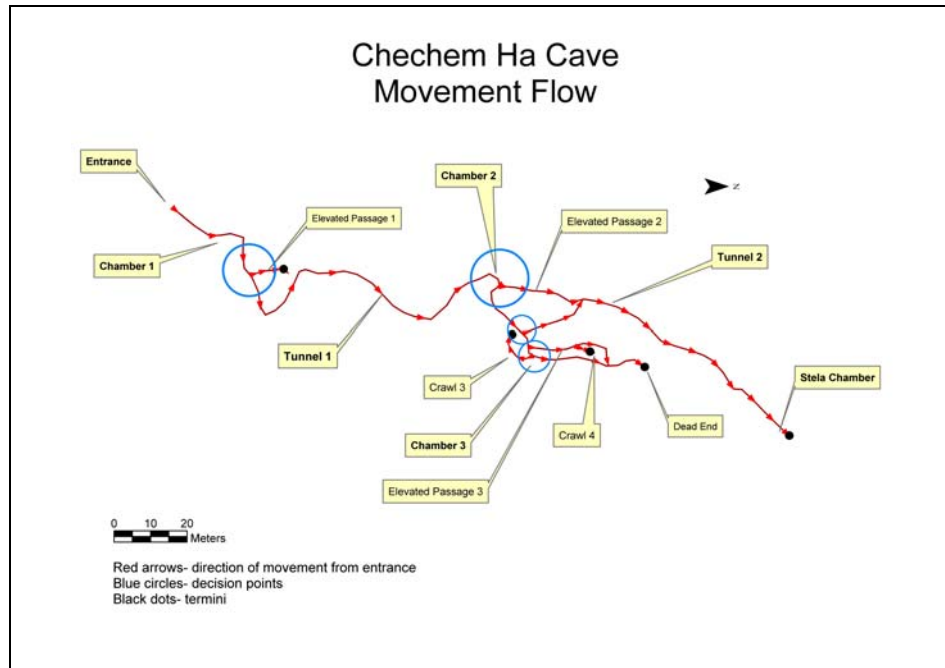




Figure 4-8. Bumpy surface of tunnel floor (photo by author).

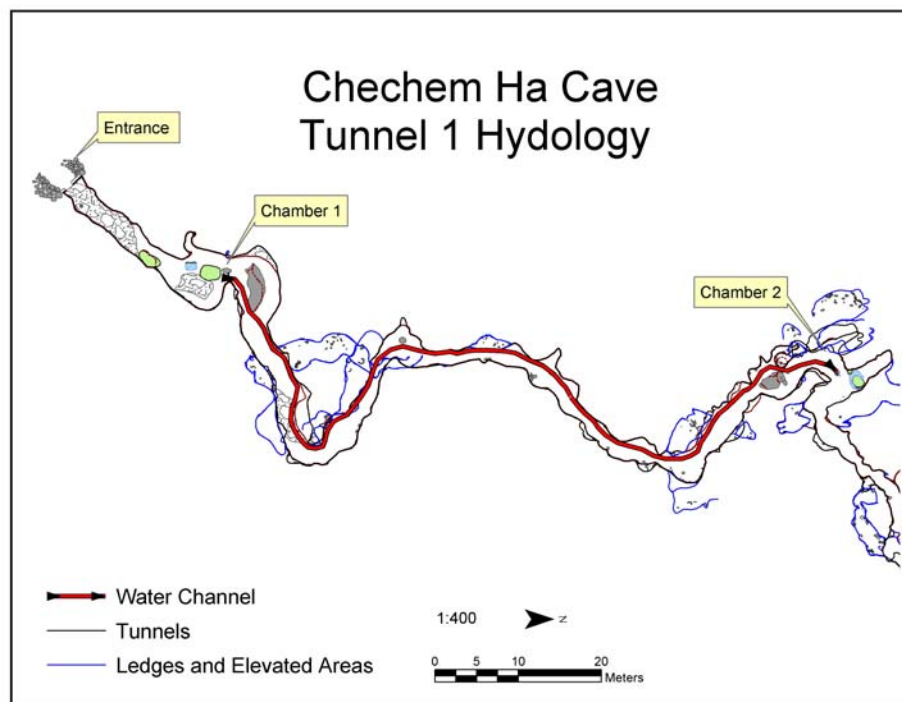


Figure 4-9. Map illustrating the pathway of the channel in the hydrologically active passage.

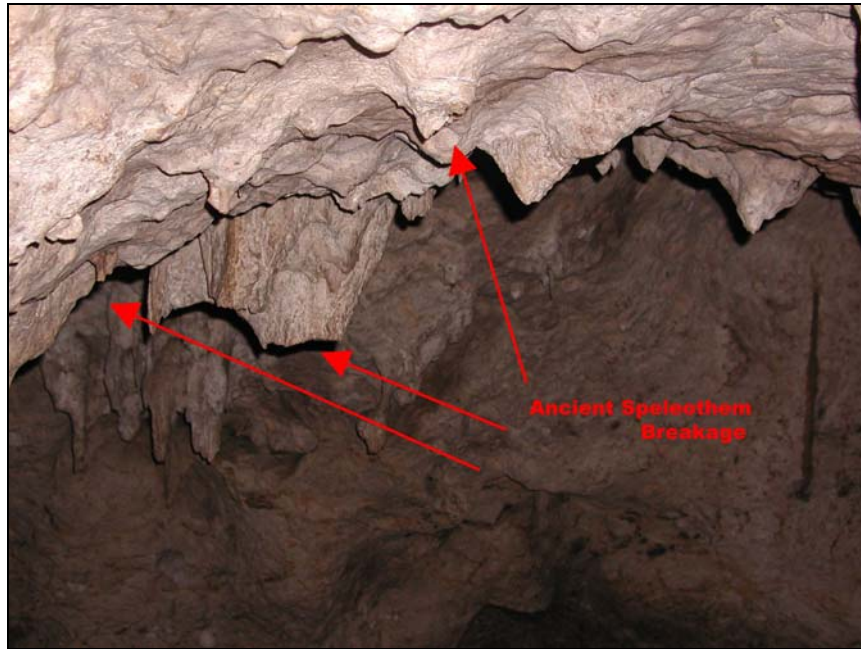


Figure 4-10. Ancient speleothem breakage in Elevated Passage 1 exhibits no re-growth (photo by author).

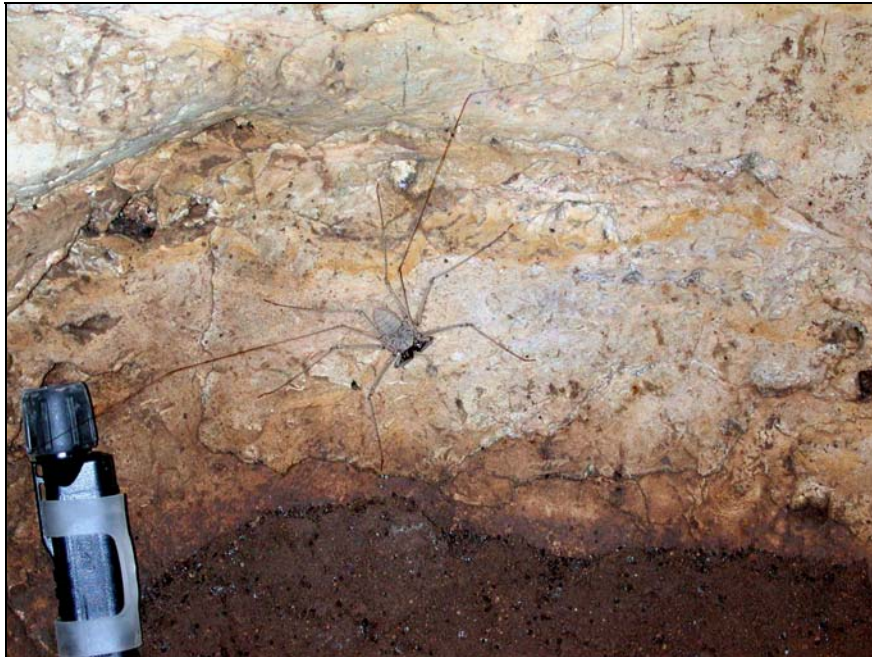


Figure 4-11. Tailless whip-scorpion (photo by author).

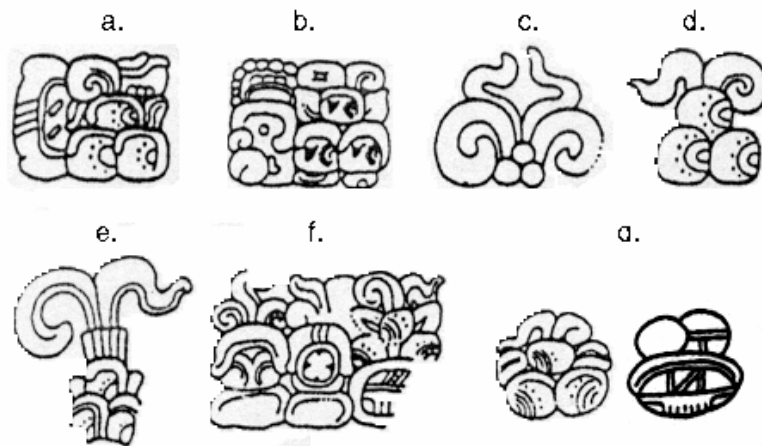


Figure 4-12. Top: The 3-speleothem-cluster located in the Burial Chamber of the Main Chamber of Actun Tunichil Muknal.

Bottom- Epigraphic depictions of the 3-Stone-Hearth assembled by Taube (1998:433): a) the green hearthstone place, Quirigua Stela; b) the Seibal emblem glyph, Tablet 4 of Hieroglyphic Stairway, Seibal; c) three smoking hearthstones, Monument 74, Tonina; d) one of a series of smoking hearthstones on headdress of ruler, detail of excavated stela, Tonina; e) three stones with burning wood, Naranjo Stela 30; f) smoking sky hearthstones with glyphs for Tikal Paddlers, Stela 16, Copan; g) smoking hearthstones with sky ahau glyph, Stela 1, Salinas de los Nueve Cerros (after Taube 1998:433).



Figure 4-13. Boulders surrounding entrance exterior (photo by Constance R. Price).



Figure 4-14. Entrance stairway into Chamber 1 viewed to north (photo by Grant Polley).

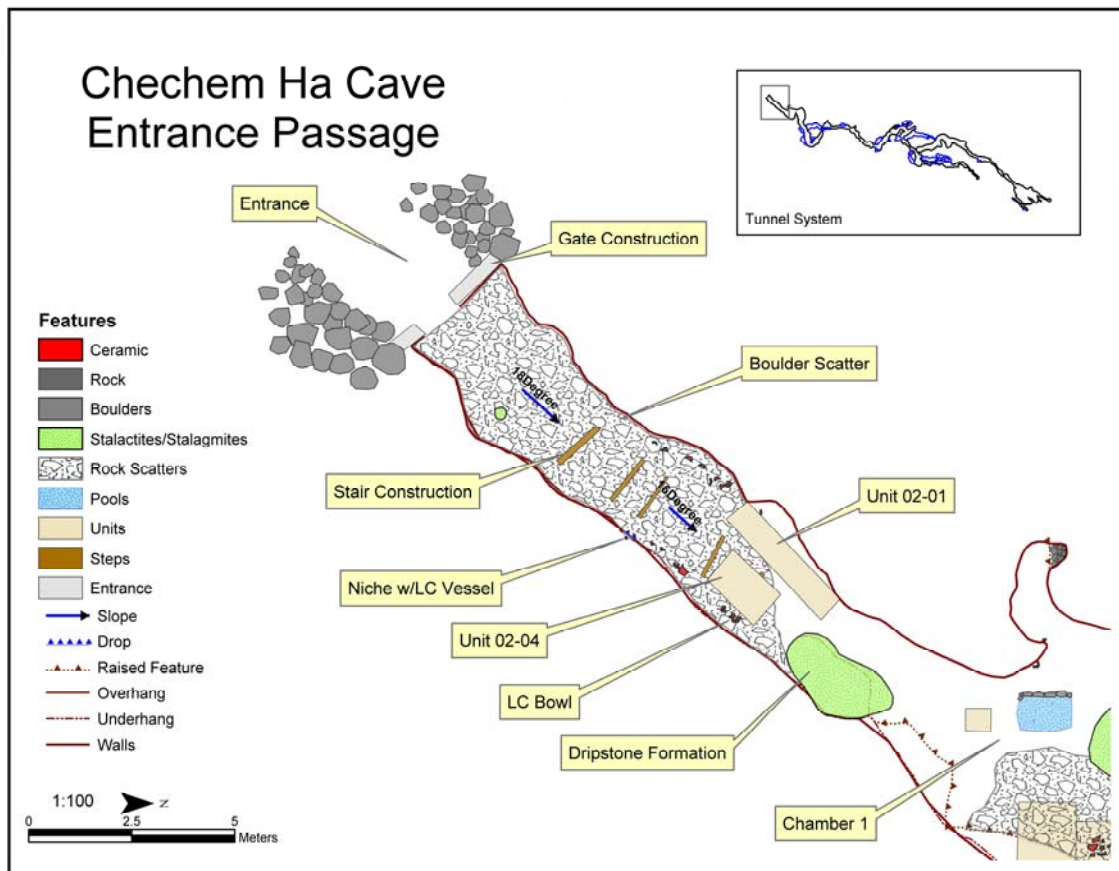


Figure 4-15. Map of the Entrance Passage.



Figure 4-16. Sherds excavated from Unit 01-02 Level 2. The two on left were identified by Jaime Awe as Reforma Incised dating to the Middle Preclassic period.



Figure 4-17. White mineral crust on surface of Unit 02-04 Level 1.

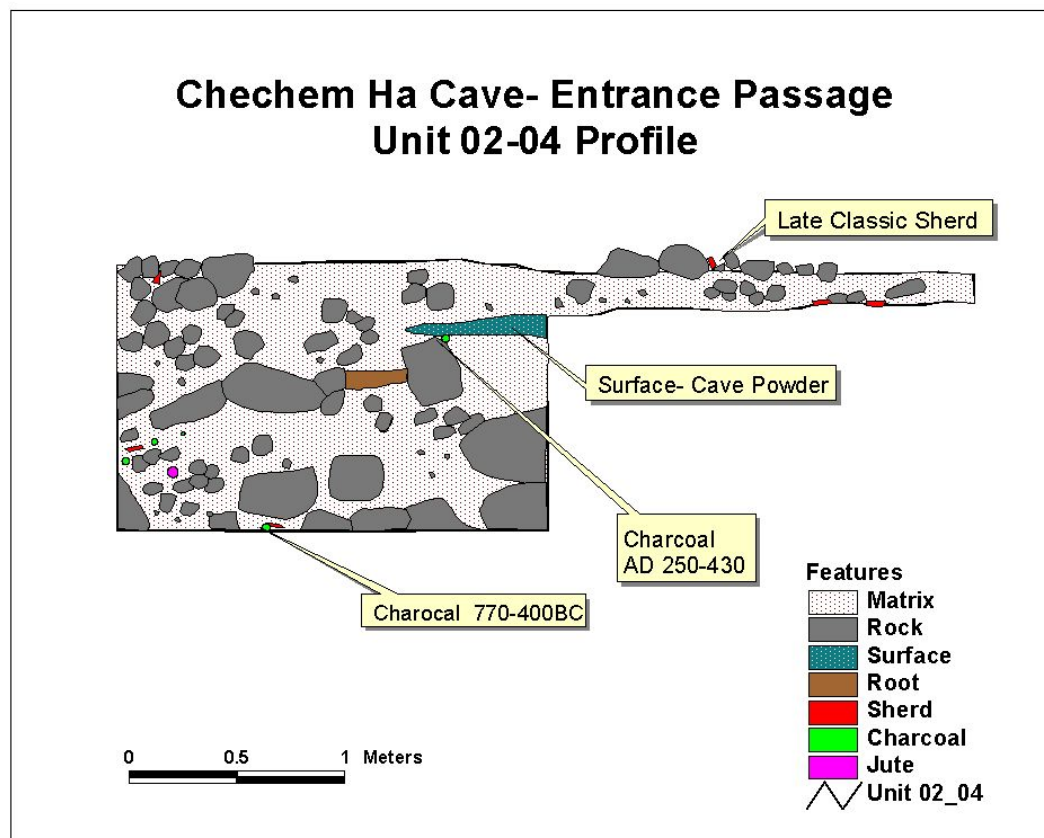


Figure 4-18. Profile of Unit 02-04.

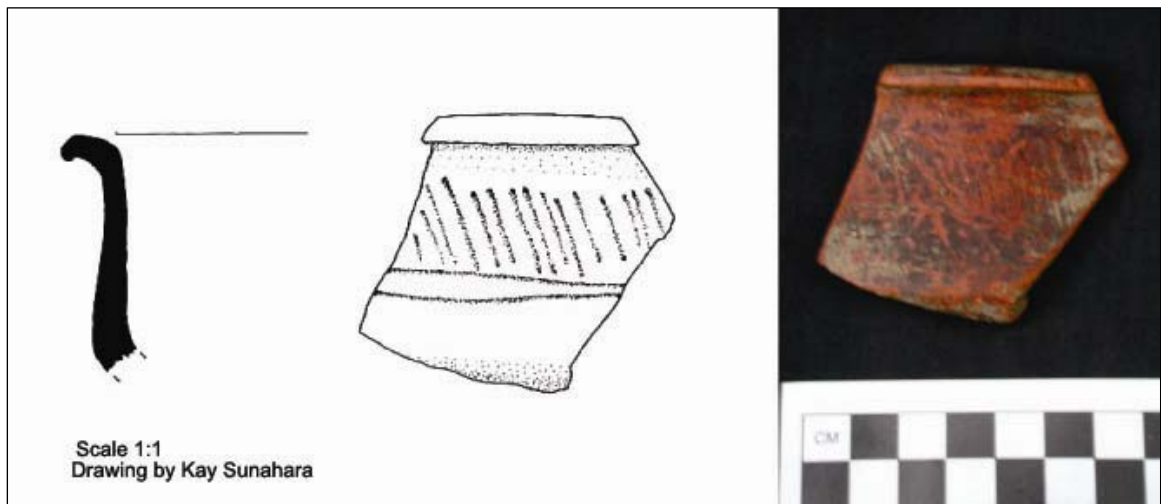


Figure 4-19. Middle Preclassic Reforma Incised sherd. Charcoal removed from beneath.



Figure 4-20. Chamber 1 viewed to north (photo by Grant Polley).

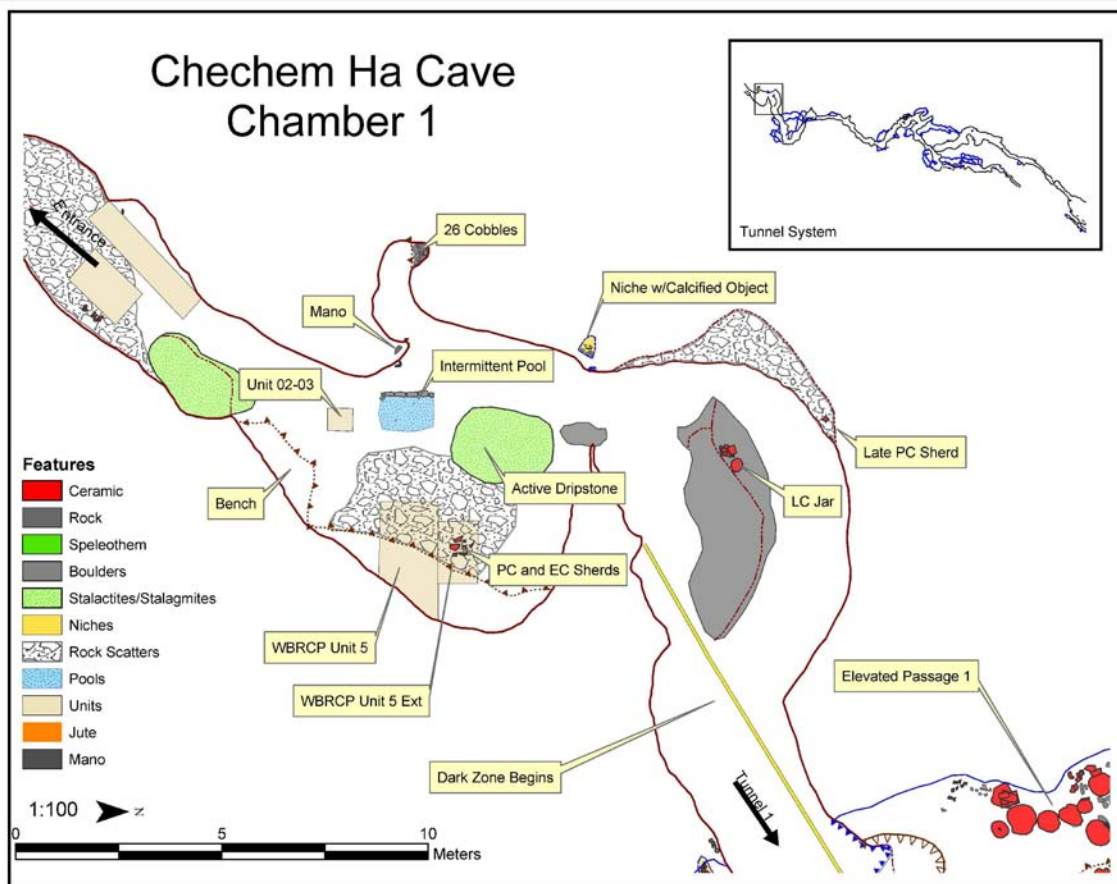


Figure 4-21. Map of Chamber 1.



Figure 4-22. Chamber 1 view to north from base of Entrance Passage. Stalactite with active drip above pictured at center and intermittent pool in foreground (photo by author).



Figure 4-23. Intermittent pool filled with water after a rain. Note cut stone boulders on west side (photo by author).



Figure 4-24. Mano placed on wall (photo by author).



Figure 4-25. Stones piled on flat rock in niche (photo by author).



Figure 4-26. Calcified object found in niche (photo by author).



Figure 4-27. Late Classic jar and sherd stack beneath overhang (photo by author).



Figure 4-28. Middle Preclassic sherd located on surface on Chamber 1 (photo by author).



Figure 4-29. Shell ring fragment excavated from Chamber 1 Unit 02-03 Level 1.

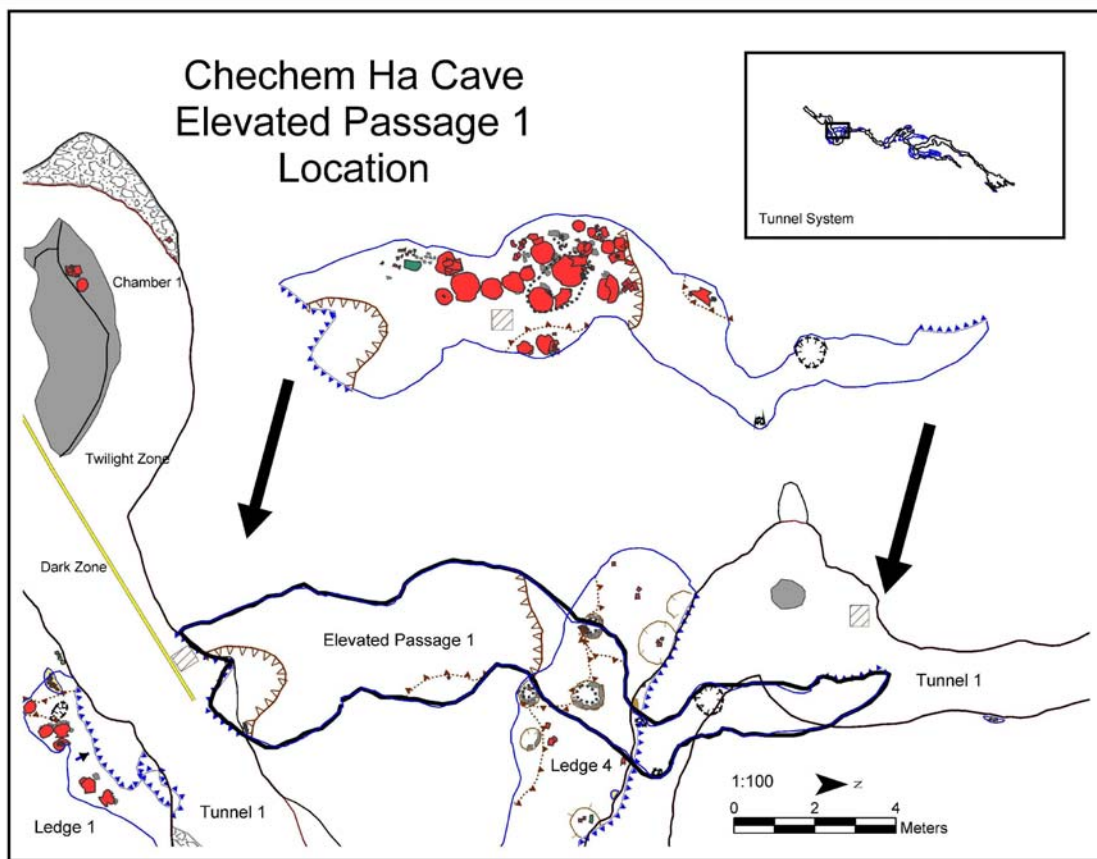


Figure 4-30. Map shows location of Elevated Passage 1.



Figure 4-31. Constance Price stands on the ladder used to access Elevated Passage 1 (photo by Grant Polley).



Figure 4-32. Late Classic period jars deposited in Elevated Passage 1, view to south from inside of passage (photo by author).



Figure 4-33. Kay Sunahara sits next to large Late Classic jar (photo by author).

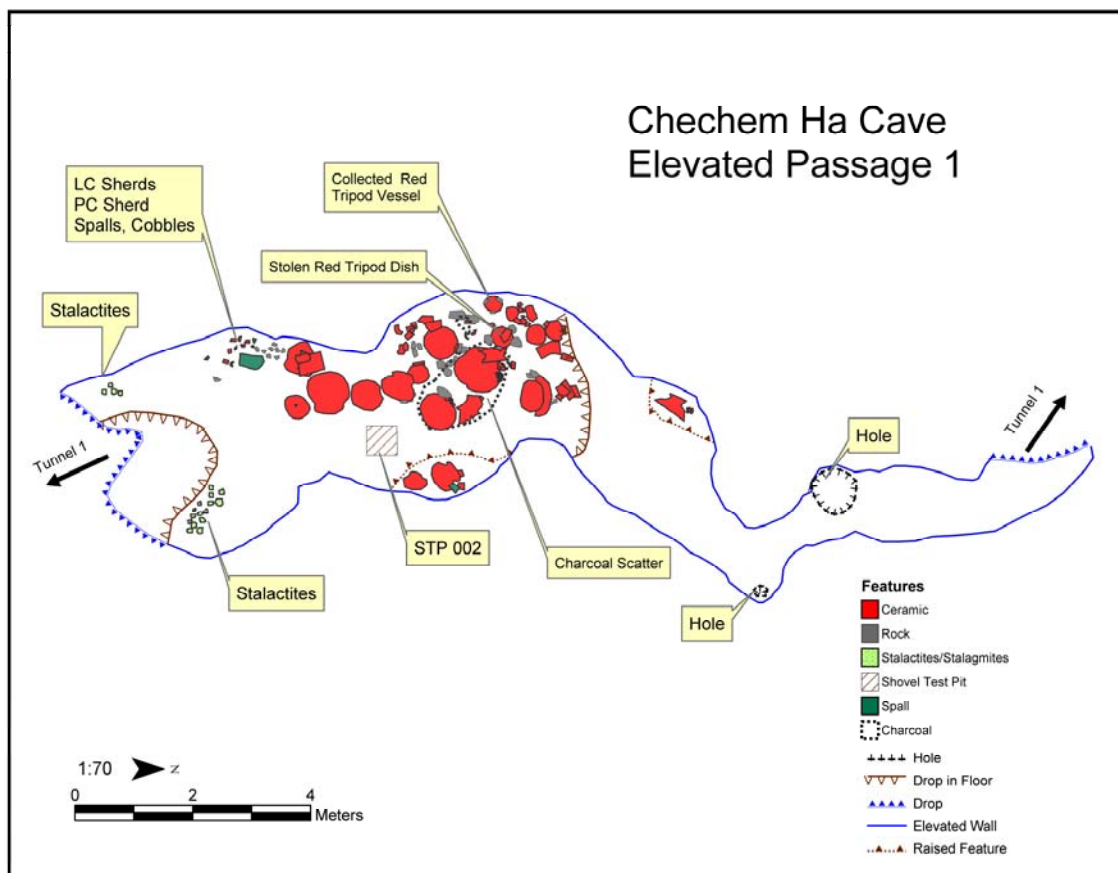


Figure 4-34. Detail map of Elevated Passage 1



Figure 4-35. Red tripod dish located at the Institute of Archaeology.



Figure 4-36. Arrow points to red ware vessel stolen in 1998 (photo by author taken in 1997).

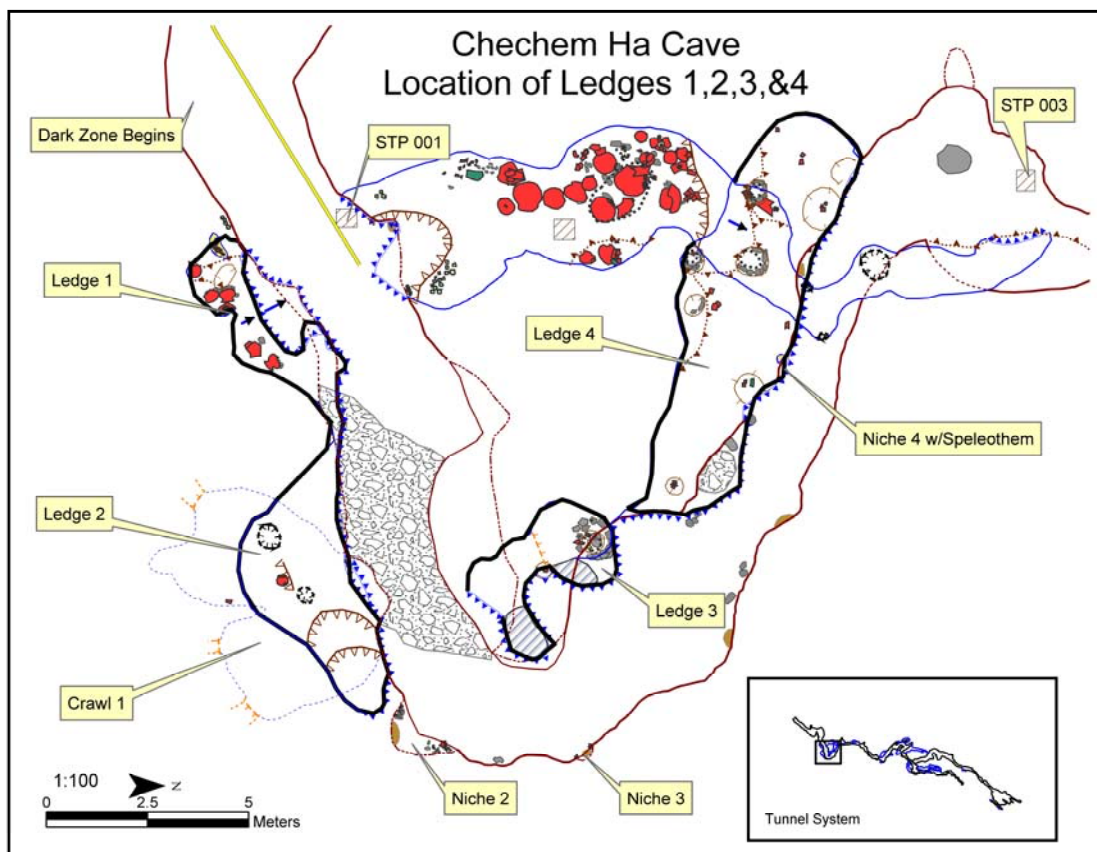


Figure 4-37. Location of Ledges 1, 2, 3, & 4.



Figure 4-38. Ledge 1 viewed to the southeast from Elevated Passage 1 (photo by author).

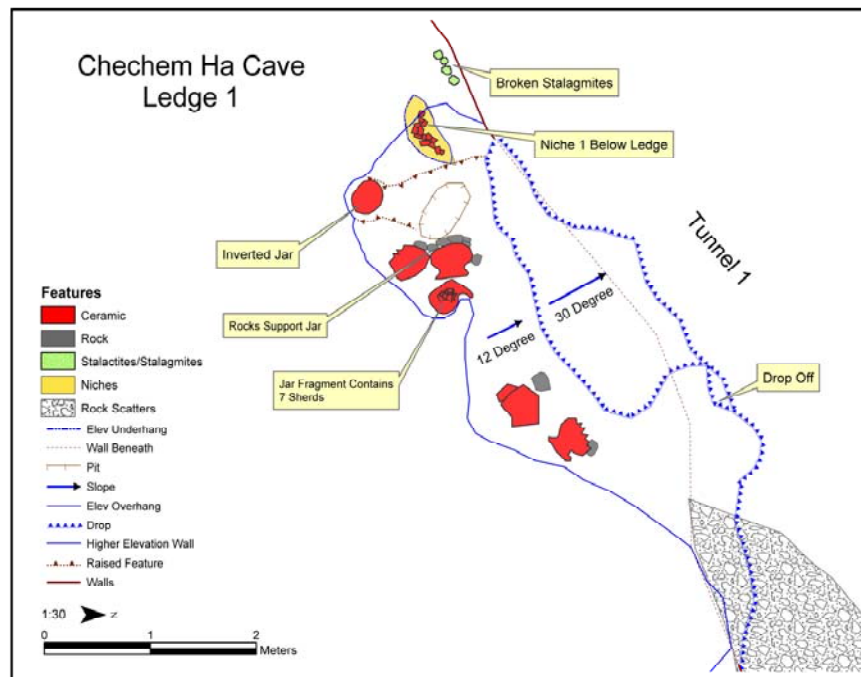


Figure 4-39. Ledge 1 detailed map.

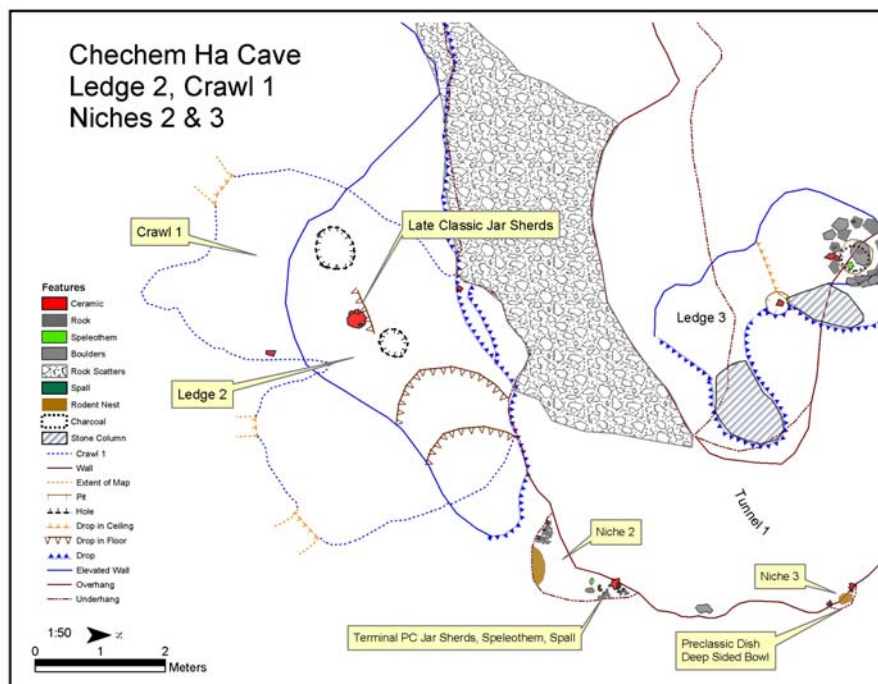


Figure 4-40. Detailed map of Ledge 2, Crawl 1, Alcove 1, Alcove 2.

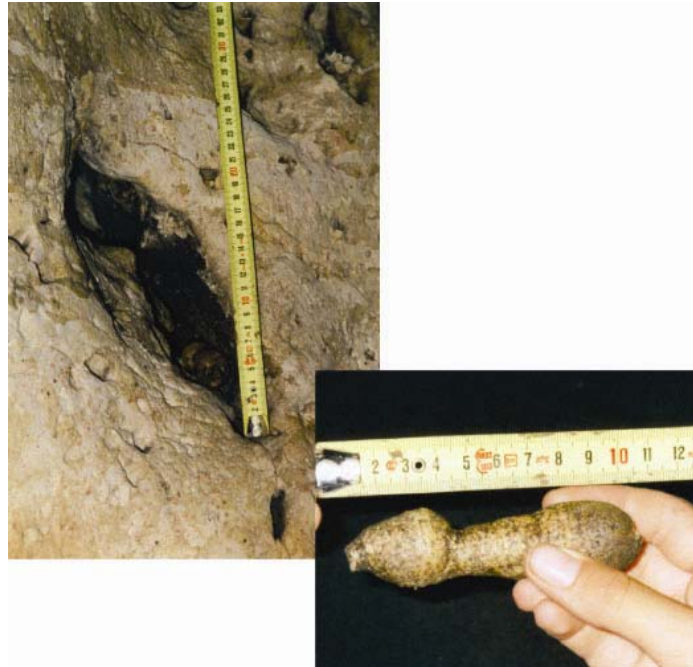


Figure 4-41. Phallic speleothem lodged in Niche 4 (photo by author).

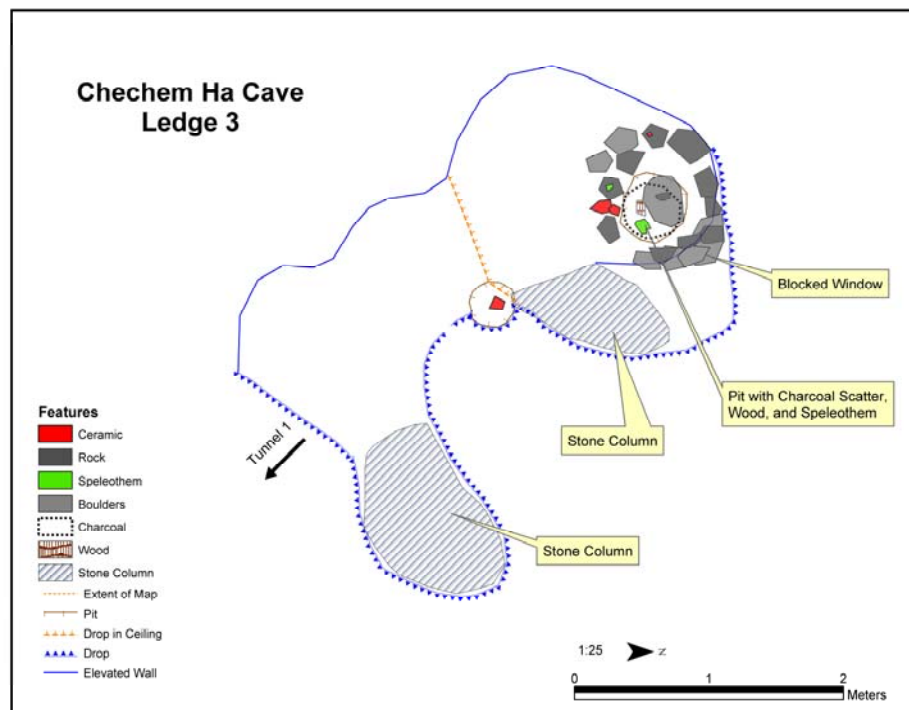


Figure 4-42. Detailed map of Ledge 3 (photo by author).



Figure 4-43. Ledge 3 pit containing charcoal, wood and speleothem. Red arrow points to speleothem (photo by author).



Figure 4-44. Blocked hole in east wall of Ledge 3. Photo taken from Tunnel 1, view to west (photo by author).

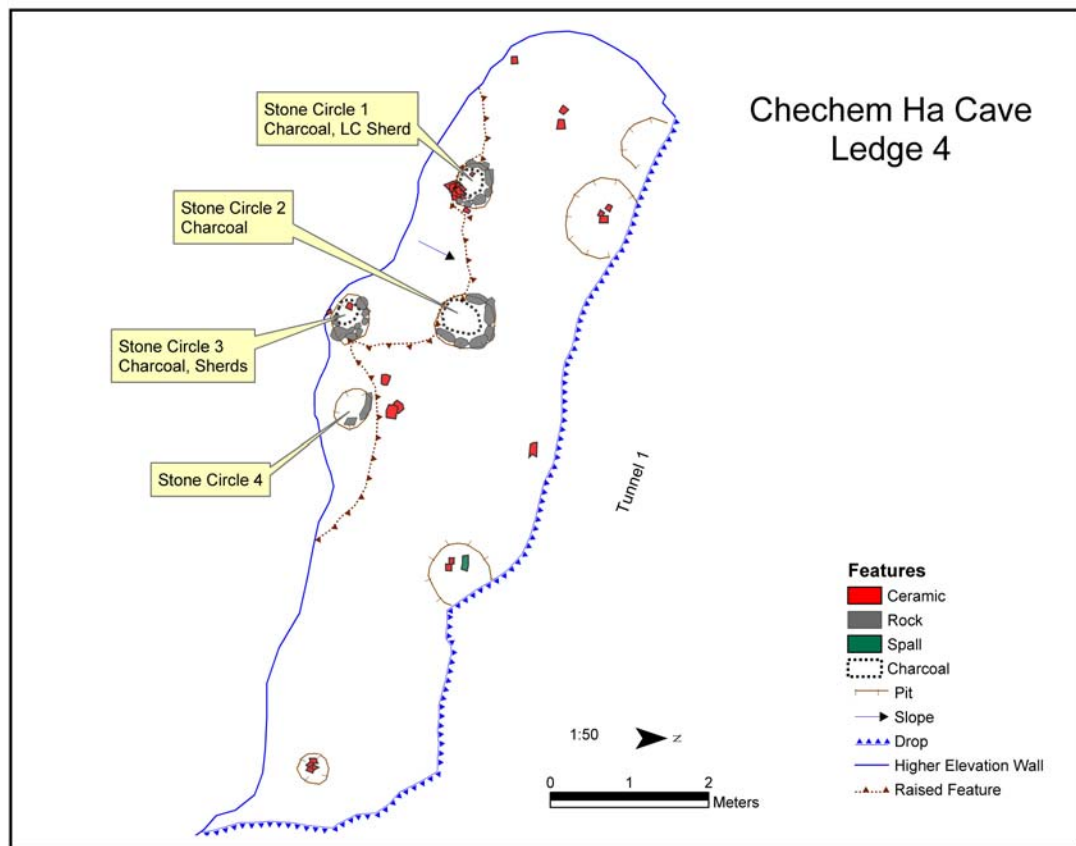


Figure 4-45. Detailed map of Ledge 4.



Figure 4-46. Photo of Ledge 4 showing Stone Circle 1 (photo by author).



Figure 4-47. Close-up photo of Stone Circle 1 shot from above feature (photo by author).



Figure 4-48. Close-up photo of Stone Circle 2. Photo taken from above feature.



Figure 4-49. Stone circle found at Rice Mill Cave, Northern Belize.

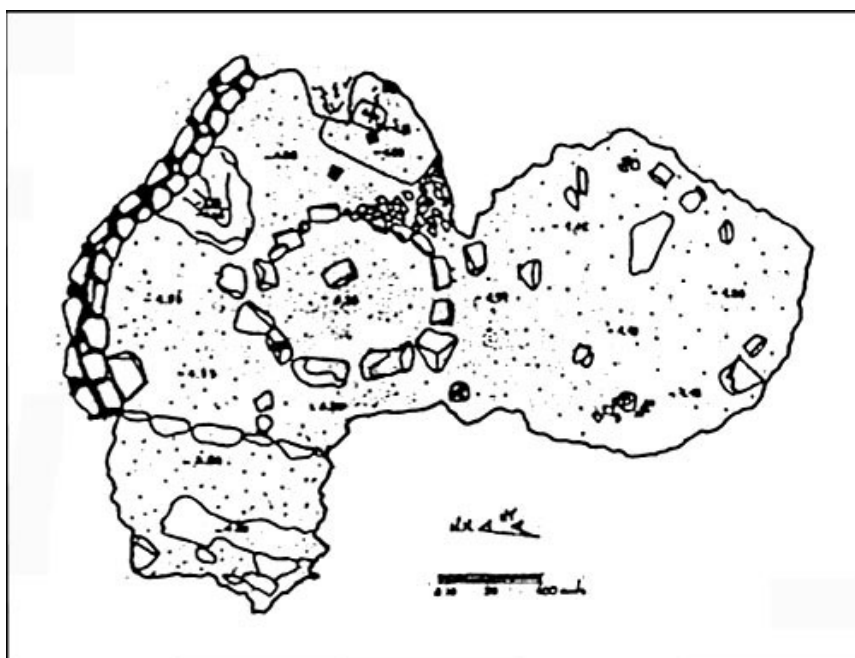


Figure 4-50. Stone circle from Cueva II, Teotihuacan (Segura 1998:183, after Figure 2)

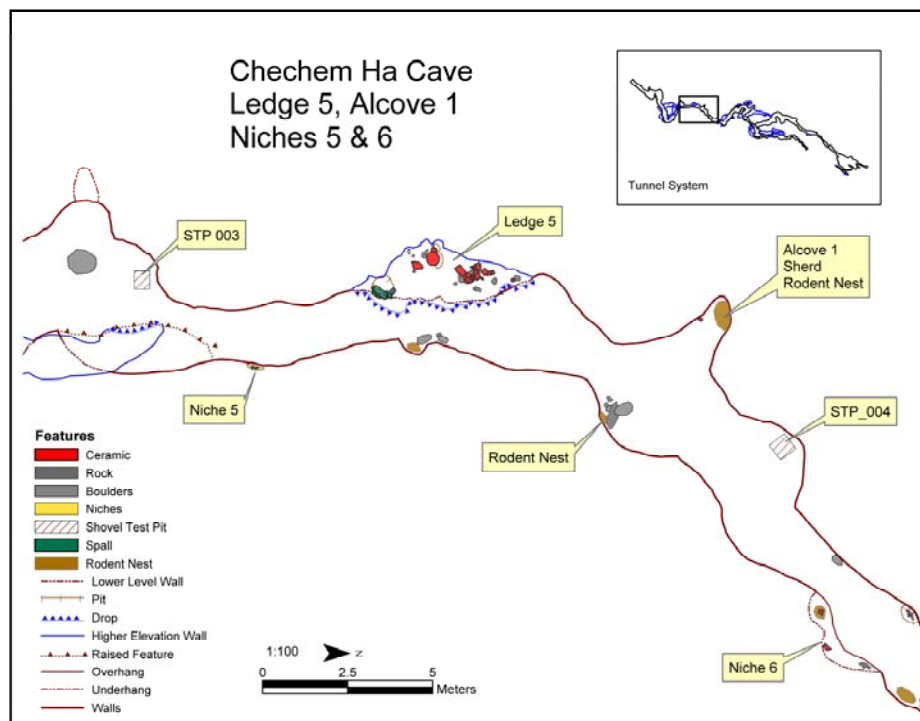


Figure 4-51. Location of Ledge 5 and Alcove 3.

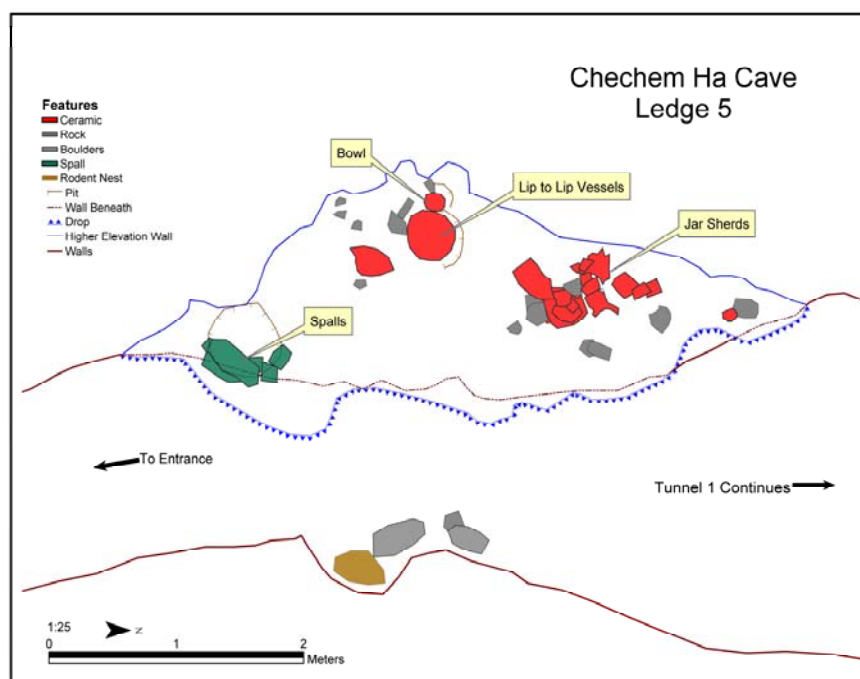


Figure 4-52. Detail map of Ledge 5.



Figure 4-53. Lip-to-lip vessels on Ledge 5. Intact bowl sits next to wall.

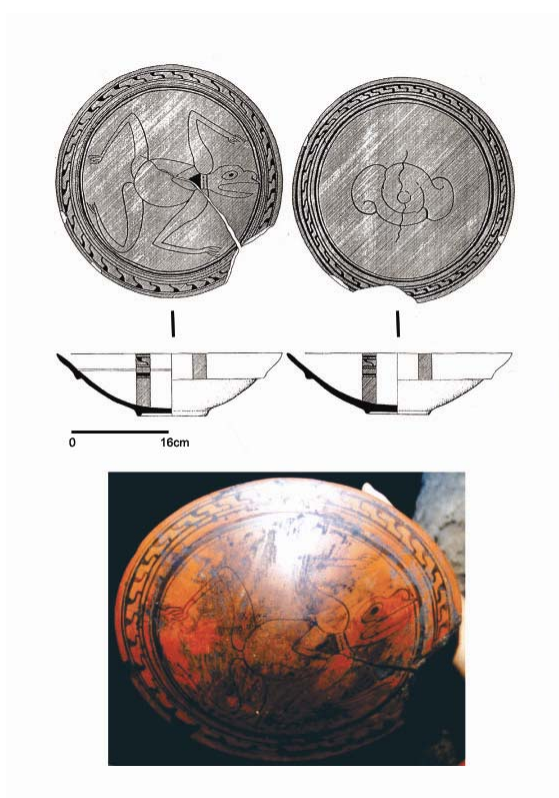


Figure.4-54. Lip-to-lip vessels Ledge 5. Drawings after Ishihara 2000:Appendix 2. Dish with frog design pictured below.

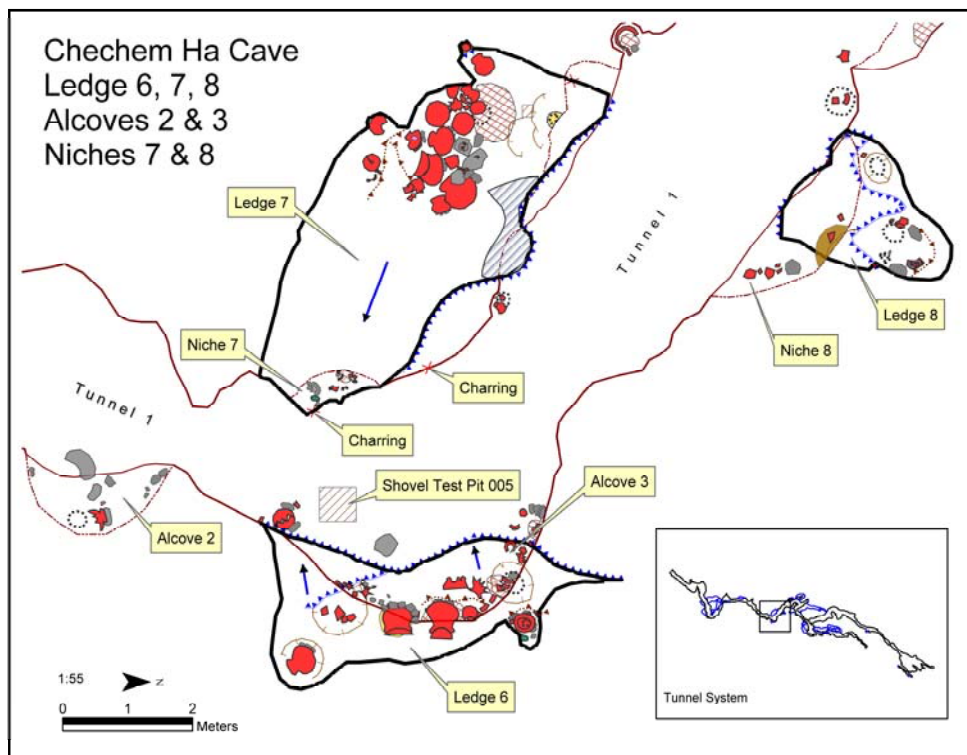


Figure 4-55. Location of Alcoves 4, 5 and 6, Ledges 6, 7, 8.



Figure 4-56. Terminal Preclassic/Early Classic jar sherd Alcove 2.



Figure 4-57. Charring above hole in wall above Niche 7.

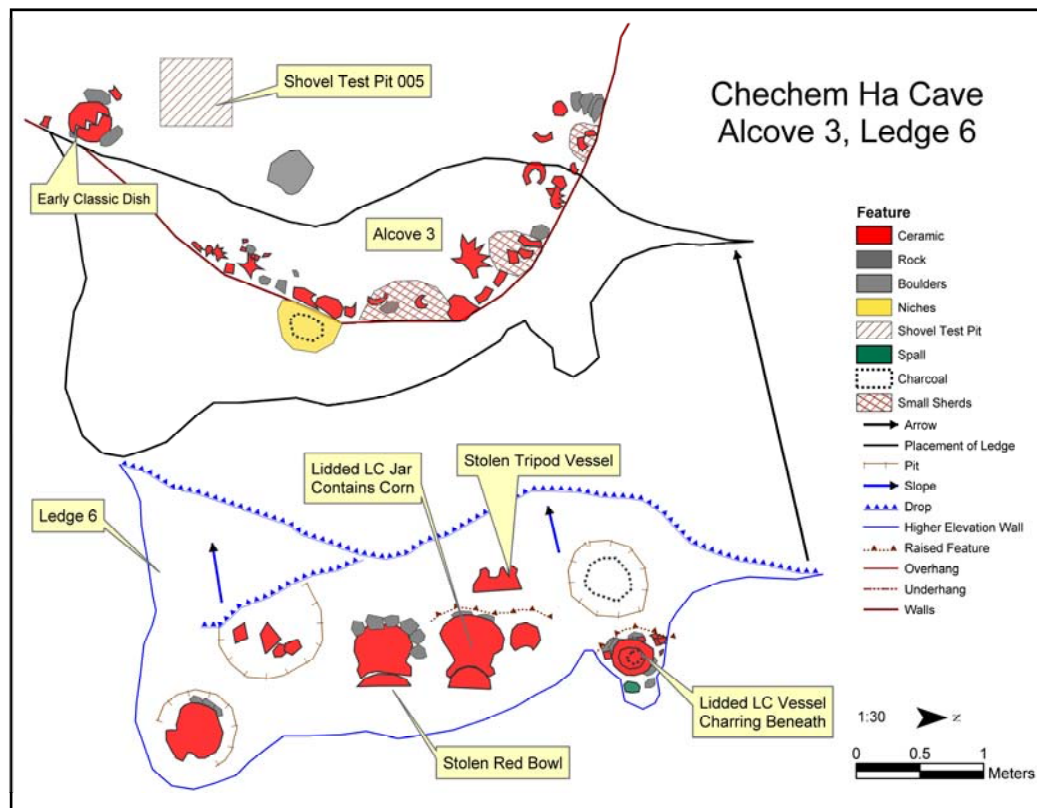


Figure 4-58. Detail map of Alcove 3 and Ledge 6.

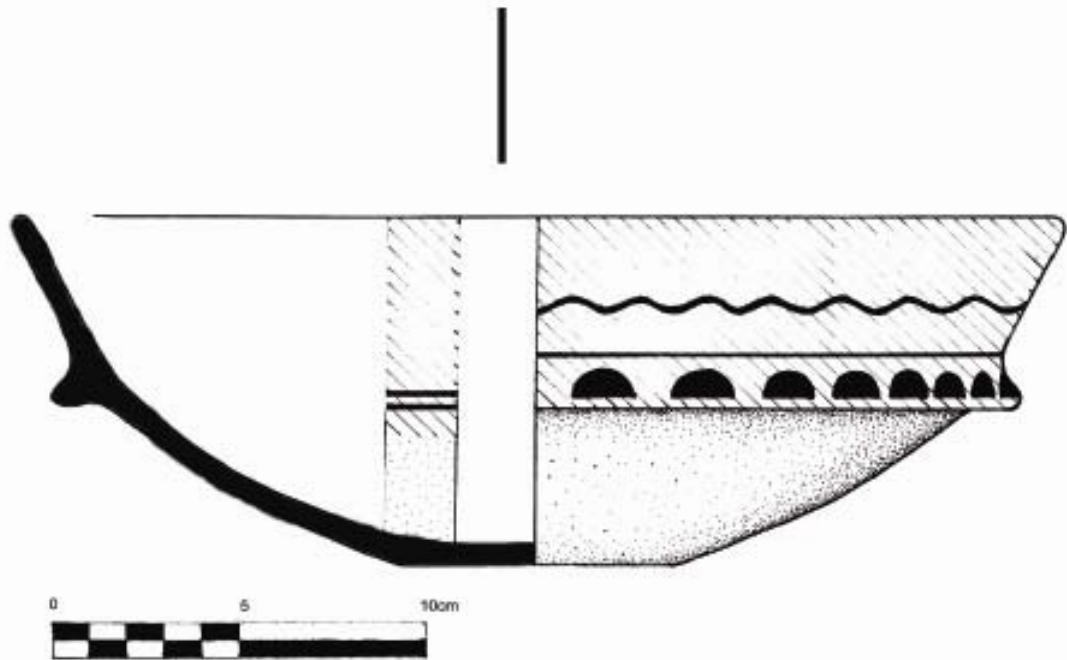


Figure 4-59. Early Classic period dish in Alcove 3. Drawing after Ishihara 2000:Figure 8.

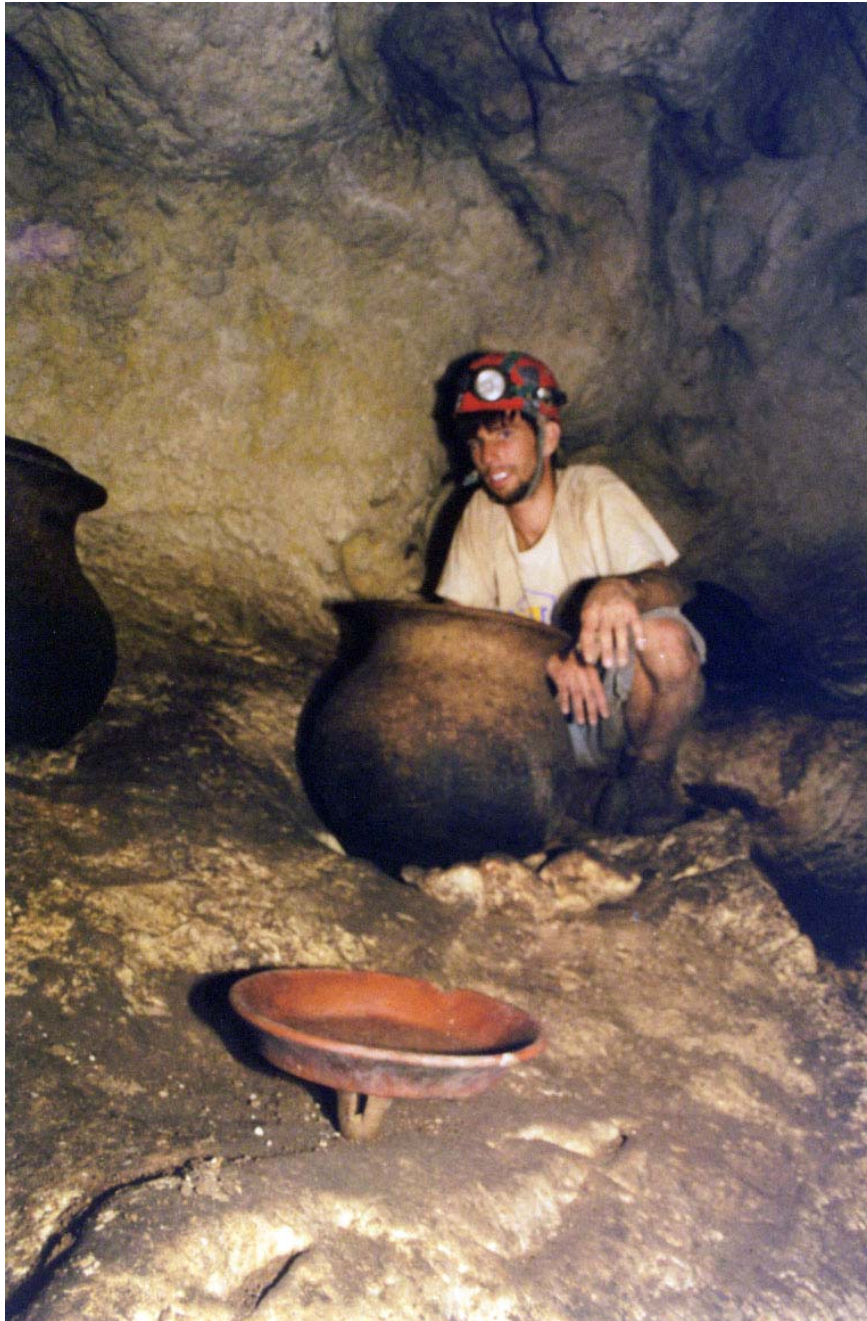


Figure 4-60. Photo of Michael Mirro on Ledge 6 that shows stolen red tripod dish. Note rocks used for stabilization beneath large jar.



Figure 4-61. (Top) Ledge 6 jar containing corn pictured in upper right photo. Note tecomate in foreground. (Bottom) Detail of jar and cobs.



Figure 4-62. Ledge 6 charred vessel with bowl used as lid.

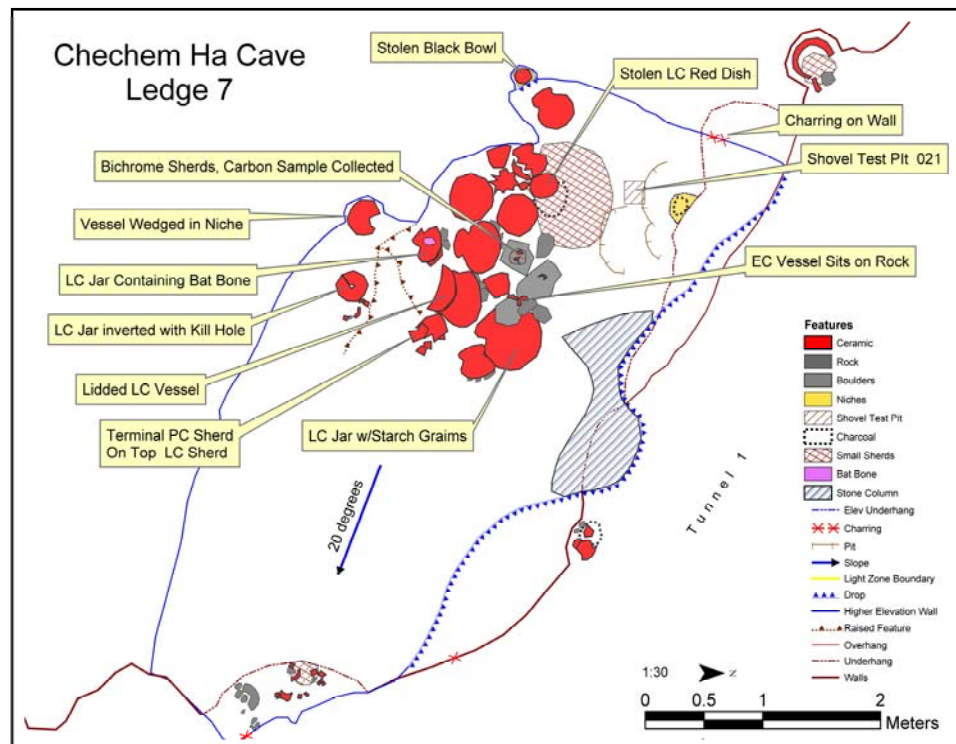


Figure 4-63. Detail map of Ledge 7.



Figure 4-64. Ceramics on Ledge 7 viewed to the north (photo by author).



Figure 4-65. Ledge 7, jar balanced in crevice in west wall (photo by author).



Figure 4-66 Charcoal was collected from beneath this rock supporting bichrome sherds. Sotero Red Brown bowl sits behind rock (photo by author).



Figure 4-67. Ledge 7, stolen red Late Classic tripod dish, early photo taken by Karen Bassie-Sweet.

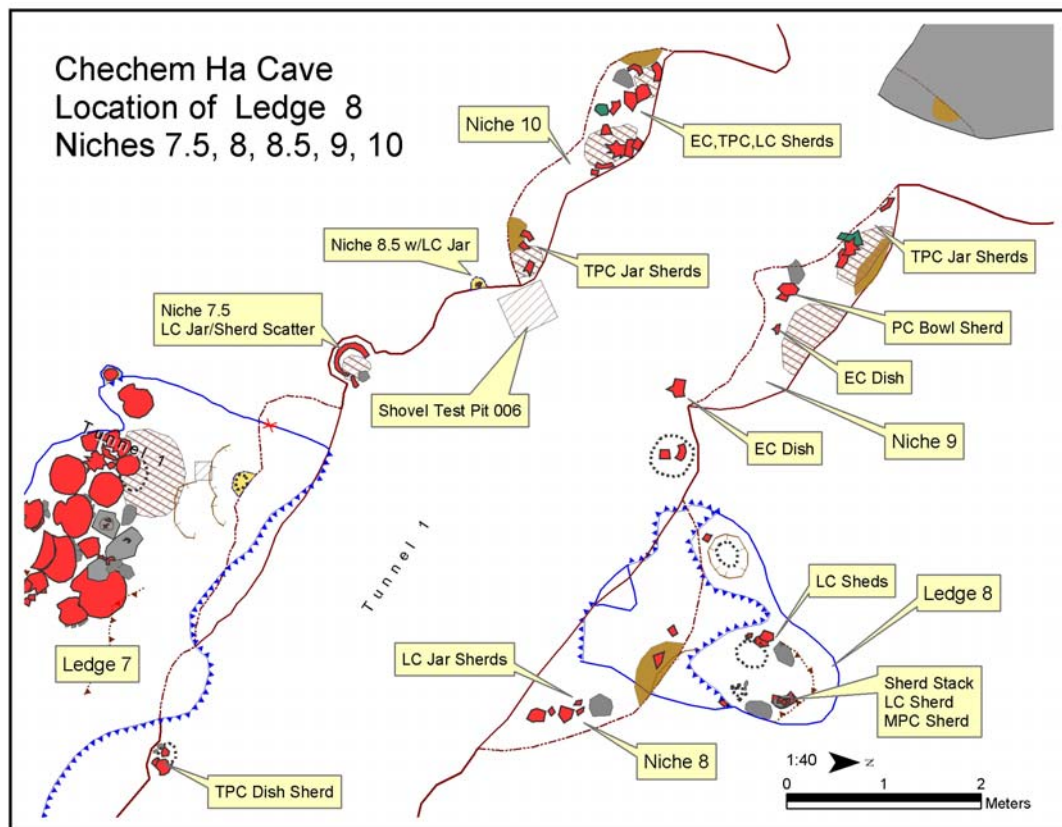


Figure 4-68. Detail map of Ledge 8, Niche 7.5, 8, 8.5, 9, and 10.

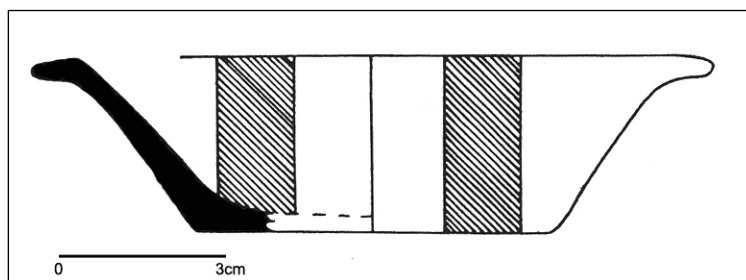


Figure 4-69. Ledge 8 Middle Preclassic bowl (redrawn after Ishihara 2000:appendix 2).

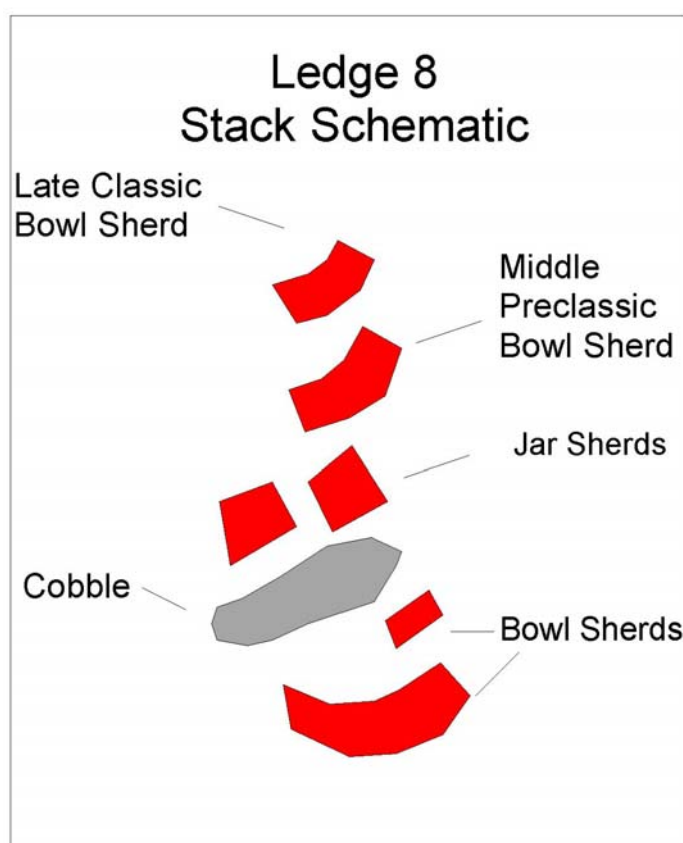


Figure 4-70. Ledge 8 schematic of stacked sherds and cobble.



Figure 4-71. Shovel Test Pit 006. Photo illustrates potsherd-lined hearth. Red arrow points to charcoal used for dating.

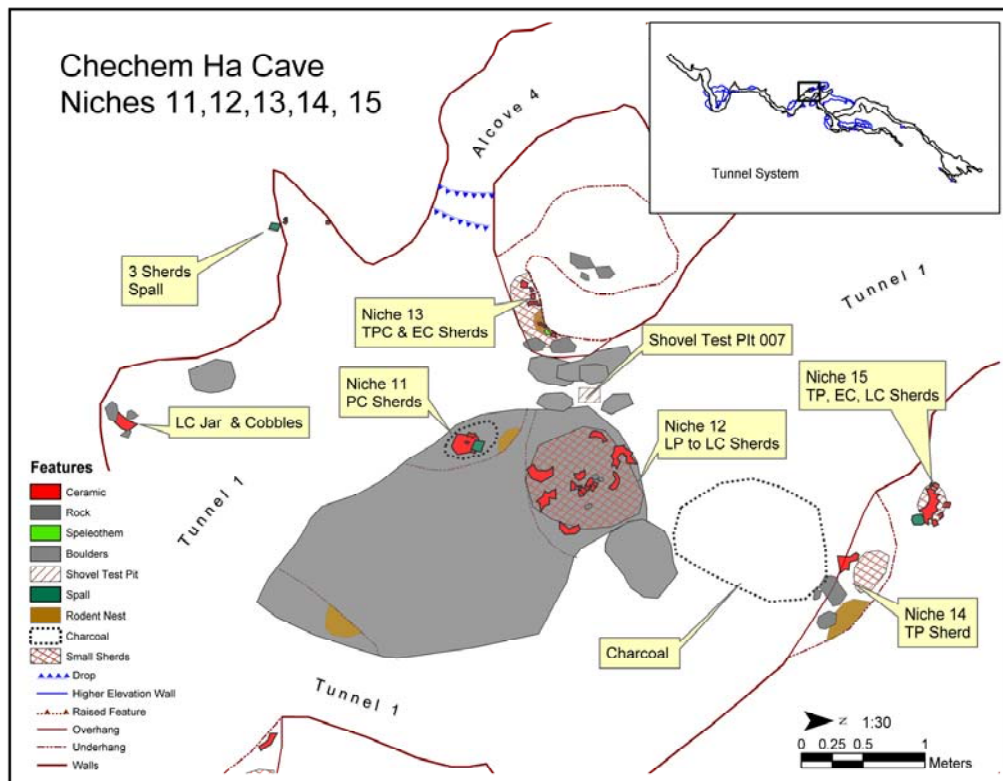


Figure 4-72. Map of area surrounding large boulder.



Figure 4-73. Photo of large boulder viewed to south showing Niche 12 beneath overhang.

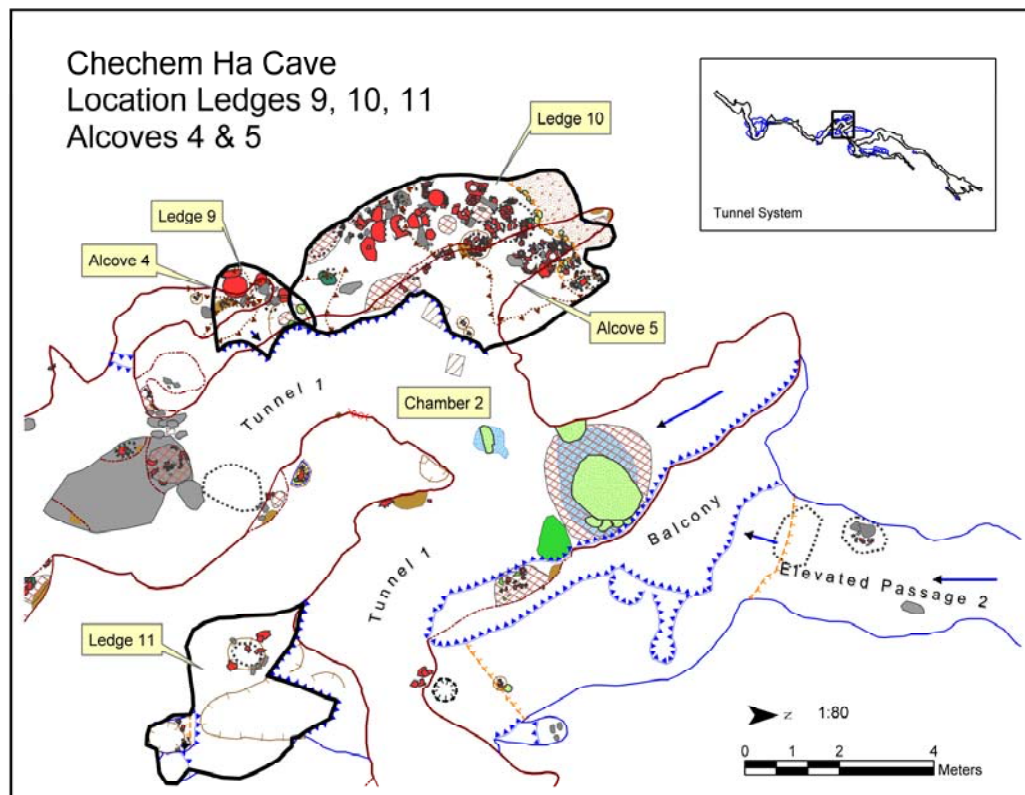


Figure 4-74. Location of Ledges 9, 10, and 11, Alcoves 4 and 5, and Chamber 2.

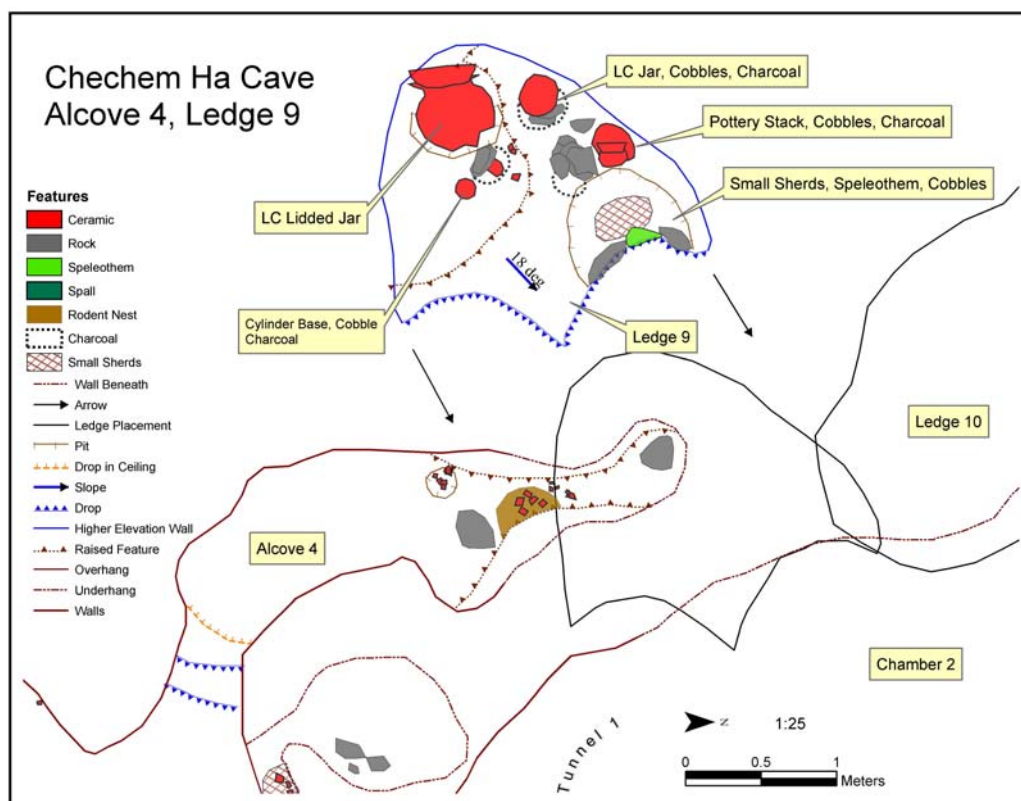


Figure 4-75. Detail map Ledge 9 and Alcove 4.



Figure 4-76. Ledge 9 artifacts. Right- sherd stack with Late Classic dish on top. Center- pile of cobbles intact jar behind pile. Left- lidded vessel, cylindrical vase base and small hearth.



Figure 4-77. Base of cylinder vase and small hearth to the right on Ledge 9.



Figure 4-78. Ledge 10 ceramic scatter. Note the numerous polychrome sherds.

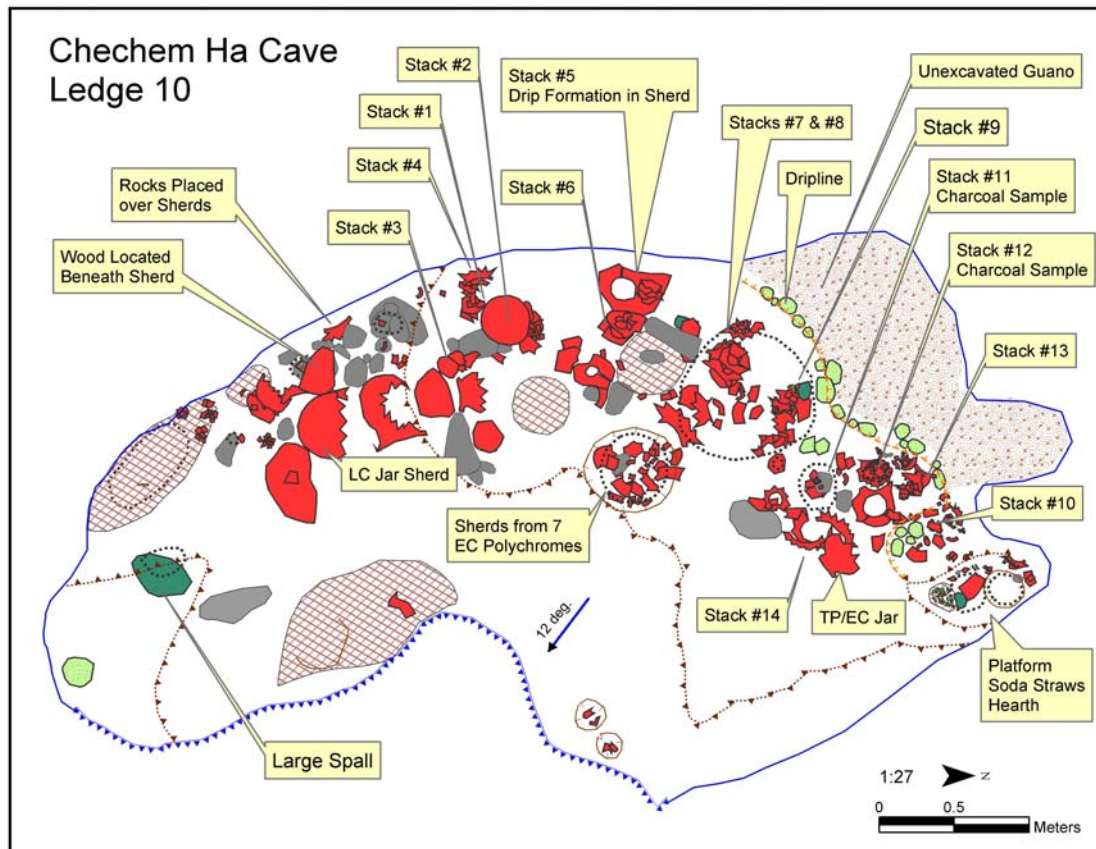


Figure 4-79. Detail map of Ledge 10.

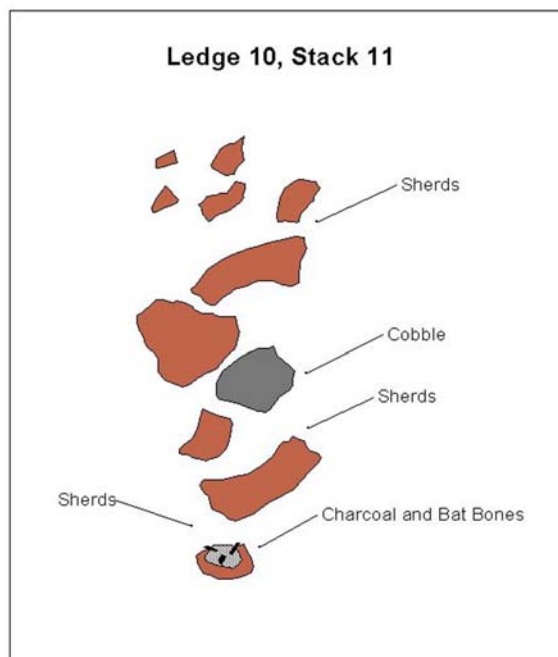


Figure 4-80. Ledge 10, Stack #11 schematic. Note the cobble placed in the center of the stack.



Figure 4-81. Ledge 10, Stack #12 located in center of photo. Charcoal collected from jar base at bottom of stack.



Figure 4-82. Cache of soda straws and sherds found on altar-like platform, Ledge 10.



Figure 4-83. Partially intact Negroman Punctated-Incised jar from the Terminal Preclassic/Early Classic Period.



Figure 4-84. Sherds of at least seven Early Classic polychrome dishes on Ledge 10..



Figure 4-85. Red arrow points to sherd at top of Stack #5 covered in calcite. Note large cobble placed atop several sherds.



Figure 4-86. Cobbles placed on top of sherds along west wall Ledge 10.



Figure 4-87. Wood fragments from torch found beneath large sherd Ledge 10.

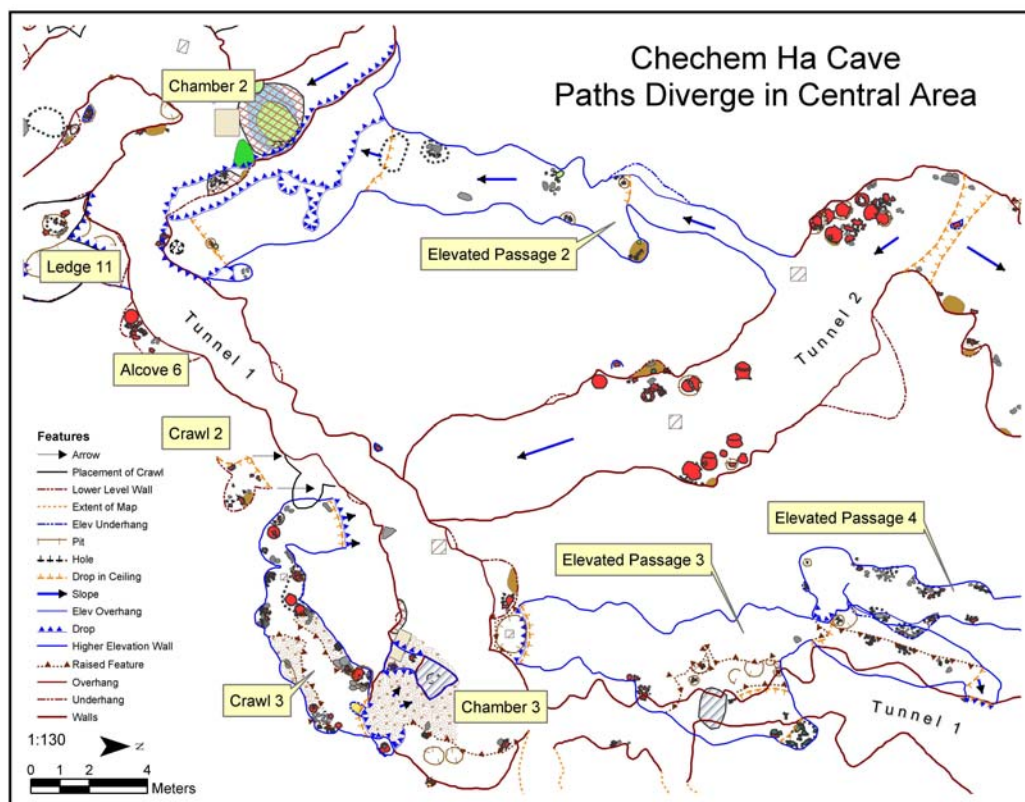


Figure 4-88. Map of tunnel system showing area where tunnel splits at Chamber 2.



Figure 4-89. Grant Polley stands beneath Chamber 2 stalactite "chandelier." Light behind feature illuminates opening to Elevated Passage 2. Also note the large stalactite fragment in the center of the chamber that marks the natural drain or sink in this area (photo by author).

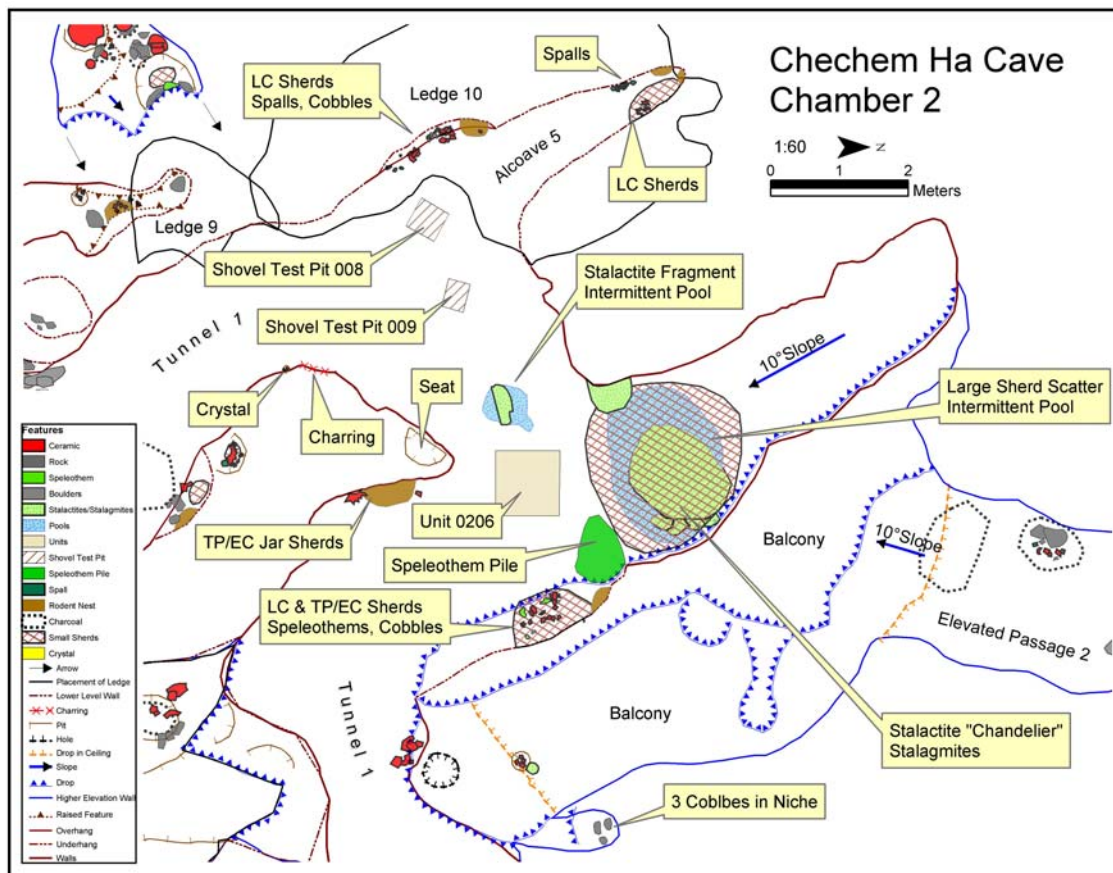


Figure 4-90. Detail map of Chamber 2.



Figure 4-91. Crystal lodged in crevice, Chamber 2 (photo by author, 1999).



Figure 4-92. Charring on west wall Chamber 2 (photo by author).



Figure 4-93. Mark Aldenderfer stands next to natural "seat" in the bedrock. This photo was taken after we began excavations. Red arrow points to base of dark stain indicating level of sediment before excavation. Note "face in profile" below Mark's left hand (photo by author).

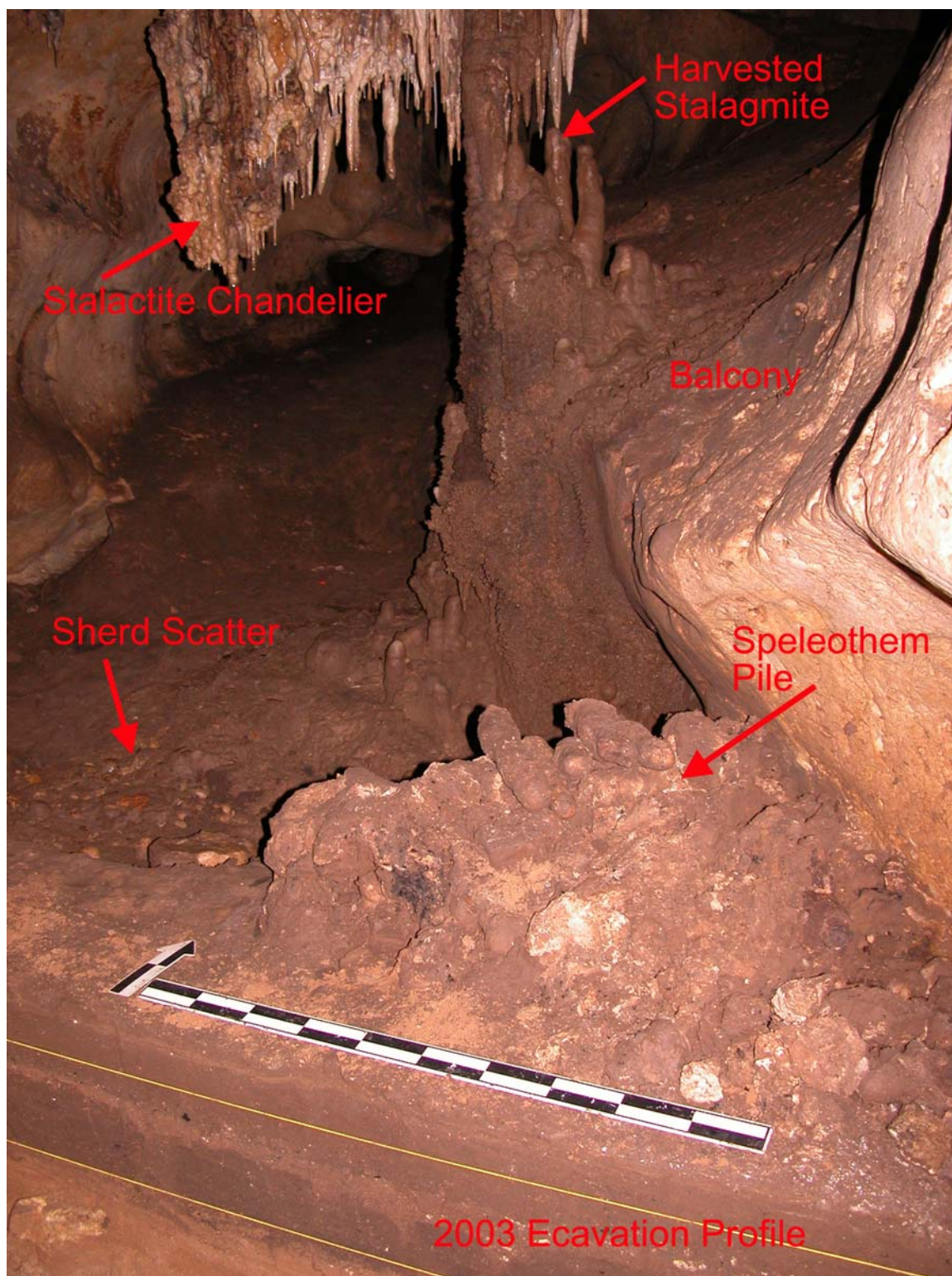


Figure 4-94. Features located below the stalactite chandelier, Chamber 2. The route leading to Elevated Passage 2 leads behind the chandelier.

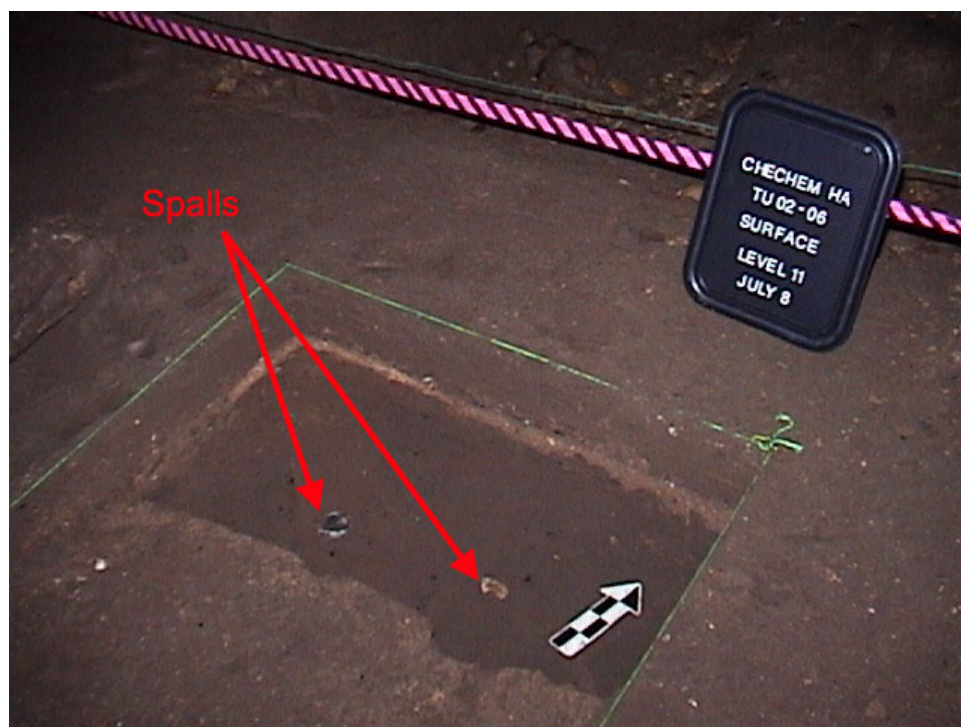


Figure 4-95. Photo of Unit 02-06 illustrates location of spalls and shows good stratigraphy.



Figure 4-96. Spalls containing residue excavated from Unit 02-06, Level 11.

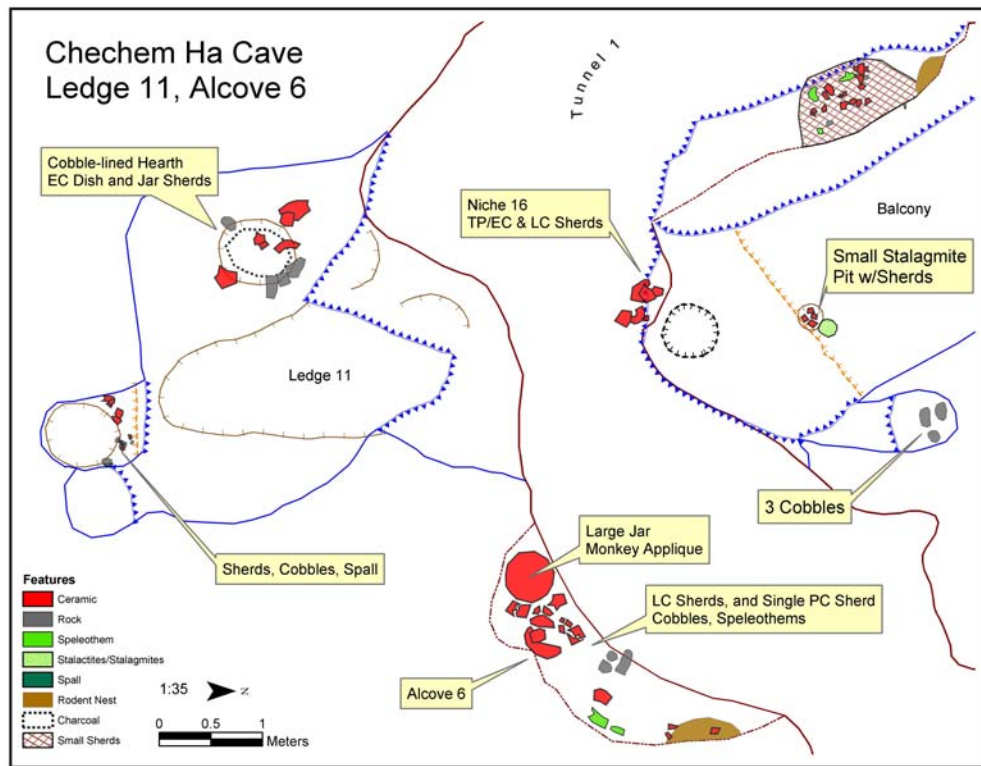


Figure 4-97. Detail map of Ledge 11, Niche 16, and Alcove 6.



Figure 4-98. Ledge 11 hearth lined with stone.



Figure 4-99. Photo of Alcove 6. Note the large appliquéd jar rim on the right. Sticks hold flagging tape to rope off area (photo by author).

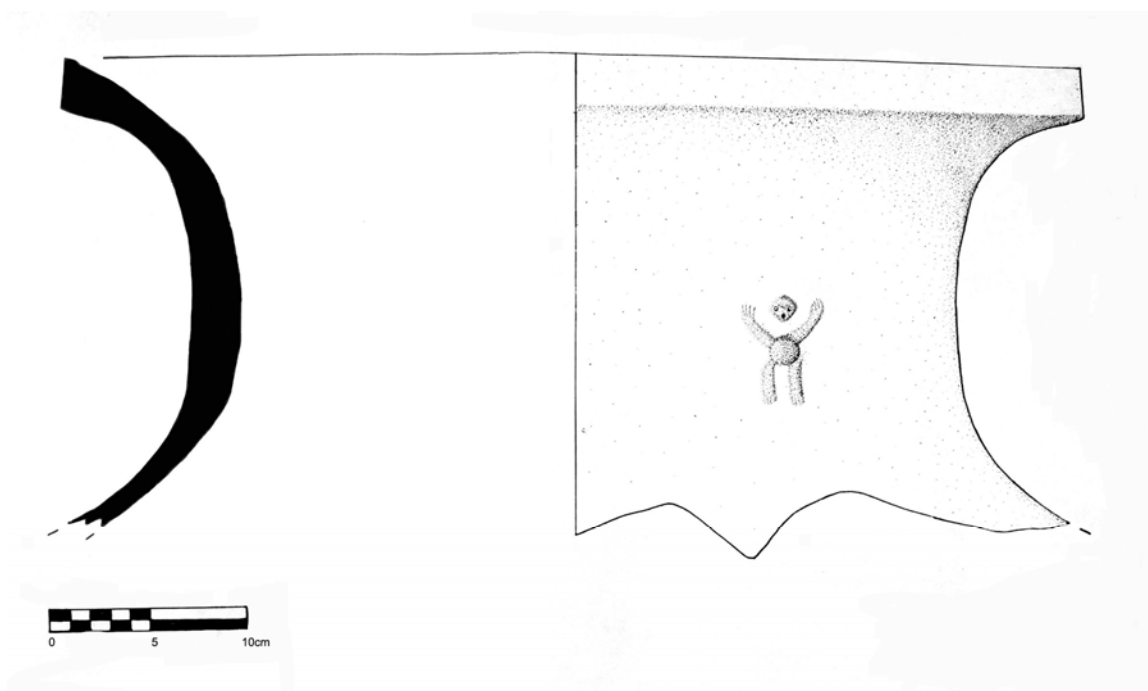


Figure 4-100. Kay Sunahara measures large vessel with appliquéd figure. Below-drawing of vessel after field drawing by Reiko Ishihara.



Figure 4-101. Vessel from Actun Tunichil Muknal with monkey-like figure appliquéd on neck (photo by author).

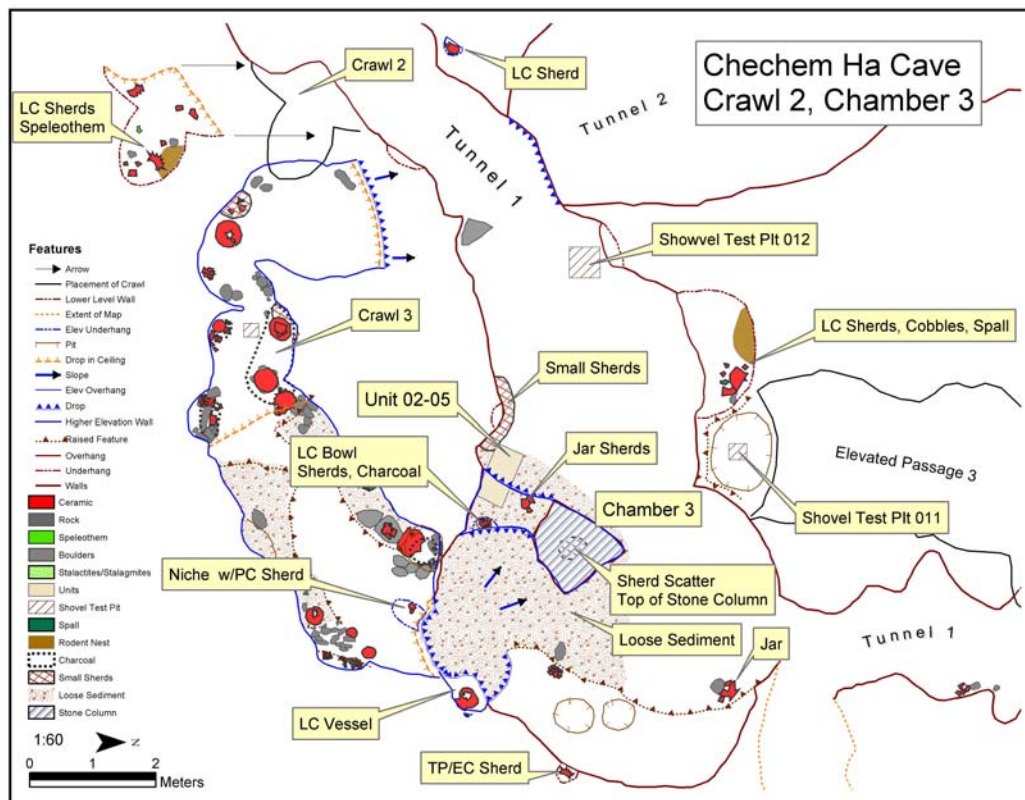


Figure 4-102. Detail map of Crawl 2 and Chamber 2.



Figure 4-103. Intact Late Classic bowl sits in niche of stone archway above Chamber 3.



Figure 4-104. Partially intact jar sits in the niche adjacent to Crawl 3 entrance.



Figure 4-105. Middle Preclassic sherds in niche beneath Crawl 3.

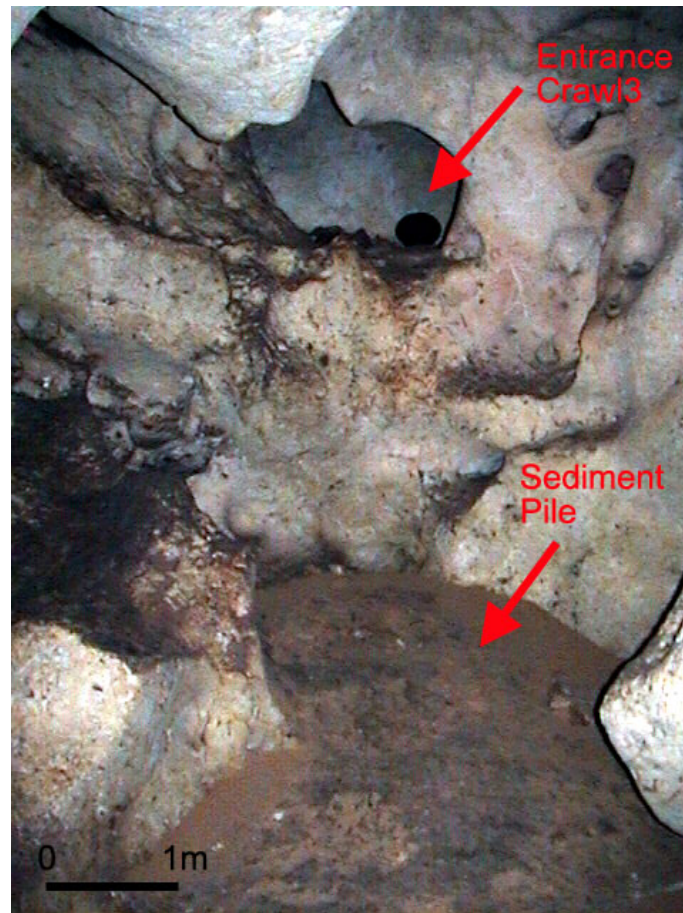


Figure 4-106. Photo of entrance of Crawl 3. Sediment can be seen below entrance.

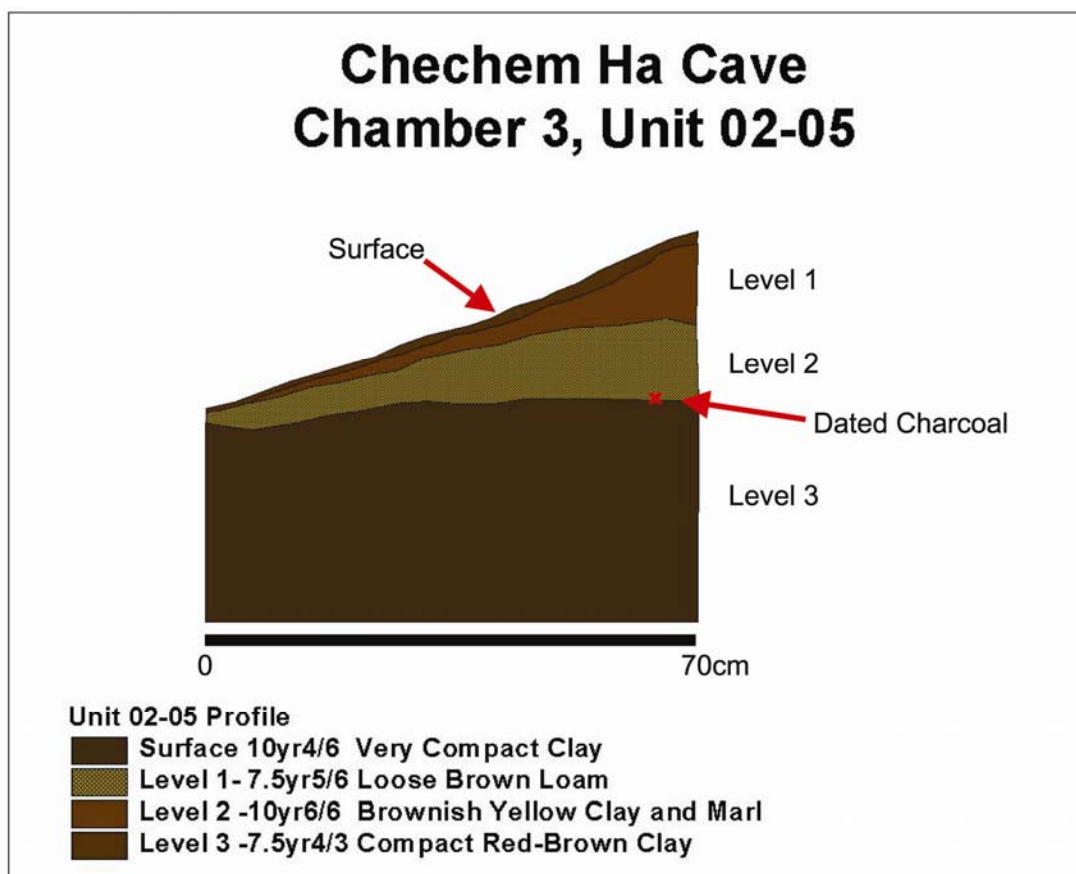


Figure 4-107. North wall profile of Unit 02-05.



Figure 4-108. Squash seed excavated from Unit 02-05, Level 3.

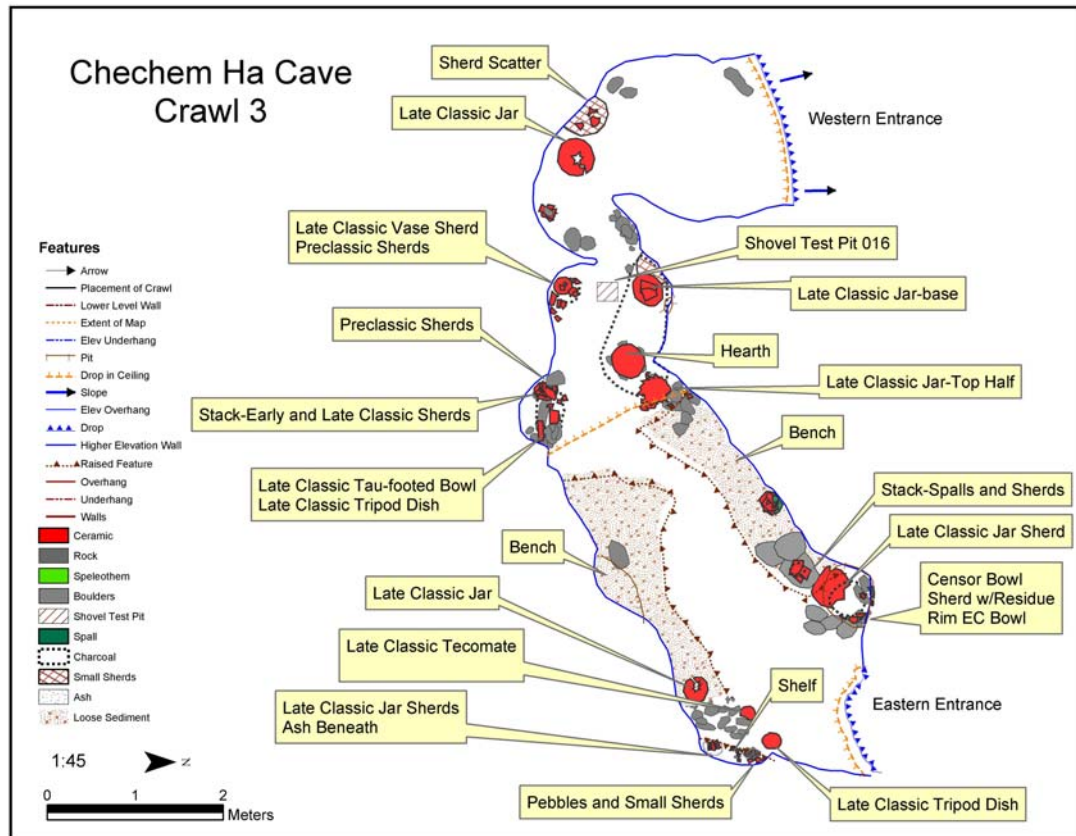


Figure 4-109. Detail map of Crawl 3.



Figure 4-110. Artifact cluster on north side of Crawl 3 entrance. Note censor bowl sitting on top of cobbles on right.

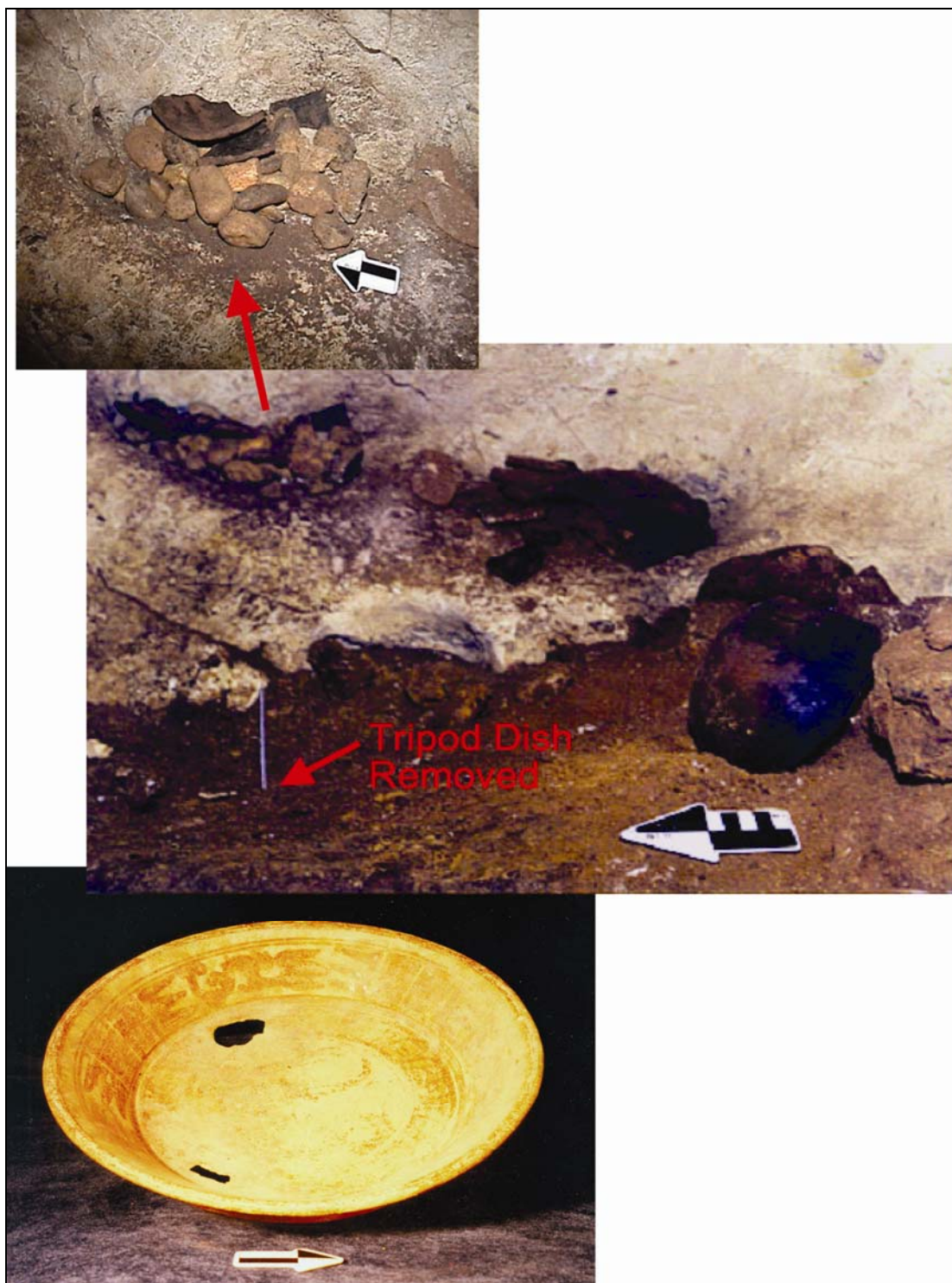


Figure 4-111. Shelf adjacent to eastern entrance of Crawl. Tripod dish was removed by the former Dept. of Archaeology and is pictured below. Close-up view of pebbles and sherds on north end of bench inset above.



Figure 4-112. Top photo of hearth in Crawl 3. The Late Classic intact jar sits on top of five hearthstones pictured below. Note dense charcoal scatter surrounding the stones.



Figure 4-113. Top photo is Late Classic dish with faded water-bird motif. Below is tau-footed bowl with caiman motif.

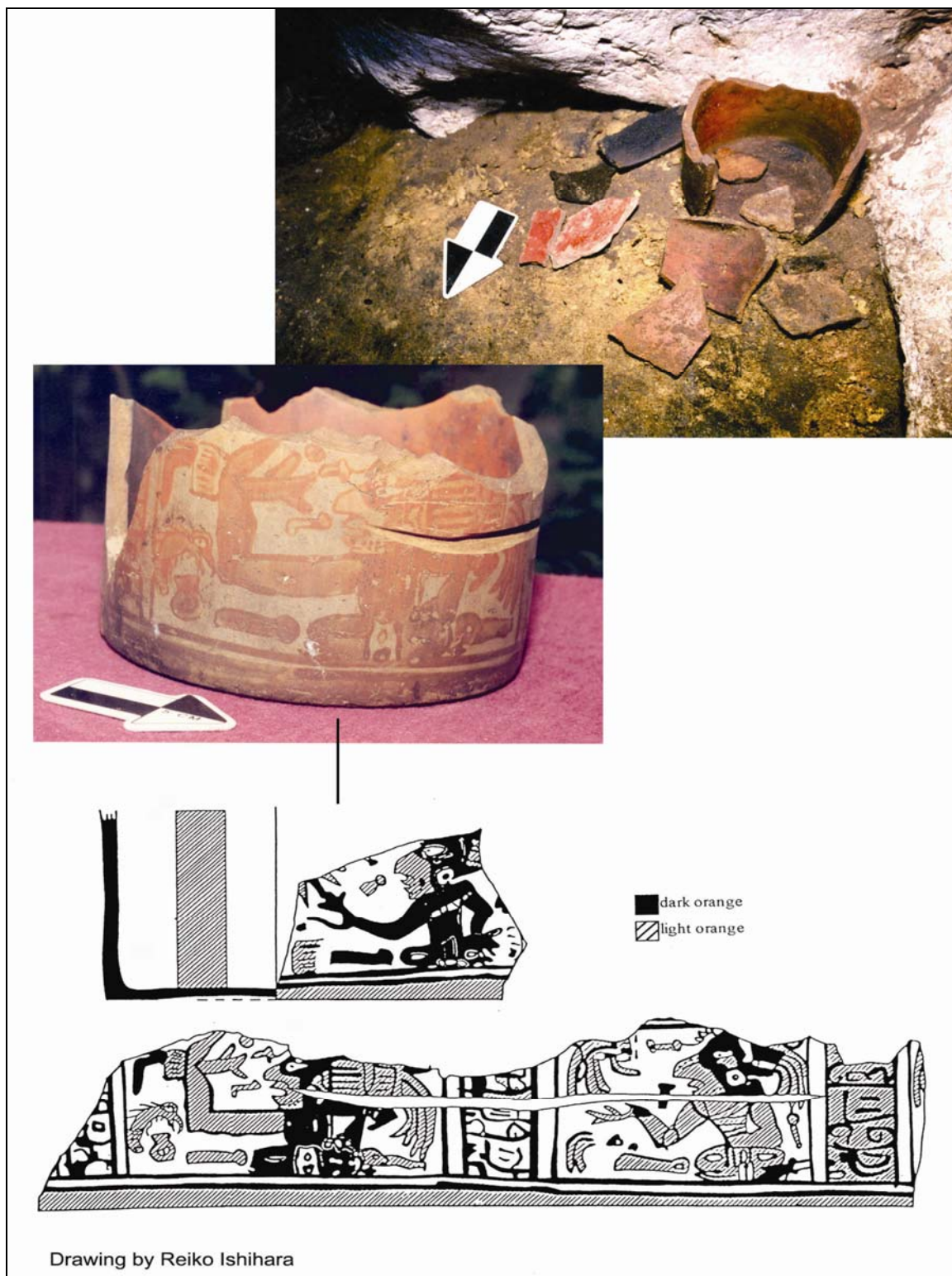


Figure 4-114. Polychrome vase and Preclassic sherds adjacent to south wall. Inset of vessel illustrates design of man with long arm. Bottom is illustration of all three panels of vase.



Figure 4-115. Cabrito Cream-Polychrome vessels from Buenavista (Ball1993:251, Figures 3, 4).



Figure 4-116. Holmul-style vessel from Naranjo (Reents-Budet 1994:183, Figure 5.18).

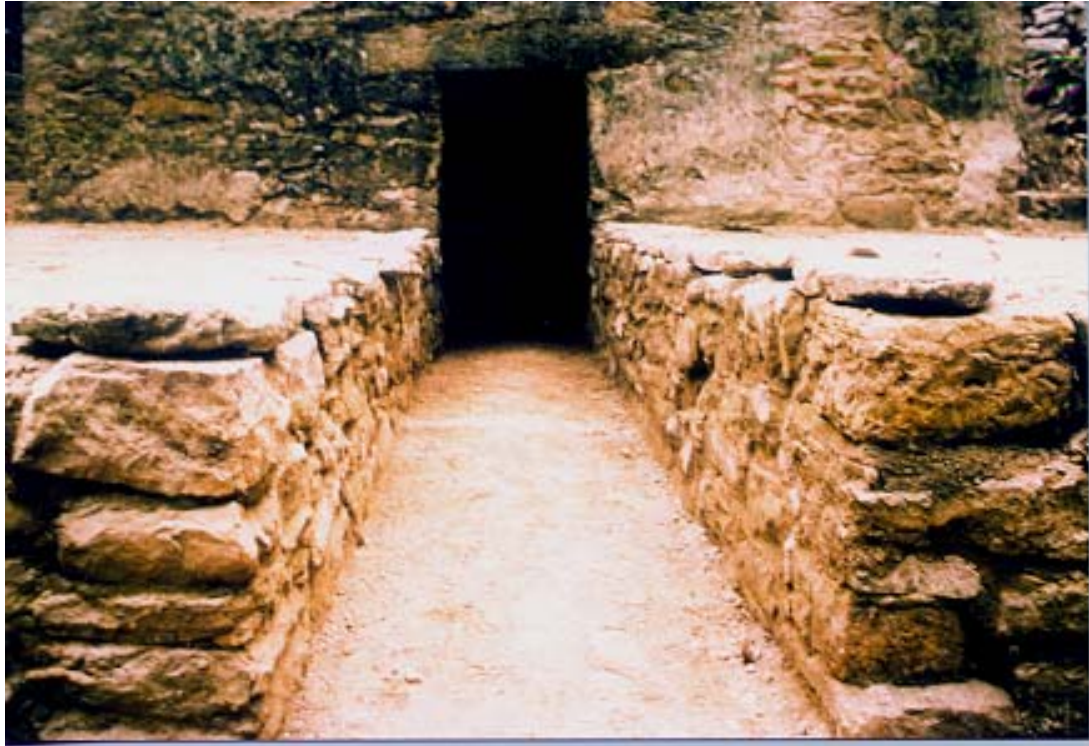


Figure 4-117. Tops shows bench/trench feature in Crawl 3 compared with a re-constructed sweatbath at Piedras Negras (Bottom photo courtesy of Stephen Houston).

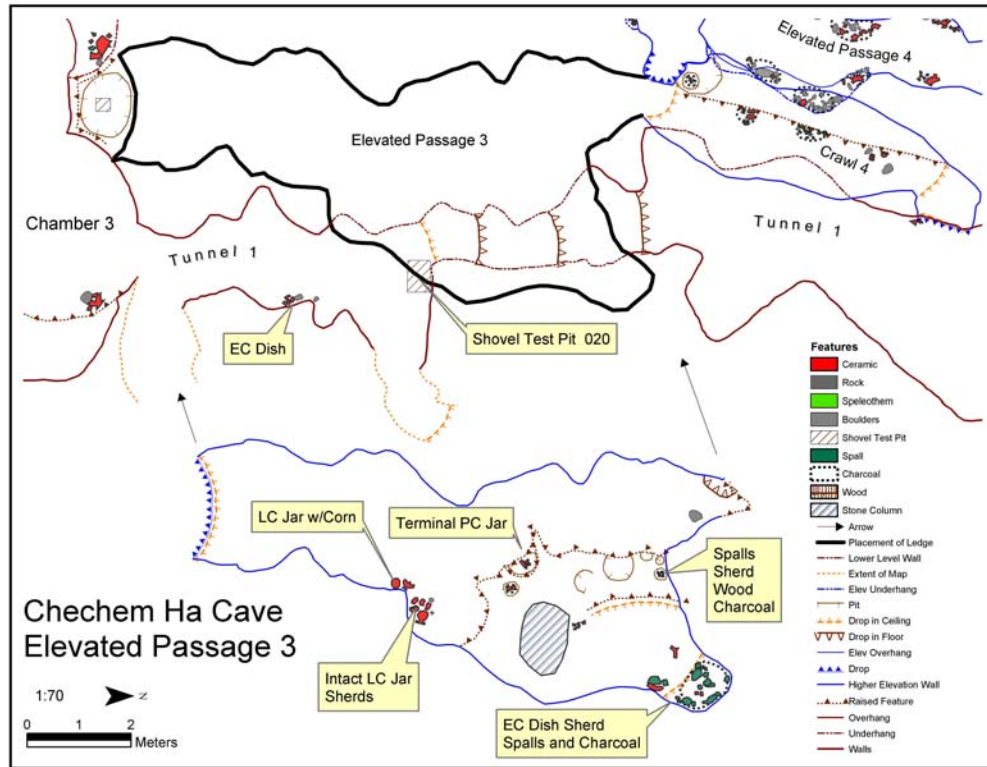


Figure 4-118. Detail map of Elevated Passage 3 and Tunnel 1 beneath.

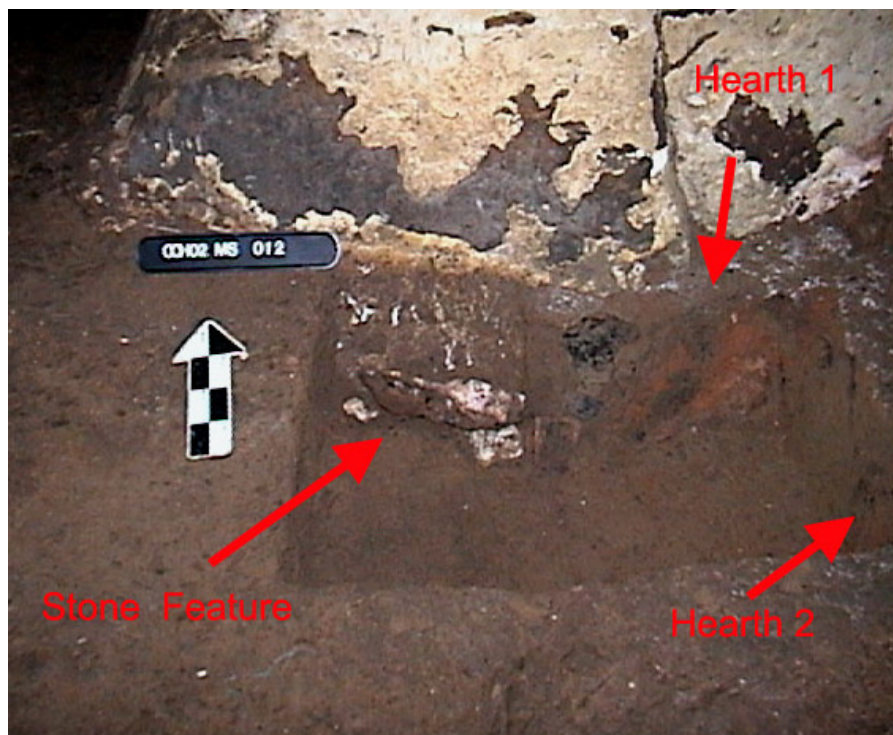


Figure 4-119. Photo of Shovel Test Pit #020 north wall.



Figure 4-120. Ramon seed excavated from hearth in Shovel Test Pit #020.

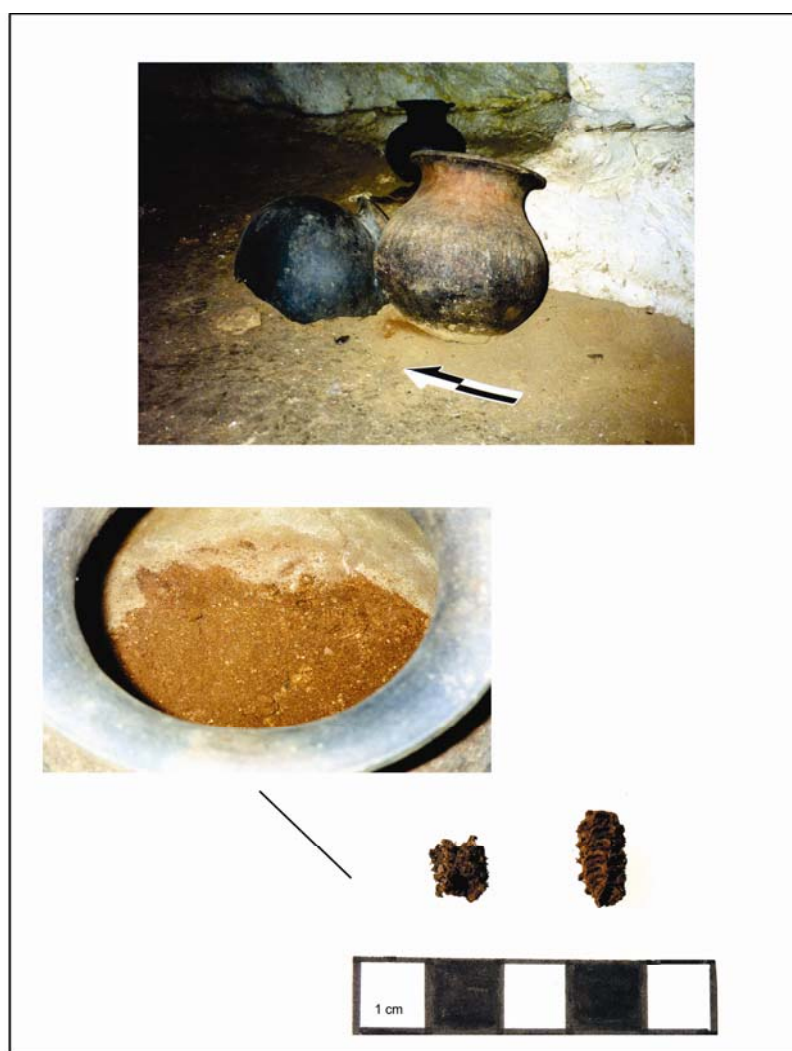


Figure 4-121. (Top) Intact Late Classic jar on right contains corn. (Bottom) Small cobs were intact (photos by author).

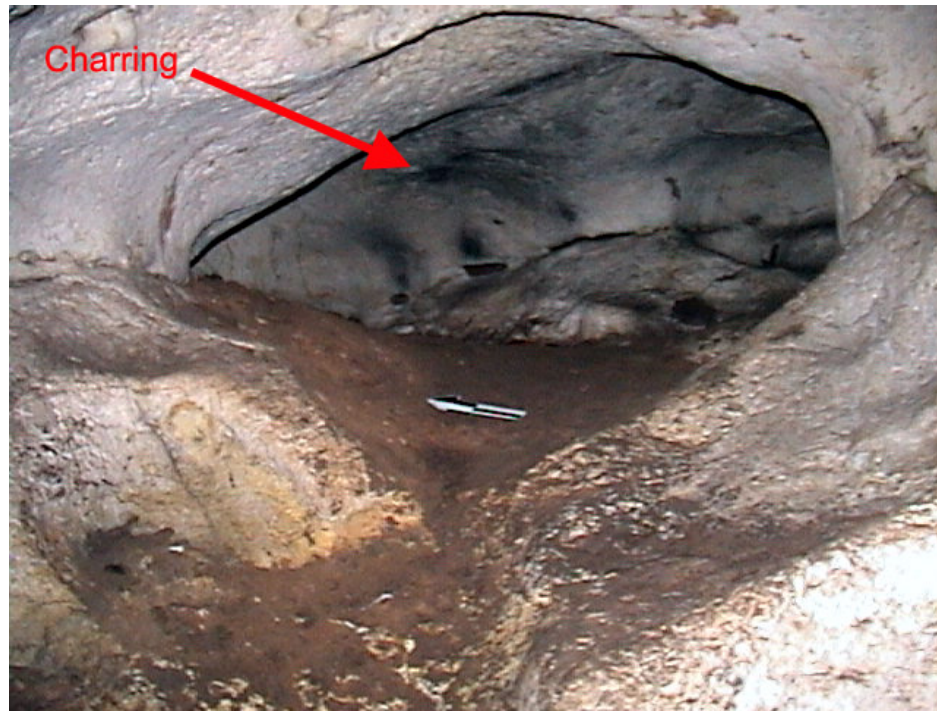


Figure 4-122. Photo of Elevated Passage 3 alcove area. Red arrow points to charring on ceiling (photo by author).

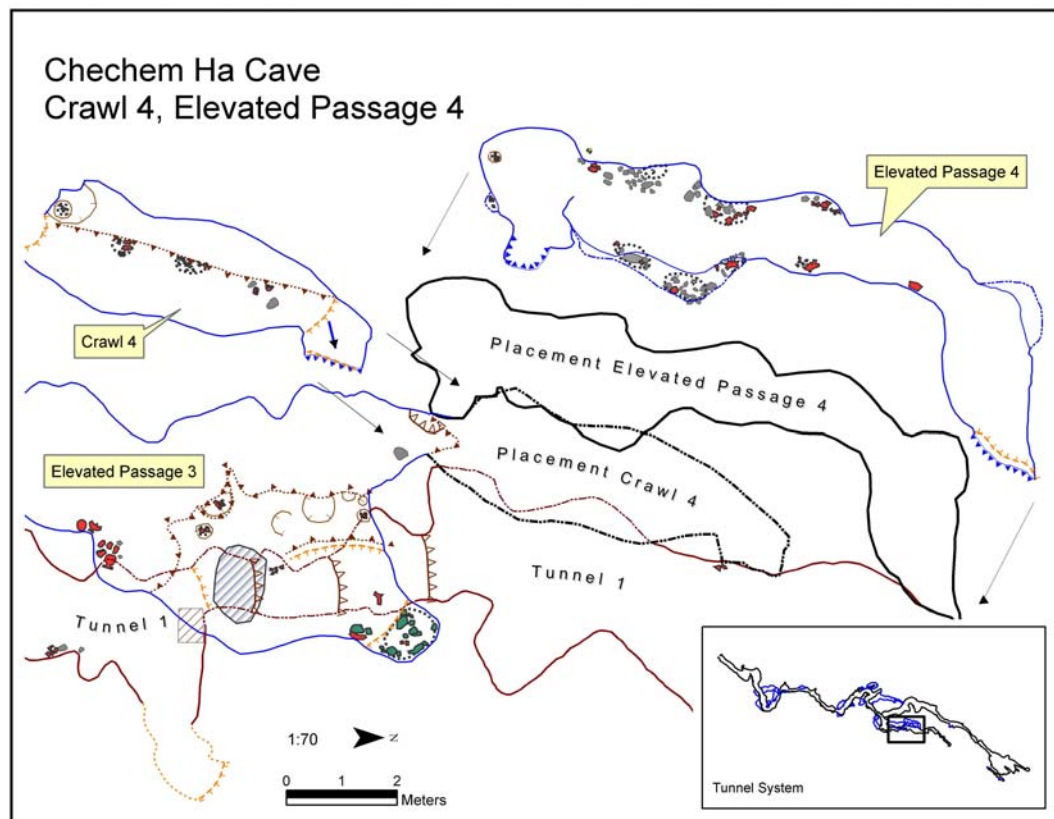


Figure 4-123. Map showing location of Crawl 4 and Elevated Passage 4.

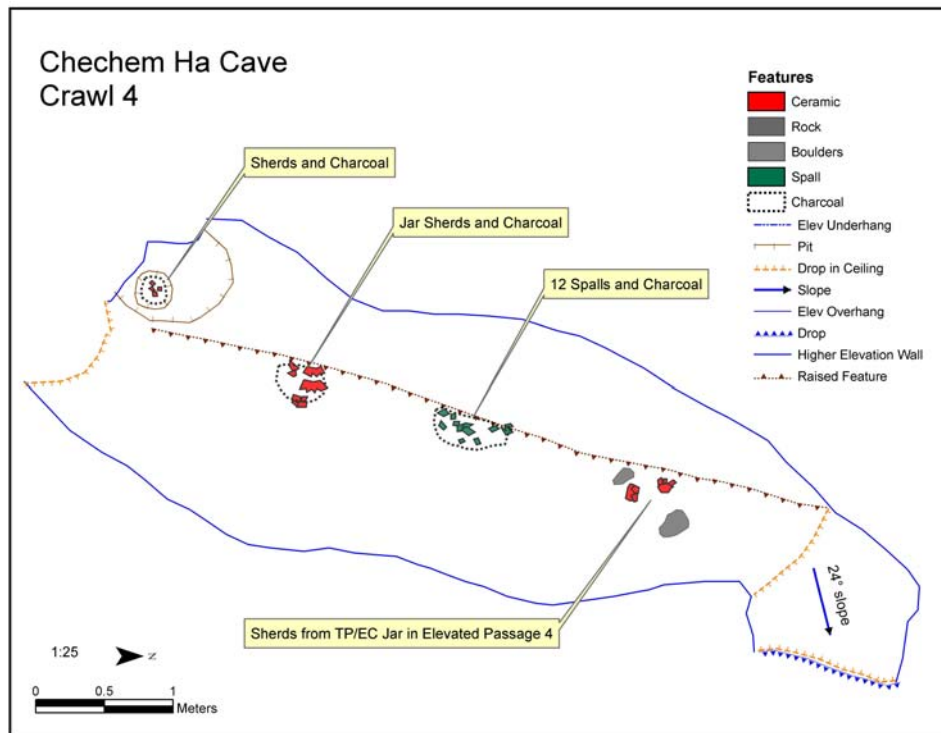


Figure 4-124. Detail map of Crawl 4.

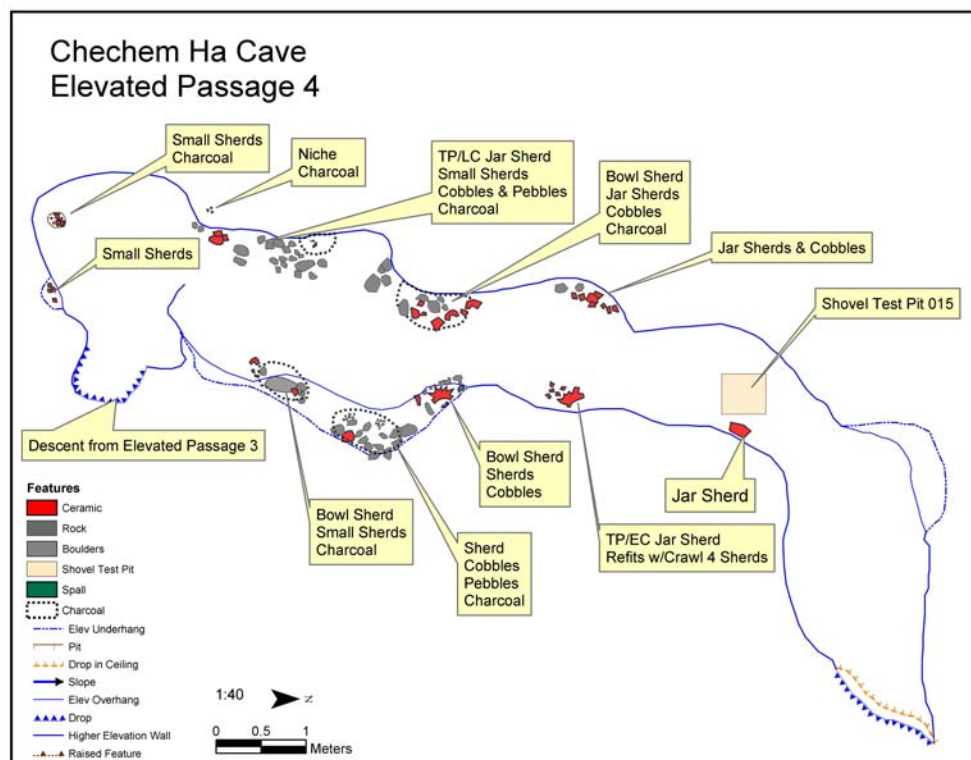


Figure 4-125. Detail map of Elevated Passage 3.

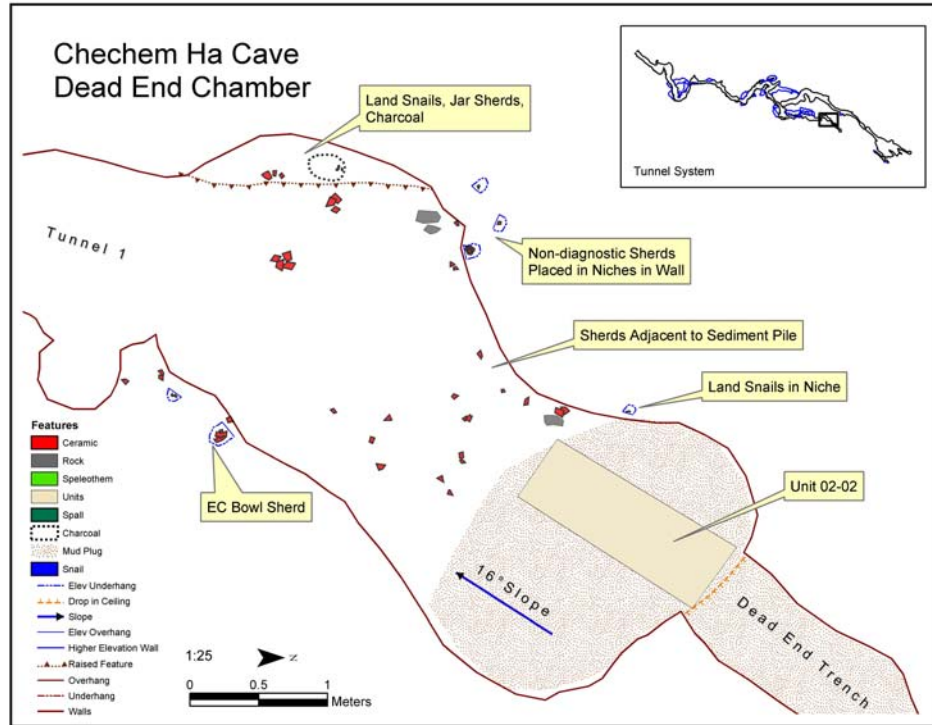


Figure 4-126. Detail map of Dead End Chamber.

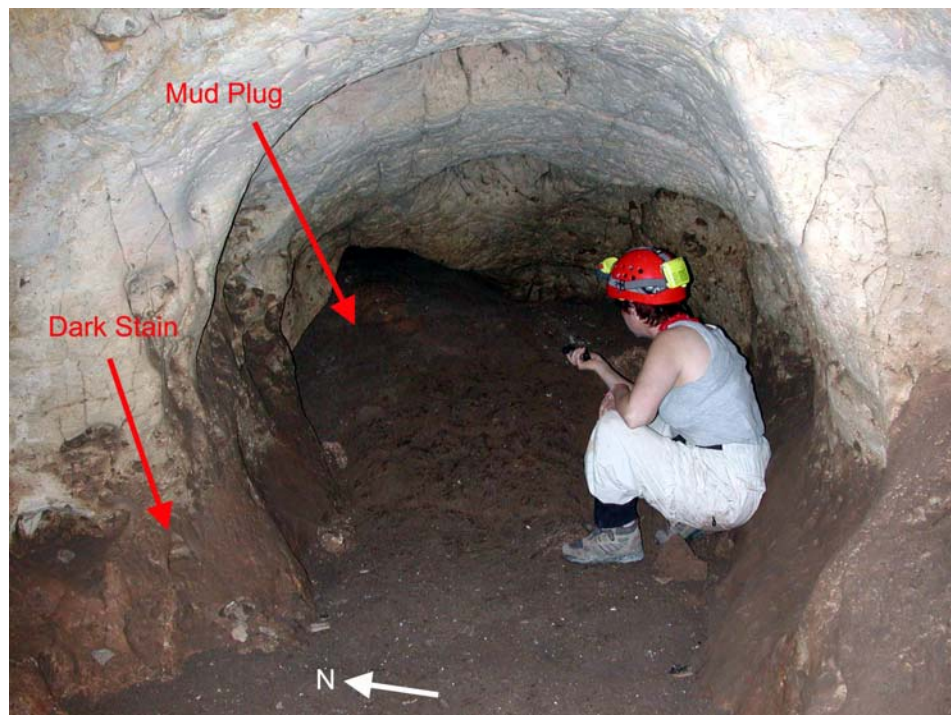


Figure 4-127. Photograph of author at terminus of Tunnel 1. Tunnel ends in mud plug. Red arrow points to stain on wall of Dead End Chamber (Photo by Mark Aldenderfer).

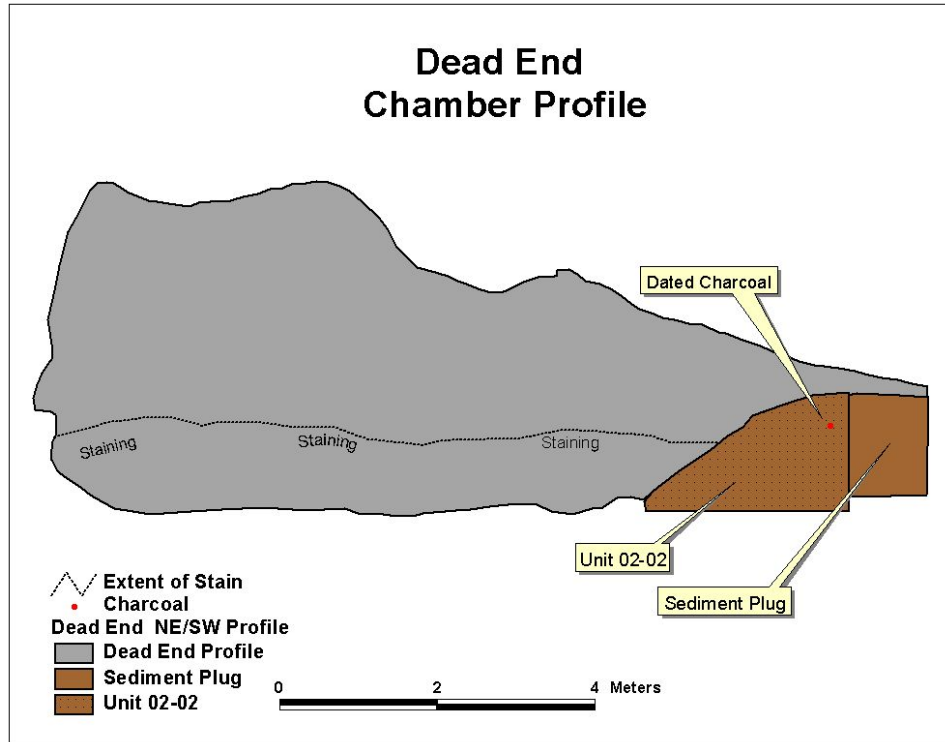


Figure 4-128 NE/SW Profile of Dead End Chamber showing sediment plug and Unit 02-02.



Figure 4-129. Artifacts collected from the Dead End trench fill (only large sherds are pictured).

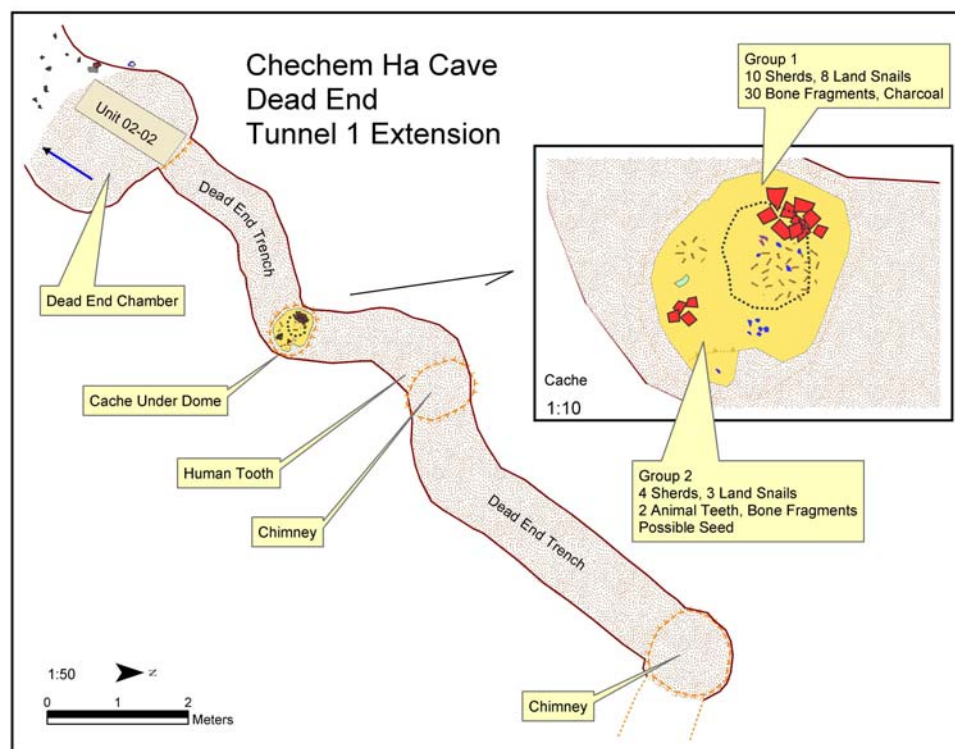


Figure 4-130. Map of Dead End Trench and detail of cache.



Figure 4-131. Dead End Trench, Cache 1, Group 1, mud covered sherds and animal bone.

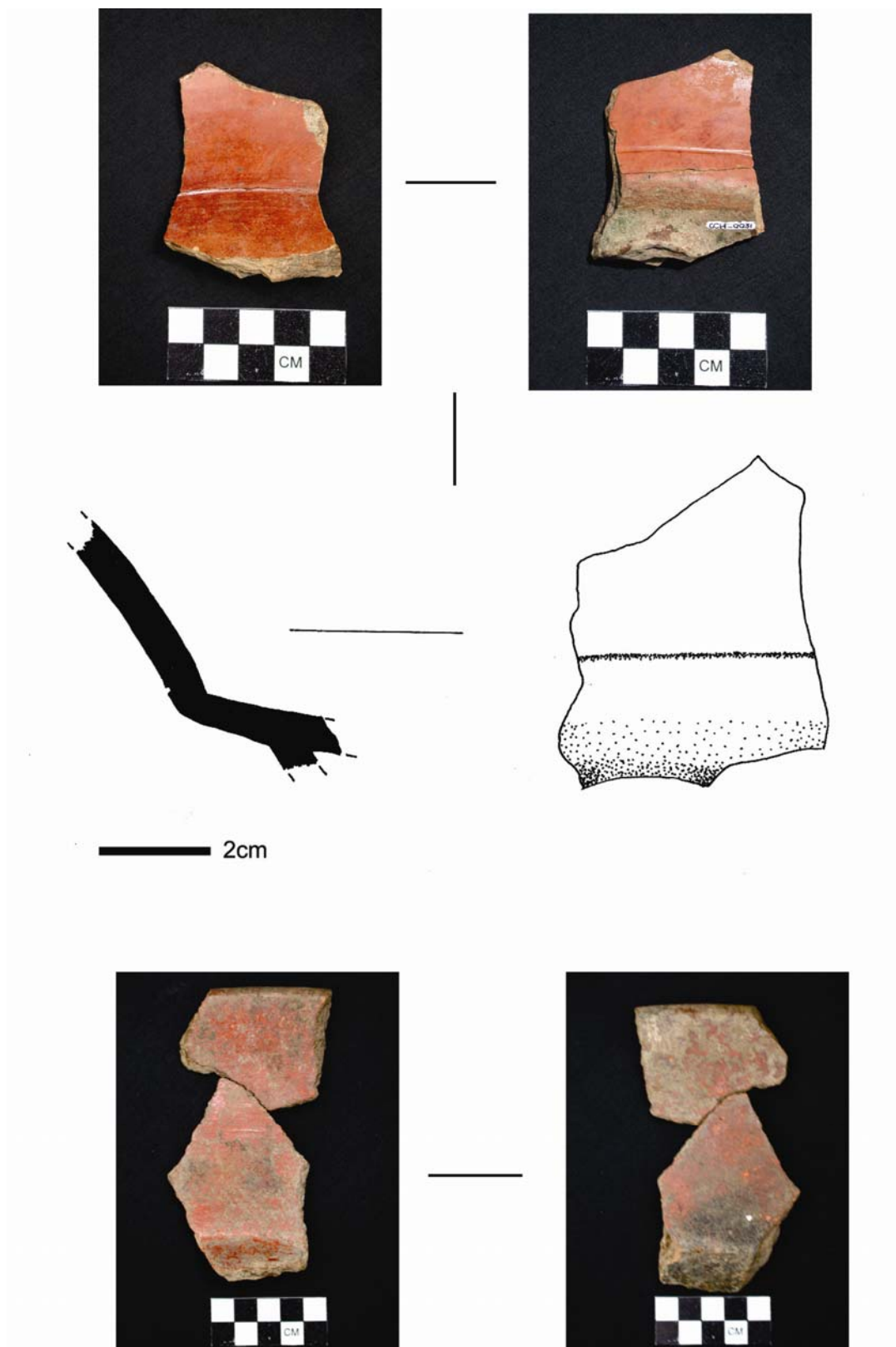


Figure 4-132. Diagnostic ceramics collected from Cache 1. Photos show front and back of sherds.



Figure 4-133. Human tooth excavated from Dead End Trench.

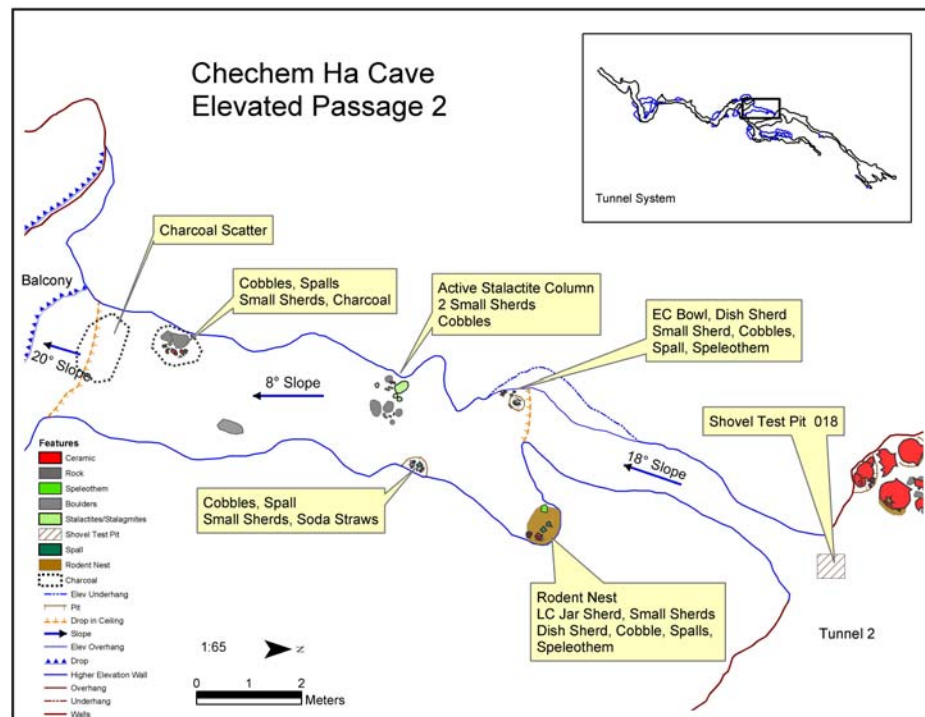


Figure 4-134. Detail map of Elevated Passage 2.

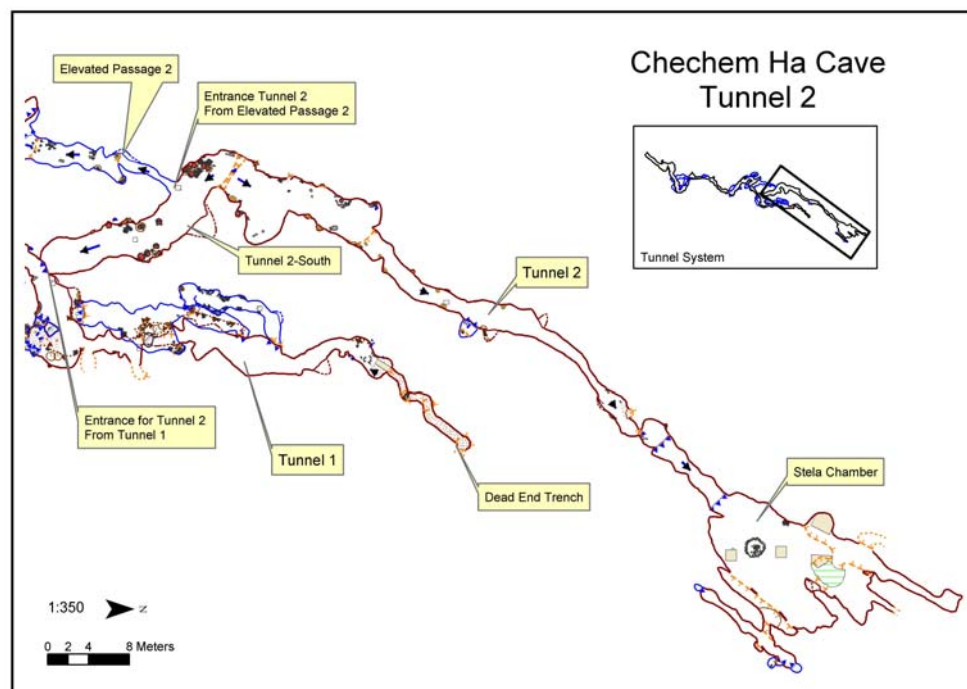


Figure 4-135. Map illustrating location of Tunnel 2.

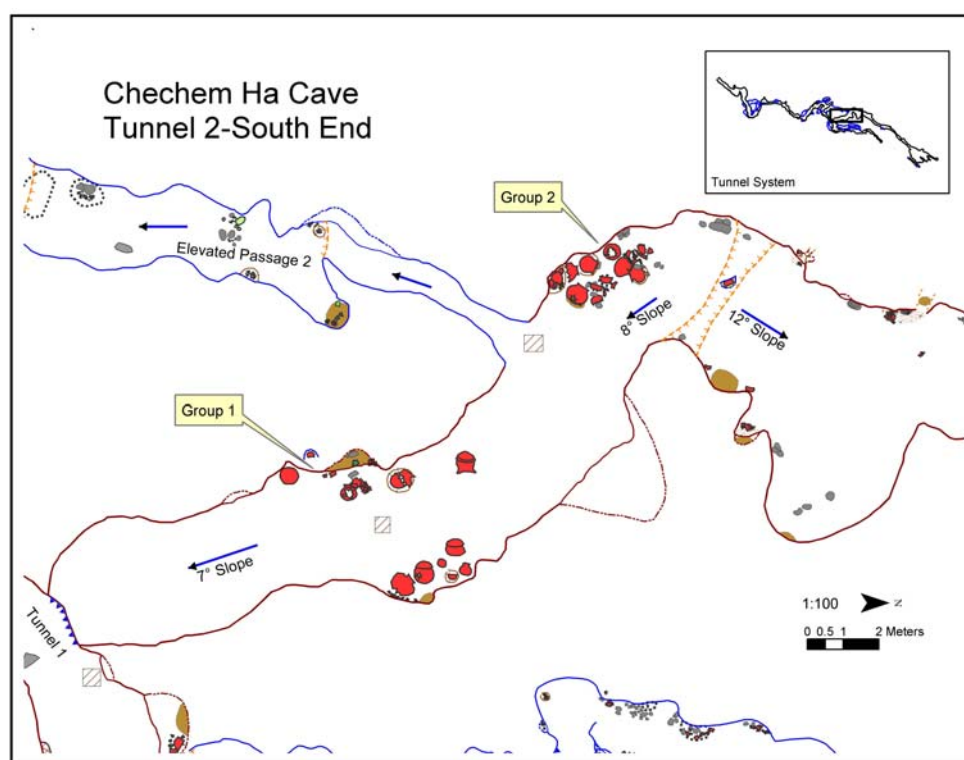


Figure 4-136. Detail map of south end Tunnel 2.



Figure 4-137. South leg of Tunnel 2 viewed east illustrating Group 1 viewed from the Tunnel 1 entrance (photo by author).



Figure 4-138. South leg of Tunnel 2 viewed to west showing Group 2 in the background. Large jar in foreground sits in inverted position with two bowls covering base (photo by author).

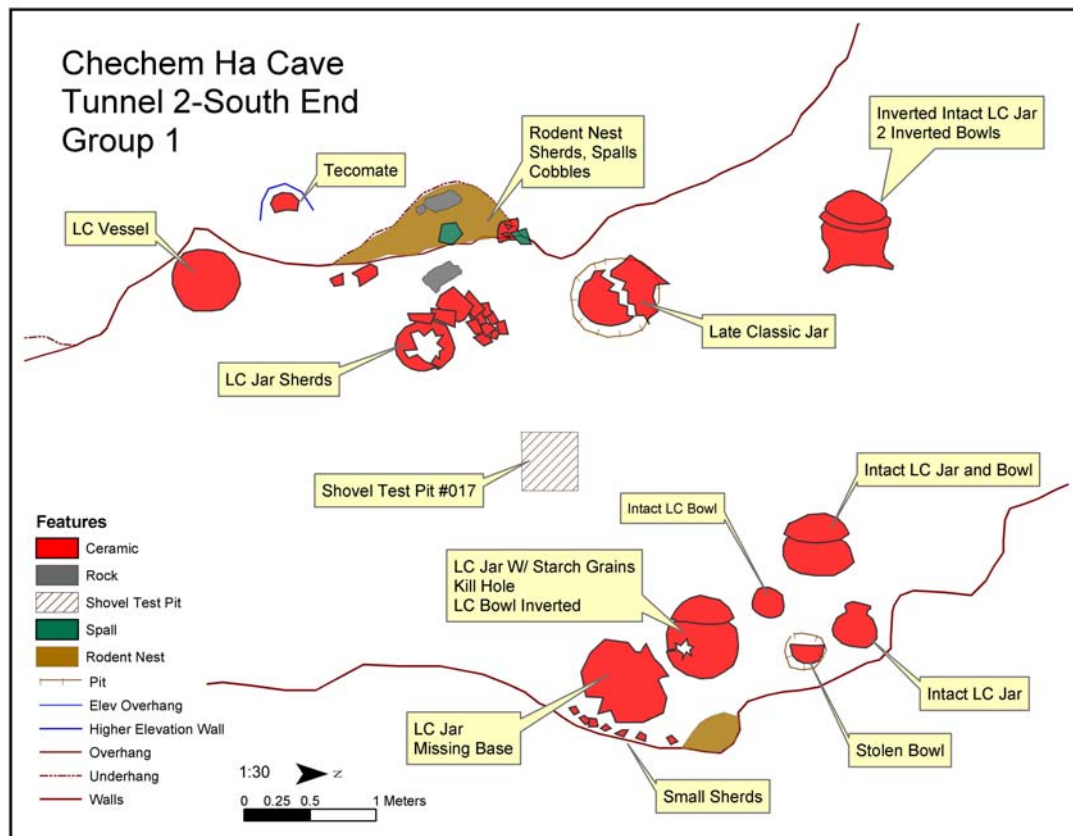


Figure 4-139. Detail map of Group 1 cluster in the south leg of Tunnel 2.



Figure 4-140. Large Late Classic jar sits in inverted position.



Figure 4-141. Late Classic tecomate style bowl curated at the Institute of Archaeology.



Figure 4-142. Two large fragments of a Cayo Unslipped jar sit in an excavated depression (photo by author).



Figure 4-143. Tunnel 2, Group 1, inverted Late Classic jar covered by two inverted bowls (photo by author).



Figure 4-144. Lidded Late Classic jar exhibiting kill hole contained starch grains (photo by author).



Figure 4-145. Mt. Maloney bowl removed from cave by the former Dept. of Archaeology (photo by author).



Figure 4-146. Late Classic jars, Tunnel 2, Group 1. Lidded jar on left exhibits exterior charring at base.

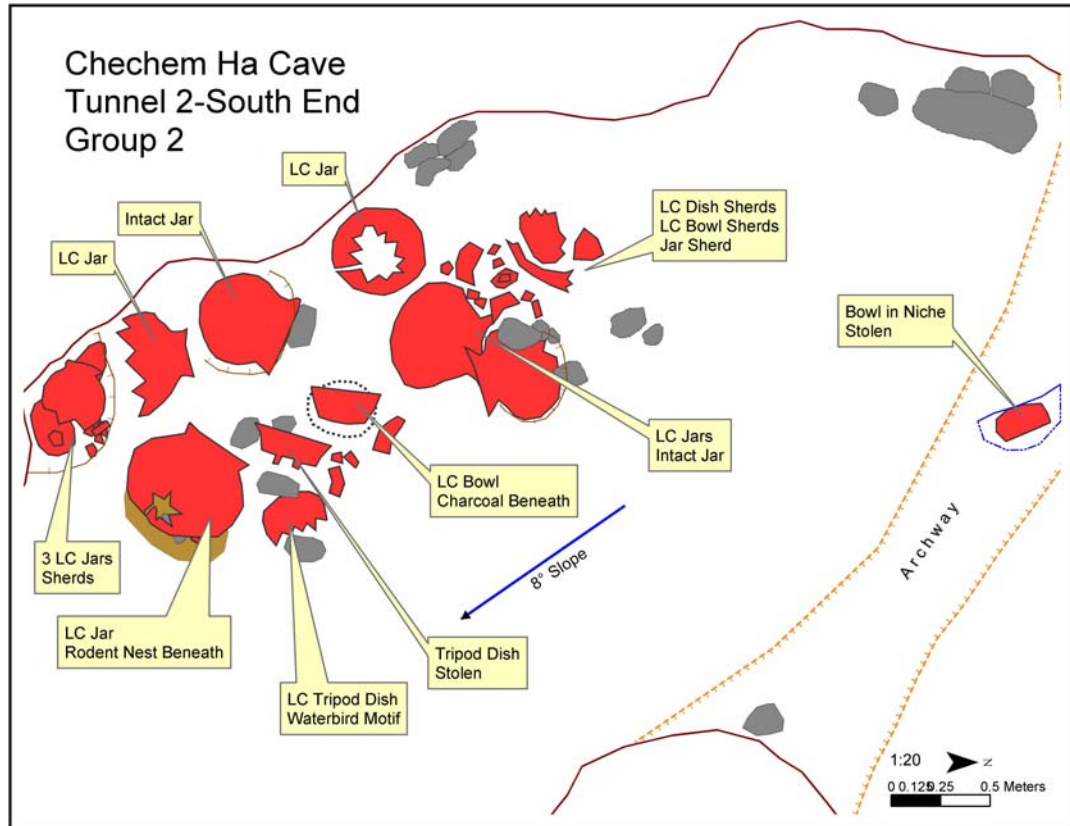


Figure 4-147. Detail map of Tunnel 2 South, Group 2.



Figure 4-148. Tunnel 2 archway contained niche with brown dish stolen in 1998 (1997 photo by author).



Figure 4-149. Early photograph taken by Mike Green. Arrow points to stolen brown tripod dish center. Large Late Classic jar on left has been moved and originally sat on its other side as picture here.



Figure 4-150. Author's 1997 photo illustrates same large jar on left in upright position. The mark on the jar's side is where it originally contacted the ground.

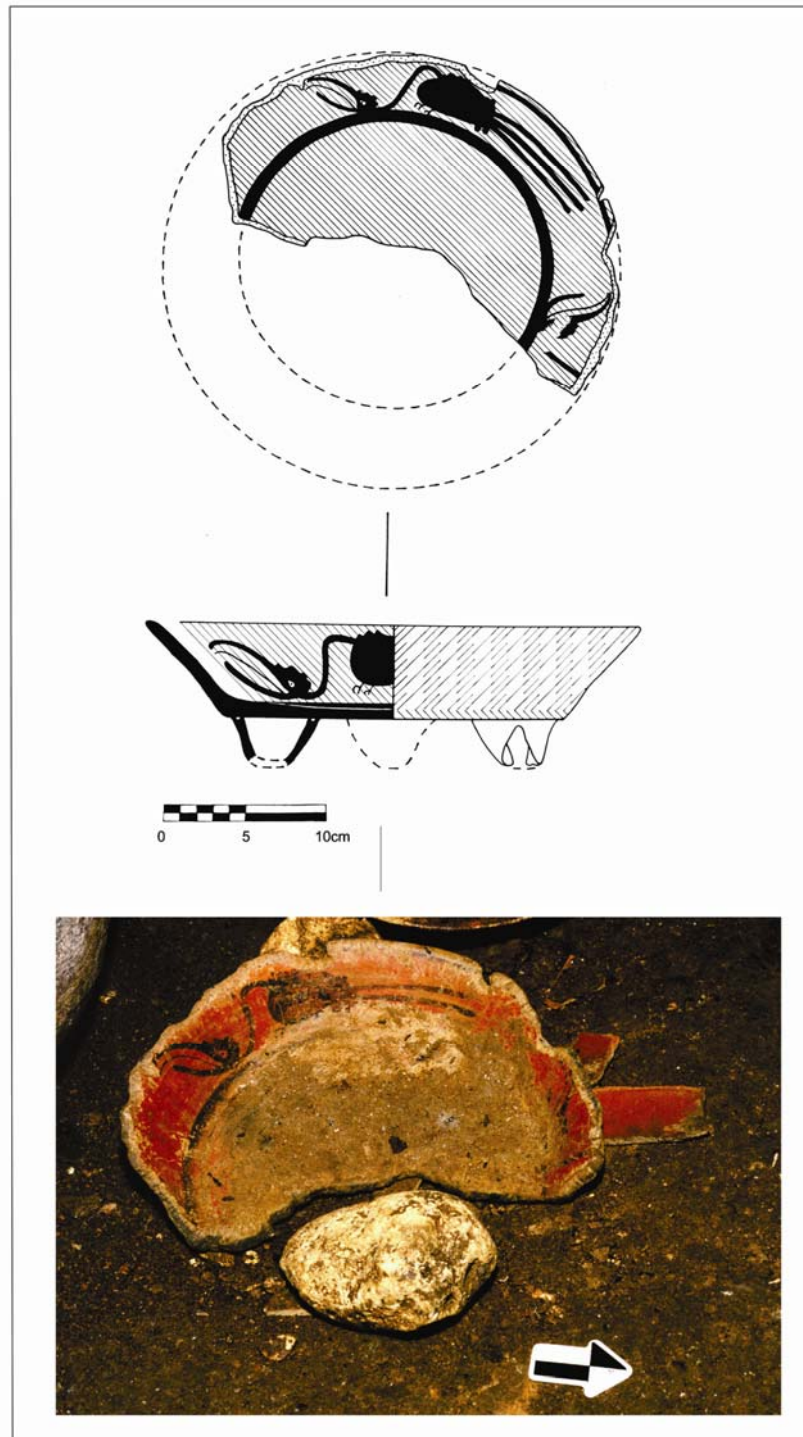


Figure 4-151. Tunnel 2 dish with water-bird motif (drawing by Reiko Ishihara, photo by author).



Figure 4-152. Mt. Maloney vessel removed by the former Dept. of Archaeology (photo by author).



Figure 4-153. Vaca Fall Red dish in sherd scatter north end of Group 2 (photo by author).

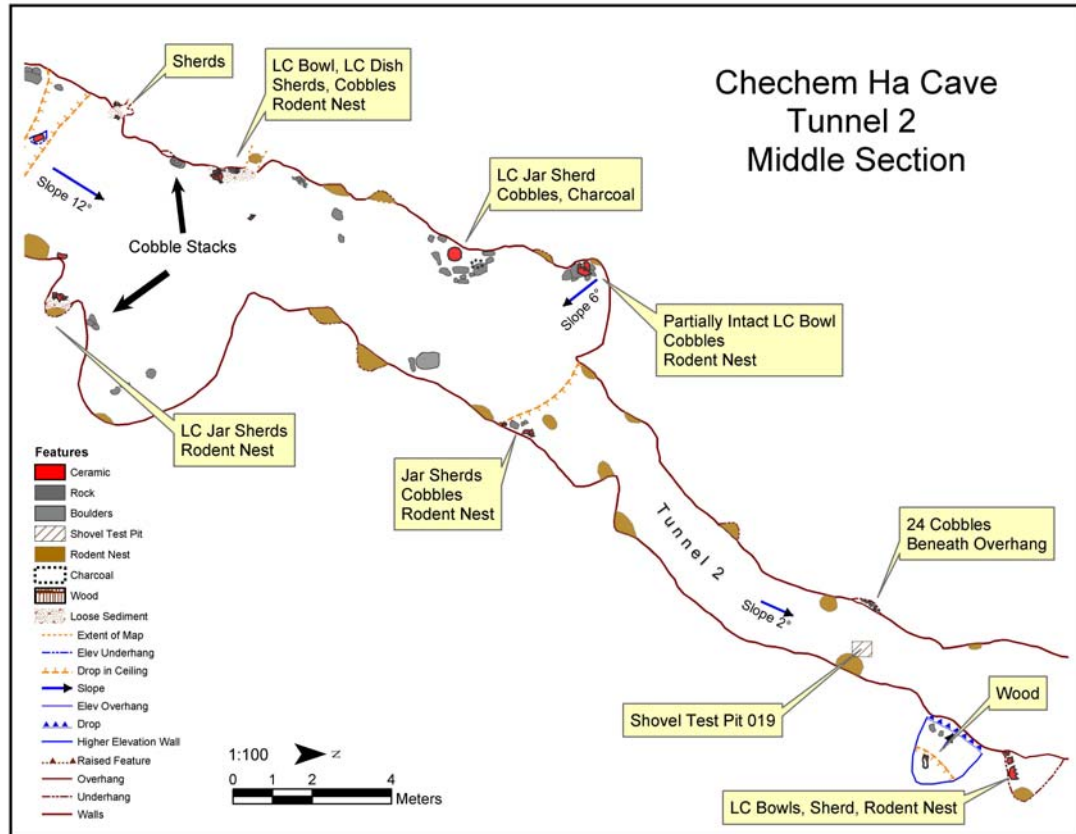


Figure 4-154. Detail map of middle section of Tunnel 2.

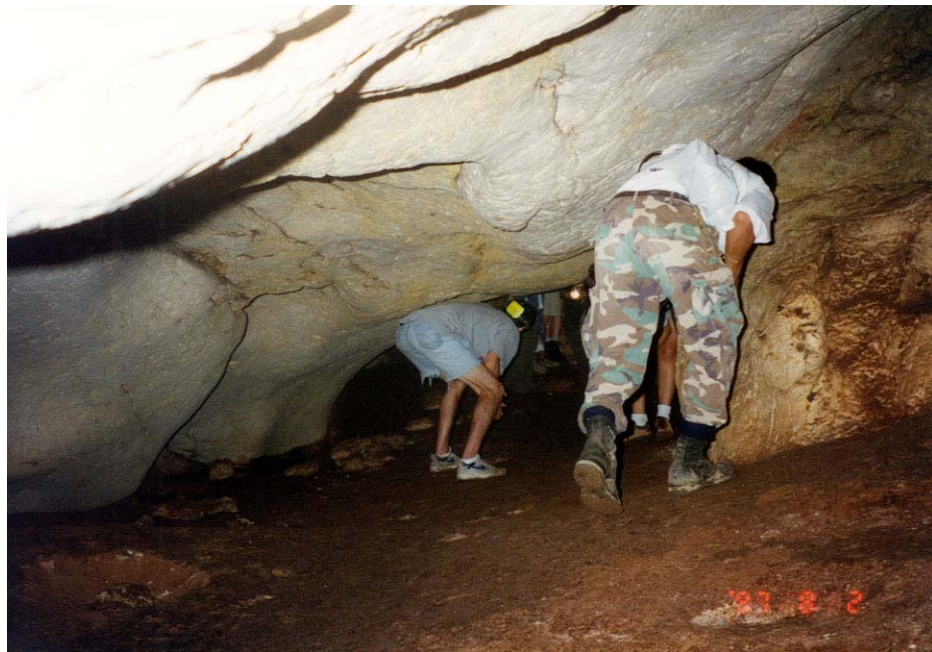
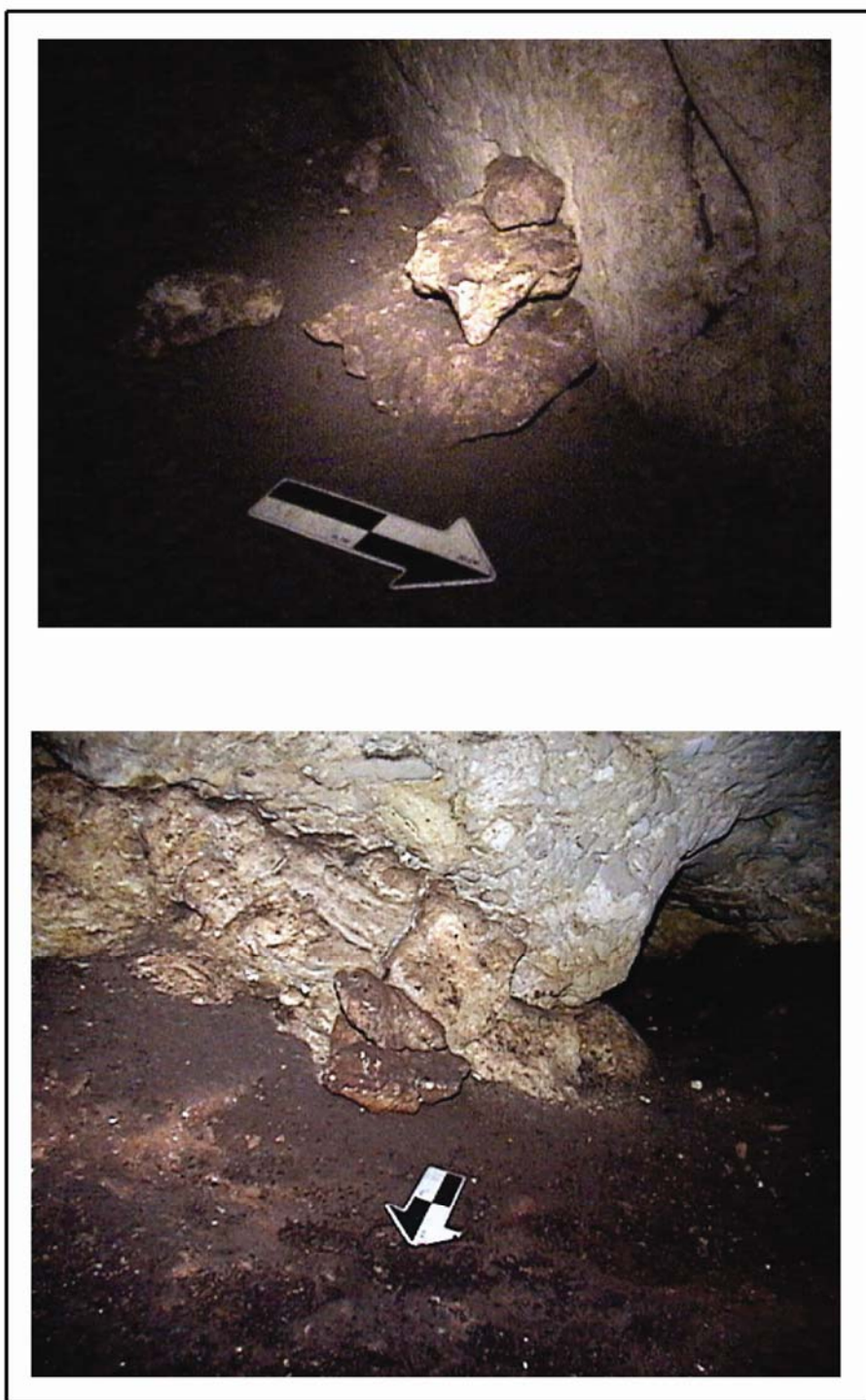


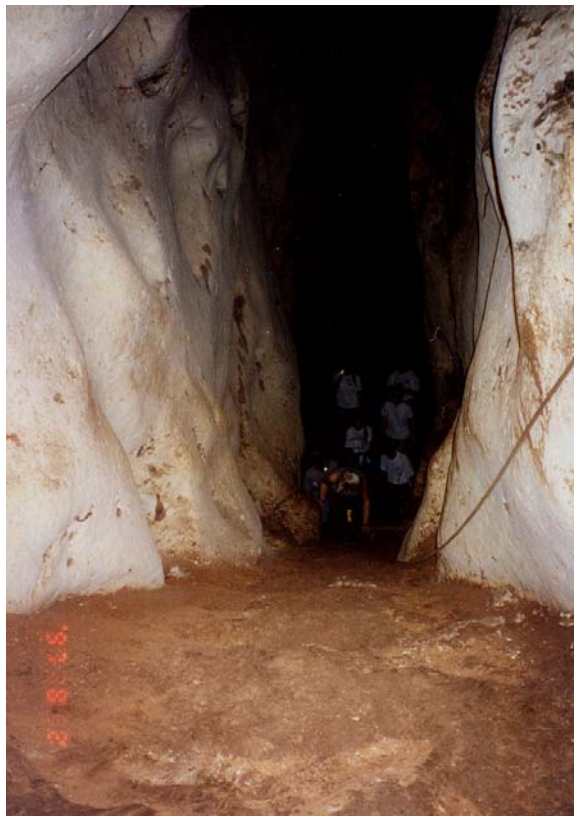
Figure 4-155. Ceiling height drops in middle section of Tunnel 2 forcing a change in body position in this area. The floor reverberates when walking in this passage.



4-156. Rock stacks located across from each other in Tunnel 2. Top- western wall stack and Bottom- eastern wall stack.



4-157. Two fragments of a partially intact Mt. Maloney vessel located in Tunnel 2 alcove.



4-158. Tunnel 2, north, descent to Stela Chamber.

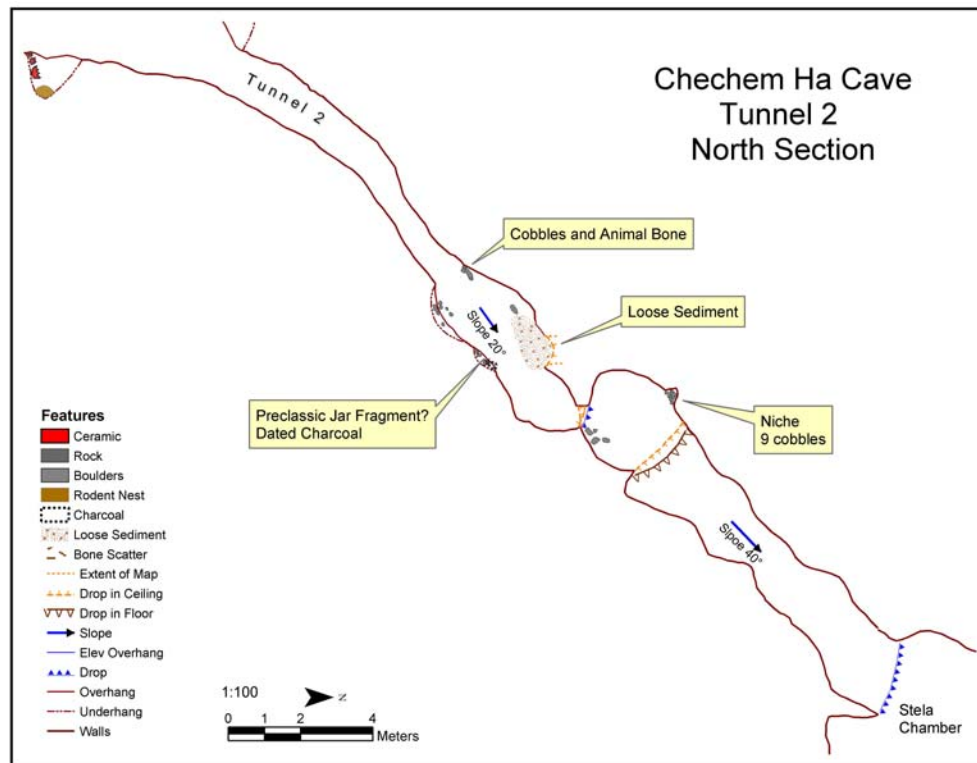


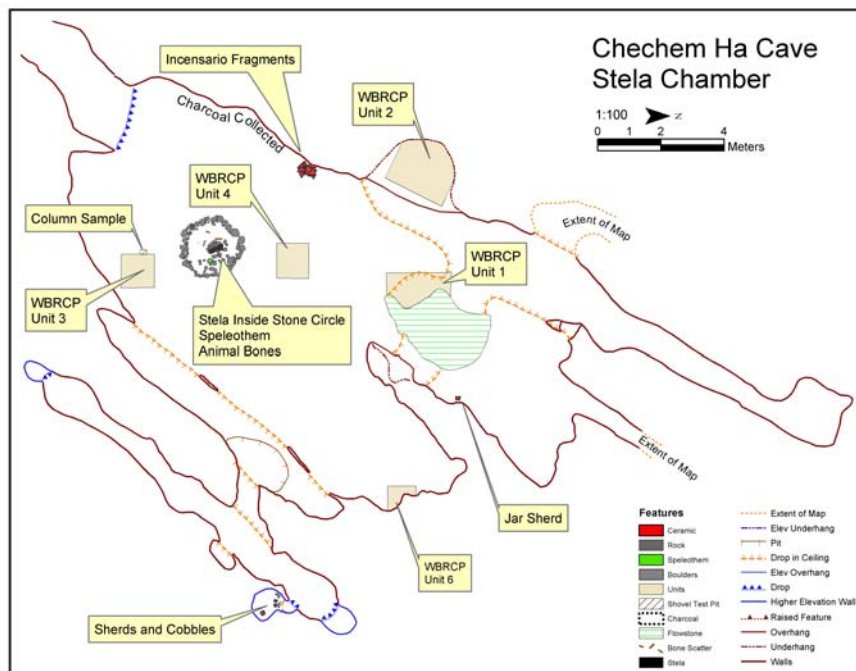
Figure 4-159. Detail map of Tunnel 2, north.



Figure 4-160. Possible Preclassic vessel (photo by author).



Figure 4-161. Photo of Stela Chamber as it is today viewed southwest toward entrance. The stone circle has been placed around the limestone slab and the slab is not in its original context.



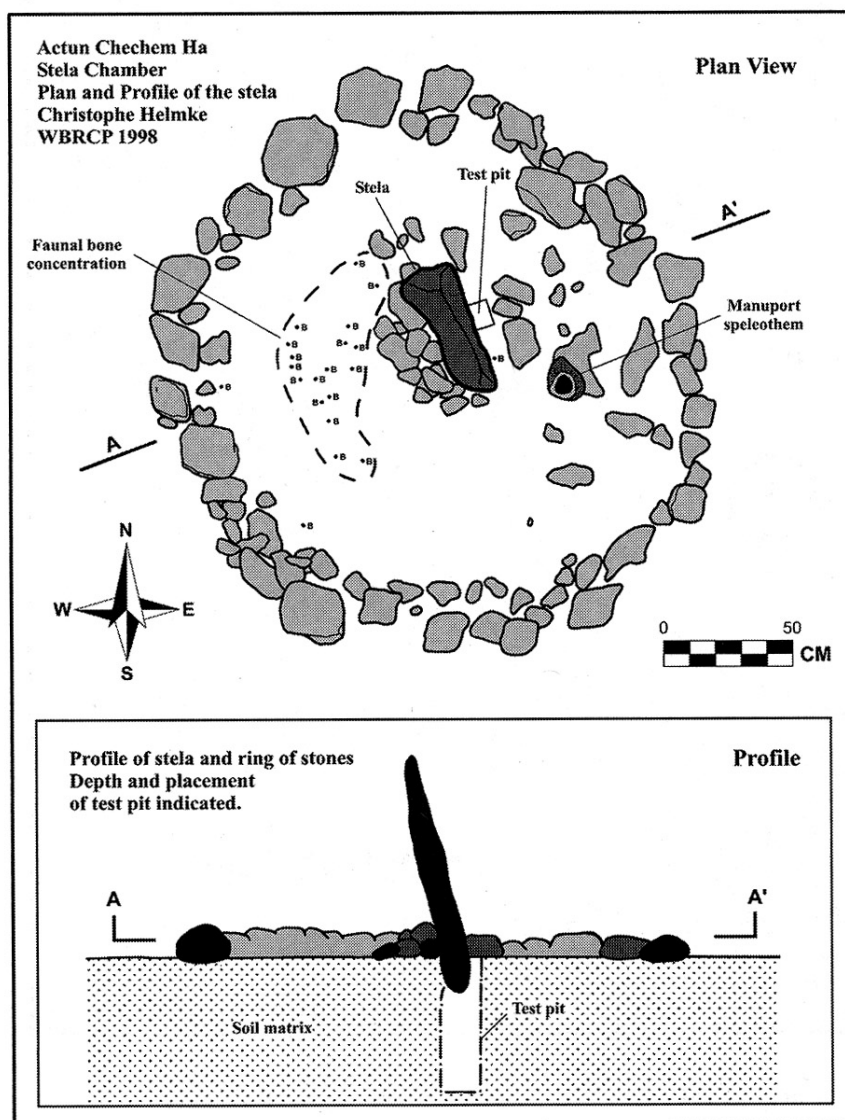
4-162. Detail map of Stela Chamber. The incensario fragments are arbitrarily placed based on information from William Plytez.



4-163. Close-up of small uncarved stela surrounded by modern circle of stones. Speleothem sits in front of stela in photo.



4-164. Photograph of Stela Chamber taken before 1991 provided to author by Logan McNatt.



4-165. Drawing of excavation illustrating that stela was shallowly set. Drawing by Christophe Helmke courtesy of WBRCF.

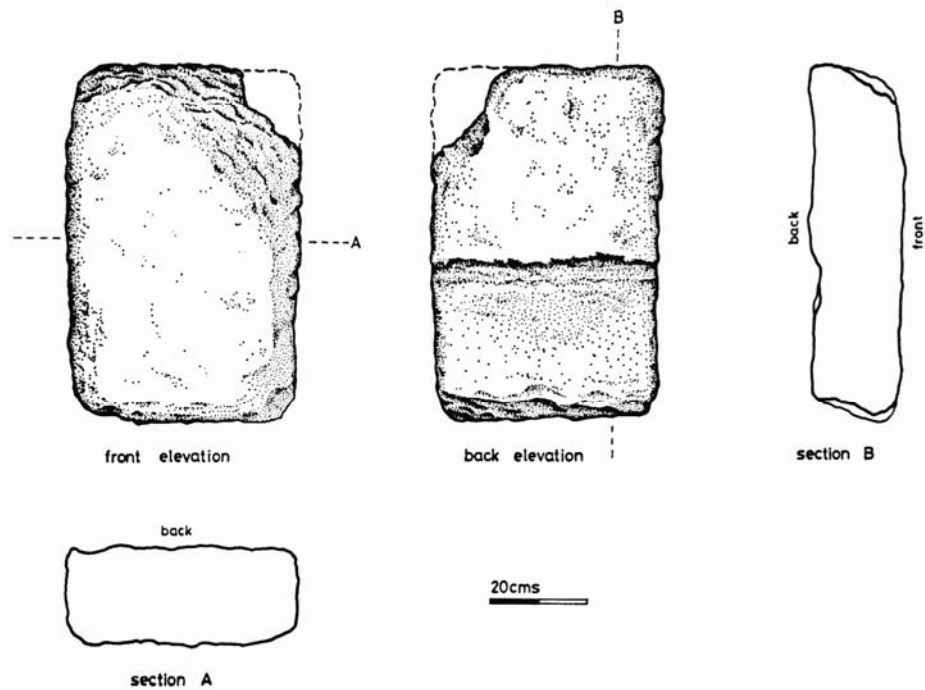
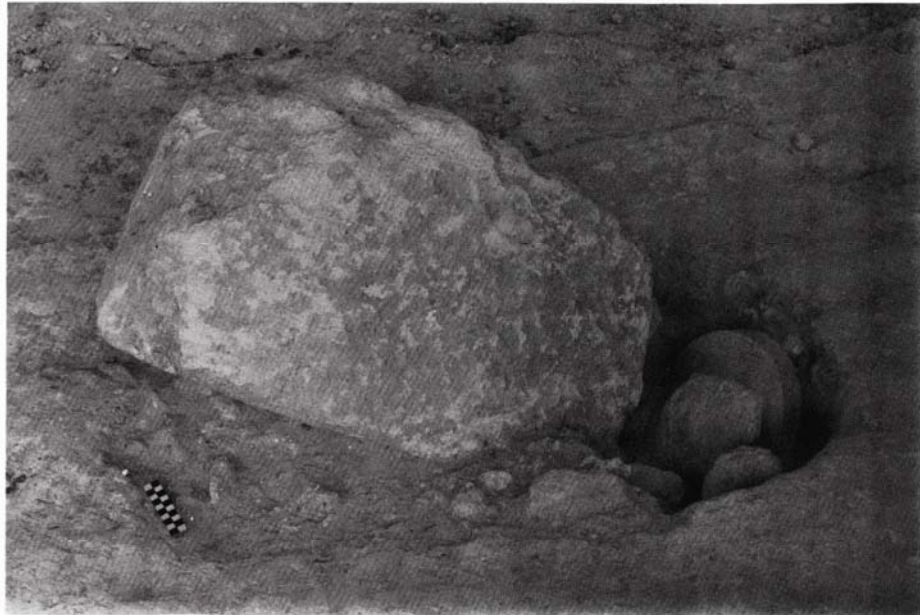


Figure 4-166. Preclassic stela excavated at Cuello (Hammond 1982:400-401). (Top) In situ photograph (figure 3). (Bottom) Drawing of stela (figure 4).



Figure 4-167. Cut limestone monument located at the entrance to the Main Chamber of Actun Tunichil Muknal (photo by author).

Chapter 5

Chamber 2 Excavations

5.1 Introduction

Chamber 2 was chosen for intensive study for several reasons. First, it is the geographic center of the cave as well as a central node in the pathway system. To reach the remote areas of the tunnel system, Chamber 2 has to be negotiated (see Chapter 4). Preliminary results from the test pitting program indicated that the area contained the best stratigraphy and deepest deposits in the cave. It also produced the oldest radiocarbon dates from the entire site. Therefore, this area was chosen for both excavation and a detailed analysis of the subsurface deposits and site formation processes.

The excavations were undertaken with a number of specific goals in mind. First, because the chamber was heavily used, it provided a good venue to assess the changes and continuities in the use of space over time as evidenced by activity areas and spatial distributions of artifacts and feature placement. Second, because people necessarily walked through this area to access Tunnel 2 as well as the more remote areas of Tunnel 1, it was the most promising area to investigate ritual intensity over time by ascertaining the density of charcoal flecks within each excavated level. Third, the deep deposits were expected to aid in understanding the sedimentation process in the cave.

The excavation extended from the south wall to the north wall of the chamber. Figure 5-1 illustrates the relationship between the excavation area and the chamber's morphological features. A grid of 1m squares that measured 2m x 8m was laid out in the chamber (Figure 5-2). Units B1-B8 and Units C1-C8 were excavated. The 1m x 1m Test Unit 02-06 excavated in 2002 was re-opened to provide a guideline for recognizing strata. This unit correlated with Unit C6 in the 2004 grid. Eighteen levels were recorded in the excavations. Because there were no prepared floors, use-surfaces were determined

during excavation by observing 1) changes in compaction, 2) changes in coloration and texture in the sediment matrix, 3) noting the presence of horizontally embedded ceramic sherds or other artifacts (indicating trampling) and 4) noting charcoal flecks embedded within the matrix.

Compaction was estimated using a commercially available, spring-operated, Pocket Penetrometer with readings from (0-4.5kg/cm²), 0 being the loosest and 4.5 the most compact sediments. Whenever possible, readings were taken in the corners and center of each unit. These numbers were averaged across each level and reported as a relative compaction index. The readings are sensitive to the moisture content of the sediment and only give a rough approximation of compaction but are used to provide a quantitative measurement so that levels can be compared with one another.

Eight classes of artifacts and ecofacts were found in the excavation listed in order of quantity 1) charcoal flecks, 2) ceramic sherds, 3) speleothems (stalactites, stalagmites, and soda straws), 4) rocks, 5) spalls, 6) jute shell (*Pachychilus indiorum*), 7) ethnobotanic remains, 8) animal bones, and 9) an obsidian blade. The Chamber 2 sediments consisted at least partially of bat guano and clays (See Chapter 6). The pH of the deposits is alkaline ranging from 7.4 - 8 (See Appendix V). This suggests that bone and ethnobotanical remains should be well-preserved.

Artifacts (including charcoal flecks) and features were recorded in situ by a technique called *photomapping* described below. Photomaps were used to produce density maps of charcoal distributions for each layer that are used to evaluate changes in patterns of the chamber's usage and as well as the intensity of use over time.

Matrix samples from Units B7 and C7 were transported to the camp for infield

flotation. Sediments were deflocculated by soaking them overnight in water using ½ cup baking soda per 5 gallon bucket. Ethnobotanicals were removed by flotation. Charcoal collected by flotation was weighed in order to estimate the increase or decrease of the chamber's usage between layers. Excavated levels were dated using wood charcoal collected from the levels surfaces and calibration charts are shown in Appendix IV. Bulk samples from each layer were collected for laboratory analyses and are reported in Chapter 6.

5.2 *Use-Intensity Measures*

In order to evaluate behavioral patterns in the chamber, charcoal flecks were employed as a proxy for its use. Chamber 2 is situated 134m into the dark zone of the cave; therefore all activity in the area must be artificially lit. Overwhelming data demonstrate that the ancient Maya used torches to light their way in caves (See Chapter 3), therefore charcoal flecks produced by torch fires make a good quantifiable proxy for the intensity of cave use as well as the location of activity areas. Whereas use of different wood types could produce varied results, pine is the most commonly used type and has been identified in multiple samples from Chechem Ha (Morehart 2002a). No previous archaeological studies have found evidence to suggest that alternative fuel sources were used by the ancient Maya in caves; therefore it is unlikely that oil lamps or other possible sources of light could account for changes in charcoal deposition.

One of the advantages of using charcoal as a signature for human use is that it is not dependent on artifact counts based on offerings. These may easily be affected by changes in ritual practice. However, torch bearing is a necessary prerequisite for cave

use that functions independently of offerings and provides an additional data source that can be compared and contrasted with ceramic counts.

The number of charcoal flecks on a surface is a good indication of the intensity of use during a range of time, but it is difficult to determine whether variability in the amount of charcoal resulted from the increase or decrease in frequency of cave use or whether there were more or fewer people using the area in a single event. The compaction of the surface sediment provides some information regarding this issue. Although compaction may be affected by water, it is also likely that layers with higher compaction indexes have undergone heavier trampling.

5.3 Artifact Movement

Inferences regarding cultural deposits, particularly activity areas, are difficult to make because artifacts are rarely recovered from their original positions (Gregg, Kintigh, and Whallon 1991; Hirvinal and Hodder 1984; Nash and Petragila 1987; Schiffer 1983; 1987; 1995:25-54; Whittlesey et al. 1982). Artifacts may be disturbed by natural processes such as wind, water, and animal movement or by human trampling and deliberate site maintenance (see Binford 1978). The site's physical characteristics such as the presence of barriers, slope, and sediment compaction may influence the degree and patterning of artifact disturbance (Andouze and Enloe 1997; Carr 1991:224; Nash and Petragila 1987:192; Rigaud and Simek 1991; Theunissen, Balme, and Beck 1998). Geochemical and geomorphological work in Paleolithic caves demonstrates the significance of geologic, biological, and anthropogenic processes on small artifacts. Influential factors include the location of drip lines, the morphology and size of the cave

entrance and the location of the deposit within the system. Hydrological factors may constrain or promote artifact movement and are largely dependent on the cave's morphology.

Within Chechem Ha Cave artifact movement could be the result of natural causes such as animal burrowing or hydrological forces or artifacts could have been displaced by human trampling. Animal and insect burrowing is unlikely because Chamber 2 is located far into the dark zone of the cave (134m). Few animal species are present in this area and no burrowing species were noted. Therefore, the processes that are expected to influence artifact movement are human deposition, trampling, or possibly water movement. Human trampling is expected to have numerous effects on artifact movement (Stockton 1973) and cannot be overlooked when assessing the suitability of deposits for carrying out spatial analyses (Clark 1977). There are a number of studies that investigate the constraints on artifact movement caused by trampling that address both horizontal and vertical displacement.

Experimental studies of the effects of sediment compaction on horizontal movement of artifacts in areas of human trampling conclude that scruffage causes the greatest movement on hard surfaces and that there is greater vertical movement in loose, sandy sediments (Gifford-Gonzales et al. 1985; Nielsen 1991; Villa and Courtin 1983). Robert Theunissen and his colleagues (1998) demonstrated by experimentation that horizontal displacement of artifacts from human trampling was primarily restricted to areas of high ceiling height (>2m) where humans could comfortably walk. It also showed that large artifacts are displaced farther than smaller ones in trampled deposits.

This finding agreed well with the experimental study conducted by Axel Nielsen who found that smaller artifacts were the least disturbed (1991).

In their detailed study of ancient artifact movement in an Australian rockshelter, Jane Balme and Wendy Beck (2002) performed tests to determine whether anthropogenic charcoal deposits were a robust indicator of activity areas. This site was ideal for the experimentation because there was no background charcoal in the sediments. They compared the site's topology, sediment compaction, pH, and moisture with charcoal and starch grain distributions. Their results demonstrated that few factors affected the charcoal. Although pH and moisture might be expected to break flecks down, charcoal was unaffected by the variable pH values (5-8) in the rockshelter or the presence of moisture at driplines.

Contrary to studies of the sandy sediments discussed above, Balme and Beck showed that sediment compaction had little effect on charcoal distributions. This may be because the majority of the sediments in the study area were moist and the charcoal was more apt to adhere to the matrix. Highly trampled areas beneath high ceilings, therefore those with the highest probability of functioning as activity areas, also contained the highest concentrations of charcoal. The authors concluded that charcoal as well as other small ethnobotanical remains were robust indicators of human activity within sheltered sediments.

Vertical displacement of artifacts must also be considered. Heavier artifacts may undergo differential settling due to gravity (Barton and Bergman 1982) and biogenic disturbance may be a prerequisite for that process (Cahen and Moeyersons 1977; Moeyersons 1987). Human trampling can also cause downward migration of artifacts

into looser substrates (Villa and Courtin 1983; Gifford-Gonzales et al. 1985; Moeyerson 1978; Nielsen 1993). Axel Nielson (1991:488) reported that several studies have considered the size, weight and density as factors in vertical migration but points out that their results are contradictory. For example Villa and Courtin (1983:277) found no correlation between size, weight and density of objects with regards to vertical migration but generalized that pieces lighter than 50g may move whereas larger heavier items remained in the level in which they were originally deposited. Gifford-Gonzales et al. (1985) found no significant correlations between downward movement and size or volume. However, Nielson cited some unpublished studies that suggested that smaller items were more readily displaced downward which led him to further investigate the issue with additional experimentation.

In his experimental study, Nielsen (1991: 490) reported that vertical displacement by trampling was largely dependent on the amount of moisture in soils. His results suggested that for dry soils, less disturbed smaller artifacts will be present in a thin (<20mm) layer of loose sediment overlying a more compacted layer. This was also noted by Moeyersons (1978). In wet trampled soils artifacts of all sizes are likely to be embedded in relatively hard substrates. This agrees with Schick (1987:95,101-102) who demonstrated by experiment that wetting and drying of clay-rich sediments can cement artifacts into place.

Stockton (1973) found that in sandy soils objects could migrate downward as much as 16cm, whereas in more compact loam Gifford-Gonzales et al (1985) reported that the maximum downward displacement was 3cm. Hughes and Lampert (1977) noted that in caves limestone gravel and calcium carbonate can provide binding agents that

prevent disturbance of a deposit. They also note that sterile layers can also help to protect underlying cultural deposits from disturbance. Collectively, these trampling studies demonstrate that sediment type is a significant factor in vertical artifact movement.

The sticky sediments found in Chamber 2 at Chechem Ha are an important factor to consider in the analysis of artifact movement. First, the presence of shrink and swell clays such as vermiculite were noted in XRD scans (See Chapter 6). Vermiculites are considered to be limited expansion clays, expanding more than kaolinites but less than smectites (Brady and Weil 2002:327). It is possible that deposits could occasionally dry out during periods of drought and in fact crack patterns are found in the deepest levels of the excavation. Alternatively, in matrices of cracking clays, small artifacts could migrate into cracks.

The humidity in Chamber 2 ranges from 97%-99% in non-drought conditions, which coupled with the intermittent introduction of water into the chamber insures that the sediments are usually moist and sticky. This quality causes the sediment to adhere easily to natural inclusions and artifacts. Researchers Nielsen and Moeyersons both demonstrated that in very wet conditions artifacts of all sizes can be displaced vertically and lodged into harder substrates below. However, this process is more likely to occur in sandy loose soils than in the clays and loams, which are soil types found in Chamber 2.

One of the short-comings of experimental studies is that small lightweight ethnobotanical artifacts are not included in any of the experimental test assemblages. Observations from archaeological assemblages suggest that vertical movement of small lightweight ethnobotanical remains such as charcoal flecks is minimal. For instance,

Arlene Rosen (1993:141-142) has argued that microartifacts (those ranging in size from 2cm-0.25mm) build up on house floors as fine sediments and are good indicators of household activities and Schiffer 1987:265 considers microartifacts to be primary refuse.

Summary

Based on this review of experimental studies some expectations can be developed. Because Chamber 2 has a high moisture content and clay or loam sediment types, human trampling within the deposits should produce little horizontal or lateral movement of large artifacts and no movement of microartifacts (Balme and Beck 2002; Neilson 1991; Theunissen, Balme, and Beck 1998). Overall, larger artifacts such as ceramic sherds or speleothems have a higher probability of horizontal movement than charcoal flecks. For this reason, charcoal flecks are expected to be better indicator of activity areas than larger artifacts. Because microartifacts are the least likely to be displaced by trampling, the evaluation of changes in activity areas over time using density analyses focuses entirely on charcoal deposits.

According to the study conducted by Theunissen and his colleagues (1998), during wet conditions trampling of both macroartifacts (in this case ceramic sherds and speleothems) and microartifacts would be expected to cause artifacts to migrate vertically in areas where ceiling heights are greater than 2m. This would include most of the center of the chamber but not the areas adjacent to walls and under overhangs on the north and south ends of the excavation. If Nielson's model is correct, artifacts of different sizes, densities, and weights could travel downward together from their original layer of deposition and settle on compacted underlying sediments. However, sediments that have

undergone wetting and drying potentially cemented artifacts into place which may have prevented this from occurring.

This suggests that in Chamber 2 ceramics or other artifacts from later time periods could be found in earlier levels but items from earlier time periods would not be expected to show up in levels dating to later time periods unless there had been 1) considerable mixing, 2) curation of artifacts before deposition, or 3) secondary deposition of early material from elsewhere in the cave. Vertical movement is assessed level by level evaluating ceramic types for chronology as well as the stratigraphic coherence of radiocarbon dates

5.4 Water Movement

The displacement of artifacts by water movement was also evaluated although the cave's hydrology suggests that this is unlikely. At present the mouth of the cave is small, restricting access to the entrance chamber. A jumble of boulders blocks the entrance and has been present at least since the early facet of the Middle Preclassic period (See Chapter 4). This suggests that most sediment in the cave interior is likely to be tracked in by humans or brought in by bats as opposed to having been blown or washed in from outside. Chamber 2 is accessed via a single tunnel that exhibits numerous changes in direction and at least three elbows (See Figure 4-9). Though there is a narrow water channel running through the tunnel system originating in Chamber 1 and culminating in the center of Chamber 2, the downward slope of the tunnel system is gradual, approximately 8m, over the 134m area. It averages out to approximately 1.7cm drop per meter therefore the tunnel is almost horizontal. This limits the velocity of the water flow

and reduces its capacity to carry heavier artifacts. Therefore, the deposition of artifacts carried by water into the chamber is unlikely. While one might argue that low velocity flow from run-off could carry charcoal it is unlikely that any substantial amounts of background charcoal could have been introduced from the cave's entrance following the early Middle Preclassic period, the point at which there were certainly boulders blocking the cave mouth.

Although the cave's current morphology precludes the introduction of background charcoal into Chamber 2, unknown hydrological processes could have been operating in the past, particularly if the cave mouth were larger or if there were cracks in the Chamber 2 ceiling that have been subsequently filled by speleothems. Therefore, to evaluate possible water movement of charcoal flecks, mapped distributions were examined and evaluated based on models of the cave's observed hydrology. If charcoal were washed into Chamber 2, it would enter the chamber from the south via Tunnel 1 and move towards the drain in the center of the room (See Figure 4-9). If charcoal was carried into the chamber from elsewhere in the tunnel system, one would expect charcoal densities to be higher in this pathway and to surround the natural drainage in the chamber's center.

5.5 Modeling Behavior Using Charcoal Deposits

It was assumed that unless otherwise indicated (such as in hearths which are easily recognized) that charcoal deposits in Chamber 2 were produced by torches used as light sources. There are only two basic classes of activities that one can envision taking place within the chamber. Individuals are either passing through on their way to one of the deeper areas or they are pausing within the chamber to engage in some kind of ritual

activity. Pausing to engage in prolonged ritual activities would be expected to generate localized densities of charcoal in roughly circular configurations adjacent to the location of torch bearers. Additionally, there is a concavity in the bedrock on the southern side of the limestone outcrop located on the east wall of the chamber (See Figure 5-1) that is currently at chair height and creates a natural seat or bench that is often used by modern tourists as a place to rest during cave tours. It is conceivable that the ancient users may have sat there as well.

Surface finds suggest that there are other activities that could have occurred within the chamber. A large scatter of ceramic sherds was noted in the intermediate pool beneath the speleothem chandelier in the northwest area of the chamber. One would expect water-related rituals to occur around this feature. A large number of ceramics were also found on Ledge 10 (dating to the Terminal Preclassic to Early Classic Periods), and a small number on Ledge 9 (dating solely to the Late Classic). Torch bearers may have stood below while ceremonies occurred above on the ledges or alternatively ceremonies may have occurred simultaneously on and below these ledges.

Passing through Chamber 2 on the way to some other location deeper within the cave should produce a rain of charcoal in the U-shape of the pathway. Although there is an alternate route to Tunnel 2 via Elevated Passage 2 that passes beneath the stalactite chandelier, this passage does not appear to be heavily utilized as evidenced by few surface finds as well as little sedimentation of the area. Passing through the chamber would be expected to produce a lower density charcoal rain than standing in a stationary position. Only when an area shows a pattern of having been passed over repeatedly would one expect it to show up in the statistical analyses.

5.6 Photomapping

One of the problems encountered in the use of charcoal flecks as a significant artifact class was how to document them in a manner suited to the time constraints of the excavation. A recently developed GIS technology called *Photomapping* (Aldenderfer in press; Aldenderfer and Craig 2002; Craig 2000; Craig and Aldenderfer in press; Craig et al. 2003) provided the technology to rapidly piece-plot large numbers of charcoal flecks and other small objects. This technique is an infield GIS-based data collection strategy for recording excavation surfaces tailored to the documentation of small artifact distributions using digital photography and in-field digitizing.

In order to photomap the 8m x 2m excavation the area was marked off into 1m grids (See Figure 5-2). Moving west to east, units were labeled B1-B8 and C1-C8. A digital image was taken of each unit within each level. These were stitched together and georeferenced in ArcMap8.1, though ArcView would have worked as well. The final product recreated the continuous surface of the excavation so that the entire level could be viewed and analyzed as a single entity. Artifact distributions were recorded directly into the GIS during excavation. All artifacts including charcoal flecks were represented as a distribution of points. The geomorphology of the cave and cultural features were represented by lines and polygons.

The advantage of this system is that 1) the accuracy of the GIS database can be checked on the spot because it is created infield, 2) an entire excavation layer can be viewed on a single screen, 3) a photographic record and georeferencing are conducted simultaneously, and 4) small finds such as carbon flecks can be rapidly piece plotted in situ.

5.7 The Profile

Profile walls were recorded using the *photomapping* technique. Figure 5-3 is a photomap of the northwest wall profile from Units C4-C8. A close up photograph of the north wall of Unit C6 (Figure 5-4) illustrates the color changes between levels and shows how thin some of the layers could be (2cm to 3cm). Figure 5-5 illustrates level delineations superimposed on top of the photograph.

Note that the two darker sediment horizons are located at the top of the deposit and the lighter ones at the base. These darker areas date to the Maya horizons, which illustrate that the human presence in the cave has a visible effect on sediments. The light brown layer between the two, Level 7, is unique in terms of its color, composition, texture, and soil chemistry (see Chapter 6).

The sedimentation rate of the deposit is quite variable. There are 95cm of sedimentation that occur over approximately an 18,203 year period. The earlier possible radiocarbon date for the deposit is 16,200 B.C (Level 17) and the latest is the modern surface (A.D. 2003). If there were a steady rate of sedimentation this would equal approximately .0052mm or .052cm per year. However, numerous factors likely influenced the sedimentation rate including whether the entrance to the cave was sealed or open, the number people entering the site, activities conducted within the chamber, and the frequency of site usage.

5.8 Density Difference Maps

To evaluate the variation in the use of space within the chamber, charcoal distributions were analyzed and compared using the point data collected and recorded in

the field for each level. The goal of the analysis was to find uneven distributions of charcoal using density analysis. Areas of high density suggest the intentional or favored use of some parts of the chamber over others.

The analysis was carried out using ArcView3.4. Traditional clustering algorithms were inappropriate for the analysis since the goal was to locate and examine unexpected densities not clusters. A new method using observed and expected density maps was employed to produce *Density Difference* maps (Craig et al. 2004). A detailed description of the operation can be found in Appendix VII, part 1. Density Difference maps were created by subtracting the expected densities from the observed densities. To create the density map of the observed data, nearest feature distances were calculated to determine the minimum distance between two points. Results of all calculations for Level 1-14 are found in Appendix VII, part 2. This value was used as the search radius in calculating density to avoid producing densities composed of single objects. The resulting raster is the *Observed Density Count*.

Expected densities were created using a uniform distribution of points. This method was chosen because, if people were moving about in the chamber, over long periods of time one would expect their torches to produce a uniform distribution of charcoal; whereas if particular parts of the chamber were more heavily utilized one would expect to find higher densities in those areas. To generate an expected density, the Animal Movements extension was used to produce the random point distributions for each level using the same number of elements as the observed set for that level. In this program by using a high minimum distance between points it was possible to produce uniform distributions. Nearest Neighbor was calculated for the set to ensure that

distributions were uniform. If the set was clustered, another set was created and tested until a set of unclustered points was generated. The density of the observed point array was used to generate the *Expected Density Count* following the procedures described above.

To create the *Density Difference* field, the Raster Calculator was used to subtract the *Expected Density Count* from the *Observed Density Count*. The resulting raster illustrated areas where there were relatively more or fewer objects than would be expected in a uniform distribution. The maps are displayed using the standard deviation stretch with a two color ramped palette. The images are based on the standard deviations away from the norm on each level. This ensured that levels were comparable although the number of flecks on each level differed.

The images illustrate density "clouds." The color and size of these clouds correlate with behavior within the chamber. First, they suggest preferred activity areas within the space that may be correlated with morphological features. Second, the cloud's color indicates the density measure of the cloud. Red clouds indicate the highest densities and blue areas the lowest. Red clouds suggest that longer periods of time were spent in a particular area or that it was a place that was used repeatedly. Diffuse clouds suggest movement whereas intense clouds suggest standing, lingering, or sitting in a particular area.

5.9 Excavations-Descriptions by Level

Although more than one matrix type is present in each level, laboratory analysis indicated that, with the exception of Level 7, the primary texture characterization

throughout the excavation was clay (Appendix V, part 2). Several observations suggested that 2:1 clays (shrink/swell) were present: 1) we noted crack patterns on the surfaces of many areas, 2) the sediment was very sticky, and 3) samples brought from the field shrank considerably when dried. Preliminary XRD analysis indicates that sediments contained mixed clays that included 2:1 varieties such as vermiculite, as well as 1:1 kaolinites (Karen Zeigler personal communication 2004). The deposits are composed of varying amounts of bat guano and differing percentages of limestone marl or gravel within each layer. Compaction indices ranged from 1 kg/cm² (least compacted) to 2 kg/cm² (most compacted).

Below is a level by level description of the structure of the sediments, artifacts, and features found within each stratum. Photographs of some of the diagnostic ceramics and speleothems are found in Appendix VIII. Each stratum was radiocarbon dated and charts of the calibration curves are found in Appendix IV. The excavation data are compiled in Table 1. This include the date for the level, major time period, compaction index, area of the level, number of charcoal flecks recorded on the surface of the level, amount of charcoal collected from the flotation of the matrix, and number and type of artifacts present. Maps of each level illustrate the finds that were embedded into the surface of the level whereas artifact counts include those collected from the intra level matrices as well.

5.9.1 Level 1

Level 1 was the modern use-surface (Figure 5-6). The matrix consisted of heavy plastic dark brown clay mixed with approximately 1% poorly sorted white limestone marl. The clay had a reddish hue in the field but was grayer when dried. The pH was 7.5. The layer ranged in thickness from 2cm to 4cm. The surface had been regularly trampled by tourists wearing boots with thick treads or sneakers and the compaction index was 1.6 kg/cm²). This probably accounts for the consistency of the matrix, which resembled modeling clay. The plastic matrix of the layer literally peeled away revealing the shiny smooth surface of Level 2 below (Figure 5-7).

In the center of the chamber was an oval shaped pit measuring 60cm x 80cm. The pit is a sink that serves as a drain for water that intermittently flows into the area from Chamber 1. The matrix within the pit was wetter than that of the rest of the level and this continued through every level to bedrock. On top of the pit sat a stalactite fragment that measured 55cm x 72cm. Artifact concentrations were found beneath overhangs on the east and west perimeters of the chamber.

Only 265 charcoal flecks were recorded on the modern surface. Very little charcoal was noted on the surface of the trampled areas in the chamber's center or in the area of the central drainage. The only heavy concentration was located beneath Ledge 9 adjacent to the westernmost wall of the chamber (See Figure 5-25). Adjacent to the charcoal beneath the overhang was a scatter were a cluster of ceramic sherds, a spall, and rocks (See Figure 5-6).

A thin layer of silt had washed into the chamber the day before the photographs were taken, but no charcoal was carried in during this event. Less than a gram of

charcoal (0.8gr) was recovered from the flotation of Unit B7. Little charcoal was noted in Level 1 matrix between in the field suggesting that this area was not heavily used by the ancient Maya during the Late Classic period. Charcoal from the matrix between Levels 1 and 2 was AMS dated with a range of A.D. 250 to A.D. 560, which falls into the Early Classic Period.

Ceramic sherds on the surface dated mostly to the Late Classic period, though Early Classic and Late Preclassic sherds were represented. Within the matrix there were 108 ceramic sherds and seven small speleothems six of which were soda straws. This count does not include the surface scatter. Of these, no sherds refit and seven were charred. Few sherds were diagnostic but of these four dated to the Late Classic Mt. Maloney group, one jar sherd to the Late Preclassic, one was a Late Classic slate ware, and one a severely eroded Late Classic cream polychrome. This level has been heavily trafficked by modern tourists and sherds found within the sediment matrix in pathway areas were probably pushed into the substrate by trampling which would explain why the sediments dated generally earlier than the ceramic material.

5.9.2 Level 2

The top of this layer was unusual because the surface texture was smooth and shiny with a velvety feel (Figure 5-8). The color was dark gray similar to Level 1, contained 1% marl, and was 1-2cm thick. This is one of the most heavily compacted levels in the excavation with a relative compaction index of 1.9kg/cm². The pH was 7.6. Although the matrix was primarily clay, thin lenses of sand and silt were present in the

northwest area of the excavation. Upon removal of Level 1 the 2002 test pits #008, #009, and Test Unit 02-06 were re-opened to provide guidelines for excavations.

On the Level 2 surface there were 770 charcoal flecks. The layer contained 241 ceramic sherds seven which were burned, a single spire-lopped jute shell, a small animal bone fragment, and 16 speleothems all of which were small soda straws. A modern nail from the 1998 survey was found in Unit B3. Sherds are clustered around the drainage in the center of the chamber. Their positions on both the northwest and southeast sides of the pit do not suggest that they were washed into the chamber

Diagnostic sherds were Mt. Maloney Black, a single Cayo Unslipped, and Chan Pond unslipped types. The charcoal on this level dated to the Early Classic Period between A.D. 250 and A.D. 440. As I have previously discussed, although they are diagnostic of the Late Classic period, Mt. Maloney black bowls can date to the Early Classic so it is not a safe to assume that they are Late Classic in this context. However, the presence of the modern nail in this level suggests that these sherds migrated downward from trampling. Chan Pond unslipped types are almost certainly Terminal Preclassic/Early Classic and temporally correlate well with the dated charcoal.

5.9.3 Level 3

Level 3 was 1-2cm thick and consisted of a clay matrix containing 1% fine marl with a compaction index of 1.9 kg/cm² (Figure 5-9). The color was very dark grayish brown and slightly darker than Levels 1 and 2. Thin lenses of water-laid silt and sand were also present particularly in the center and the northwest areas of the excavation.

There were 2179 charcoal flecks recorded on the surface of the level. The matrix contained 165 ceramic sherds, 16 small speleothems, and a single spire-lopped jute shell. Eight of the sherds were charred. Diagnostic sherds were from the Mt. Maloney, Cayo, and Chan Pond and groups dating to the Late Classic and Late Preclassic/Early Classic periods. A single charcoal sample dated between A.D. 400 and A.D. 560. This date is the latest in the excavation and does not statistically overlap the date from Level 2 at the 1-sigma probability but does slightly overlap at 2-sigma. Although this charcoal fleck was most likely pushed down into the Level 3 matrix by trampling, the date suggests that subsurface deposits in Chamber 2 do not postdate A.D. 560 despite the presence of Late Classic ceramics.

Two features were present and both were located in the northwestern part of the excavation. In this area, the southwest part of the cave wall slopes inward and little sediment covers the bedrock. Ceramic sherds were deposited on the bedrock in two small natural depressions measuring 8cm to 10cm in diameter (Figure 5-10). The placement of objects in natural depressions and crevices has also been noted in surface deposits throughout the cave. A modern nail, probably overlooked during datum removal for the 1998 WBRCF survey, was also found in this layer suggesting that artifacts were vertically displaced due to trampling.

5.9.4 Level 4

Level 4 was 2cm to 6cm thick and the matrix color and texture was similar to Level 3 (Figure 5-11). The compaction index was 1.8 kg/cm², slightly less than Level 3, and pH was 7.5. What we believed to be cracking of the deposits was noted in this level.

Patches of brown silt (7.5YR5/6) located between the cracks were present in the central area of the excavation and did not appear to be water laid. The peculiar morphology could be explained by the movement of shrink/swell clays. As noted in Chapter 4 (Figure 4-8) the deposits in the cave can have a bumpy appearance which is probably caused by clay expansion and contraction during periods wetting and drying. Bat guano raining from above collects in the valleys surrounding the raised areas. This would explain the curious pattern observed during excavation. The tops are being cut from the raised areas of the sediment, which give it the patchy appearance.

There were 1779 charcoal flecks on the surface of the level and the matrix contained 112 ceramic sherds and seven speleothems four of which were soda straws. Of these, 25 sherds and a speleothem were located in the drainage pit. Thirty-three of the sherds were charred.

Diagnostic ceramics dated entirely to the Floral Park groups falling into the Late Preclassic/Early Classic period which agrees with the AMS date for this level of 250-440 A.D. This was the first level of the excavation that both absolute and relative dates correlated well.

5.9.5 Level 5

The Level 5 sediment was slightly darker in color than Level 4 and was less compacted with an average index of 1.6 kg/cm² (Figure 5-12). Although the sediment appeared somewhat similar to Levels 1-4, there was slightly more marl (2%) within the 2cm to 6cm thick level. The pH was 7.6. The surface of the layer was structurally similar to Level 4.

We recorded 3341 charcoal flecks on the level's surface. Within the matrix there were 210 ceramic sherds and 21 speleothems. Of these 124 were charred. Thirty-nine of the sherds were found in the drainage pit, which continued to manifest as a wet depression in the center of the chamber on this level. Ceramics dated to the Hermitage and Floral Park groups which agree with the AMS date for the level of A.D. 240 to A.D. 440. Joseph Ball and Jennifer Taschek (personal communication 2005) identified a single Mount Maloney style sherd that is an early manifestation of the later diagnostic variety.

Two hearths were located adjacent to the cave wall along the southwestern boundary of the excavation. Many of the charred sherds on this level came from these features. The first, Hearth #1, was approximately 50cm in diameter and contained 16 ceramic sherds, a spire-lopped jute shell, and an animal bone fragment. Some of the wood was only partially charred. Moving 30cm northwest along the wall was a Hearth #2. The extent of sediment charring was approximately 40cm in diameter and contained a cluster of 74 ceramic sherds, a spire-lopped jute shell, a rodent tooth, and a great deal of carbonized wood. A limestone cobble sat on top of two sherds and there was a great deal of charring beneath it. Both of these deposits were located directly below sherd clusters present on the modern surface. A white cave powder crust was present on the surface of the level between the two features.

5.9.6 Level 6

The Level 6 sediment was clay mixed with 20% marl, which was ten times more than in the overlying levels (Figure 5-13). It was 1cm to 3cm thick and the sediment was

dark grayish brown in color, slightly lighter than the sediment in Level 5. Orange to brown (7.5YR4/4) patches of silt sized deposits were present throughout the level similar to Level 5. The pH was slightly more acidic (7.4) than the uppermost levels and the compaction index was lower than the five overlying levels (1.6kg/cm²).

The matrix contained 462 ceramic sherds and 29 speleothems. Eighty of the sherds were charred. Although speleothems were found on all levels, this is the highest level in the excavation to contain a stalagmite. Sherds dated to the Hermitage and Floral Park phases correlating with the Terminal Late Preclassic/ Early Classic period. This agrees well with the AMS date for this level that produced a 2-sigma date range of A.D. 130 to A.D. 420. But, there is a 92.6% chance that the layer dates between A.D. 210 and A.D. 420 (See Appendix IV).

There were nine sherds typed by Joe Ball and Jennifer Tascheck (personal communication 2005) as Polvero Black. This type falls into the Barton Creek phase and dates to the earlier part of the Late Preclassic period. Although it is puzzling to find this ceramic type in a later level, Gifford (1976:99) notes that at Tikal this group continues through the Terminal Late Preclassic period. Alternatively, these sherds may have been either curated by the Maya or removed from another area and re-deposited in Chamber 2 at a later date. Movement of sherds was noted in other areas of the cave and most likely occurred on Ledge 8 (See Chapter 4).

Both Hearth #1 and Hearth #2 encountered on Level 5 appear to have originated in Level 6. The hearths do not appear to have been dug into the lower level, but rather seem to be continually used. Hearth #1 contained 31 sherds on this level, and Hearth #2 contained 12. Both hearths contained some charred sherds but appeared to contain un-

charred ones as well. An obsidian blade fragment was found under a cobble at the base of Hearth #1. The fragment was the tip of a bifacial blade and measured 2cm x 1cm. A cluster of ceramic sherds, three of which were charred was noted in the drainage pit on this level.

Although Level 6 was only 1cm to 3cm thick, the amount of charcoal from the intra layer flotation was the highest of all the levels (21.98gr) as were the number of charcoal flecks recorded on the level surface (8357). This suggests that there was more activity in the Chamber at this time than any other during its history. The most intense area of activity occurred below Ledge 10 and extended into the entrance of Alcove 5 (See Figure 2-26). This dense deposit is also adjacent to the hearths located against the west wall of the chamber. The hearths are not illustrated on the density map because the charcoal was clearly not generated by torches.

5.9.7 Level 7

Level 7 dated to the Late Preclassic Period (Figure 5-14). The sediment color was light brown to yellowish-brown, contained 4% marl, and was 1cm to 2cm thick. Small nodules of pea-sized gravel occurred throughout the deposit. The sediment in Unit B8 in the northwest area near the intermittent pool was thicker than in other units. This layer was slightly less compacted (1.2kg/cm²) than the overlying Level 6 and pH was alkaline (7.7). An XRD analysis of this deposit demonstrated that, although the deposit had the texture of clay loam, it was almost entirely organic and was closely identified with results from the known guano sample. The high phosphate (16%) and elevated copper content (300 ppm) of this level further suggested that it was composed primarily of bat guano

(See Chapter 6). Channeling in the deposits was noted in Units C4, C5, and C7. The channels appeared to be water eroded and probably originated from the intermittent pool beneath the stalactite.

On the surface of the level there were 836 charcoal flecks suggesting sparse usage of the chamber during this time period. Only 10 ceramic sherds and 3 speleothems were recovered from the layer. The only diagnostic sherd was Polvero Black dating to the Late Preclassic period contemporaneous with the single radiocarbon date ranging from 350 B.C. to 40 B.C. There is an 88.2% probability that this level falls into the later part of the 2-sigma range between 210 B.C. and 40 B.C. This presence of the thick layer of bat guano in the chamber coupled with the low numbers of artifacts and low compaction index suggests that there was little use of Chamber 2 during the period of time represented in this level. There is a dramatic increase of use beginning in Level 6.

5.9.8 Level 8

The Level 8 sediment was very dark grayish brown in contrast to the lighter overlying Level 7 matrix (Figure 5-15). The Level 7 matrix was very thick in Unit B8 and we were not able to coordinate the strata again until Level 13, therefore it is missing in the photomap. Level 8 was 1cm to 3cm thick and contained 2% marl. Compaction averaged 1kg/cm² and pH was 7.5, slightly alkaline. Sediment color patterns resembling cracks similar to those in Levels 4 and 5 were present throughout the matrix. They can be seen particularly well in this photo (Figure 5-16).

There were 1290 charcoal flecks on the surface of the level. The pattern of deposition changed considerably at this time. The highest densities shift from being

predominantly in the east part of the chamber to the western areas (See Figure 5-26).

Within the matrix there were 13 ceramic sherds and 28 speleothems. The speleothems within this level were larger than in levels 1-7. There were 12 soda straws, 15 stalactite fragments, and one stalagmite. The speleothems were clustered roughly in the center of the chamber suggesting that they did not arrive at their current positions naturally. While the stalactites and soda straws may have fallen from the stalactite chandelier they are 2m distant from that location suggesting they have been moved either deliberately or by scruffage.

None of the sherds on this level was charred. In Unit B6, abutting the wall, two ceramic sherds and a spall were stuck vertically into the deposit penetrating to level 10. Three types were identified by Joseph Ball and Jennifer Taschek (personal communication, 2005), Quemado incised, Quemado Smudged-black, and a single Negroman Punctated-incised jar sherd. The Quemado group dates to the Early Jenny Creek phase of the Middle Preclassic period. This is contemporaneous with the radiocarbon date attained from this level of 1130 B.C. to 890 B.C. It is unlikely that this level is mixed and the presence of the Floral Park style jar sherd is interesting because it suggests that this type is either an early occurrence of the Negroman Punctated-incised type or that the sherd is a continuation of the earlier Jocote group.

A stone circle was encountered adjacent to the east wall of the cave positioned directly below Hearth #1 located in Levels 5 and 6. (Figure 5-17). The feature measured 20cm in diameter and was composed of 14 cobble-sized limestone rocks and one speleothem. It is reminiscent of the stone circles located on Ledge 4 and like these, did not appear to be associated with burning and did not contain macro artifacts. A sample of

the sediment within the feature was collected to test for residues but no results are currently available. A dark circular stain was located west of the feature abutting the wall. It did not appear to be related to hearth activity.

5.9.9 Level 9

The Level 9 matrix was very dark gray, slightly darker than the Level 8 sediment and similarly containing little marl (Figure 5-18). This level also contained lenses of dark yellowish-brown sediment mixed with poorly sorted sand. It was 2cm to 4cm thick with a compaction index of 1kg/cm² and basic pH of 7.6.

There were 2884 charcoal flecks on the level. Areas of high density were not well-aggregated and were dispersed between the east, west, and central areas the chamber (Figure 5-27). Six ceramic sherds and six soda straws were collected from the level. As in Level 8, the speleothems were not found below the stalactite chandelier but were located in the center of the chamber. Two well-preserved corn kernels were recovered from the flotation. There were three sherds from the same jar typed by Ball and Taschek (personal communication 2005) as a Jocote Orange-brown, dating to the Early Jenny Creek phase coeval with the AMS date for this level of 1000 B.C. to 820 B.C.

5.9.10 Level 10

This was the lowest level in the deposit to contain ceramics (Figure 5-19). The chamber received some of its heaviest use at this time, second only to that recorded in Level 6. The Level 10 sediment was dark brown to black in color, slightly darker in Level 9. The layer was 2cm to 3cm thick and contained little marl. The pH was 7.6 and

compaction was 1.2kg/cm². There were numerous crack patterns in this layer and lighter colored (7.5YR3/2) sediment mixed with white marl filled the cracks. These patterns had the typical geometric shapes of mud cracking which suggests that the sediment was very dry at some point. Much of the charcoal on this level was found in the lighter matrix.

There were 3537 charcoal flecks on the surface. Within the matrix there were four ceramic sherds and one speleothem. Two sherds were diagnostic of the Early Facet Jenny Creek phase. The first type was a Luminoso burnished and the second a small shed of a rare kaolin white ware also found in the basal layers of excavations at the nearby Chan site (Joseph Ball and Jennifer Tacshek, personal communication 2005).

5.9.11 Level 11

Level 11 dated to the Middle Preclassic Period from 1190 B.C. to 920 B.C. At the 93.9% calibration this can be narrowed to 1130 B.C. to 920 B.C. The matrix was very similar to that of Level 10 but was mixed with slightly more marl (4%) (Figure 5-20). The level was 2cm to 4cm thick, the compaction index was 1.31.2kg/cm², and pH was alkaline (7.8). There were 1390 charcoal flecks and three spalls present on the surface. Only 2 speleothems (soda straws) were found in the matrix. As the lower levels of the cave were excavated the surrounding walls sloped inward and the area of the excavation began to decrease dramatically. In viewing the photomap one gets a sense of how different the chamber appeared in its early usage before greater amounts of sedimentation occurred during later time periods.

5.9.12 Level 12

Level 12 dated to the Middle Preclassic Period between 1320 B.C. and 820 B.C. Two dates were run on this level. The first was from the 2002 test excavation Unit 02-06. This was dated by Beta Analytic (170518) and produced a date range of 1010 B.C. to 820 B.C. The second was collected in the 2003 excavation and produced a date range of 1320 B.C. to 930 B.C. at 2-sigma and 1320 B.C. to 970 B.C. at 93.5% probability.

The 5cm to 7cm thick sediment was very dark brown, slightly darker than Levels 10 and 11. The layer contained 3% marl, had a compaction index of 1.3kg/cm², and pH of 7.8. Channels of brown silt (7.5YR34/4) ran through the units on the north end of the excavation. The level is at the same height as the top of the eroded area beneath the stalactite chandelier. It was also noted that the sediment on this level was wetter than in higher layers suggesting that water could be moving horizontally through the layer from the pool beneath the stalactite. There were 1591 charcoal flecks on the surface and one speleothem in the matrix.

In the 2002 test excavation, (2003 Unit C6 northwest quadrants), two bowl-shaped spalls were found sitting in an upright position on the surface. Both contained a black sticky residue. The first was triangular in shape measuring 5 x 4cm and 2.5cm in height and the second was roughly circular and measured 6cm in diameter and 3cm in height (See Chapter 4 for photos). This level is the earliest dated and deepest level to contain distinctly modified artifacts.

5.9.13 Level 13

Level 13 dated to the Middle Preclassic Period (1130 B.C. to 910 B.C.). The sediment had a high concentration of marl (22%) and the color was dark grayish brown. The compaction index was 1.4 kg/cm² and pH was 7.6. The layer was 6cm to 10cm thick and a water channel ran through it (Figure 5-22). The channel originated in the east side of the excavation and continued to the north wall. Seven speleothems were found in the channel. The surface of the level exhibited the same crack patterns seen in other layers but in this level the lighter brown color (7.5YR4/4) is the primary matrix and the darker brown sediment is located between the cracks. This suggests that the darker sediment may have been deposited at a later date probably coeval with Level 12. There were 917 charcoal flecks located on the surface. Although there were no other distinctly cultural manifestations, the amount of charcoal and the date obtained suggests that this level represents the initial use of the cave by the Maya or another earlier related ethnic groups.

5.9.14 Level 14

Levels 14-18 all predate known sedentary groups in the region. As the excavation approached bedrock, the sampled area became progressively smaller as noted in Table 1. Additionally, due to time constraints the excavation was reduced to six units (C4-C8 and B7). The sediment from Level 14 was very dark grayish brown containing 11% marl and was 8-10cm thick. The compaction index was 1.2 kg/cm² and pH was basic (8.0). Crack patterns were distinct on this level (Figure 5-23). Nine small speleothems and soda straws as well as four spalls were found in the excavation. A large bowl-like spall resembled those found in Level 12 but unlike those in Level 12 did not contain residue.

There were 172 flecks of charcoal recorded on the surface. Two dates were obtained from Level 14. The first correlates to the Late Archaic period 4690 B.C. to 4450 B.C. and the second to the Early Holocene 9600 B.C. to 9220 B.C.

5.9.15 Level 15, 16, and 17

As the excavation neared bedrock fewer charcoal flecks were present. In the field the lowest levels did not appear to be anthropogenic. Level 15 consisted of Units C5, C7, C8 and the west half of Unit B7. We excavated through Level 15 in Unit C6 before arbitrarily dividing Levels 15 and 16, therefore it is missing in the photomap. Level 16 consisted of Units C5-C8, Level 17 consisted of Units C6 and C7, and Level 18 consists solely of Unit C6.

The dates from Levels 15, 16, and 17 ranged from the Pleistocene to the Early Holocene periods. Levels 15 and 16 were clearly mixed. Level 15 produced two dates from the Terminal Pleistocene (10,400-9600 B.C.) to the Early Holocene (8250-7600 B.C.). Level 16 produced a single Early Holocene date of 8250-7600 B.C. Level 17 the earliest date obtained from the excavation and is close to bedrock. It dated to the Pleistocene period 15,200-16,000 B.C.

These lower levels were composed of similar soil matrices with the exception of the top of Level 15 which consisted of 2cm to 3cm of compacted limestone gravel. Photomaps for the lower levels are found in Figure 5-24. The gravel layer can be seen clearly in the photograph of Unit C6 in the north wall profile at the top of Level 15 (See Figure 5-5). The color of the sediment below the gravel was brown to grayish-brown, contained 37%-39% marl, and was very wet throughout. In the field, it appeared to have

a greenish gray cast. The marl was friable and disintegrating and some of the pebbles were green-tinged. Cobble-sized mudstones were also present. The compaction index ranged between 1.0 and 1.4 kg/cm² and pH was basic ranging between 7.9 and 8.

Levels 15 and 16 were arbitrarily separated into 10cm levels and Level 17 was a 10cm level. Layer 15 is at the same level as base of the intermittent pool beneath the stalactite chandelier. This suggests that water may have been introduced into this level from horizontal seepage when the pool filled during rainstorms. This could account for the very wet condition of the basal layers of the excavation. It also helps explain how the sediment beneath the compact limestone could be much wetter than that above the hard and somewhat impermeable stratum.

Although it was unclear as to whether these levels were cultural, 20 charcoal flecks were recorded on the surface of Level 15 and others were noted throughout the matrix. Morehart identified one large charcoal fleck as a species of *Pinus*. Only 12 small flecks were present in Level 16 and 5 flecks were found in Level 17. Because few charcoal flecks were located in Levels 16-18, density maps were not made for these lower levels.

A *density difference* map was constructed for Level 15 (Figure 5-28). The highest charcoal density is located around the drain in the chamber's center. This suggests that the chamber was much wetter at this time. Charcoal was likely to have been washed in and accumulated around the drain during drainage. This is the only level of the excavation that suggests such a process.

Levels 16, 17, and Level 18 (bedrock) contained numerous large speleothems. Some are visible in the north wall profile of the excavation (See Figures 5-3, 5-4, and 5-

5). Thirty-four speleothems were collected in Level 15, 67 in Level 16, 42 in Level 17, and six on the surface of Level 18. They were not spread throughout the excavation but were found in clusters. In Levels 16, 17, and 18 the clusters were directly on top of one another suggesting that they were stacked. Eighteen of the speleothems from these levels were large stalagmites. Although stalactites could conceivably fall from the ceiling, it is highly unlikely that the stalagmites could have arrived at their current positions without assistance. Additionally, the placement of the speleothems within the excavation is reminiscent of the speleothem pile located on the modern surface.

Bedrock was reached at Level 18. The limestone at the base of the cave was highly disintegrated. Six speleothems including three stalagmites and a spall were collected on this level. No stumps from stalagmites were noted on the cave floor. Although a black fleck originally thought to be charcoal was collected from the basal deposit, according to the Arizona AMS Laboratory the fleck was not wood.

5.10 Dating Human Usage

Based on compiled 2-sigma ranges of AMS dates the excavation can be divided from top to bottom into the Early Classic, Late Preclassic, Middle/Early Preclassic, Archaic, Early Holocene, and Pleistocene periods (Figure 5-29). The profile shows two layers of dark earth at the top of the deposit with a layer of lighter reddish colored sediment sandwiched between them. The topmost dark layer (Levels 1-6) dates to the Early Classic period (A.D. 210-560.), the lighter layer (Level 7) to the Preclassic period (350-40 B.C.), and the bottommost darker layer (Levels 8-13) to the Early to Middle Preclassic (1320 B.C. to 820 B.C.). The chamber does not appear to be used during the

five hundred year period between 820 B.C. and 350 B.C. nor during a later almost 300 year period between 40 B.C. and A.D. 210. As of this writing the Early Middle Preclassic levels at Chechem Ha provide the earliest radiocarbon-dated examples of ritual cave use in the Maya lowlands. Having said this, many caves that have been excavated have not been radiocarbon dated and it is likely that future archaeologists will discover more early sites.

The sedimentation rates for these periods vary as well. There are a possible total of 18,203 years represented within the deposit. The earliest possible date is 16,200 B.C. based on the radiocarbon date from Level 17 at the 2-sigma probability range. The latest date is the modern usage as of 2003. There are 95cm of deposit present in the chamber. Based on these figures, the average sedimentation per year is .052cm. There is no sedimentation in the chamber after A.D. 560, the Early Classic period, although 6.8cm of sedimentation would be expected during this 1303 year period spanning the Late Classic period through A.D. 2003. The Early Classic period spanning Levels 1-6 lasted from A.D. 210-560. The sedimentation rate for this time was 14cm, which is 12.18cm over the expected rate of 1.82cm for this 350 year period. This is over 7 times the expected rate.

Although Level 7 dated to the Preclassic period from 350 B.C. to 40 B.C., it is bracketed by much earlier and much later dated levels. Therefore the Level 7 deposit represents the temporal period beginning at the latest possible date for the Middle Preclassic levels, 820 B.C., to as late as the earliest date of Level 6, A.D. 210. This encompasses a temporal span of 1,030 years. The actual sedimentation was 4cm, close to the 5.4cm expected on average.

In the Middle Preclassic period, which lasted up to 500 years from 1320 B.C. to 820 B.C., the sedimentation was 17cm, over six times the expected rate of 2.6cm. The pre-Maya levels dating from as early as 16,200 B.C. to as late as 4,450 B.C., encompassing a 11,500 year period, produced a 60cm deposit. This equaled the expected value of 60.06cm. It is interesting to note that periods of intense human use produce sedimentation rates far over the average whereas periods of little or no human usage tend to fall very close to the average expectation.

The topmost layer in the chamber is currently impacted by modern tourists and was used during the Late Classic period as evidenced by the presence of Late Classic ceramics on the surface and pressed into the Level 1 matrix. What is curious is that the two AMS dated charcoal samples from this layer dated to the Early Classic period. This demonstrates that there was little sedimentation in the chamber after the Early Classic period suggesting that usage of this area was sparse after this time. Based on the density of charcoal flecks, the layer shows intensity of usage only in the area beneath Ledge 9 which makes sense as this ledge was used solely in the Late Classic period, perhaps in a single event. There are Late Classic ceramic sherds as well as cobbles and spalls found beneath the ledge suggesting that events occurred both on the ledge and directly below it though it cannot be assumed to be simultaneous usage. Although there are Late Classic ceramics under the overhang along the east wall, based on the charcoal remains it does not appear to be an area of intense usage during this time period.

Level 14 dates to the Archaic period (9600-4450 B.C.). Although there are no remains that are unambiguously anthropogenic, the charcoal flecks in the deposit are numerous enough to suggest that they may have been deposited by humans. While there

is slowly accumulating evidence for human occupation in the Belize Valley during the Archaic period, the Pacific coast of Mexico was well-occupied as early as 4,000 B.C. (Blake 1999:4; Blake et al. 1995; Michaels and Voorhies 1999:39-54; Voorhies 1976) and Barbara Voorhies has more recently pushed this date back to 5,500 B.C (Voorhies 2004). Recent evidence suggests that Archaic people lived in coastal northern Belize as early as 2500 B.C. (Rosenwig and Masson 2001; Rosenwig 2004:267). However, these early Belizean sites postdate Level 14, which suggests that the charcoal is likely to be the result of natural forest fires though this is by no means certain.

The morphology of the site may have changed considerably and the entrance may have been larger prior to the Early Middle Preclassic usage. This may have allowed charcoal from natural fires to enter the chamber. Although only small amount of charcoal may have been introduced, considerable accumulation could occur over this long time span.

Layers 15 and 16 are mixed and date to the Terminal Pleistocene to Early Holocene transition (10,400-7600 B.C.) but contain little charcoal to suggest human usage. Level 15 is the only level in which charcoal is clustered around the central drain. Charcoal present in these levels may have been introduced into the chamber as the result of natural fires, although this is not completely clear. Of interest is that Christopher Morehart (personal communication 2005) identified a single fragment from Level 15 as a *Pinus* species which, as noted above, is known to be used by the ancient and modern Maya for creating torches, a practice that could date to earlier time periods. However, to the contrary, today stands of pine are found on hilltops in the vicinity of the cave so it is possible that pine forest covered the area at an earlier time period. According to Barbara

Leyden and her colleagues (Leyden et al 1993; Leyden et al. 1994; Leyden 2002) during the last glacial maximum (24,000-14,000 B.P.), high percentages of pine were present in Petén lake cores. By 8,000 B.C. semi-evergreen forest was established at Lake Petén-Itza (Islebe et al 1996). Given these data, it is possible that pine forests were present during the Pleistocene/Holocene transition near Chechem Ha.

What is most puzzling about these lower layers is that stalactites and stalagmites were found in association with each other and appeared to be stacked. Although the stalactites could have fallen from the chandelier above, the stalagmites are more problematic. They could not have fallen over in situ as there is no evidence in the vicinity for their growth and they are too large and heavy to have washed into the area except by the most torrential flood. The stacked arrangement is curious and one cannot entirely rule out anthropogenic placement.

I am not arguing for human use of the cave in the Archaic, Early Holocene, or Terminal Pleistocene eras but, based on growing evidence of a human presence in Mesoamerica in these early periods, I want to stress that the possibility cannot be ruled out. First it is important to remember that exploration of the dark zones of caves can be traced to deep antiquity. Exploration of deep caves in Western Europe dates to at least 30,000 years ago as evidenced by extensive well-dated cave art (Clottes in press; Clottes 2003; Clottes et al. 2005). The use of deep caves in Australia also can be traced to this early period (Flood 1997:225; Taçon et al. in press).

There is also evidence that humans were in the region by approximately 10,000 B.C. A single Clovis point was found in Ladyville, Belize near the coast (Hester et al. 1980; Kelly 1993) and another just outside of Ladyville (MacNeish and Nelken-Terner

1983). A third fluted lanceolate point was recently reported from the area surrounding August Pine Ridge (Valdez and Aylsworth in press). A probable Clovis was also recovered in Highland Guatemala (Brown 1980).

According to Kelly, no other point types are found in Belize that pre-date 2500 B.C. but this may be due to the ephemeral nature of the sites and difficulty in finding them. Pleistocene mammals have been found in the nearby rockshelter Actun Halal, which may be associated with early lithic tools though this has not been authenticated (Griffith et al. 2002; Lohse et al. in press; Lohse and Collins 2004).

The basal layer at Chechem Ha is Pleistocene and dates between 16,200B.C. and 15,000 B.C. There is little charcoal material in this level to suggest human usage. More importantly, the lack of charcoal also suggests that there is no background charcoal present in the cave. This is an important point because natural forest fires tend to be cyclical and if charcoal is entering the chamber from outside contexts one would expect to find evidence of it in all excavation levels, or at least in those occurring before the Early Middle Preclassic period. Alternatively, considerable climate change has undoubtedly occurred since the Pleistocene, and the area may have been very wet during this time discouraging burning. Leyden's (2002) work indicates that before 8,000 B.P. the climate was cooler and dryer supporting sparse temperate vegetation. Therefore one might not expect to find charcoal-producing fires to have occurred at this time, which would account for the lack of background charcoal in the earliest levels.

5.11 Changes in *Use-Intensity* Based on Charcoal

The graph in Figure 5-30 illustrates the *use-intensity* index for levels 1-15. Although the data collected from Levels 14-15 may not be anthropogenic, they are included as background information. To correct for the changing spatial area of the excavation the index was calculated by dividing the number of charcoal flecks recorded on each surface by the area of the excavated space.

The charcoal data indicates that there was heavy usage of the chamber in the early part of the Middle Preclassic period (Levels 8-13). The period of most intense usage during this period occurred in Level 10 and began to taper off in Levels 9 and 8. There were few ceramic sherds found in any of the Middle Preclassic layers and Level 10 was the deepest layer of their occurrence. It is of note that the charcoal indices in many of the Middle Preclassic levels exceed those of Early Classic. Level 7, dating to the Late Preclassic period is a transitional level between the Middle Preclassic and Early Classic periods but shows little evidence of the chamber's use during that time.

Peak usage of the chamber occurred in Level 6 which has a 92.6% chance of dating between A.D. 210 and A.D. 420, the Terminal Preclassic/Early Classic period. Usage began to taper off over the course of the Early Classic period with the exception of a slight increase in Level 3. The ceramic assemblage indicates that the last usage of the area occurred in the Late Classic period, though none of the sedimentary levels dated that late and there was little charcoal on the surface of the chamber.

These charcoal data can be distributed into three phases (Figure 5-31). The heaviest *use-intensity* (52%) occurs in the Early Classic period between A.D. 210 and A.D. 560. It is nearly rivaled in the Middle Preclassic period (46%) between 1320 B.C.

and 820 B.C. There is little use of the area in the Late Preclassic period (2%) between 350 B.C. and A.D. 210 and less than 1% is present on the Late Classic level (A.D. 600 to A.D. 900).

Although it is difficult to sort out whether the variability in the amounts of charcoal is a result of an increased number of people visiting the chamber or whether it reflects increased frequency of use, it is possible to address the issue by correlating the charcoal counts with the compaction data if we assume that compaction is a result of human trampling. Although sediment moisture can affect compaction readings all the layers had some degree of moisture. The wettest levels were 15-17 and are not included in the analysis because there are doubts as to whether they are anthropogenic.

In viewing the density difference maps, the size of density clouds is significant. Few large discrete clouds suggest that individuals are stationary for longer periods of time or that the same area is used repeatedly. Numerous small clouds are expected to represent either the presence of more individuals or more frequent usage of shorter duration. Diffuse clouds suggest movement. Diffuse density clouds in the U-shaped path suggest movement through the chamber to other areas.

In evaluating the *use-intensity* and compaction data there are four possible scenarios. Either both the *use-intensity* and the compaction increase, *use-intensity* increases as compaction decreases, *use-intensity* decreases as compaction increases, or both *use-intensity* and compaction decrease. If both increase this suggests increased use of the chamber. This could take the form of more individuals involved in rituals or of individuals moving about within the space. If the *use-intensity* increases and compaction decreases this suggests that a few individuals are spending long periods of time in the

chamber but there is little movement. This would be an especially compelling conclusion if density clouds were more compact suggesting standing in one place. If there is a decrease in *use-intensity* and an increase in compaction this suggests that individuals are moving through the chamber but not lingering. Both a decrease in *use-intensity* as well as compaction suggests reduced usage.

Use-intensity and compaction either increase or decrease between levels and are correlated in the graph illustrated in Figure 5-32. Beginning with Level 14 we see that both *use-intensity* and compaction increase with time as might be expected when people begin to use the space. The Level 13 *density difference* map shows small diffuse clouds as well as four areas of heavy charcoal concentration (Figure 5-28). This suggests that individuals were both standing and moving around the chamber.

Similarly, both *use-intensity* and compaction increase between Level 13 and Level 12. Large density clouds for Level 12 show heavy discrete charcoal concentrations in front of the stalactite chandelier and under the Ledge 10 overhang. This suggests that individuals are standing in stationary positions or are using the same areas repeatedly. Both *use-intensity* and compaction is slightly reduced between Level 12 and Level 11. The Level 11 map suggests that the entire chamber is used at this time. The numerous diffuse clouds suggest that people are moving about the chamber but spend more time on the north side adjacent the stalactite or directly under the Ledge 10 overhang.

Use-intensity increases almost three-fold between Level 11 and Level 10 to the heaviest usage during the Middle Preclassic period. Although there is a large increase in intensity, there is a decrease in compaction on this level. The activity areas on the *density difference* map for Level 10 (Figure 5-27) are similar to those of Level 11. The clouds on

this level are more defined suggesting that individuals are spending more time standing in stationary positions in the chamber rather than moving.

There is a decrease in both *use-intensity* and compaction between Levels 10 and 9 but the Level 9 *use-intensity* is heavier than Levels 11-13. The *density difference* map (Figure 5-27) illustrates that the densest charcoal scatters are small in size and more numerous than in any other level. One of the densest areas on this level is found adjacent to the southwest wall beneath the Ledge 10 overhang. The diffuse nature of the density clouds suggests that users may be moving around within the chamber or traveling through the area. Activities may have been of shorter duration as well.

Between Level 9 and Level 8 there is a decrease in *use-intensity* by half and increase in compaction. This suggests that people were moving around within Chamber 2 or moving through the chamber. The Level 8 density distributions are radically different from those in Level 9 and show large red clouds in the northernmost half of the chamber adjacent to the stalactite chandelier. Unlike the previous levels there is little usage of southern half of the chamber. Of note is that the number of ceramics brought into the cave increases dramatically during this period.

Between Levels 8 and 7 there is another decrease in usage and another increase in compaction. Because there are low density scatters surrounding the U-shaped path leading to the deeper areas of the cave, it suggests that people are moving through Chamber 2. Level 7 is the least utilized strata of the excavation. Density clouds are located primarily in the southern half of the chamber adjacent to the southwest wall and in Alcove 5. One cloud is located adjacent to the northernmost wall in front of the stalactite.

Between Levels 7 and 6 there is a dramatic increase in *use-intensity* but a decrease in compaction. Small density clouds are scattered throughout the chamber suggesting either more frequent rituals or the presence of more participants. The density map for this level illustrates intense activity near the southwest wall, beneath Ledge 10 and in at the entrance to Alcove 5. The earliest hearth activity in the chamber dated to this period and was located in this area adjacent to the south wall. Of note is that although density clouds occurred below the Ledge 10 overhang in previous levels, the clouds occurring in this level extend farther to the west. This is interesting because we know that Ledge 10 comes into use at this time. The area is directly below the edge of the overhang suggesting that a torch bearer stood beneath a ladder. Diffuse scatters surround the U-shaped path suggesting that individuals were moving through the chamber.

Use-intensity between Levels 6 and 5 is reduced by more than half although compaction increases. This suggests that activity is more frequent and that people are moving around and through the chamber at this time. These data are supported by the density map of Level 5 (See Figure 5-26) that illustrates activity around the U-shaped path. Three large dense scatters are located beneath Ledge 10. One of these is located directly below the edge of the Ledge 10 overhang. Hearth activity near the west wall was also present in this level which suggests that prolonged activity occurred around the hearth and beneath the ledge.

Between Levels 5 and 4 *use-intensity* is again halved and compaction is slightly increased. Movement through the chamber could produce this effect. The density map of Level 4 (See Figure 5-25) suggests that people are also standing or sitting in stationary positions. High density clouds are located adjacent to the "seat" in the east wall

limestone outcrop and below the Ledge 10 overhang. There is little activity in the northern areas.

Between Levels 4 and 3 there is a slight increase in both *use-intensity* and compaction. A large high density cloud is located beneath the edge of the Ledge 10 overhang suggesting that an individual or individuals stood beneath the ledge. Diffuse scatters in the U-shaped path suggest that people moved through the chamber as well.

Between Levels 3 and 2, *use-intensity* is reduced by almost 2/3rds, whereas compaction increases. The density map (See Figure 5-25) illustrates that the entire chamber was used at this time. Density is diffuse and although there are a number of high density clouds, they are relatively small. High density clouds occur adjacent to the "seat" in the east wall limestone outcrop, below the edge of the Ledge 10 overhang, and adjacent to the north and south walls. The small size of the clouds suggests activities of shorter duration. The increased number of clouds suggests that either ceremonies involved greater numbers of participants or that there was repeated usage of the chamber. The diffuse clouds in the U-shaped path suggest movement through the chamber.

The most dramatic change in the pattern of chamber use occurs between Level 2 and Level 1. Few charcoal flecks were recorded on the Level 1 surface. The density map indicates only one area of high usage on this level--beneath Ledge 9. Late Classic ceramics were found on the surface beneath and overhang under the ledge. A very low density charcoal scatter is located adjacent to a cache of Late Classic ceramics located beneath the north wall overhang. There is no indication that other activities occurred in the chamber at this time and although there is little evidence to indicate that people were traveling to the deepest parts of the cave it is certainly not true because Late Classic

ceramics are found in these areas. Because there is little material in the U-shaped path, it suggests that few people traversed it or entered Tunnel 2 via Elevated Passage 2 at this time. This suggests a considerable change in the chamber's usage between the Early and Late Classic periods.

Overall, throughout the Early Classic period (Levels 2-6) compaction exceeds that of other temporal periods (See Figure 5-32). Compaction ranges from 1.3kg/cm² to 1.9kg/cm² in the Early Classic levels and from 1kg/cm² to 1.4kg/cm² in the Middle Preclassic levels. Coupled with the increased *use-intensity* data this indicates either increase in the number of ritual participants or increased ritual frequency.

Evidence from Ledge 10 suggests that these data represent increased frequency of use. Twenty percent of the cave's entire ceramic assemblage was located on the ledge and many of the sherds were stacked. Among the Quiche, stacking of ceramic material is equated with the cleaning and maintenance of ritual sites (Tedlock 1992:76,113, Figure 13). Stacking of sherds may suggest an increase in ritual frequency during the Early Classic period. This would have occurred after A.D. 210 based on the radiocarbon date from the Level 6 sediment or possibly after A.D. 240 according to the earliest date from the ledge.

Finally, as noted in section 5.9, increased sedimentation also parallels use intensity. In the Early Classic levels 1-6, sedimentation is over seven times the expected amount of deposit and in the Middle Preclassic levels 8-13, it is six times the expected rates. In Level 7 charcoal deposits are sparse suggesting little use and the sedimentation rate is very close to the expected average. Also in the early pre-Maya levels 14-17 the sedimentation is the same as the expected average rate. If we assume that increased

sedimentation is produced by the tracking in of deposits by humans, it suggests that sedimentation rates could be used as a coarse indication or adjunct to other methods for inferring the frequency of use.

5.12 Activity Areas

A considerable change in ritual practice between the Middle Preclassic, Early, and Late Classic periods can be postulated based on changes in the *use-intensity* of Chamber 2, but spatial patterning of activity areas in the chamber changes as well. Table 5-2 below summarizes these data. First, the area below Ledge 10 in the southwest part of the chamber was used almost continuously from Level 13 through Level 2 spanning the Middle Preclassic through the Early Classic periods. The only time that this area was not heavily utilized was in Level 8 which represents the end of the Middle Preclassic and again in Level 1, the Late Classic level. One can understand the importance of this area during the Terminal Preclassic to Early Classic periods when there was a great deal of activity on Ledge 10, but it is unclear why the area beneath the ledge was important during the Middle Preclassic period. It is not associated with any particular features. It is possible that torch bearers were positioned in this area because it was the best area from which to light the chamber.

Overall there is more activity around the stalactite chandelier in the northern and western areas of the chamber during the Middle Preclassic period than during later periods. Beginning in the Early Classic focus shifts to the southernmost areas of the chamber and to Ledge 10. Enclosed spaces begin to be utilized in Level 7, during the Late Preclassic period. These would include Alcove 5 and Ledge 10. Sedimentation in

Alcove 5 does not occur until the Late Preclassic and some of the ceramics in the area date to this early time period.

5.13 Ceramics

One of the intriguing questions in cave archaeology concerns the nature of objects brought into caves. Although the presence of burned sherds may suggest to some archaeologists that they are burned in situ, the data from the Chamber 2 excavation demonstrates that small sherds are brought into the cave as offerings and many times these sherds have been burned in their previous use-lives. Burned sherds within the excavation did not refit with others and were often very heavily encrusted with charcoal. They were scattered throughout the excavated area and with the exceptions of those collected from specific features, were not associated with hearths. This agrees with observations made regarding ceramics found on the cave's surface. Many vessels exhibited charring but were not associated with hearth activity suggesting that they were burned in their prior use-lives.

Ceramics in the chamber temporally correlate well with absolute dates though clearly some later sherds are pushed into earlier levels by trampling. The largest number of sherds (62%) in the excavation date to the Terminal Preclassic/Early Classic period. This would be expected given that at least 5 levels date to this time period and that the highest levels of *use-intensity* occurred during the Early Classic period.

There are a number of sherds dating to the Late Classic period (19%) though there is little other evidence of Late Classic usage of the chamber. This implies that there were few users in the Late Classic but that they were bringing in more objects and were not lingering in the area.

Only a total of 39 sherds were found in the Middle Preclassic levels (8-10). No ceramics were present in Levels 11-13 but there were copious amounts of charcoal in the chamber and spalls containing residues were present on Level 12. It suggests that the chamber was used for possibly hundreds of years before objects began to be imported into the cave.

The ceramics from these early levels are informative because they are located in a sealed context and are securely dated. The following conclusions are based on conversations with Joseph Ball and Jennifer Tacshek (personal communication 2005). First of all, Levels 8-10 contain ceramic sherds that are solely from the Early Jenny Creek complex. This is the only area of the cave to contain such a deposit and is the oldest dated material found throughout the cave system. The radiocarbon dates show conclusively that Early Jenny Creek predates 800 B.C.

Ball and Tacshek (2003) suggest that Middle Preclassic ceramics can be divided into two groups, the KXM (Kanluk-Xakal-Madrugada) tradition and the SBM (Swasey-Bladen-Mamon) tradition. The KXM tradition includes Jocote Orange-brown, Mars Orange Paste-Wares, and a local mimic referred to as Yesoso Orange-Paste Ware. The SBM tradition includes lowland Maya slipped "waxy wares," and the unslipped Achiotes and Sapote Striated groups. They propose that the KXM group is associated with a widespread Middle Preclassic ceramic tradition whose origins are associated with ethnic Zoque peoples from the Gulf Coast of Mexico whereas the SBM tradition represents an indigenous ethnic Maya cultural presence coming from northern Belize.

The limited Level 8-10 Middle Preclassic ceramic assemblage in Chamber 2 contains Jocote Orange-brown sherds and variants such as Luminoso Burnished types as

well as Mars Orange-Paste wares, sherds from the Quemado group and Tumbac Unslipped Wares, and a rare unspecified/undesignated kaolin white paste-ware, all of which belong to Ball and Taschek's KXM tradition. The assemblage suggests that Early Jenny Creek ceramics are distinct from the SBM tradition. Waxy wares are found in other areas of the cave, particularly Chamber 1, but contexts date slightly later after 800 B.C. This observation is intriguing considering that there are changes in the utilization pattern of the chamber after the Middle Preclassic period. This may represent either a change in ritual practice within a particular group or it could suggest that a different group altogether was using the cave after 800 B.C.

5.14 Speleothem Use

Although it is well-known that the ritual use of speleothems is a common practice among the Maya, the antiquity of the practice has yet to be addressed. Based on the San Bartolo Murals dating to 100 B. C (Saturno et. al 2005:14), it is clear that the Maya were aware of speleothems by the Late Preclassic period. On the north wall of the mural a mountain is depicted with a zoomorphic cave maw. A fang hangs from the top of the mouth which is marked as stone. The irregular form of the fang and the stone marking identifies it as a speleothem.

Data collected in Chamber 2 demonstrate that ritual speleothem use occurred in the Middle Preclassic period. In Level 8, a stalactite fragment is used as part of the stone circle located beneath the overhang on the west wall. Additionally, although one could argue that some of the stalactites in the Chamber 2 excavation may have fallen from the large stalactite chandelier at the north end of the chamber, it is much harder to justify the

presence of stalagmites within the excavation. Level 8 contains a large stalagmite measuring 22cm in length and 6cm in diameter.

The youngest stalagmite in the Chamber 2 deposit was found in Level 6 which dates to the Terminal Preclassic/ Early Classic period. The stalagmite measures 10.6cm in length and 7.3cm in diameter. It is unclear as to its original provenience. Dried inactive stalagmite stumps are present in several places throughout the cave system. Many of the stumps are large, over 4cm in diameter, which suggests that the harvested stalagmites may have originated from one of these areas.

In the field we noted that all of the larger stalagmites and stalactites were found below Level 6 and that there were larger numbers of speleothems in the deeper excavated levels. The speleothems found in the upper levels were primarily soda straws and small fragments of stalactites. Figure 5-34 is a graph of the measurements of the excavated material by level. Size of the speleothems was determined by multiplying the length times the radius. The trend over time demonstrates that speleothems found within the excavation are progressively smaller in the more recent material.

Although it is unclear as to whether the speleothems from the lower levels (14-18) were placed in the area by humans, the pattern is none-the-less striking. Recall that the only stalagmites found in the cave by my team began to grow after the Late Classic collapse when the cave was closed up. The pattern discovered in the excavation suggests that over time there were fewer and fewer speleothems to harvest. Increasingly smaller speleothems were used as offerings until the only ones present were soda straws. This may be a reason why there were so few speleothems accompanying the Late Classic artifact caches.

It appears that by the Early Classic period, all of the stalagmites had been harvested. There is nothing to suggest that this was a change in ritual practice because in other caves most examples of speleothem breaking, caching, and removal date to Late Classic contexts. Apparently at Chechem Ha, the ancient Maya ran out of easily available material.

5.15 Summary

Chamber 2 use appears to begin gradually in the Middle Preclassic period around 1000 B.C. The early rites occurred primarily around the stalactite chandelier and involved the movement of speleothems as well as the opportunistic use of spalls as offering bowls positioned in front of the feature. A stone circle was placed beneath the overhang on the west wall of the chamber and a speleothem was included as part of the circle. The activity area surrounding the stalactite and use of speleothems suggests that earliest rites were water-related. Plant material was imported into the cave, as evidenced by the corn kernels found during flotation. Coupled with the water-related rites, this is good evidence that caves were equated with agricultural rituals by this very early time. By the end of the period ceramic sherds were imported into the site but there were no whole vessels. Usage tapered off at the end of the period as late as 820 B.C.

After 820 B.C. there was little use of the chamber until the Terminal Preclassic period beginning about A.D. 210. A single date range of 350 B.C. and 40 B.C. was obtained from the intervening layer that was composed primarily of bat guano. Some charcoal was present in the deposit but the guano accumulation suggests that few people were in the area during this long temporal period. Low-density scatters suggest that

people moved through the area. Alcove 5, a restricted space, began to be used at this time.

Beginning as early as A.D. 210 use of the chamber rapidly peaked. There was a great deal of activity on Ledge 10 and many polychrome vessels and unslipped jars were imported into the cave. This is attributed to an increase in ritual frequency.

There was little evidence that whole vessels were carried in, though they could have been brought in, smashed, and sherds removed from the site to be curated or used in other rituals. People appeared to be standing beneath Ledge 10 holding torches. Informal hearths were constructed adjacent to the west wall directly above the Middle Preclassic stone circle and at the entrance to Alcove 5. A single obsidian blade fragment was found at the base of the hearth. In this context it suggests that blood letting rites may have occurred, though the blade has not been tested for residues. Additionally, sherds were placed in the pit at the chamber's center.

As the Early Classic period wore on the chamber continued to see heavy use but usage began to taper off suggesting that use became less frequent. The hearth area was heavily utilized but eventually abandoned. A few jute shells were found in the chamber but there were no large caches. Some small sherds were placed in the depressions in the cave wall and people continued to place them in the central drainage pit. The chamber fell out of use by A.D. 560.

The next evidence for the Chamber's use occurred in the Late Classic period. A few offerings were left on Ledge 9 during what was likely to have been a single event. Most of the vessels are intact or partially intact and a rare speleothem was placed on the edge of the ledge. Ceramic sherds, cobbles and spalls were deposited below the ledge.

More sherds were placed in the drainage pit at the chamber's center possibly along with a fragment of a large stalactite that may have been collected from the nearby stalactite chandelier. Sherds were also placed along the northernmost wall of the chamber beneath an overhang. The sparse charcoal deposits and lack of sedimentation suggest that there were few people involved in these rites and that they were not lingering in the chamber. Movement through the chamber was ephemeral as well. Although numerous vessels were placed in deeper areas of the cave, the evidence from Chamber 2 indicates that there were few individuals involved in these rites. These data collectively suggest that cave rites became increasingly esoteric over time between the Early and Late Classic periods.

Table 5-1. Summary by level of Chamber 2 excavation data.

Level	AMS Date	Period	Compaction	Excavated	Surface	Flotation	Ceramic	Speleo	Special
			Index kg/cm ²	Area m ²	Charcoal	Charcoal (gr.)	Sherds/Burned	thems	Finds
1	250-540AD	Early Classic	1.6	12.77	265	0.8	108/7	7	
2	250-440AD	Early Classic	1.9	12.61	770	4.72	241/7	16	jute, bone
3	400-560AD	Early Classic	1.9	12.47	2155	1.97	165/8	16	jute
4	250-440AD	Early Classic	1.8	12.76	1779	4.62	112/33	7	
5	240-440AD	Early Classic	1.6	12.3	3341	5.49	210/124	21	hearth, jute animal bone
6	130-420AD (210-420)AD	TPC/ Early Classic	1.3	12.58	8244	21.98	462/80	29	hearth, obsidian blade
7	350-40BC	Late Preclassic	1.2	12.58	815	7.03	10/0	3	
8	1130-890BC	Middle Preclassic	1	10.06	1290	1.57	13/0	28	stone circle
9	1000-820BC	Middle Preclassic	1	10.1	2884	2.02	6/0	6	corn kernel
10	1000-820BC	Middle Preclassic	1.2	9.965	3537	6.59	4/0	1	
11	1190-920BC	Middle Preclassic	1.3	9.473	1390	1.85	0	2	
12	1320-930BC	Middle Preclassic	1.3	9.270	1591	1.98	0	1	2spalls w/res(Unit 02-06, 2003)
13	1130-910BC	Middle Preclassic	1.4	10.25	917	4.87	0	7	
14	4690-4450BC 9600-9220BC	Archaic	1.2	5.545	172	4.16	0	9	spall
15	9220-8800BC 10400-9600BC	Term. Pleist/Early Holocene	1	3.249	20	1.02	0	34	
16	8250-7600BC	Archaic	1.4	3.737	12	0.01	0	67	
17	16200-15000BC	Pleistocene	2	2.0	5	trace	0	42	
18		NA		0	0			6	

Table 5-2. Usage areas of excavated levels in Chamber 2.

Chamber 2- Areas of Highest Charcoal Density												
	West	Below	Below	Alcove		North	Central	In Front		Speleo		East
	Wall	Ledge 9	Ledge 10	5	Drain	Wall	Area	Bench	Path	Pile	Stalac tite	Wall
L1		x										
L2	x		x			x	x	x	x	x		
L3			x					x	x			
L4			x				x	x	x			
L5	x	x	x			x			x	x		
L6			x	x		x			x		x	
L7	x		x			x			x			x
L8							x		x	x	x	x
L9			x		x	x	x			x	x	x
L10			x				x				x	x
L11			x				x			x	x	x
L12			x		x		x			x	x	x
L13	x		x							x		x
L14												x
L15					x							

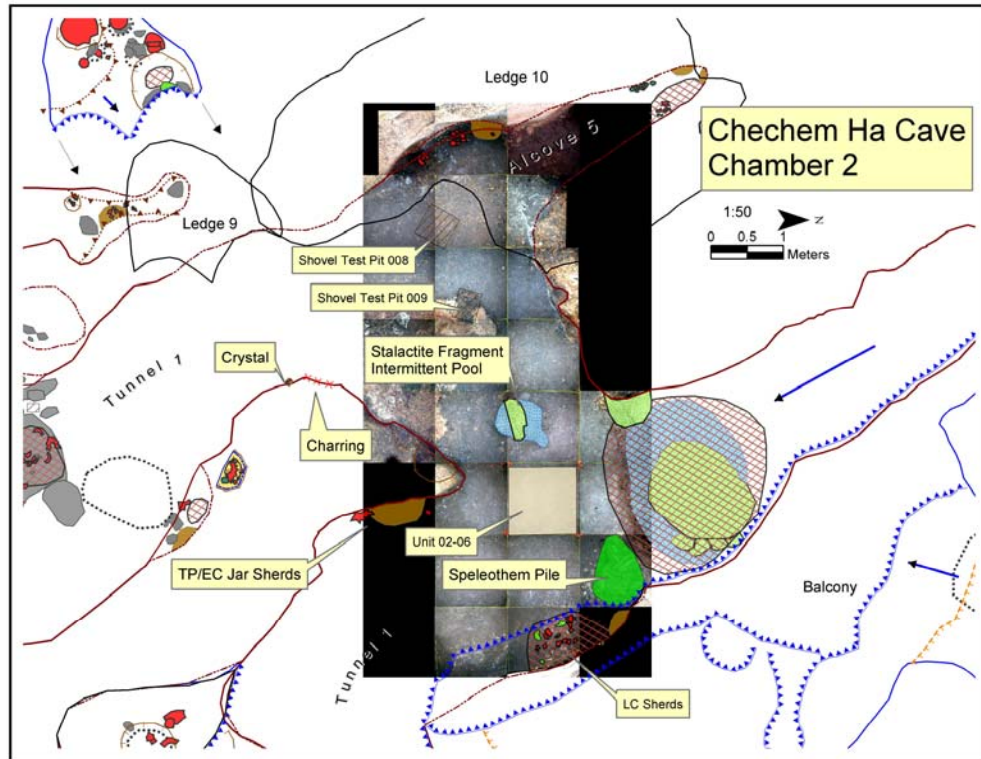


Figure 5-1. Base map superimposed on photomap surface level.

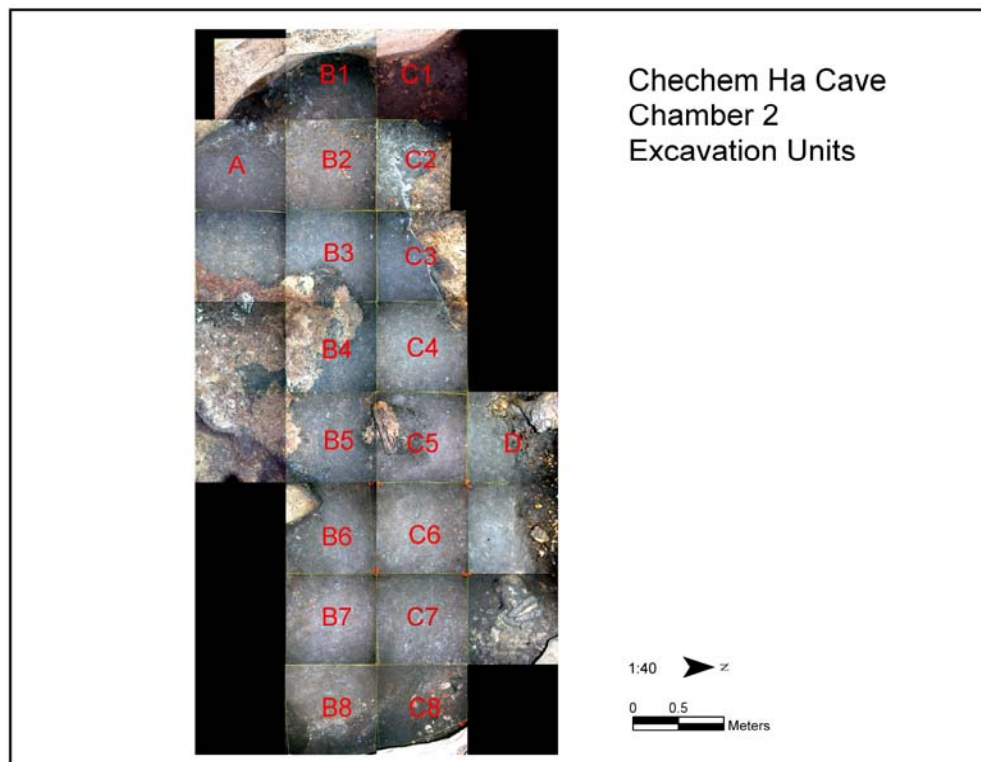


Figure 5-2. Photomap of surface showing excavation grids B1-B8 and C1-C8.

Chechem Ha Cave Chamber 2 Photomap of North Wall Profile



0 0.25 0.5 1 Meters

Figure 5-3. Photomap of northwest wall of 2004 excavation

Chechem Ha Cave- Chamber 2
North Wall Profile Unit C6



Figure 5-4. Close up photograph of Unit C6 of north wall profile (photo by Nathan Craig).

Chechem Ha Cave- Chamber 2
North Wall Profile Unit C6
Excavation Layers

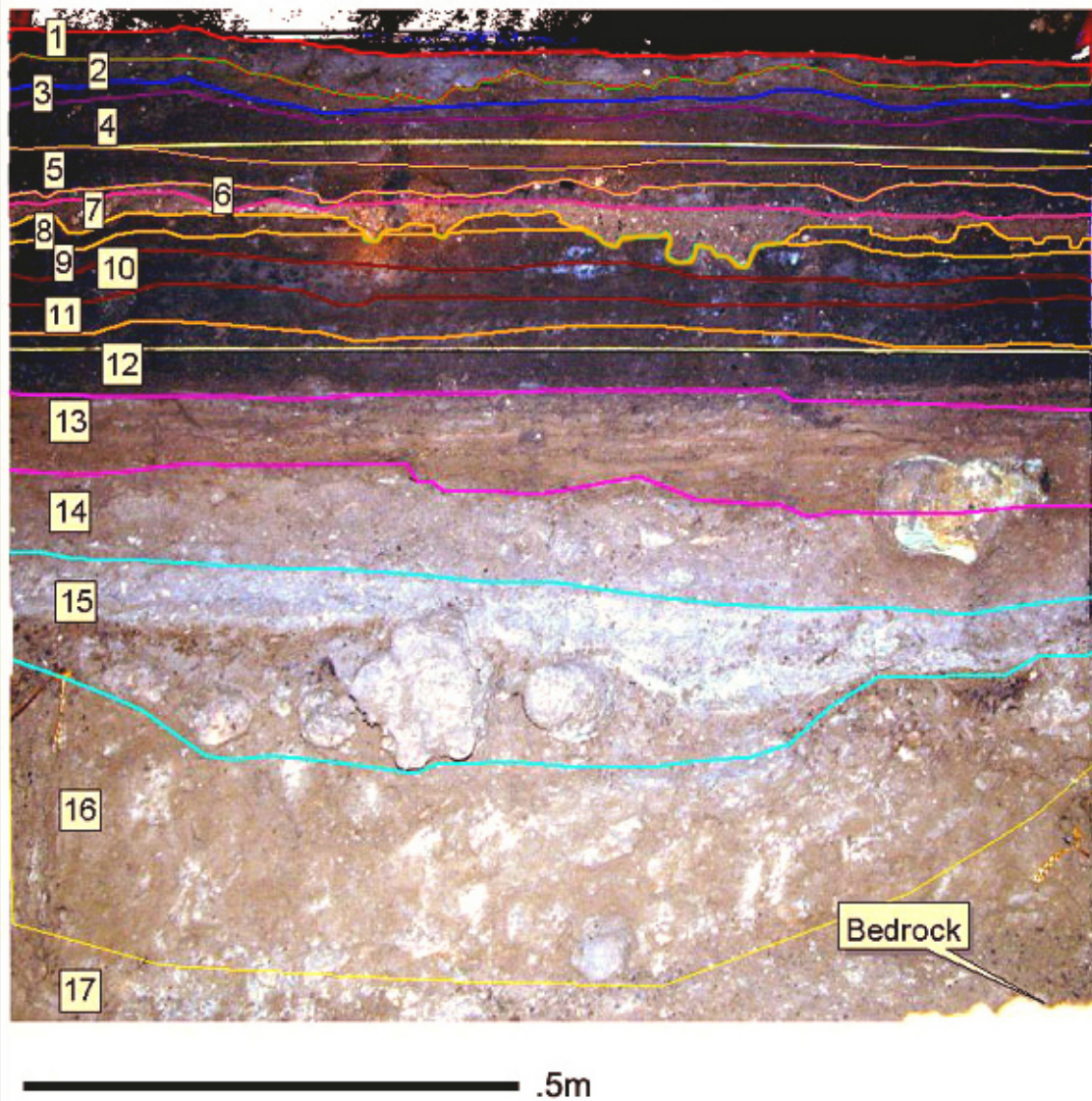


Figure 5-5. Photograph of Unit C6 of north wall profile illustrating excavated 17 excavated layers.

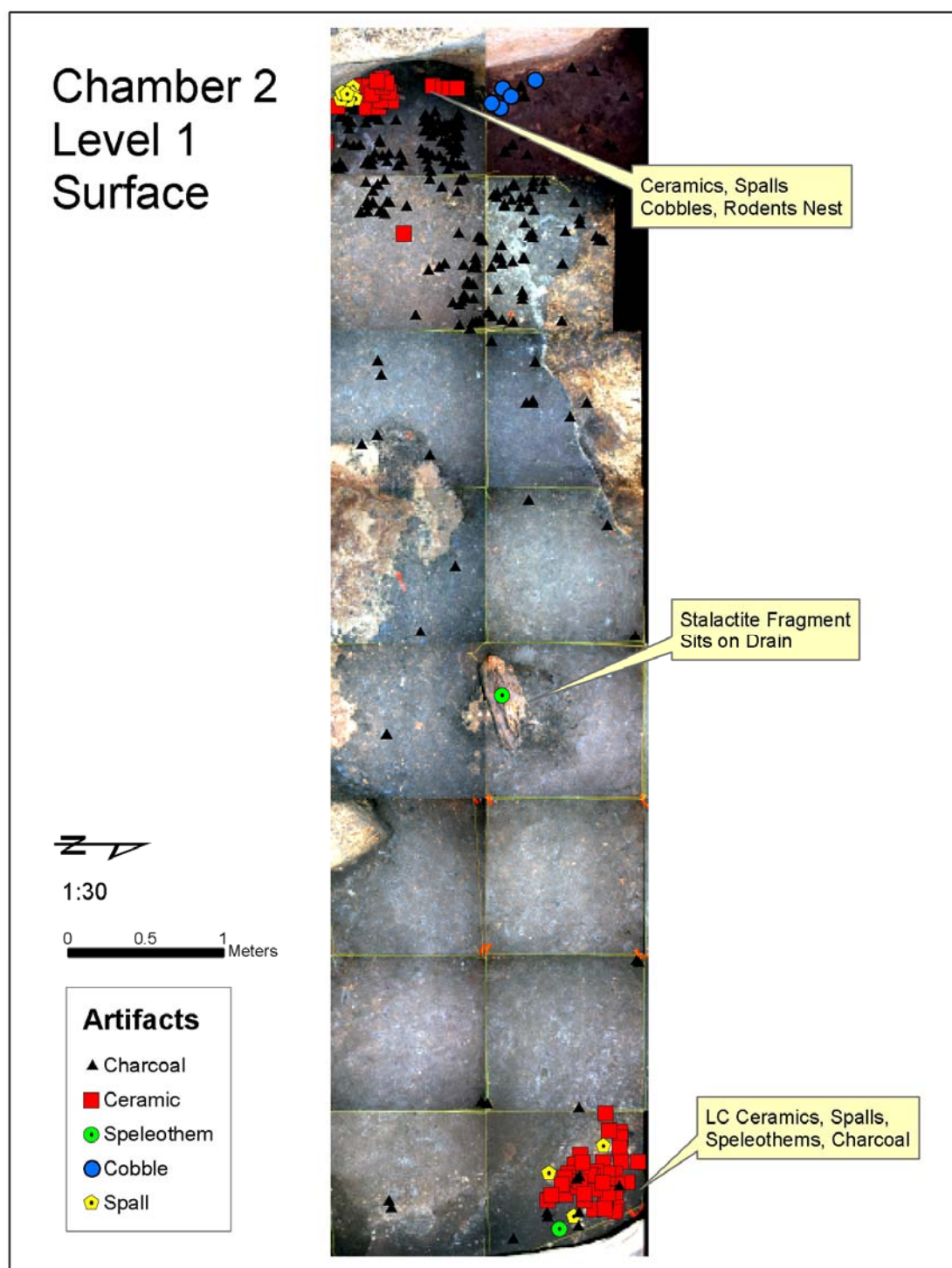


Figure 5-6. Photomap of Chamber 2, Level 1.



Figure 5-7. Level one was heavily compacted and could be easily separated from Level 2.

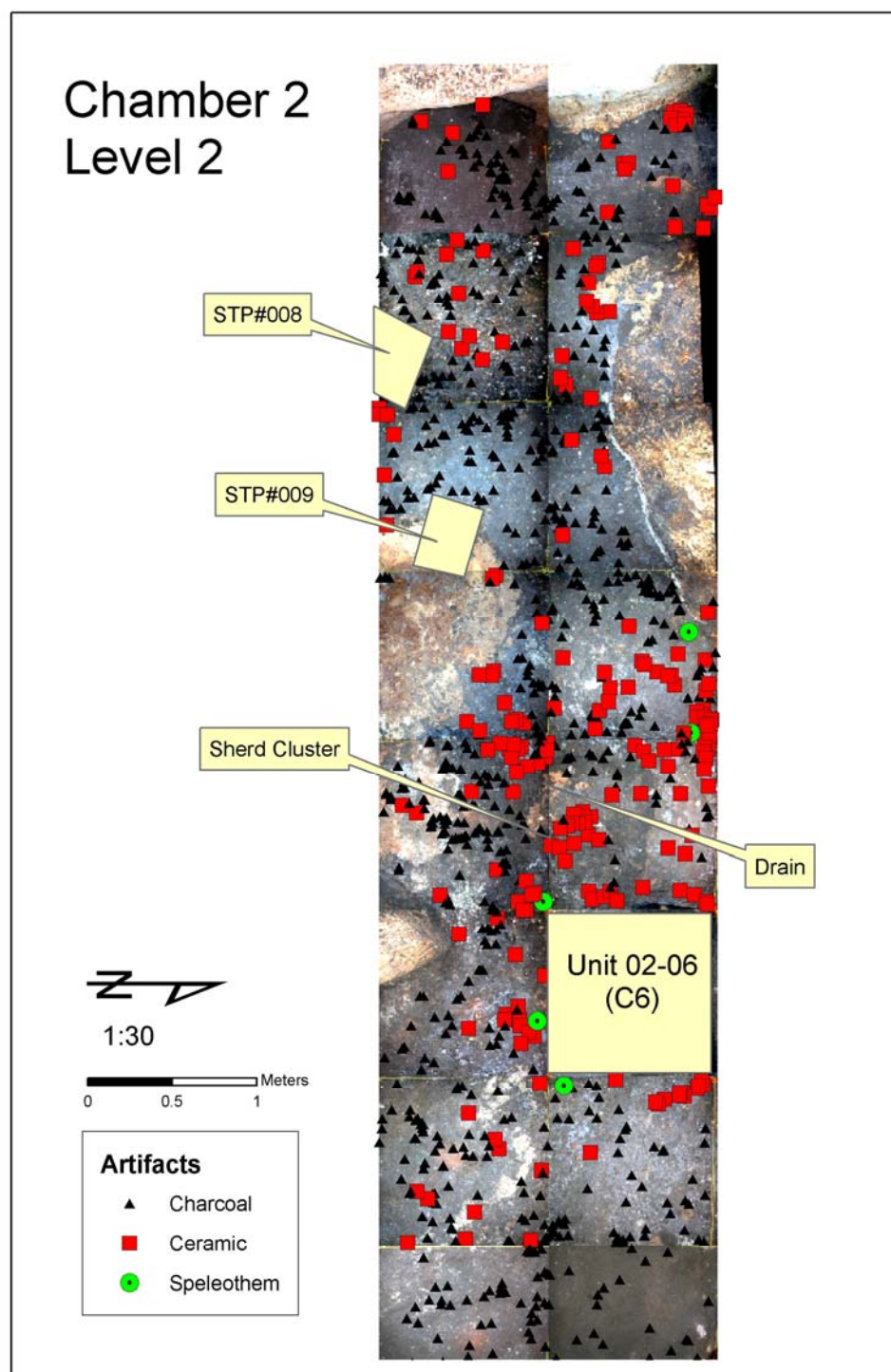


Figure 5-8. Photomap of Level 2. Note sherd clusters surrounding drainage.

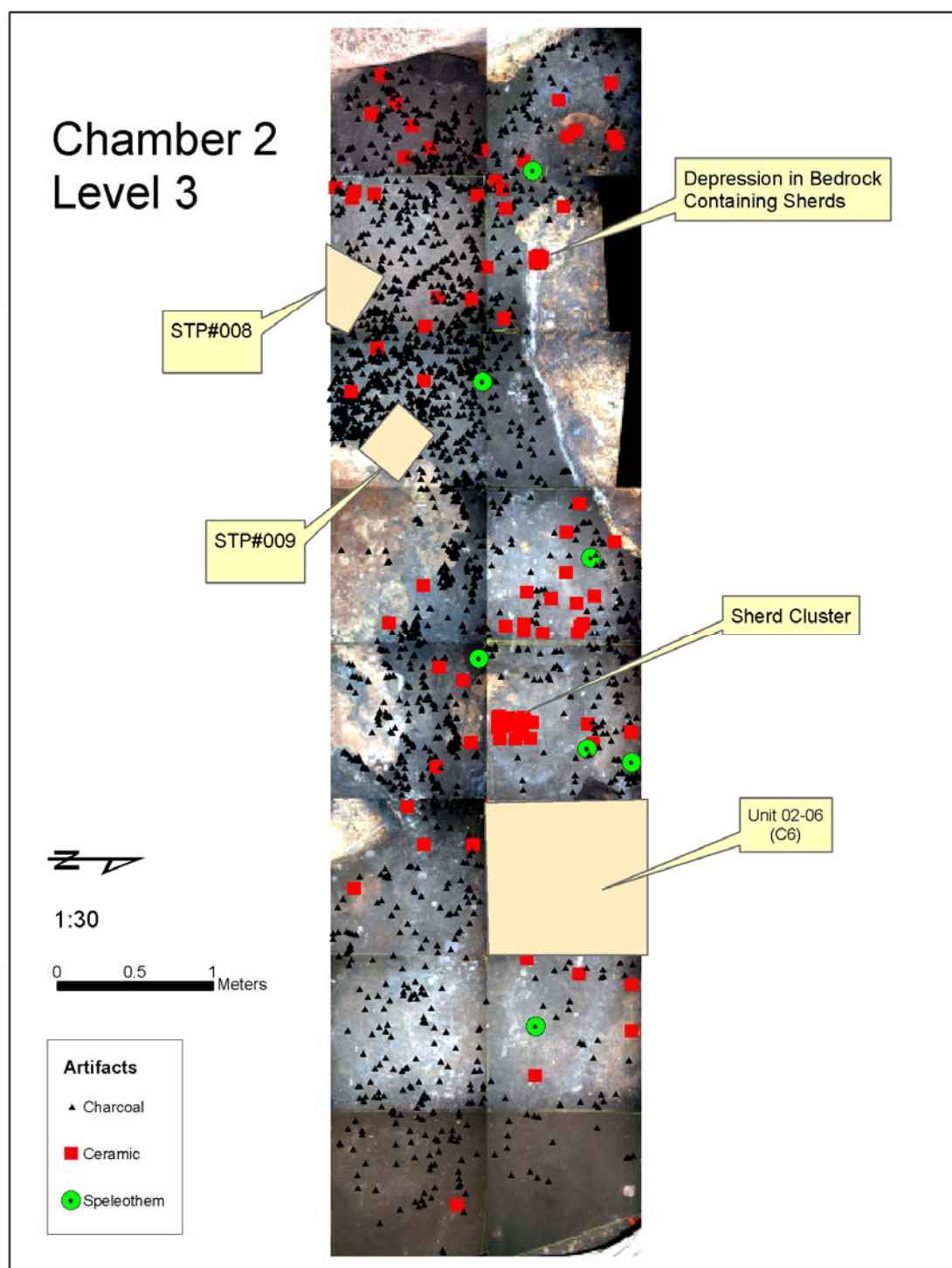


Figure 5-9. Photomap of Level 3. Sherd clusters located on west side of drainage pit and in depression in bedrock in Unit C2.

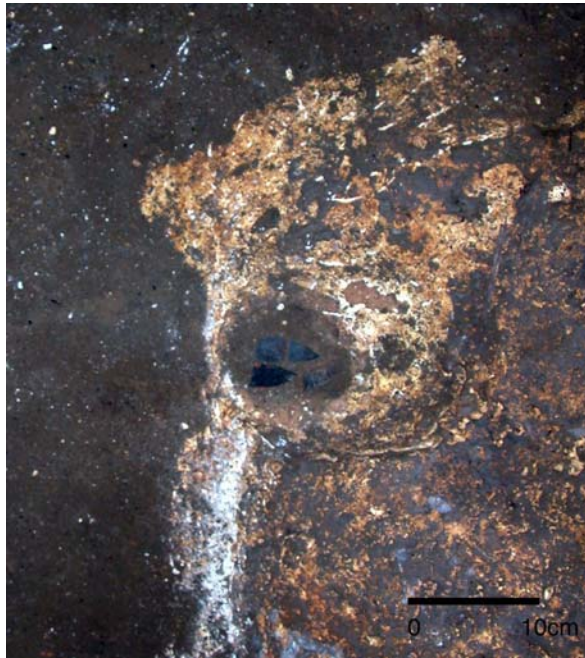


Figure 5-10. Level 3 feature. Sherds were placed in a depression in the bedrock of the cave.

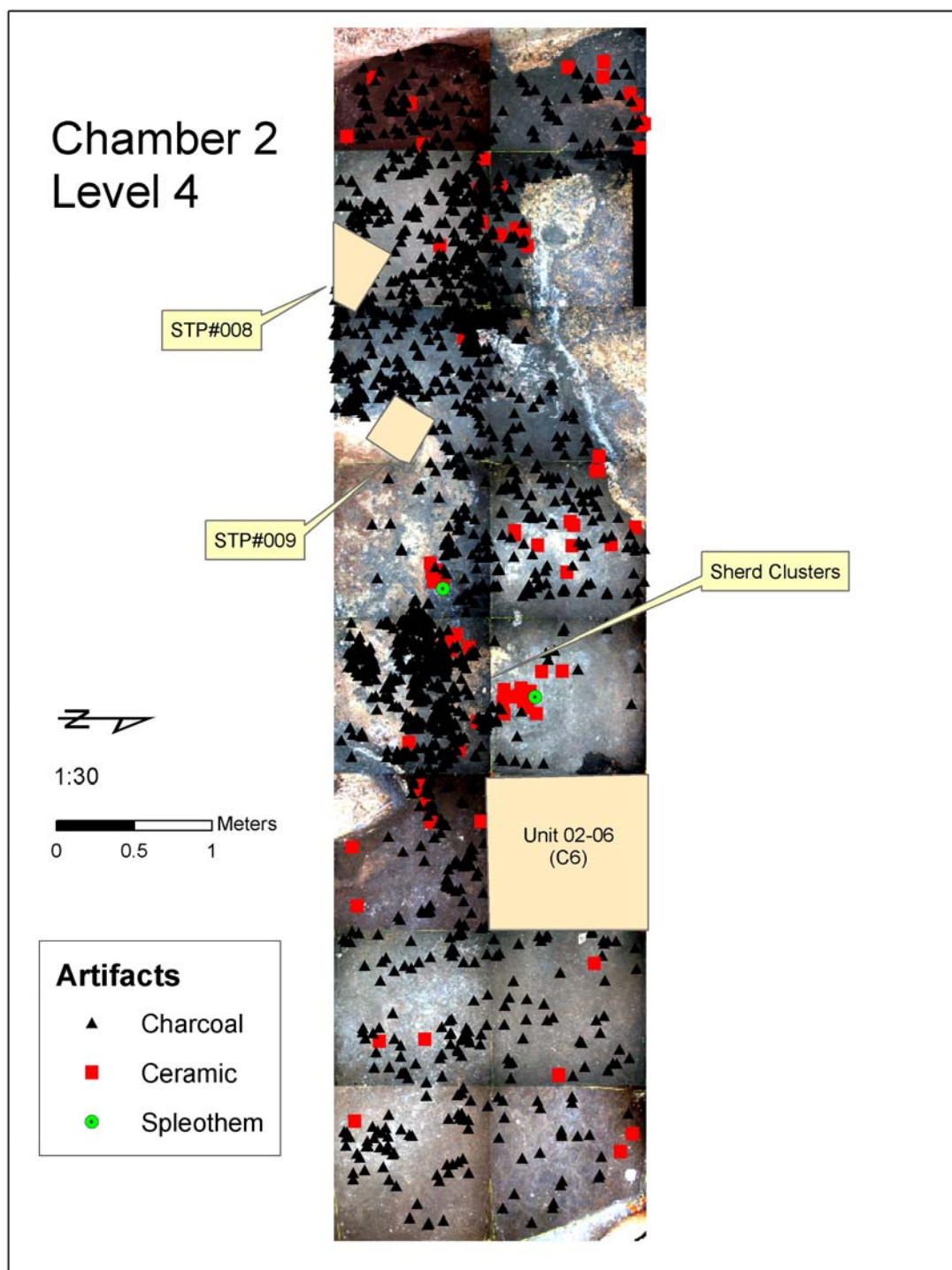


Figure 5-11. Photomap of Level 4. Note sherd cluster on the west side of the drainage pit.

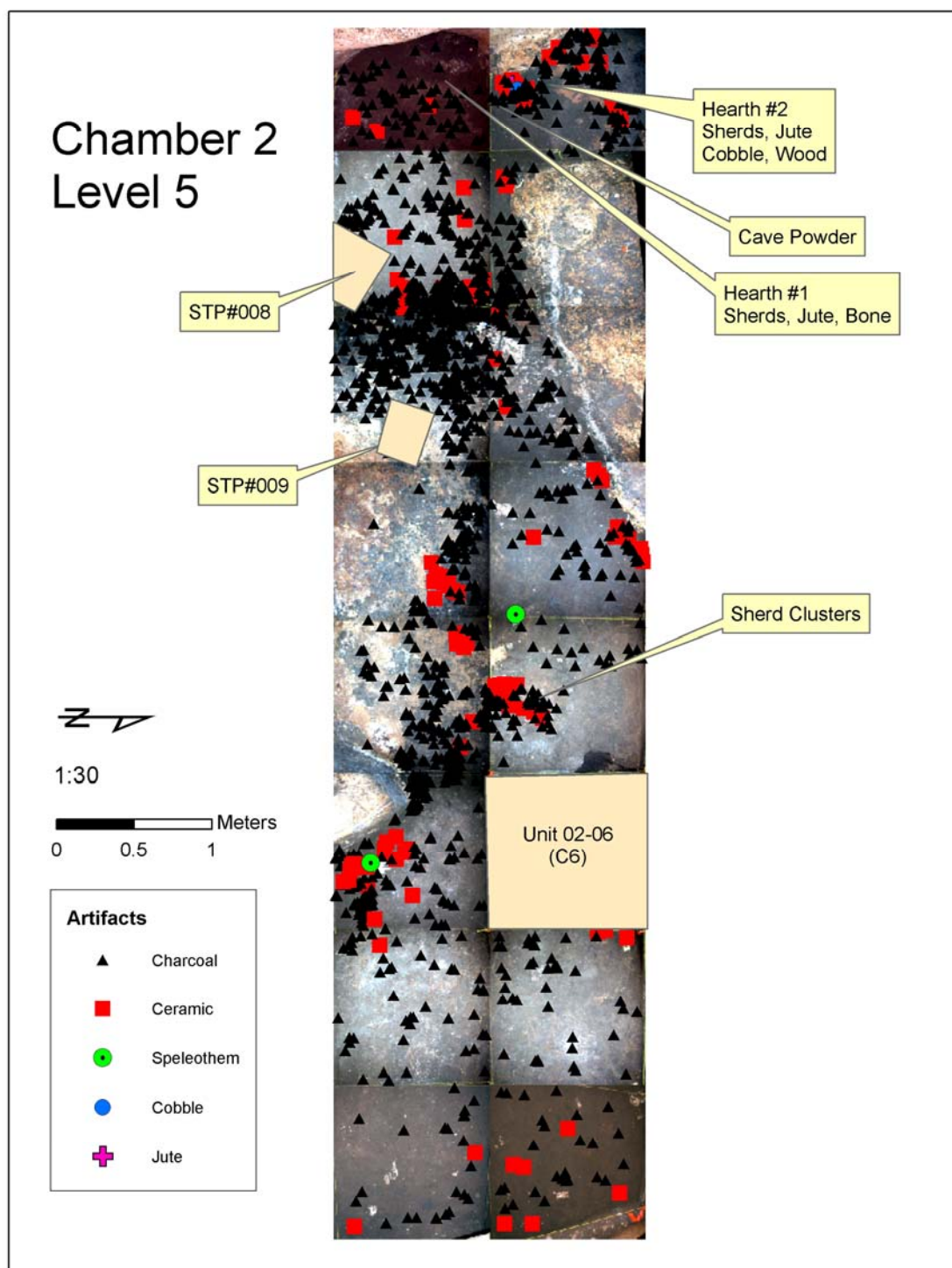


Figure 5-12. Photomap of Level 5.

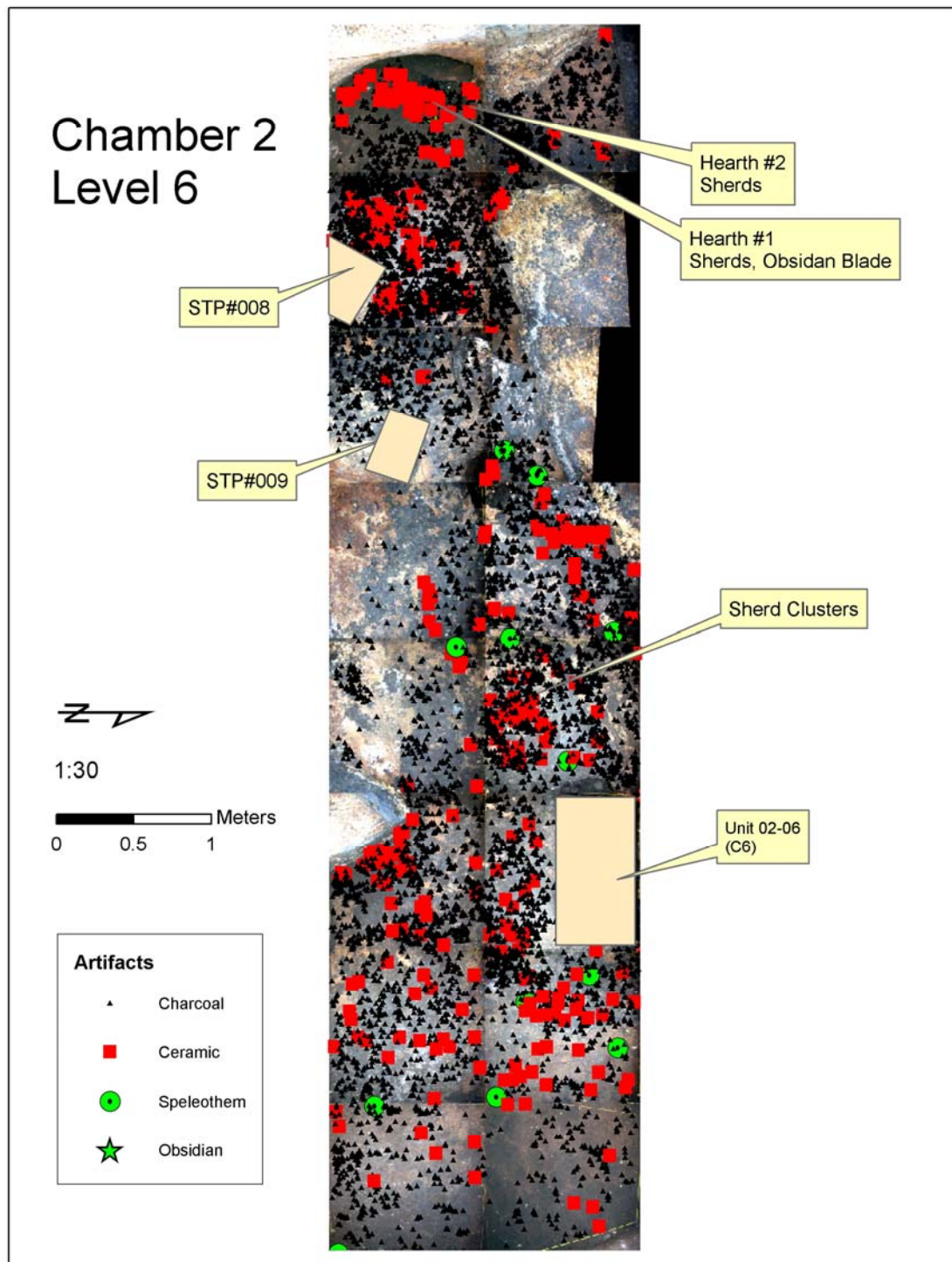


Figure 5-13. Photomap of Level 6.

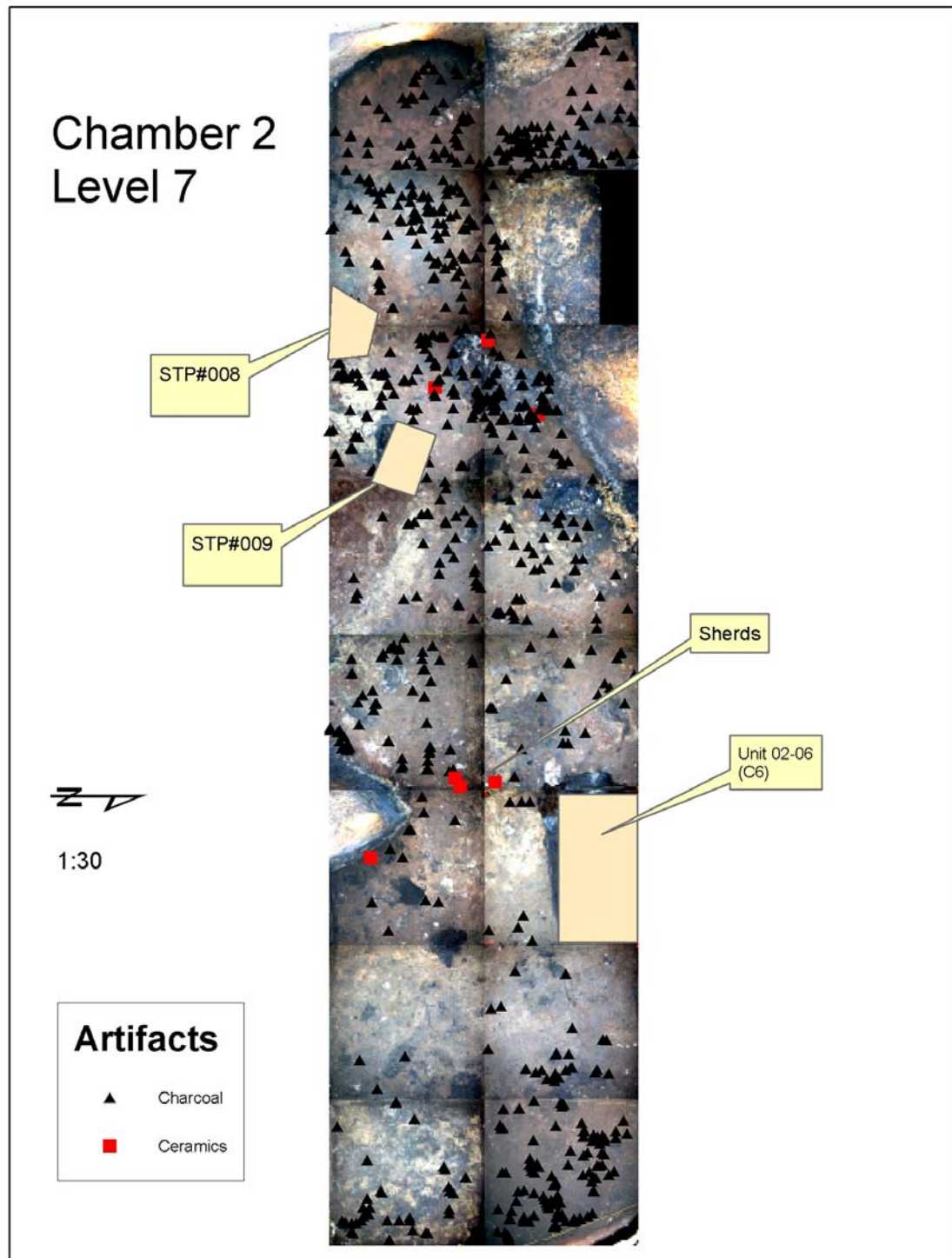


Figure 5-14. Photomap of Level 7.

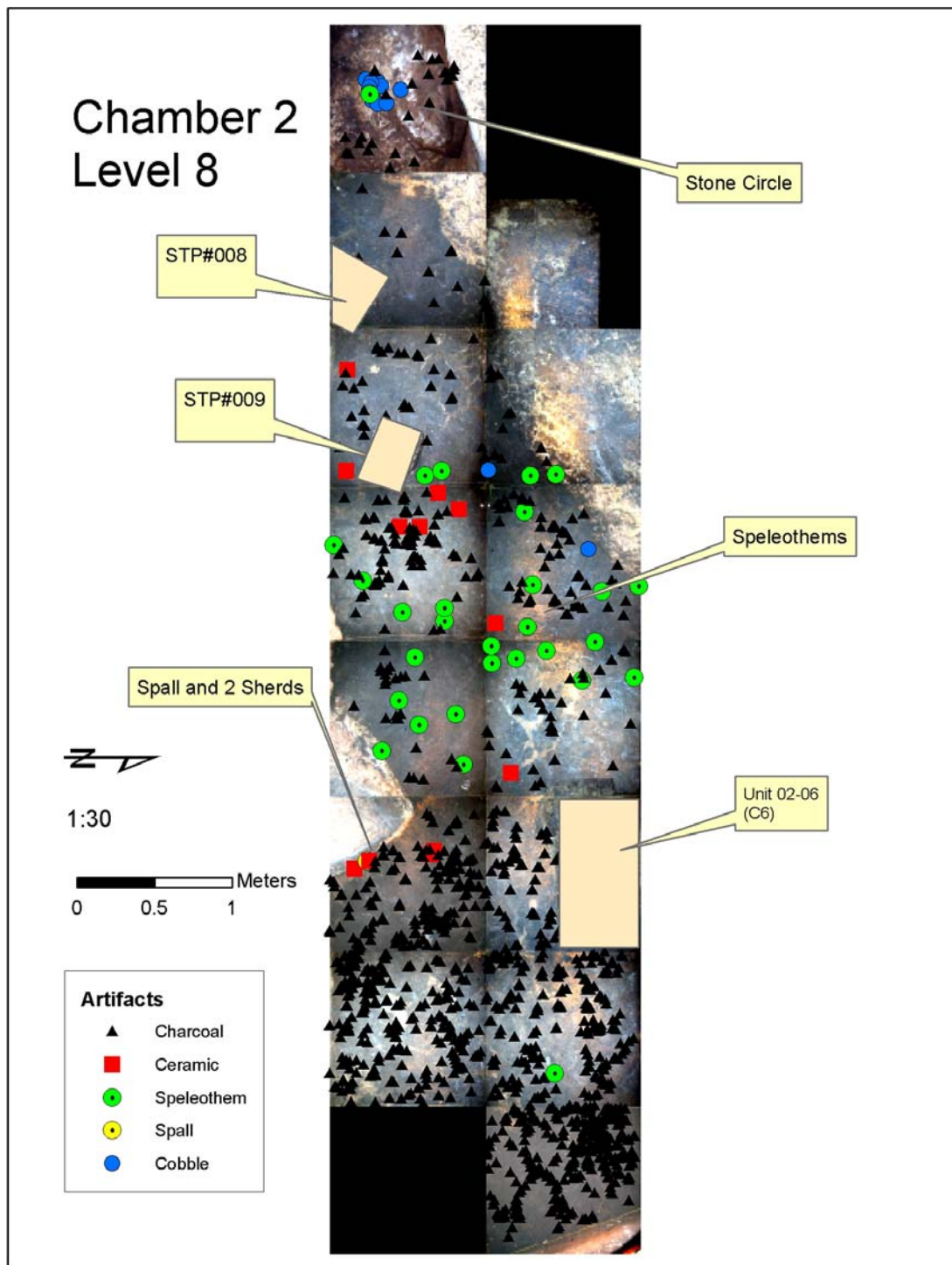


Figure 5-15. Photomap of Level 8. Note distribution of speleothems in level. Stone circle is adjacent to west wall and also contains a stalactite fragment. Spall and two ceramic sherds were stuck vertically into the sediment in Unit B6.



Figure 5-16. Photo of Level 8, Unit C7 illustrating sediment patterning of the use-surface.

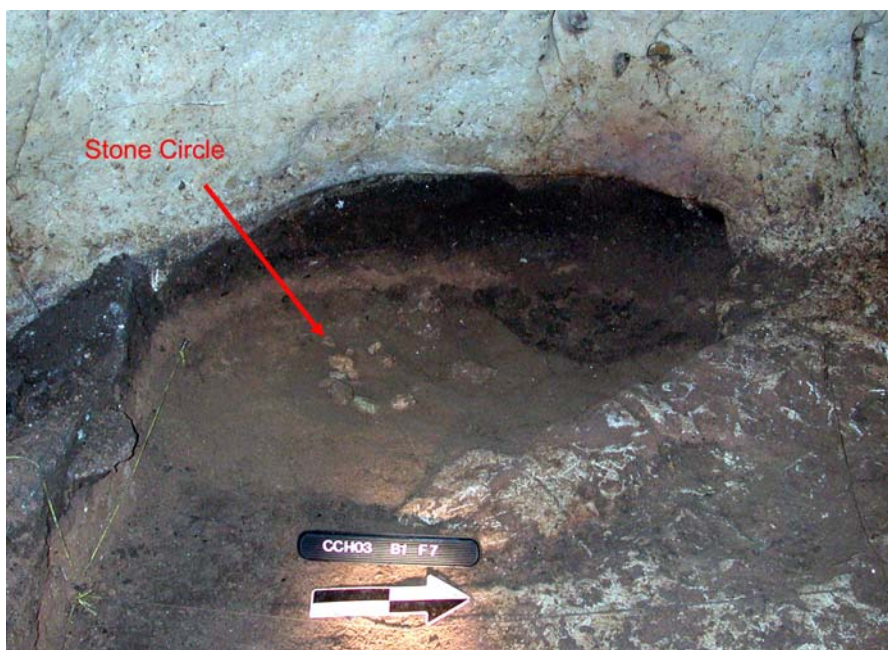


Figure 5-17. Photo of Level 8, Unit B1 stone circle.

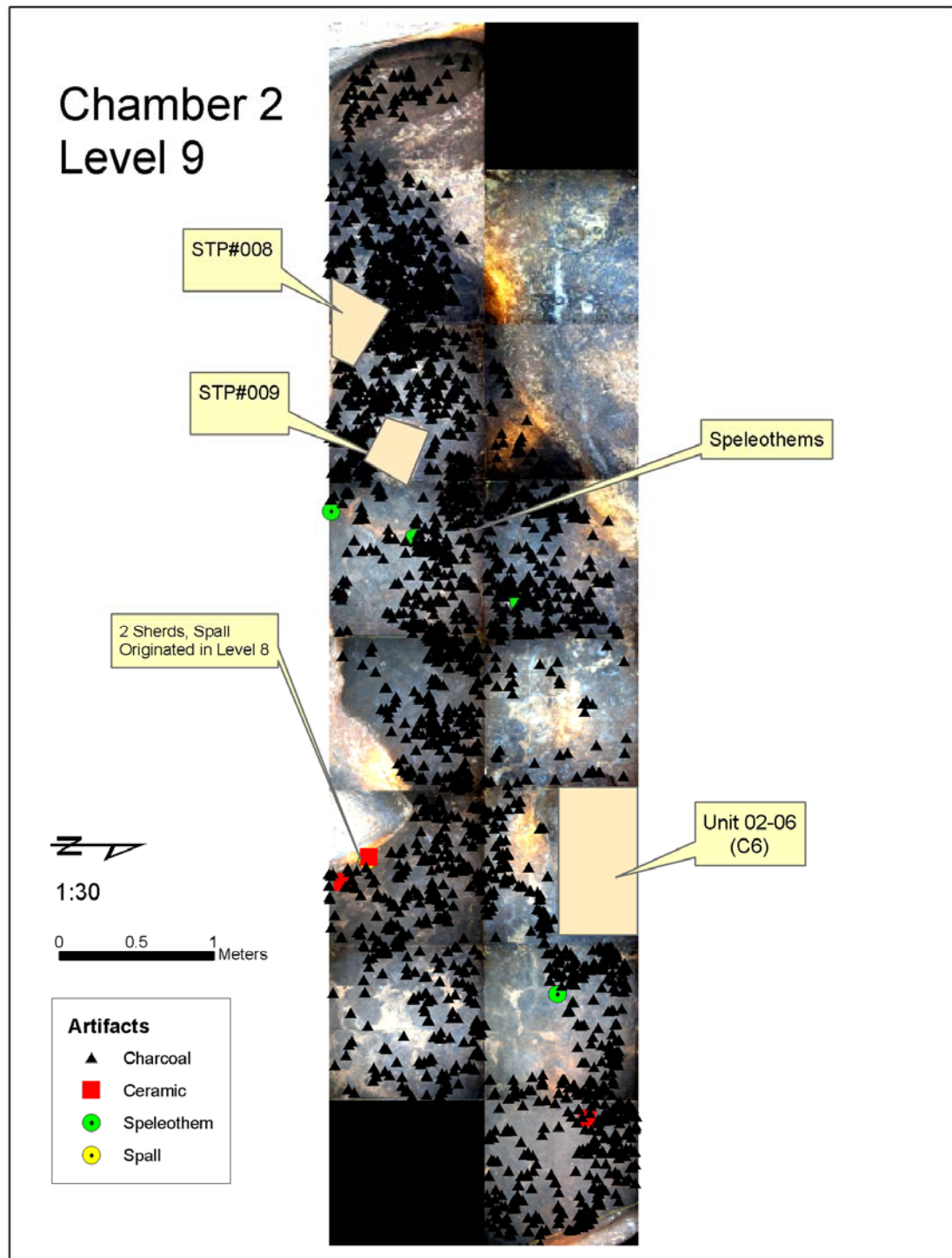


Figure 5-18. Photomap of Level 9.

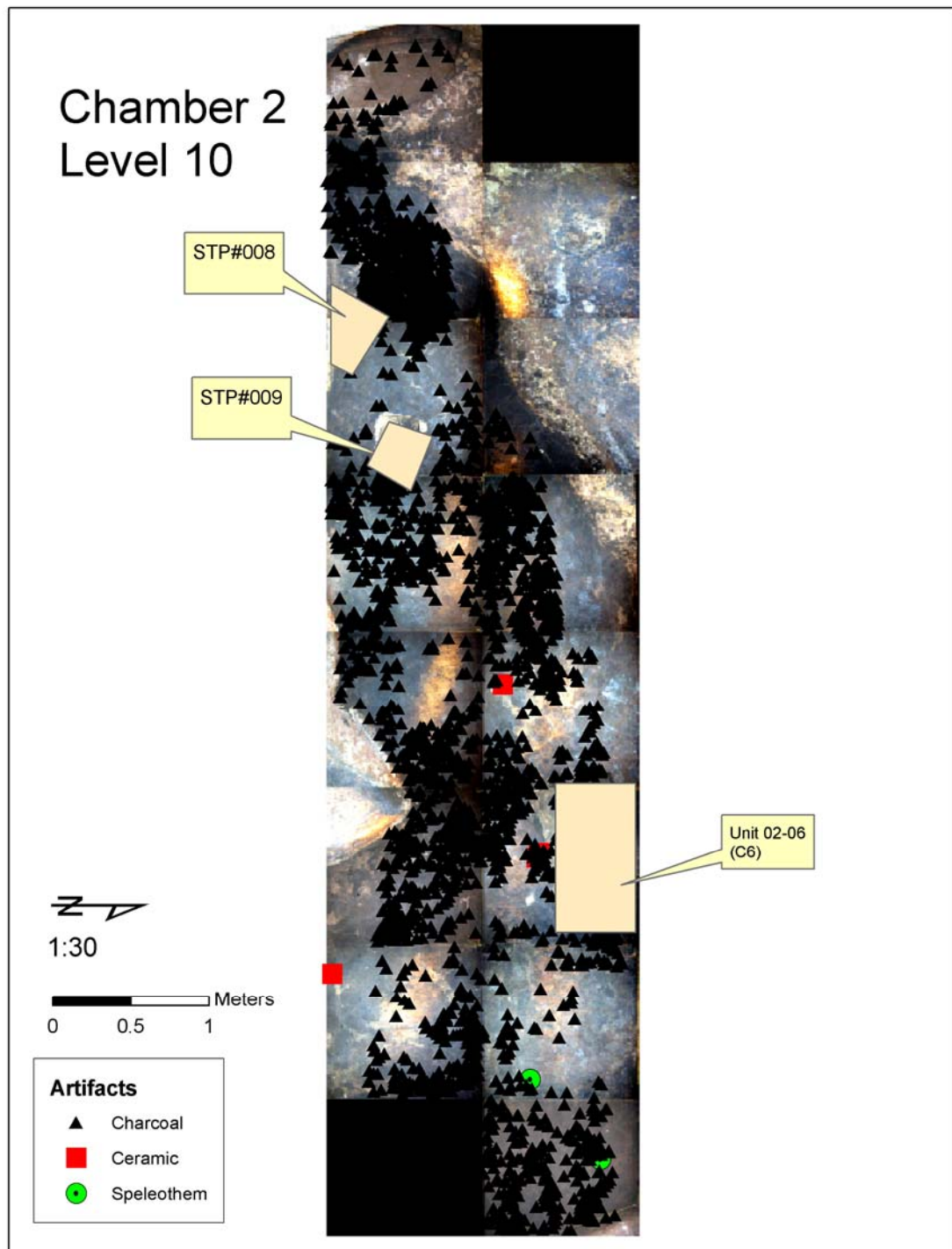


Figure 5-19. Photomap of Level 10.

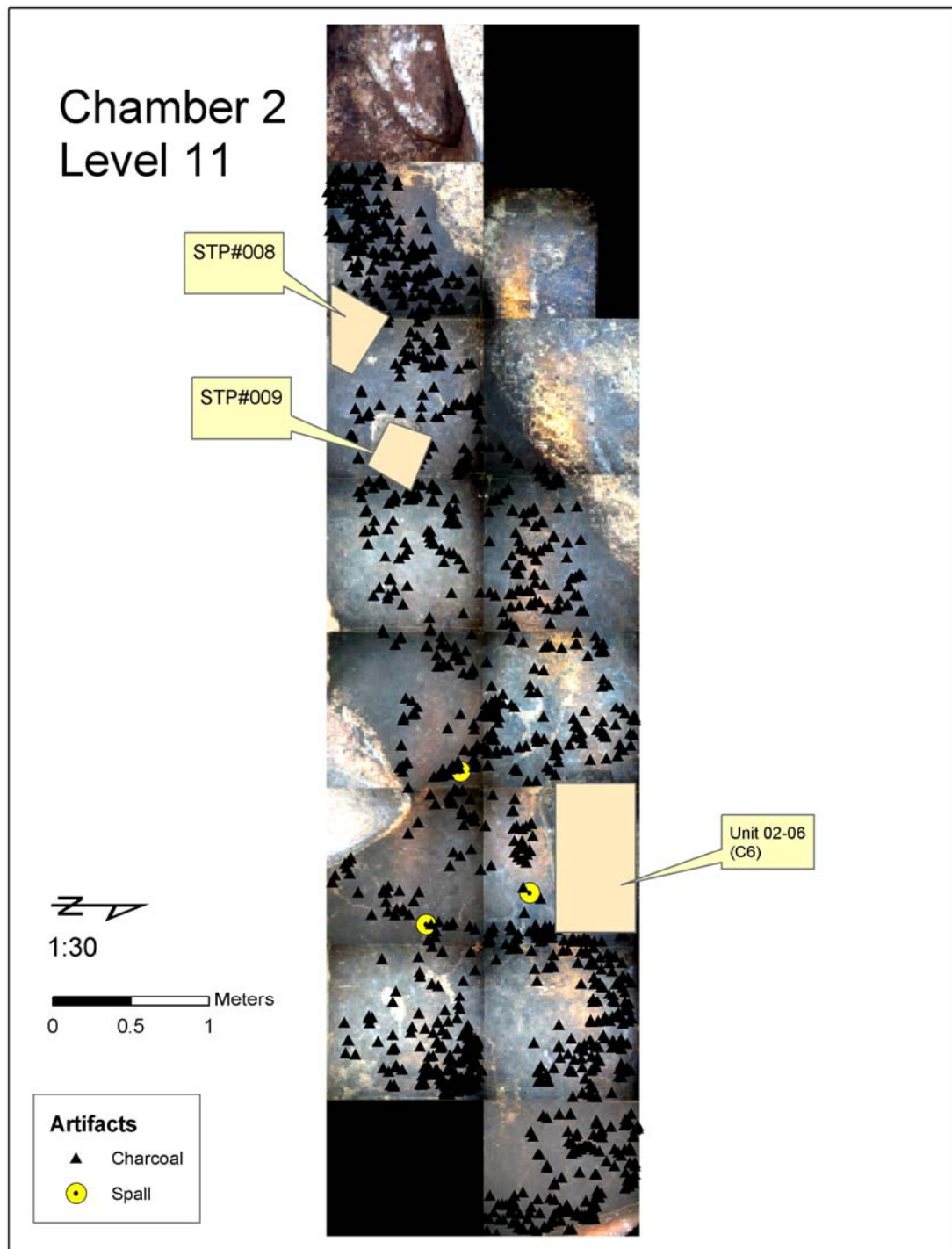


Figure 5-20. Photomap Level 11. Note that cave walls slope inward and excavation area decreases.

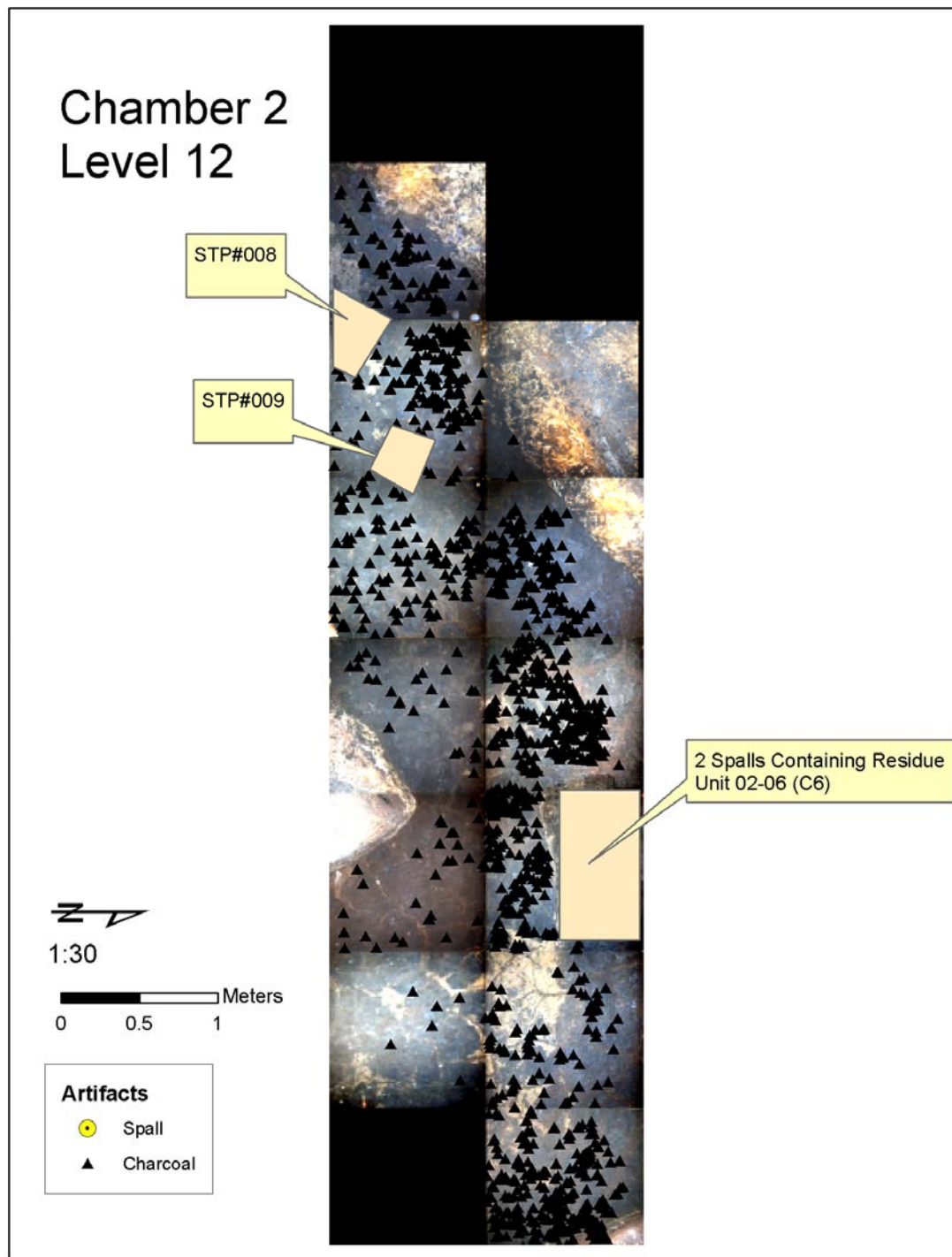


Figure 5-21. Photomap Level 12. Spalls containing residue found in northwest quadrants of 2002 Unit 02-06.

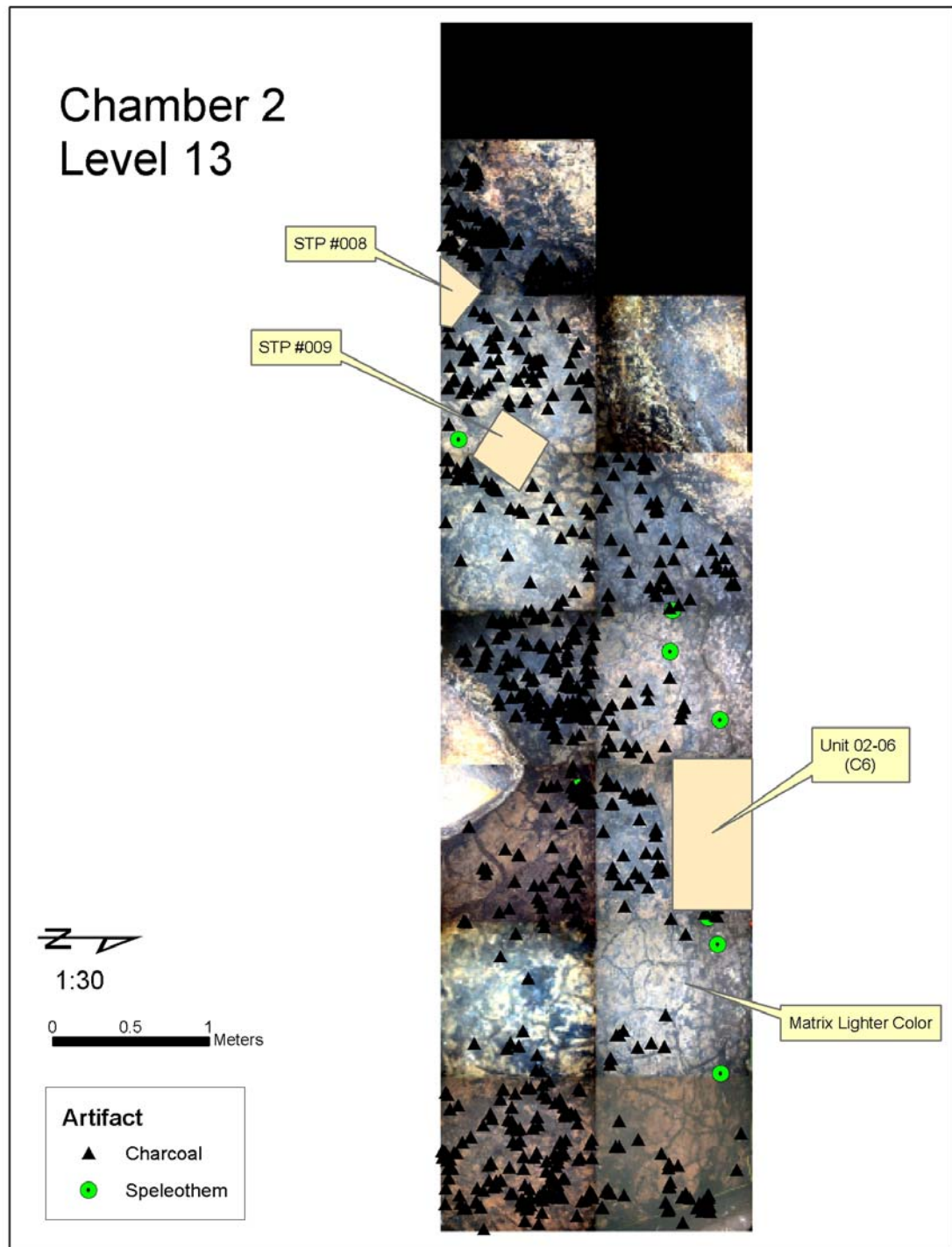


Figure 5-22. Level 13 photomap.

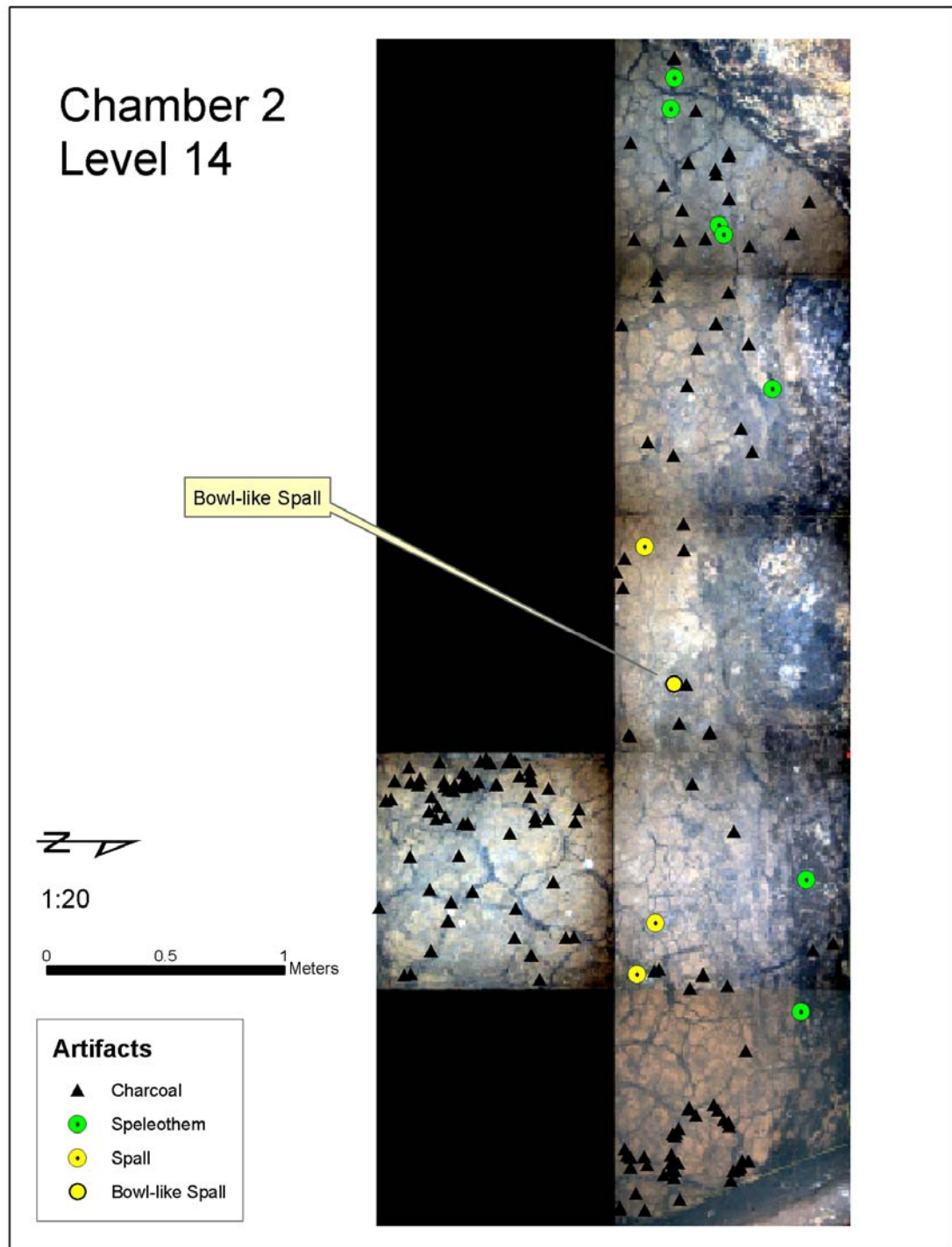


Figure 5-23. Level 14 photomap.

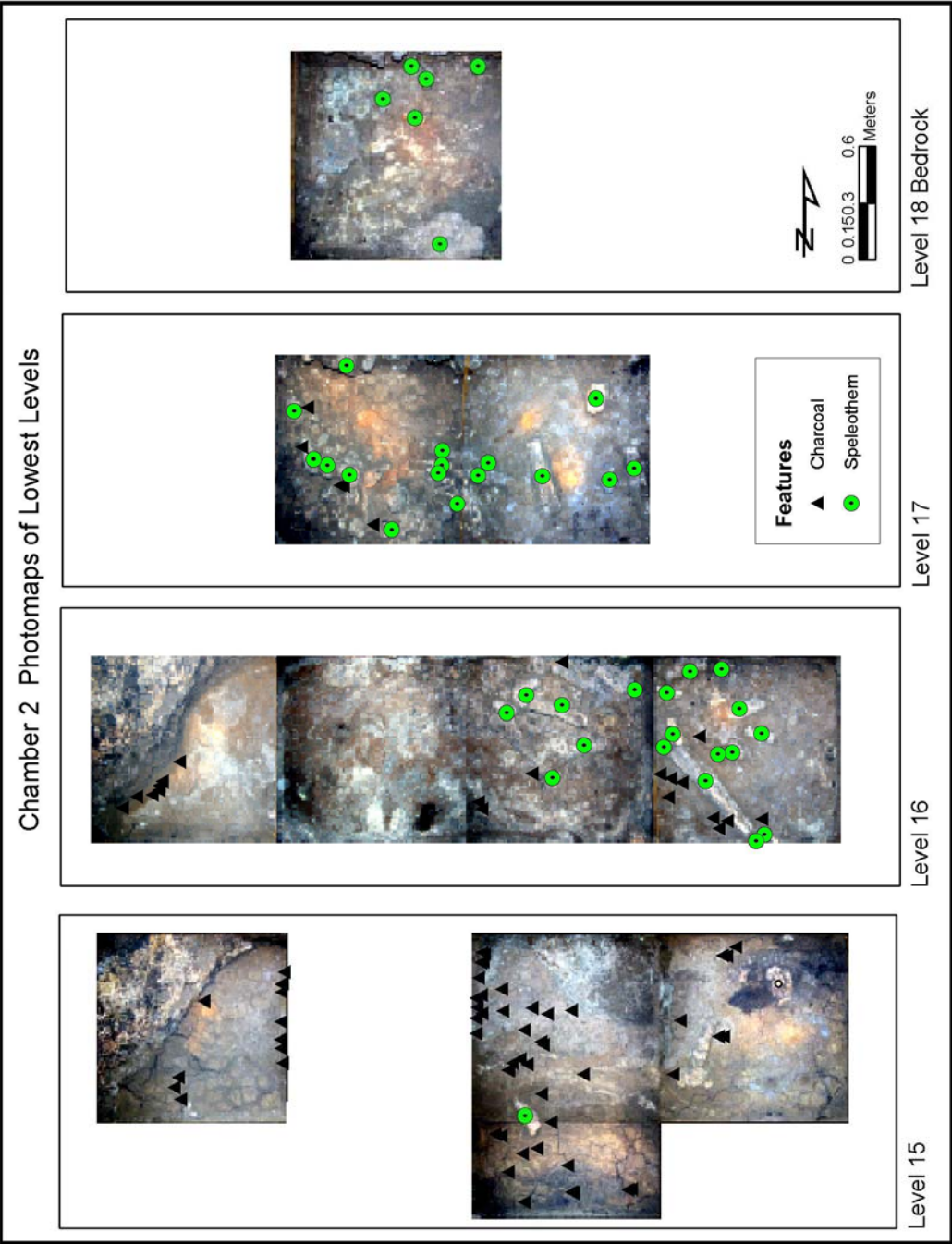


Figure 5-24. Photomaps of Levels 15-18.

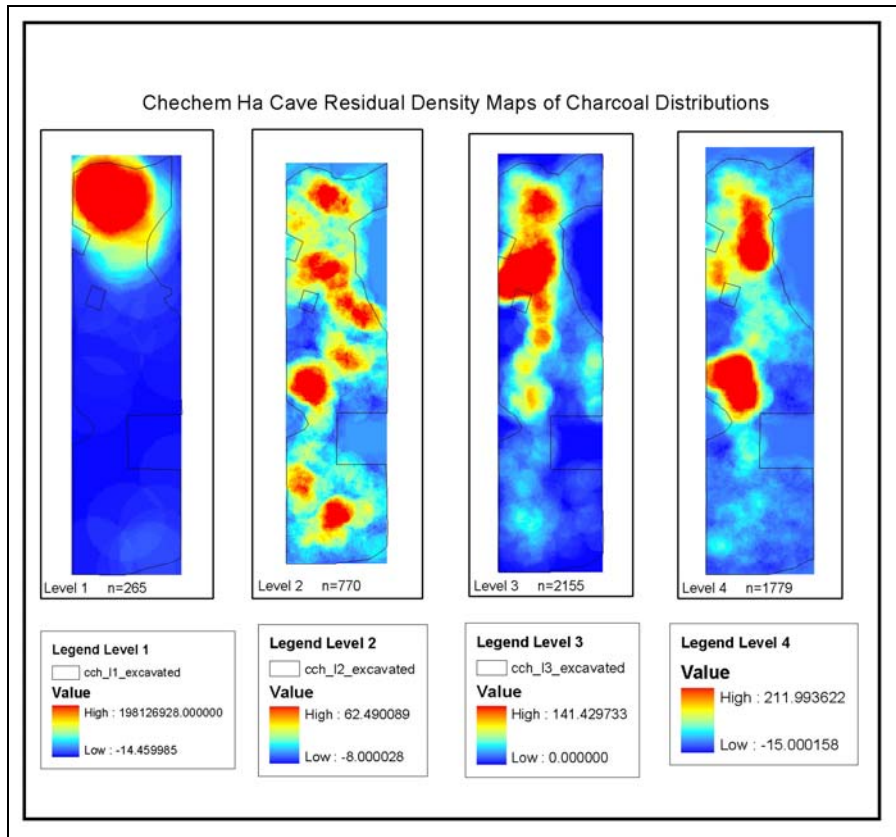


Figure 5-25. Residual density maps of charcoal distributions Levels 1-4.

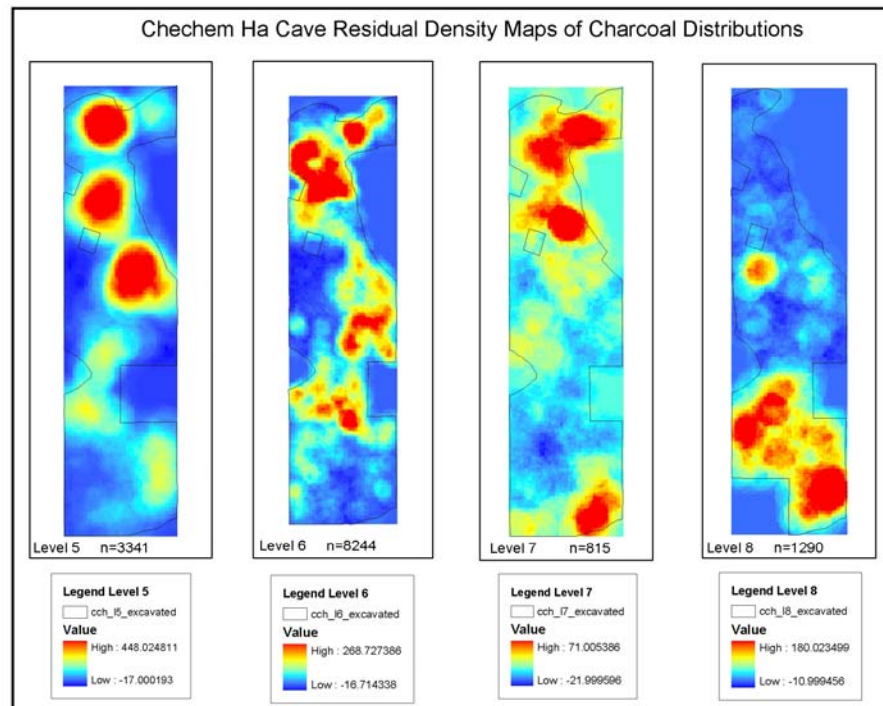


Figure 5-26. Residual density maps of charcoal distributions Levels 5-8.

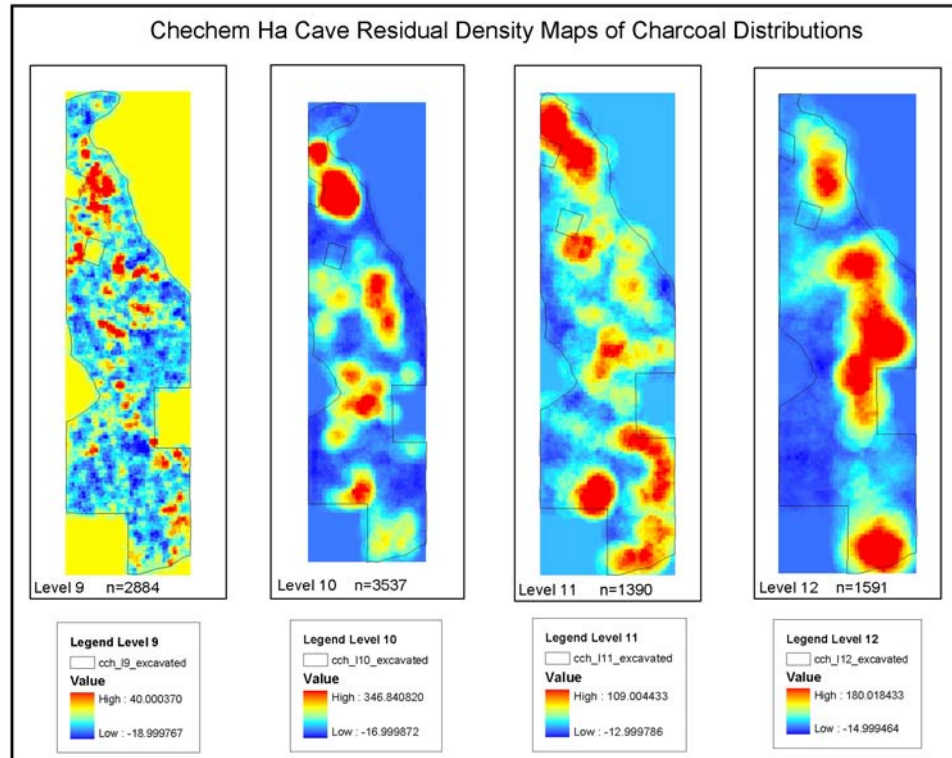


Figure 5-27. Residual density maps of charcoal distributions Levels 9-12.

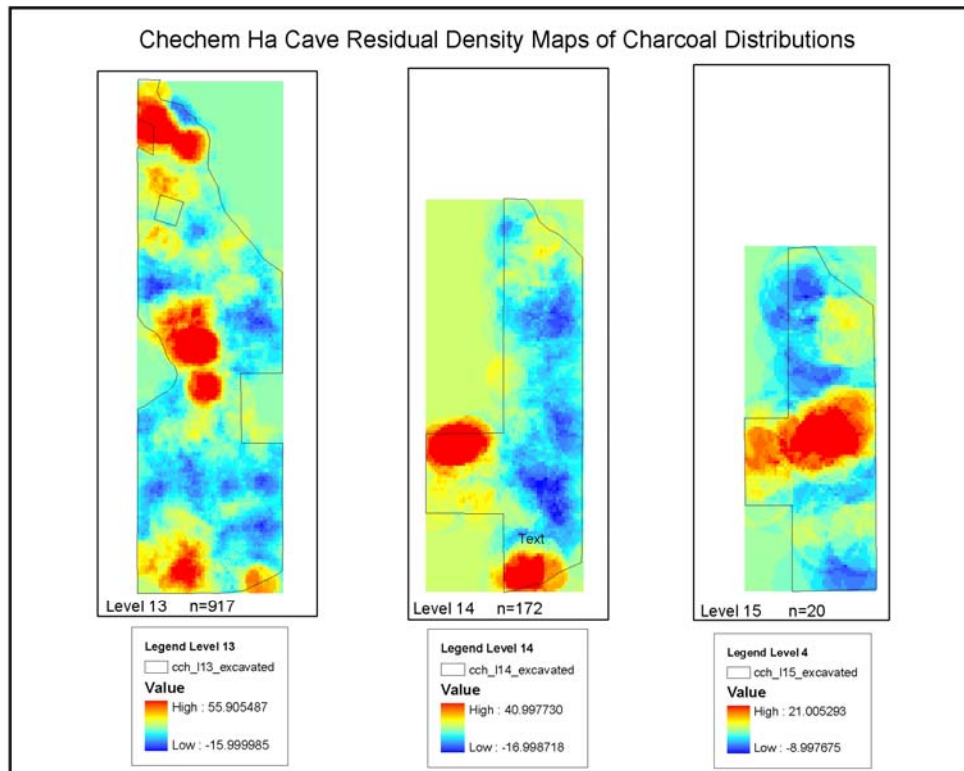


Figure 5-28. Residual density maps of charcoal distributions Levels 13-15.

Chechem Ha Cave- Chamber 2
North Wall Profile Unit C6



_____ .5m

Figure 5-29. Compiled chronology of AMS dates of excavated sediments from Chamber 2.

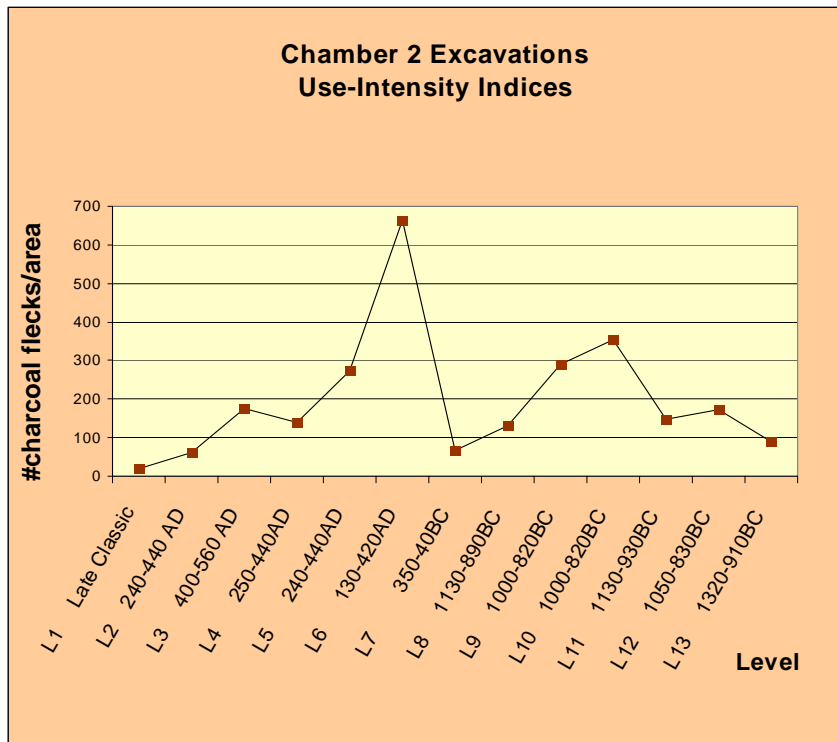


Figure 5-30. Graph of *use-intensity* index shows numbers of charcoal flecks per excavated level divided by surface area of excavated space.

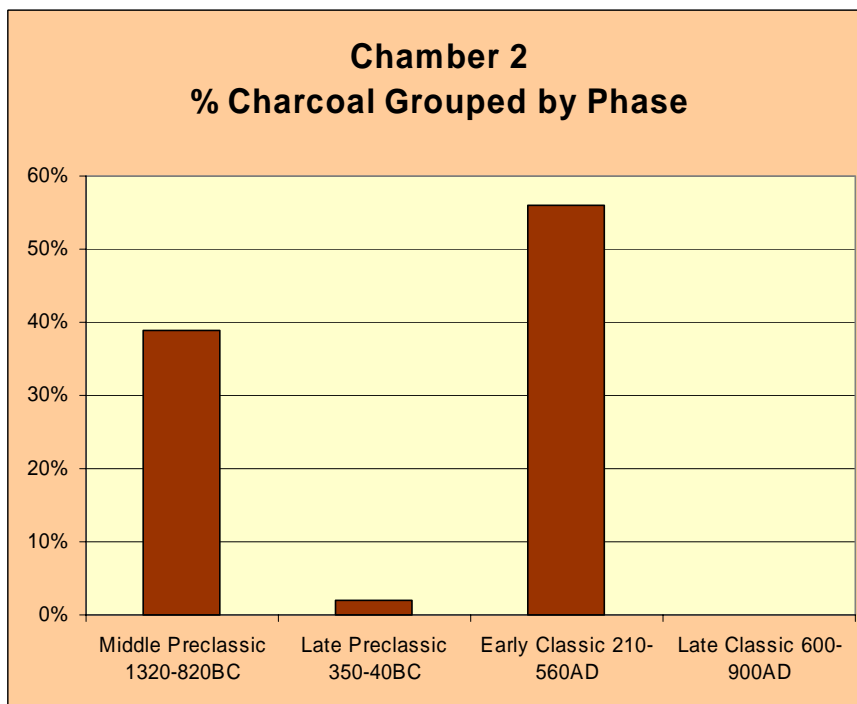


Figure 5-31. Compiled *use-intensity* data grouped by phase.

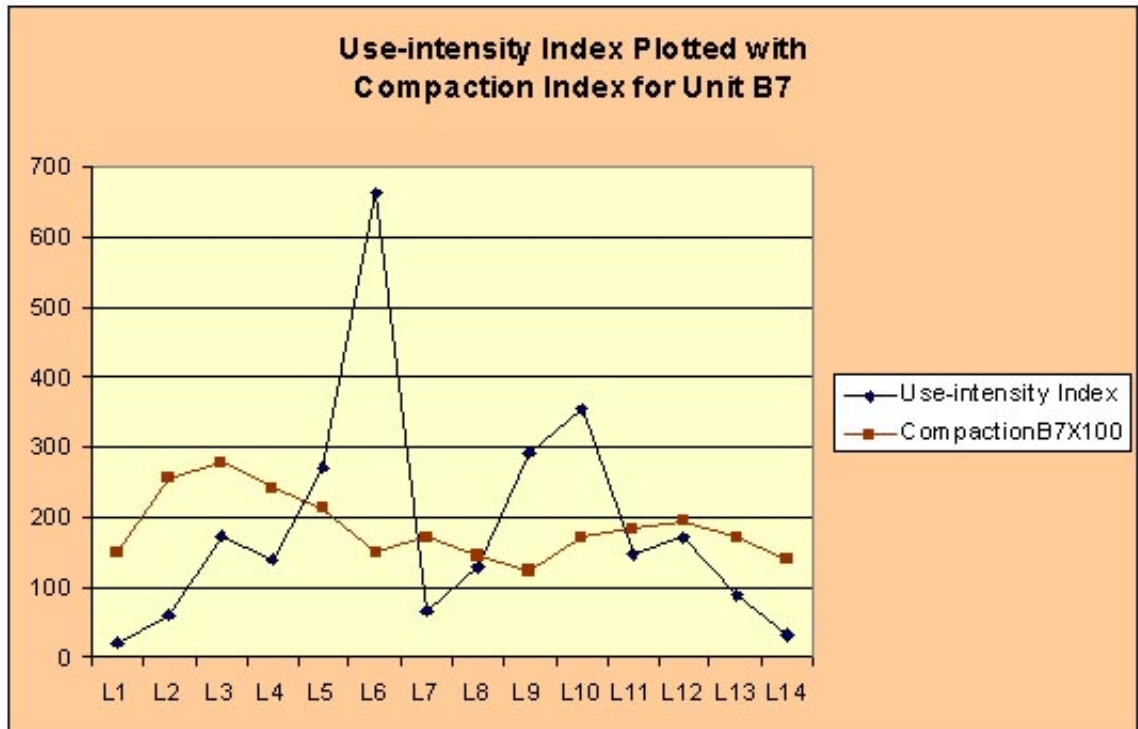


Figure 5-32. Comparison by level of *use-intensity* index with compaction index of Unit B7 (multiplied by 100).

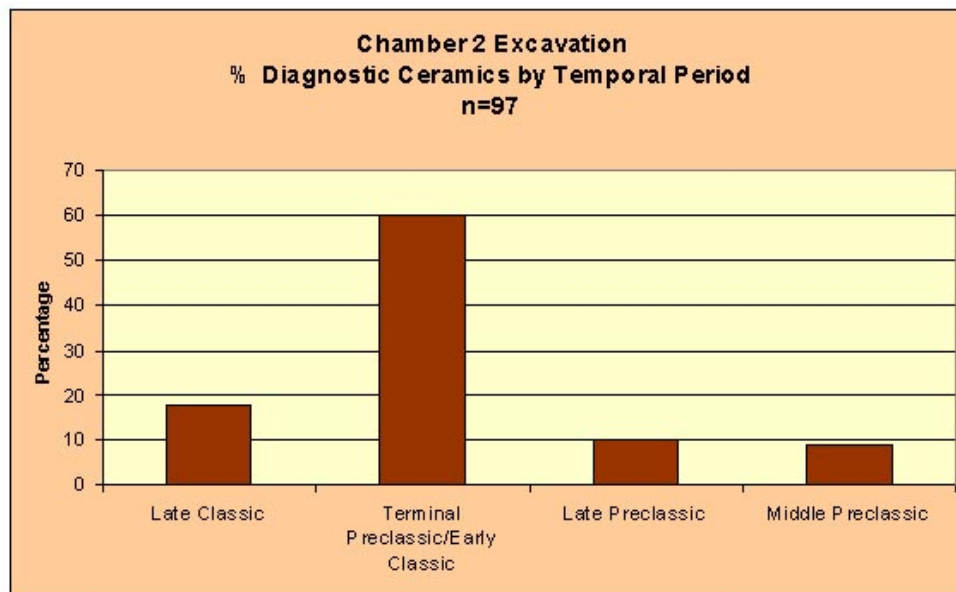


Figure 5-33. Chart illustrating the number of diagnostic ceramics per temporal period recovered from the Chamber 2 excavation.

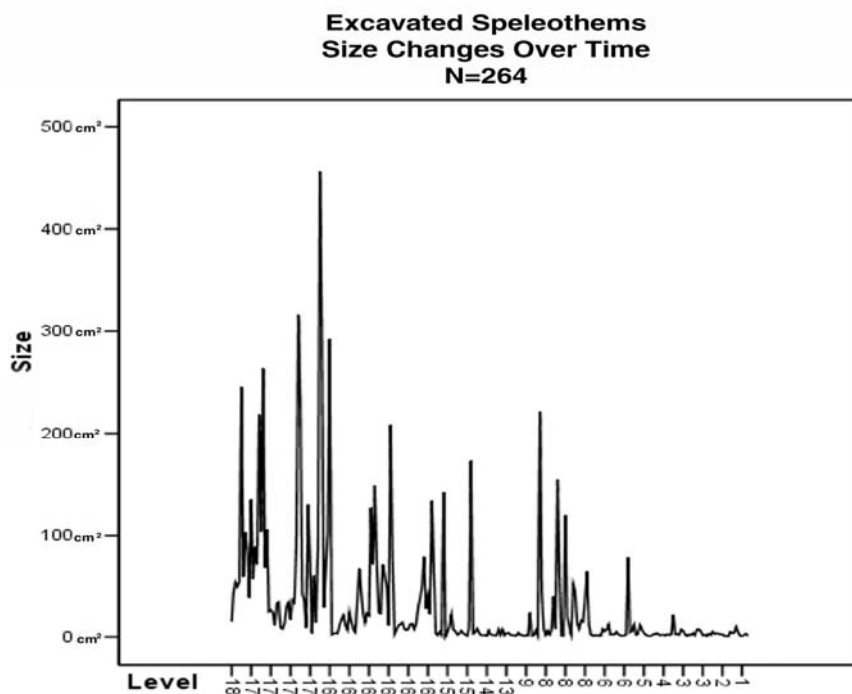


Figure 5-34. Chart shows size of excavated speleothems moving from Level 18 (oldest) to Level 1 (youngest) on the right. Note the trend of decreasing size over time.

Chapter 6

Site Formation Processes: Sediment Analyses

6.1. Introduction

Caves have often been referred to as "sediment traps" in the literature meaning that accumulation of sediment exceeds erosion (Collcutt 1979, Farrand 1985:21; Ford and Williams 1989:317; Sherwood and Goldberg 2001:145; Straus 1990:256). This can be an advantage to the archaeologist because in many cases cave sediments are better preserved than those on the surface because they may be protected from weathering and erosion (Farrand 1985:21; Schmid 1958; Woodward and Goldberg 2001:328). In tropical caves, guano-producing bat populations can produce large amounts of sediment. For example, Niah Cave in Borneo is noted for its guano accumulations several meters thick that date to the Neolithic period (Bird 2004). At Chechem Ha, the Chamber 2 sediments are well-stratified and are relatively young in geological time. The base of the 95cm deposit dates to 16,200 B.C although the cave itself may be older.

Although caves can produce good well-stratified sediments, site formation processes may be complicated (Woodward and Goldberg 2001:327; Sherwood and Goldberg 2001; Strauss 1993). Shrinking and swelling clays, slumping, flowstone intrusion, burrowing, hydrology, and other effects may influence the stratigraphic integrity of the deposit. Strata may differ laterally in age and variation rates of deposition can be extreme. Additionally there can be much reworking in hydrologically active areas (Ford and Williams 1989:318).

Conversely, many of the post-depositional formation processes such as tree growth or building collapse that plague archaeologists at surface sites do not typically occur in the dark zones of caves. Although burrowing animals can disrupt cave sediments, light and twilight zones are the areas most affected because many non-cave

dwelling species can live in these partially lit zones. Dark zones, however, support only limited species; therefore extensive burrowing is not expected. Due to the restricted sediment production in deep cave interiors the cave environment potentially protects some artifacts, features, and modifications, and preserves them in their original spatial contexts (Ford 1976).

6.2 Sediment Types

The origins of cave sediments may be either endogenous or exogenous (Ford and Williams 1989:317; Sherwood and Goldberg 2001:148-150; White 1988). Endogenous deposits include clasts of bedrock, travertine or other detritus produced by carbonate weathering as well as autochthonous organically derived minerals. Exogenous deposits may be entrance talus, infiltrates, fluvial deposits, glacial deposits, aeolian deposits (airborne), organic debris, biogenic debris, or anthropogenic processes. Aeolian deposits are usually restricted to the entrances of deep karstic settings such as Chechem Ha.

Woodward and Goldberg (2001) point out that caves may be hydrologically active (humid) or passive (dry) but note that these are two end members that may have many intermediate categories. They propose a number of natural processes that are expected to affect site formation (Table 6-1) and note that the hydrological and chemical setting may change over time. It is important to consider that in horizontal caves such as Chechem Ha, fluvial transport is typically low in velocity and in this case volume and is capable of carrying only small or lightweight material.

6.3 Site Formation at Chechem Ha

The deposits in Chamber 2 are the primary focus of the investigation because these were the deepest, best stratified, and best dated sediments. The goal of the analysis is to compare sediments and the limestone parent material from within the cave to off site (outside) soil samples in order to better understand the origins of the deposits and their temporal variability. This information is vital to understanding the amount of artifact movement and reliability of the results of spatial analyses.

Sediments may be derived from the cave itself, or be introduced into the cave by animals, water-borne deposits, or people. If outside soils are washed into the cave or are carried in by animals or humans, the cave deposits would be expected to be similar to the exterior soils. However, if interior deposits are autogenic they should differ in their composition.

My interest is also to develop models that aid in recognizing anthropogenic sediments when they are present or found in tandem with natural processes. The presence of man-made artifacts such as ceramics or stone tools is not the only indication of the human usage of caves and subtler cues may also suggest a human presence. In order to meet these goals cave sediments are compared to outside soils by describing their color, texture, pH, and geochemistry. By understanding these differences it is possible to make determinations regarding whether or not outside soils are entering the chamber and to determine their modes of transport.

Sherwood and Goldberg (2001:148-149) noted that sedimentation in deep caves is typically low and that there is virtually no continued sedimentation in hydrologically arrested cave passages after the water has abandoned the areas. The sediments in

Chechem Ha are interesting because there has been sedimentation on all areas of the tunnel system floor and some on ledges whether the area was hydrologically active or not. This argues that the sediments were not water-borne deposits. According to the radiocarbon dates from the test pits placed in dry areas such as ledges, many of the deposits are relatively recent, dating to temporal period during which the space was used by the ancient Maya. This suggests that much of the sedimentation was either anthropogenic or derived from animals.

Some deposits in the hydrologically active areas may be water-borne. Chamber 2 is one of the most complicated areas for evaluating the deposits because it is intermittently active during some rainy seasons depending on the forest cover over the cave. Although sedimentation processes in the past may not have been identical to the present, Colcutt (1979:295), referring to quaternary deposits that are much more remote in time than the deposits in Chamber 2, noted that the observation of modern processes are useful for understanding ancient ones. This approach is also advocated by Jefferson Reid (1985) who suggested that out of the myriad of possible processes, general existing conditions can provide guidelines for modeling site formation. Based on field observations there are four probable origins that account for the majority of the cave sediment in Chamber 2: 1) organic deposits such as animal excrements and detritus, 2) anthropogenic processes, 3) water-borne deposits, 4) detritus from weathering, erosion of the cave walls, or autogenic rock. Each of the four types would be expected to leave specific signatures.

6.3.1 Organic Deposits

Bat roosts were noted in Chamber 2 suggesting that bat guano could be a major contributor to the sediment accumulation in the chamber. As noted in Chapter 4, at least one species of bat has been identified by Fiona Reid as *Mimon bennettii* or Golden Bats. They are a carnivorous leaf-nosed species that typically roosts in caves and is often found together with *Carollia perspicillata*, a species that eats fruit and insects. When viewed microscopically, insect parts were present in a small sample of sediment collected from Ledge 4, indicating that there are insectivorous species living in the cave today.

There are two major studies that investigate the geochemistry of guano. George Evelyn Hutchinson (1950) compiled elemental analyses from dozens of bat caves on a global scale that included a number from karstic areas of the Americas and Caribbean. Commercially there was a keen interest in guano as an effective fertilizer which prompted the study. Therefore, Hutchinson's primary interest was the relationship between phosphates and nitrates as well as in the volume of the deposits.

The second major work produced more recently by Ruth Shahack-Gross and her colleagues (2004), consisted of case studies comparing guanoses from four Israeli caves with modern samples. Although the focus of the work was to investigate the conditions leading to the formation of secondary minerals, differences between guanoses from fruit bats vs. insectivorous bats and their diagenic processes were well described.

Hutchinson (1950) made a number of observations regarding the recognition of bat guano deposits that are useful to this study. First he noted that the color of the deposits varied between dark to reddish brown but in deep (older) deposits the color varied from cream to pale brown, was banded, and contained less organic matter. He also

noted that decomposed insectivorous guano turns gray over time.

Hutchinson also described a number of deposits from karstic caves that contained bat bones and sometimes contained extinct species suggesting that bone was well-preserved in the material. This is investigated more fully in Shahack-Gross et al. (2004) who demonstrated that bones may in fact preserve in normally acidic guano deposits when pH levels are buffered by decomposing limestone containing calcium carbonate. This explains why bones would preserve in tropical limestone caves, particularly those that are hydrologically active.

Hutchinson also noted the presence of insect parts such as wing sheaths containing chitin and added that almost all guanos contain small amounts of silicates. This is reiterated by Shahack-Gross et al. (2004:1262) who also characterized insectivorous bat guano as containing chitin and traces of clay (silicate) (Table 6-2). Shahack-Gross et al. observe that insectivorous bat guano is slightly acidic (pH 5.8) but that fruit bat guano is neutral to alkaline (pH 7.7 to 8.0). Fruit bat guano is composed primarily of cellulose and contains small amounts of clay and calcite. They suggest that the calcite is derived from plant oxalates ingested by the bat.

Hutchinson and others (Hill and Forti 1997; Shahack-Gross et al. 2004) observed that guanos are high in phosphates. Fresh fruit bat guano from Israel had a total phosphate content of between 5.1%-7.7% by weight whereas insectivorous bat guano was 25%-57% by weight (Shahack et al. 2004:1262) (See Table 6-2). This major difference is attributed to diet. The protein in insects is richer in phosphorous than is the glucose in fruits.

As guano degrades phosphates increase as nitrogen decreases. Leaching by water exacerbates this process. Lower nitrogen levels together with high phosphate percentages suggest leaching by water because in calcitic soils, especially those that are high pH, phosphorus is fixed in the soil (Brady and Weil 2002:608-609). Over time phosphorus undergoes sequential reactions that produce phosphorus-containing compounds of lower and lower solubility. Therefore in aged sediments the solubility of phosphorus compounds tends to be extremely low. Alternatively, nitrogen is easily leached from soils (Ibid: 546-553). The breakdown of organic residues and manures produce ammonia gas (NH_3), which is in equilibrium with ammonium ions (NH_4) in solution. Particularly in high alkaline and calcareous soils, drying of soils converts the NH_4 to the NH_3 gas, which is released thus leaching nitrogen from the soil. This observation agrees well with Shahack-Gross et al. (2004:1266) who demonstrate that between two insectivorous bat caves in Israel, among similar guanos, the phosphate content of the hydrologically active cave is higher than that of the dry cave because the guano decomposes at a more rapid rate.

Although Hutchinson accumulated numerous examples of this process, the Puerto Rican cave guanos were the most thoroughly sampled. Based on these data he extrapolated a general model of the aging process (1950:385-388) (Figure 6-1). The Puerto Rican examples clearly demonstrated an inverse relationship between total phosphate and total nitrogen levels over time (Table 6-3). Hutchinson postulated that material in caves containing very little nitrogen and phosphorus was highly contaminated with cave earth of inorganic origin. If there were high phosphate levels and low nitrogen content the deposit was likely to be decomposed or leached guano, and if there was a

lower phosphate and higher nitrogen content it was likely to be relatively un-decomposed and uncontaminated (Ibid:386). My own sample of fresh guano agrees with these findings. Phosphates to nitrogen by weight are close to a 1:1 ratio (See Appendix V).

One of Hutchinson's (1950:461) most useful observations was that guano produced by insectivorous bat populations had a high copper content. Some examples from Malaysia cited by Hutchinson were as high as 0.34% to 0.4%. He did not offer explanations regarding the origins of the copper but noted that although the phenomena was "curious" it was reported frequently enough to eliminate its occurrence as methodological error.

Analysis of a comparative sample of fresh bat guano from Actun Chapat, a nearby cave site had a very high copper content of 210ppm as opposed to surface soils that contained between 20-40ppm. The sample also exhibited a high total P of just over 5% and a very high N of 5% by weight indicating that the guano was not well-decomposed. The Ca content was also high at 14.7% as opposed to surface soils that do not rise above 2.6%. Silicates were low but present at 10%. These values all agree well with other observations of guano content and behavior.

In sum, based on geochemical studies of guano deposits, these types of sediments in caves would be expected to have higher phosphate, higher nitrogen and higher copper values than outside soils. It would also be expected that small amounts of silicates could be present though these values should be much smaller as compared to outside soils. Silicates and calcium from guano could be completely masked by other processes that introduce these elements such as, in case of silicates, the tracking in of sands or mud, and in the case of calcium, the disintegration or sloughing of limestone cave walls or floors.

6.3.2 Anthropogenic Deposits

Aside from man-made or modified objects, one of the most reliable signatures of ancient anthropogenic deposits in the dark zones of Mesoamerican caves is the presence of charcoal. The archaeological record is clear that wood torches were the sole source of light for these ancient people (see Chapter 3 for a thorough discussion). Not only does charcoal suggest the presence or absence of human use, but the amount of charcoal within an area suggests its intensity. Greater amounts suggest either 1) a greater number of people in an area, 2) greater frequency of visitation, or 3) that people stayed in an area for a longer period of time. Although charcoal alone may indicate human usage, its co-presence in association with other artifact classes strengthens the case.

It is possible, but unlikely, that natural charcoal from forest fires could wash into Chechem Ha as far back as the Chamber 2 area. If so, there should be indications of that process. Firstly, if the charcoal were to be carried via the water channels originating in Chamber 1, we would expect accumulations of flecks in the area of the drainage in Chamber 2 where sediments would filter the charcoal as the water drained out. We would also expect to see size sorting along the path from the channel to the drain. In Chapter 5 maps of charcoal distributions indicate that this is not the case in the Maya levels. Level 15 was the only one to directly show charcoal density around the drain. What this suggests is that the cave's hydrology may have changed since the entrance to the cave was first modified, which would be as early as the Middle Preclassic period (about 1000 B.C.).

Additionally, if the cave contained background charcoal from forest fires, we would not expect to find sterile levels in the cave deposits. The test pitting program

conducted throughout the cave system demonstrated that sterile levels were present in almost every shovel test pit excavated in the Tunnel 1 floors. Although there was some charcoal present in the lowest levels (L15-L17) of the Chamber 2 excavations, the number of flecks was very low (between 1 and 20). This suggests that even if this is natural background charcoal the amounts entering the chamber were quantitatively insignificant in the analysis of the Maya levels.

Although there was a recent forest fire in 2001 and we know that water currently enters Chamber 2 from Chamber 1, there are no areas of charcoal deposition surrounding the drainage in the center of the chamber today. This is hardly surprising when we consider the possibility of natural charcoal making its way over the boulders at the cave entrance, being picked up by a low velocity stream in Chamber 1 and transported 134m into Chamber 2.

The other possible signature of human use would be the presence of sand, which is typically comprised of silica, iron, and aluminum. Silicates are not ordinarily heavily represented in limestone caves but are well-represented in tropical surface soils. This would be true of the local area where the bedrock of the Maya Mountains is comprised of sandstones and conglomerates (Bateson and Hall 1977:3; Donnelly et al. 1990).

Color is another factor in identifying anthropogenic deposits though it is best to consider color along with other lines of evidence. The dark brown color of most of the layers that dated to the Maya era suggested that these were anthropogenic sediments caused by activities within the chamber. However, though guano is usually a reddish brown it can also be dark brown in color.

6.3.3 Water-born Deposits

Chamber 2 is one of the few hydrologically active areas of the cave (See Chamber 4 for discussion). A depression in the center of the floor of the chamber serves as the drainage for water intermittently entering the cave via Chamber 1 during heavy rains. The low velocity flow of the water observed entering the area precludes sediment transport of anything but silts or clays (Figure 6-2). Silts and clays are the most widespread allogenic clastic deposits in caves because they may be carried in suspension by low velocity fluvial transport (Ford and Williams 1989:323). Most of their accumulation is expected to be on floors but they may also coat walls or ceilings. Very thin layers of silt were noted in the upper strata of the excavations, which suggested that these may have been water-borne deposits that probably originated at the cave entrance and terminated at the sink in the center of Chamber 2. Alternatively these layers could be mud or silts spilling over from the pool beneath the stalactite chandelier. Mud or silts could enter the chamber as filtrates seeping in from cracks in the cave walls though there is no direct evidence of this or any indications of seepage such as staining on the chamber walls. In an elemental analysis mud or silts could produce higher silicate, aluminum, and iron values, but the laminated sub-floor deposits are ephemeral and their signature could be easily masked by other processes when sampled in bulk.

These are probably best identified by observing strata in excavation profile walls or by using micromorphology. Another method to evaluate the effects and nature of water-borne deposits is to examine the amount of leaching in individual strata using geochemistry.

6.3.4 Detritus from Weathering, Erosion, or Autogenic Rock

Chemical weathering of cave walls may also contribute to sedimentation. Limestone pebbles, cobbles and sand-sized clasts were noted in sediments during excavation. In preliminary studies of the micromorphology of these sediments many of the clasts were identified as calcite and were often micritic. The most parsimonious explanation for the clasts is that they originate from within the cave. These clasts are found in all parts of the cave and on ledges so it is unlikely that they are carried in by water. The low energy water flow between Chamber 1 and Chamber 2 would not be expected to have a high enough velocity to transport pebble sized rocks from exterior soils.

These clasts may originate from the bedrock on the cave floor as clasts may move upward in soil profiles (Johnson 1972; Lasca and Donahue 1990:553). It is possible that limestone clasts are being pushed up through the sediment profile by the shrinkage and swelling of the deposits during wetter or dryer phases. Large clasts that measured in excess of 2mm were removed from the deposits prior to elemental analysis and are represented as the coarse fraction in texture analyses (Appendix V, part 2).

Comparative data collected from the elemental analysis of a limestone rock from Level 16 of the excavation show that the three most significant elements in the rock are CaO (47.4%), SiO₂ (5.9%), and MgO (1%). The silicates would be expected because clay minerals and silica are the most common insoluble impurities in carbonate rocks (Ford and Williams 1989:30). MgO is also a common element and values of 1%-3% have been demonstrated to be correlated with the greatest solubility of pure carbonates integral to cave formation (Rauch and White 1977; Ford and Williams 1989:30).

The cave rock differs from the parent material collected by Thomas Miller from the Vaca Plateau (1996:111). Like the cave rock, Miller's 3 samples were very high in CaO (67.2%) as one might expect in a karstic area. The second highest constituent was MgO (25.7%) and the third most common element was Na₂O (5.9%). There was no evidence of silicates, aluminum or iron in his samples suggesting interregional differences (See Appendix V, part 4).

6.3.5 Summary

There are four indicators of site formation processes correlating to the four hypothesized processes. The first is that charcoal in the cave reflects human usage. The second is that high copper values in the elemental analysis are an indication that the deposit is composed at least somewhat of bat guano. Because copper does not move in soil profiles, higher values probably represent larger percentages of insectivorous guano. These values may be correlated with total P and N as independent lines of evidence. High P values and low N suggest that the guano deposit has been weathered and most likely leached by water.

The third is the presence of thin laminated deposits as seen in the excavation wall profiles. These laminates suggest that the sediment has been deposited at least partially by water-borne silts and clays. The fourth is that pebbles and cobble-sized limestone clasts incorporated into sediment matrices are likely to be autogenic deposits. Their size prohibits fluvial transport in low velocity streams and although some channeling exists, there is no indication of erosion of the Chamber 2 deposits to suggest high energy water flow.

Silicates are present in many types of deposits so it is difficult to model the site formation process using this element alone. Silicates may be brought in by low energy water borne deposits as silts and clays, are known to be present in bat guano, are present in autogenic limestone rocks, or may be brought into the cave by tracking. Although it is not possible to wholly differentiate between these processes using geochemistry, some inferences can be made regarding their possible origins by examining the relationship between bats and humans in the cave.

6.4 Sampling

Samples were collected from a number of venues both within and outside of the cave. Within the cave each of the layers in the Chamber 2 excavations were bulk sampled beginning with layer 2 which lay directly below the modern surface. These samples are labeled BZ1-BZ26 and are correlated with their provenience in Appendix V. No sample was analyzed for Level 17 because it was essentially an arbitrary level in the excavation as it appeared to be a continuation of Level 16.

Field observations suggested that the pile of sediment below Crawl 3 was deposited on the cave floor below the crawl during the ancient modification of the area. To further investigate, bulk samples from level 2 of Unit 02-05 (BZ26), the sediment pile, as well as from the top (BZ16) and base (BZ25) of the low walls in Crawl 3 were analyzed to determine whether the deposits were closely related. An additional sample (BZ21) was collected from the end of the Dead End tunneling excavation to investigate the origin of the deposit.

For comparative purposes two samples of exterior soils were collected from above the cave entrance, the first from the surface (BZ22) and the second 20cm below surface (BZ23). Three samples were collected from the valley bottom from a road cut at the base of the hill that the cave sits on. One was collected from the surface (BZ18), one from 20cm below surface (BZ19) and one 40cm below surface (BZ20). Also a comparative sample of bat guano was collected from the nearby cave of Actun Chapat located roughly 0.5k (BZ17). This cave currently has large active bat populations that have produced meters of guano deposits. Although the sediments may have been produced by numerous species, they were useful for comparison because the deposit consisted of relatively pure guano. To determine the elemental composition of the cave itself, analysis was also conducted on a sample of limestone rock (BZ 24) excavated from the base of Level 17 of the Chamber 2 excavations closest to bedrock.

6.5 Methods

All soils were described using standard methods (Schoeneberger et al. 2002). Elemental analysis, loss on ignition (LOI), pH, and texture analysis were conducted on samples from the Chamber 2 excavations to supplement infield observations. Sediment and soil colors were noted using Munsell descriptions. See Appendix V, part 1 for the compilation of the results.

Texture analysis and pH analyses were undertaken by the author at the University of California Soils Lab under the direction of Dr. Oliver Chadwick. Texture analysis was conducted on samples collected from excavation layers L2-L16 (BZ1-BZ15) using the hydrometer method following Carter (1993:507-509). Sediments were sieved through a

#270 (53 μ m) sieve. The fraction of coarse material (gravel) for each sample is reported in Appendix V, part 2 along with the results of the analysis. Readings were collected at 40sec and 7hrs. The pH was measured using the method described by Carter (1993:141-143). Samples were homogenized using a mortar and pestle and measured with a meter after preparation of saturated solutions in water.

Soil samples were dried and sieved (<2 mm) and analyzed for SiO₂, Al₂O₃, Fe₂O₃, CaO, MgO, Na₂O, K₂O, Cr₂O₃, TiO₂, MnO, P₂O₅, SrO, BaO, LOI, Total Cu, Nb, Zr using x-ray fluorescence by ALS Chemex (Sparks, Nevada). Coefficients of variation (CV) for soil elements were <5%. Loss on ignition was also conducted by the commercial laboratory. Results are reported in percentages for major elements and parts per million for the trace elements Cu, Nb, and Zr (Appendix V, part 3).

6.6 Cave Sediments vs. Outside Soils

To evaluate the differences between sediments within the cave and outside soils, the data were divided into two groups. The inside sediments included 19 cases: the excavated samples from Chamber 2 Levels 2-16, the two samples from Crawl 3, one sample from Unit 02-05 Level 2, and a single sample from the end of Dead End excavated tunnel. There were five cases from the outside soils: two samples collected from the top of the hill above the cave entrance and three from alongside the road at the base of the hill. The averages of some elements between groups, particularly SiO₂, CaO, MgO, MnO, P₂O₅, Cu, and Zn, suggested that interior cave sediments differed from outside soils in their composition (Appendix V, part 5).

An ANOVA (Analysis of Variance) was used to test the significance of the differences between the two data sets using SPSS version 12.0. This method relies on variance as the key to answering the significance question in groups of three or more cases (Drennan 1996:171-184). The problem with ANOVA is that statistical analyses based on comparing means assume that the population has a normal distribution. Therefore they are strongly affected by outliers. To evaluate outliers box and whisker plots were drawn for each element. Results are reported in Appendix V, part 6. Outliers were located for the following elements: Na₂O, K₂O, P₂O₅, SrO, BaO, Cu. If all cases with outliers were removed this would eliminate half of the data. Six elements showed no overlap between 50% of the samples between the two groups: SiO₂, CaO, MgO, P₂O₅, Cu and Zr. Because these elements would be expected to produce the most significant results, extreme outliers were removed based on these elements. Cases 6, 7, and 17 (inside sediments Level 6, Level 7, and the top of Crawl 3) had extreme outliers in the elements of P₂O₅ and Cu (and also SrO). Case 24 (outside at cave entrance B horizon) had a P₂O₅ outlier. These four cases were removed before conducting the analysis. Results of the ANOVA are shown in Appendix V, part 7.

The difference observed between the elemental make-up of the two sets differs significantly among the following elements: SiO₂, CaO, MgO, MnO, P₂O₅, SrO, BaO, Cu and Zr. Elements that have the highest significance are SiO₂ (F=22.656, $p<.0005$), MgO (F=34.703, $p<.0005$), and Cu (F=7.671, $p=.003$). Viewed collectively the elemental analyses indicate that there are significant differences between at least nine elements out of the 16 tested between inside and outside soils. This suggests that although it is not possible to claim that *no* soils are introduced into the cave, it is very clear from the

analysis that the cave sediments vary considerably from outside soils. Therefore it may be concluded that the majority of the sediments are not being washed in from outside but rather are developing within the cave.

6.7 Copper in Guano Deposits

Having established that much of the cave sediment is developed in situ, the next issue concerns the origin of the material. Because these are the hallmarks of insectivorous bat guanos the high copper and as well as high phosphate content suggests that the deposits contain varying amounts of bat guano. In the cave sediments, these values nearly parallel each other as illustrated in the graphs showing the Chamber 2 data (Figure 6-3). In order to evaluate the significance of the correlation, Pearson's correlation coefficient was determined for the two sets using SPSS 12.0. Using all sediment samples collected from the cave ($n=19$), there is a very strong correlation between copper and total phosphate values ($r=-.988$, $p<.005$) significant at the .01 level. Additionally, the copper content of all sediments within the cave is higher than those of surface contexts and samples taken from directly outside the cave entrance have higher levels than those collected from the road. Copper does not tend to move in soil profiles whereas phosphates, particularly organic phosphates composed of animal wastes can be leached by water (Brady and Weil 2002:605). Therefore copper is the best indicator of the presence and amount of guano within cave deposits.

Although one would expect insectivorous guano to be acidic, the deposits in Chamber 2 and the Dead End tunnel tend to be alkaline ranging from pH 7.4-7.8. In other areas they are closer to neutral (6.5-7.2). This is best attributed to the buffering

effect of high calcium content in the cave sediments (Brady and Weil 2002: 376, 394-397).

The copper levels in the modern sample of bat guano collected from Actun Chapat are very high 210ppm as compared with the highest level found in the surface soils, which is 40ppm. Copper contents of some deposits in Chechem Ha exceed those of the modern Actun Chapat sample. These levels are apt to be composed almost entirely of guano. They include in Chamber 2 Level 6 (190ppm), Level 7 (300ppm), in Crawl 3 the sample from the top of the low wall (230ppm) and the base (90ppm), below Crawl 3 in Unit 02-05 Level 2 (120ppm) and in the rear tunnel of the Dead End excavation (120ppm).

With the exception of the Chamber 2 deposits, no water-born deposits would be expected in other areas of the cave or in elevated areas such as Crawl 3. Given the findings from the elemental analyses, the most parsimonious explanation to explain the accumulation of sediments in these areas is the presence of bats. Without exception these sediments appear to be aged bat guanos. One might argue that the LOI of the deposits is only 16% to 30% suggesting that the deposits were only partially organic, but the deterioration of guano is characterized by lower LOI as is demonstrated by Gile and Carrero (1918) (See Table 6-3, column 1).

In Chapter 4 I suggested that the sediment pile located in Tunnel 1 below Crawl 3 was the result of clearing sediment from the crawl to create the ritual sweatbath. Of interest is that the value for the copper content of the pile (120ppm) is very close to the average content between the top and base of the low walls in Crawl 3 (160ppm). This suggests that the sediments were mixed as one might expect if they are being discarded

into the pile below the crawl entrance.

Although much of the sediment from the Dead End excavations contained charcoal and artifacts, in the passageway beyond the dome containing the artifact cache, the sediment was sterile (See Chapter 4). The deposit in the area resembled modeling clay and the nature of its deposition was unclear. The clays were moist and water seeped into the area from cracks in the bedrock during heavy rains. The high copper levels (120ppm) and phosphate content (4.28%) strongly suggests that this is an accumulation of guano, but the high SiO₂ content is indicative of fine silts or clays seeping into the deposit carried by the ground water.

6.8 Bats and People

The Chamber 2 deposits are complex due to human usage and hydrologic activity. Although silicates may be carried in by either process it is possible to make some inferences regarding which process is likely to be producing the silicates found in the elemental analyses of the excavated levels.

Level 7 is an extreme case in that it contains both the highest copper and phosphate concentrations in the cave, but produced little charcoal and few artifacts. As I argued in Chapter 5, this suggests that the chamber did not receive heavy usage during this period. Further the high copper and phosphate concentrations indicate that bats took up residence in the chamber in the absence of humans. Although there is no published data on the subject, cavers and scientists have long observed or asserted that the presence of humans disturbs bat populations (for example see Shahack et al. 2004).

If this is true then silicates introduced into the Chamber by human tracking should be an inverse relationship with the amount of copper (representing guano) and silicate values within each level. Figure 6-4 graphs the trends for Levels 2-16. Beginning with

Level 16, the oldest deposit, Cu remains stable and there is a slight rise in SiO₂ between Levels 16 and 15 as well as between Levels 14 and 13. A more dramatic increase in SiO₂ and decrease in Cu occur between Levels 13 and 12. Level 13 is the first sedimentary level that dates to the Middle Preclassic period. The decrease in Cu and increase in SiO₂ further argue for human usage of the chamber at this time.

Following Level 12, both the Cu and SiO₂ remain relatively constant with a slight increase in both between Levels 11 and 10. Beginning in Level 9 the Cu content rises steadily peaking at Level 7 while the SiO₂ content decreases to one of its lowest readings in Level 7. Between Levels 7 and 6 the Cu content drops considerably and SiO₂ rises. This trend continues through Level 5. From Level 5 through Level 2 SiO₂ is almost stable, only dropping off slightly over the period. In the period between Level 5 and 4 Cu drops 10ppm but trends upward from Level 4 to Level 2. These data seem to suggest a negative correlation between SiO₂ and Cu.

In order to evaluate the significance of the correlation Pearson's correlation coefficient was determined for the two sets using SPSS 12.0. For excavated Levels 2-16 in Chamber 2 there is a moderately strong negative correlation between copper and silicates ($r=-.551$, $p=.033$) at the .05 significance level. While it is acknowledged that other processes may contribute to the silicate values in the chamber, the Cu and SiO₂ data correlate negatively as one would expect if human populations disturbed bat activity in the cave. The same test was conducted between the percent of sand from the texture analysis and Cu with similar results ($r=-.524$, $p=.037$) at the .05 significance level. This further suggests that there are enough silicates brought in via trampling or other human activity to produce this effect.

6.9 Leaching

Leached deposits provide information on the hydrology of the cave deposits. This is important information in the evaluation of the site formation process as water movement, particularly horizontal movement, could affect charcoal distributions thin Chamber 2. The occurrence of large amounts of water flowing into the chamber would be expected to produce erosion and standing water would produce downward transposition of soluble material in the soil profile. Increasing iron values within a soil profile are often a good indication of leaching (Brady and Weil 2002:415) as can be observed in the outside soil samples in which the lower horizons have progressively more Fe_2O_3 than those above horizons (See Appendix V part 3). However, iron is less soluble in pH values above 7 such as those in Chamber 2, the top of the Crawl 3 deposit and the Dead End rear tunnel. Therefore it would not be expected that iron in these deposits would undergo translocation. In fact, in Chamber 2, the iron values vary from level to level and there is no trend toward accumulation. Iron contents do tend to positively correlate with silicates which would be expected due to their adherence to clays. Using all of the cave samples there is a moderate positive correlation between silicates and iron content ($r=.627$, $p=.004$) at the .01 significance level. In the Chamber 2 deposits the correlation is very strong ($r=.954$, $p<.0005$) at the .01 significance level. These data suggest that iron is entering the cave with silicates and is not translocating in the Chamber 2 sediment profile.

Having established that the sediments within Chamber 2 contain large amounts of bat guano leaching can be suggested based on the relationship between phosphates and nitrogen. When total phosphates and nitrogen by weight are graphed for the Chamber 2

deposits, we find elevated phosphate to nitrogen values in Levels 6, 7, 13, 14, 15, and 16 suggesting leaching of the sediments on these levels (Figure 6-5).

As noted in Chapter 5, Levels 15-17 were the wettest deposits in the excavation and water channels were located in the northwest area of the excavation in levels 14-16. In the field we noted that the basal level of the eroded pool beneath the stalactite chandelier that formed during rainstorms was at the same level as the top of Level 15 and concluded that water seeped horizontally into the base of the deposit from the pool. This is the most parsimonious explanation as to why the lower levels are leached whereas those that sit directly on top of them are not. This also makes sense because trampling of clays can orient clay platelets so that they inhibit water movement. Therefore a level that received water during its deposition could be sealed. Because of this property, leaching of particular strata could be suggestive of increased rainfall during particular temporal periods, though this evidence alone is far from conclusive.

Level 7 exhibits lower iron values, comparatively low nitrogen values, and very high phosphate values. It may have undergone considerable leaching which tapers off in Level 6. The levels above 6 do not exhibit the same characteristics so that it does not appear that much water moves vertically through the sediment profile. This suggests that the Level 7 sediments were leached at the time of their deposition or soon after. Level 7 dates between 350 B.C. and 40 B.C. at the 2-sigma probability but there is an 82.2% probability that the date is later in the range between 210 B.C. and 40 B.C. According to Webster's rainfall record for the time period beginning at approximately 180 B.C. there is a trend towards wetter conditions that culminates in one of the wettest episodes of the Maya era from 150 B.C. to A.D. 50. The leaching in Level 7 suggests that the guano

layer was leached during this very wet period following its deposition.

6.10 Calcium Oxides

Calcium oxide values are substantially greater in the cave deposits than in outside soils. This suggests that the calcium in the deposits are coming from cave walls and floors as might be expected in a karstic environment. The Chamber 2 strata with very high values of CaO correlate with levels that are leached. In the deposits from the lower strata (13-16) it is likely that the calcium is coming from the wet disintegrating limestone of the cave bedrock floor. Levels 15 and 16 are clearly mixed and Level 17 sits in contact with the bedrock. There are no data for Level 17, but Level 16 is composed of almost 23% CaO. Additionally there is a greater amount of coarse fraction found in the texture analysis in these levels than in the dark colored anthropogenic sediments. This is likely to have been sloughed from the wet bedrock

Curiously, Levels 6 and 7 also had very high CaO values. In the field we noted that both levels contained gravel-sized limestone inclusions. The coarse fraction in Level 6 is the highest (20%). These inclusions are clearly not translocated upward from the base of the deposit because they are sandwiched between other deposits that do not exhibit this characteristic. Because Level 6 was by far the level with the heaviest utilization, it could be that the clasts were tracked in and vertically displaced into Level 7 by trampling. Alternatively bats may have brought these inclusions into the chamber, they may come from the walls or ceiling of the cave, or they may have formed in situ.

6.11 Summary

The elemental analysis of the cave sediments was helpful in assessing site formation of the cave deposits and determining sediment origins. Based on observations of modern sedimentary processes, the cave sediments could be introduced by animals or people, by water-born deposits, or could be derived from natural erosion and weathering of the cave bedrock. The elemental analysis demonstrated that there were major differences between outside soils and interior sediments eliminating the possibility that the cave deposits were soils that had washed in from the surface and demonstrating that they were primarily formed within the site. All cave deposits showed high incidences of copper and phosphates suggesting that insectivorous bat guano is a major component of their composition. Based on some extraordinarily high values it is likely that some strata in Chamber 2 as well as deposits in areas of the cave that are hydrologically inactive are composed almost entirely of guano.

Silicates in the form of clays and silts were also present in all cave deposits but correlated negatively with coppers and phosphates. This suggests that the silicates in Chamber 2 are most likely to have been introduced by human activity or trampling rather than hydrologic forces. Because bat roosts are likely to be disrupted by the presence of people, the correlation suggests that when bats were more plentiful in the cave, people were using the space less intensively and vice versa. The sedimentation data (Chapter 5) supports this conclusion. One would expect that silicates would produce a deposit that would retain its bulk over time as opposed to guano which is primarily organic matter and expected to disintegrate. Sedimentation increased above expected values when there was a demonstrated human presence in Chamber 2 (Figure 6-6).

Water entering Chamber 2 is not likely to have caused a great deal of disruption of the excavated deposits. Most of the evidence of hydrologic activity is confined to the northwest area of the chamber (See Chapter 5). Water entering the area from the active stalactite appears to be responsible for the channeling found in the lower strata of sediments adjacent to the intermittent pool and explains why these are the wettest levels of the deposit. Water flows in beneath the upper levels, moves horizontally through the sediments, and exits via the central drain. During heavy rains the overflow from the intermittent pool is most likely producing the laminated strata that can be observed in upper levels of the Chamber 2 deposits in this area (See Chapter 5). Trace amounts of very fine clays and silts are probably introduced into Chamber 2 in this manner though some may come in via the low energy water flow originating in Chamber 1. These trace amounts of silicates are most likely masked in the elemental analyses by the more robust processes such as trampling which would account for the negative correlation observed between silicates and copper/phosphates. Silicates from the deposit found in the back tunnel of the Dead End deposit are most likely introduced into the deposit by ground water seepage.

Because of the high pH, iron accumulation is not a good indication of water movement through the cave sediments. Rather, high phosphate to low nitrogen values on some levels suggests weathering due to leaching. Some deposits in the cave have undergone more weathering than others. The wetter deposits in the lower strata of the Chamber 2 deposits are leached, as is Level 7. Based on comparative rainfall records (See Chapter 2, Figure 2-9) it is likely that the accumulation of the Level 7 deposit occurred during the wettest period of ancient Maya history. This is interesting because it

suggests that guano deposits potentially reflect general environmental conditions.

Table 6.1 Table of sediment processes in caves compiled by Goldberg and Sherwood 2006:23, Table 1.

Sediment Type	Autochthonous (Endogenous)	Allochthonous (Exogenous)
Clastic Sediments		
Weathering detritus	●	
Block breakdown (<i>éboulis</i>)	●	
Grain breakdown by dissolution, abrasion ^b	●	
Entrance talus	●	●
Infiltrates (drip)	●	●
Fluvial deposits		●
Glacial deposits		●
Aeolian deposits		●
Biogenic debris		
• Bird and bat guano	●	○
• Gastroliths	●	○
• Carnivore coprolites and bone	●	●
• Wood, grass	○	●
• Humus	○	●
Anthropogenic deposits	○	●
Microartifacts (bone, shell, lithics, etc.)		
Transported soil/sediment		
Wood/charcoal		
Ash		
Chemical Sediments		
Travertines, speleothems, and flowstones	●	○ ^c
Evaporites	●	
Guano, phosphate, and nitrate minerals	●	
Resistates	●	
Ice	●	

^a Modified from Sherwood and Goldberg¹¹ and adapted from White.⁸
^b (Hughes and Lampert, 1977)
^c Can include fallen speleothems when roof was more extensive but now collapsed.

Table 6-2. Fresh guano samples from Israeli caves indicating the minerals found in the fresh material and its ash, PO₄ concentration, organic matter content, pH, and insoluble fraction of the ashed material (Shahack-Gross et al. 2004:1263, Table 1).

Source material	Sample number	Minerals in source material	Ash content (% by weight from source)	Minerals in ash	AIF content (% by weight from source)	Minerals in AIF	PO ₄ content (% by weight)	Organic matter content (% by weight)	Acidity (pH)
Fruit bat guano	FKB-1	Clay, dolomite	14.9	Clay, AS ^a , calcite, dahllite	5.0	Clay, quartz	6.3 ± 1.6	63.6	8.0
	HYG-1	Calcite, clay	21.6	Calcite, AS, dahllite	4.1	Clay, quartz	7.7	63.9	7.7
Insectivorous bat guano	BYN	Clay	11.0	AS, unknown phosphate mineral	1.7	Clay	24.8	53.5 ^b	5.8
	MYO	Brushite, nitratite, ardealite, taranakite	20.8	AS, unknown phosphate mineral	1.0	Opal	56.8 ^c	59.9 ^b	6.1
Pigeon guano	FKB-8	Clay, dolomite	16.5	Dahllite, calcite, AS	1.5	Clay, quartz	7.1	65.1	7.8
	HYG-2	Nitratite, calcite, clay	23.4	Calcite, dahllite, AS, quartz, clay	7.3	Clay, quartz	11.5	62.3	7.1

^a Ammonium sulfate.

^b Weight loss calculated between 250 and 750 °C.

^c High value due to presence of authigenic phosphate minerals.

Table 6-3. Data collect by Gile and Carrero (1918) in Hutchinson (1950:385, Table 34) illustrates inverse relationship between total phosphates and nitrogen in aging guano deposits.

	Ign. Matter	Total N	Total P ₂ O ₅	P ₂ O ₅ Water Sol.	P ₂ O ₅ Cit. Sol.	K ₂ O Water Sol.	CaO	MgO	Fe ₂ O ₃	Al ₂ O ₃	SO ₃	Insol.
	%	%	%	%	%	%	%	%	%	%	%	%
Fresh, Lares	83.65	10.25	6.95	2.82	6.43	3.88	2.36	1.40	0.38	0.0	3.0	0.16
"Ancones" Barrio Ancones, San Germán:												
0-1 ft.	32.85	1.46	7.75	0.90	1.37	0.25	25.51	0	3.35	0.23	23.95	4.01
1-2 ft.	31.86	1.43	10.50	0.78	0.80	0.06	19.45	0	4.60	4.46	19.31	5.62
2-3 ft.	21.13	0.27	28.08	0.24	1.37	0.10	7.49	0	6.27	15.77	7.81	10.84
3-4 ft.	27.27	0.28	31.20	0.30	4.97	0.47	6.75	0	5.03	19.52	2.24	5.87
5-6 ft.	17.42	0.33	26.51	0.40	1.22	0.13	3.78	0	7.56	12.90	2.32	25.37
Black peaty, from pocket	46.38	5.35	13.06	0.39	2.08	0.31	13.12	0	5.97	2.00	1.46	16.97
Francisco Quiñones, San Germán:												
Fresh cave mouth	82.63	11.73	7.42	2.40	5.04	1.57	4.56	1.03	0.78	0.49	3.80	1.39
3-4 ft., mouth	24.30	0.80	19.04	0.19	3.94	0.28	8.18	0.57	8.46	8.44	5.56	23.68
6-7 ft., mouth	19.51	0.64	29.31	tr.	3.81	0.22	2.15	tr.	13.25	13.08	0	18.28
0-1 ft., near center	15.92	0.38	22.91	tr.	0	0.23	2.02	0	15.20	6.15	0	38.14
0-1 ft., different place near center	15.35	0.56	24.43	tr.	0	0.13	2.48	tr.	15.00	8.44	0	31.62
8-9 ft., different place near center	14.40	0.18	21.45	tr.	0	0.34	0.74	tr.	11.33	7.77	—	42.70

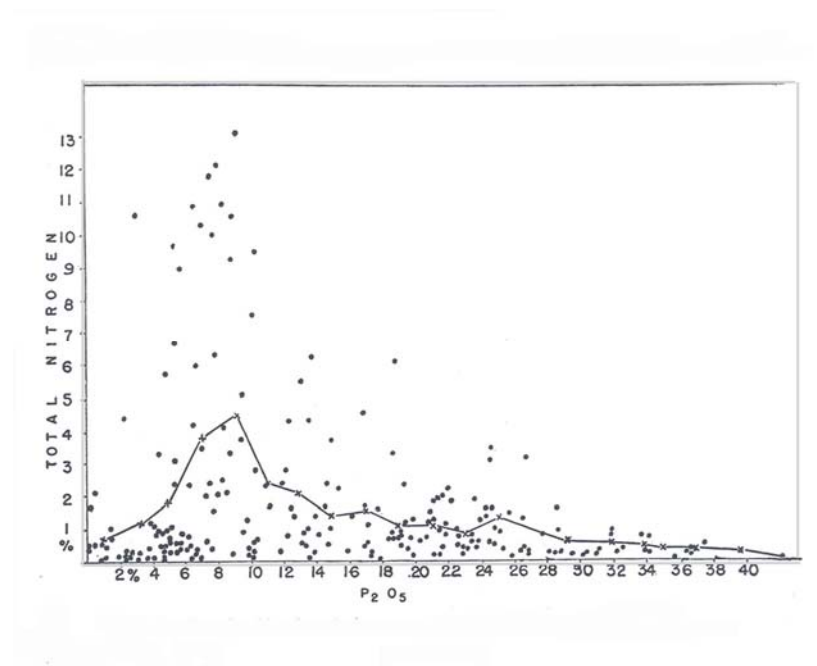


Figure 6-1. Relationship of nitrogen to phosphates in Puerto Rican bat guano. As nitrogen level decreases the percent of phosphate in the sediment increases (Hutchinson 1950: 386, Figure 79).

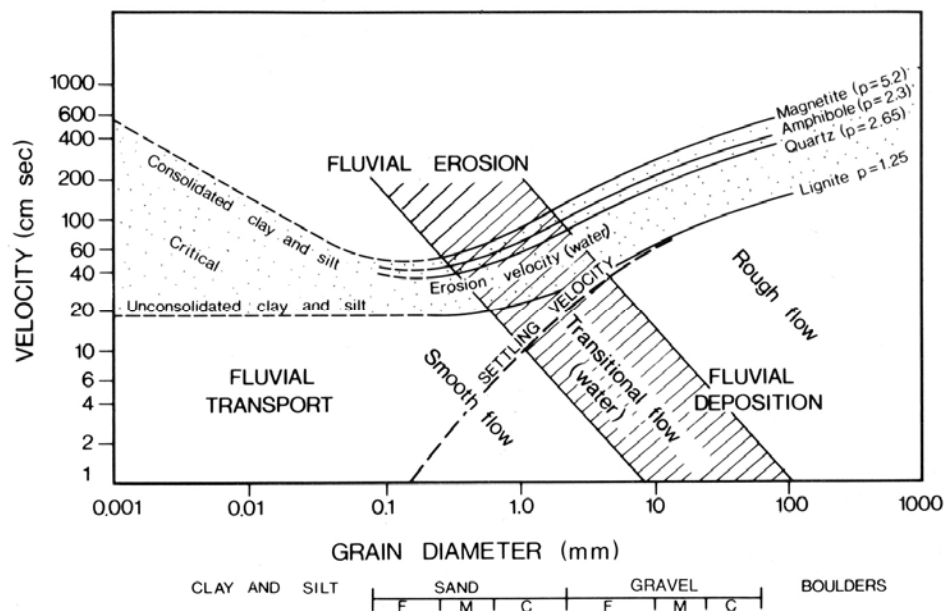


Figure 6-2. Chart illustrating the dynamics of sediment transport. Curves show relations of grain size to critical erosion velocities for flowing water with material of different densities (Ford and Williams 1989:319).

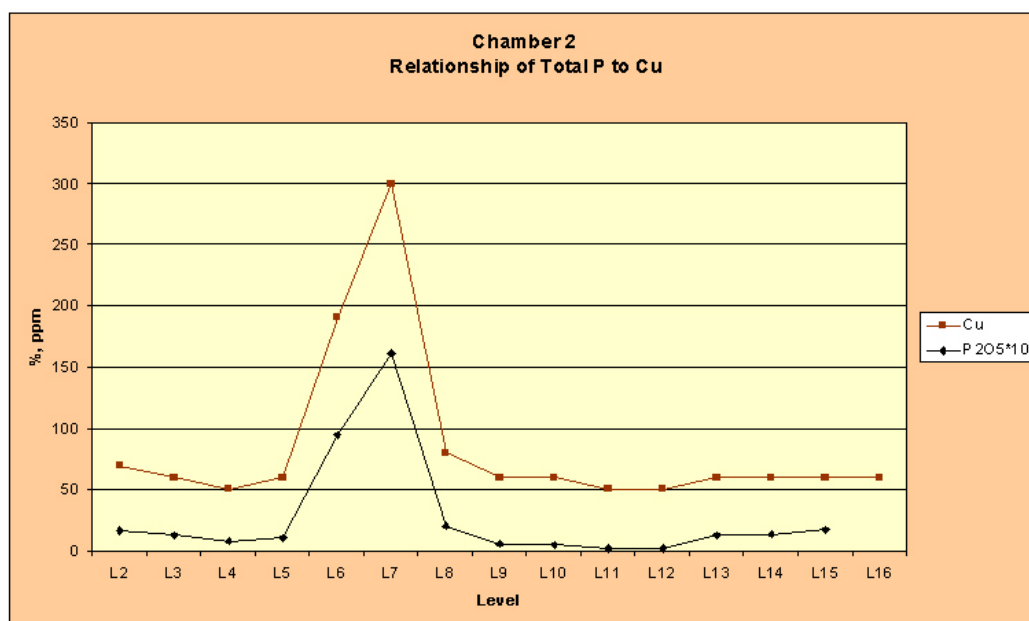


Figure 6-3. Chamber 2 deposits relationship between phosphates and copper by level.

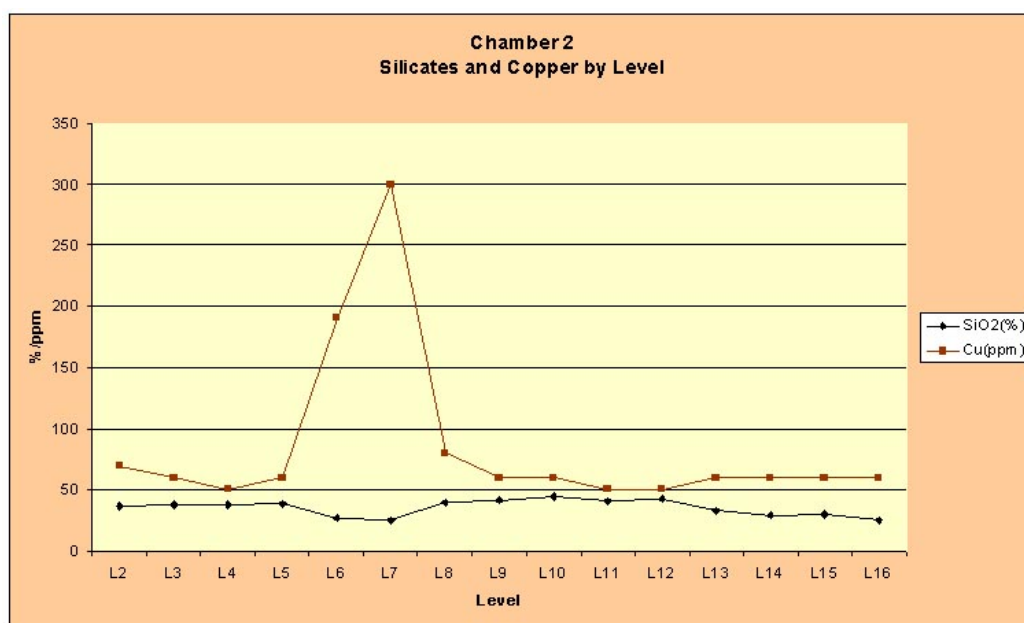


Figure 6-4. Chamber 2 deposits illustrate inverse relationship between SiO_2 to Cu.

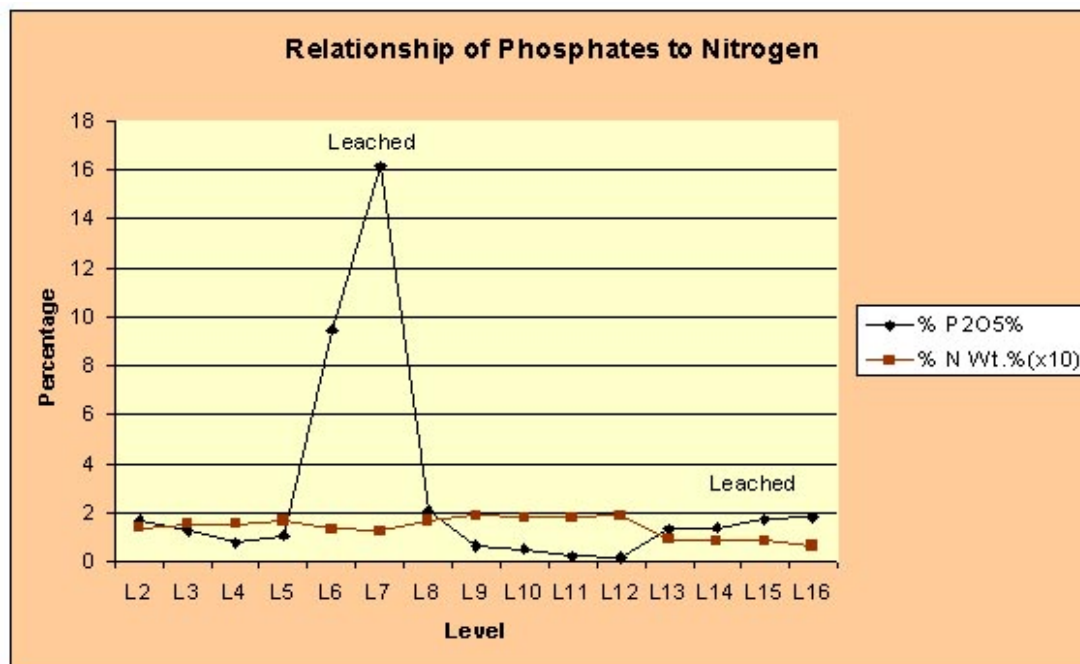


Figure 6-5. Chamber 2 deposits relationship between phosphates and nitrogen.

Chapter 7

Synthesis

7.1 Modeling the Use of Space in Caves

Data from Chechem Ha illustrates that accepted middle range models of ancient cave use predicated on surface finds are inaccurate. Dorie Reents-Budet (1980) was the first to suggest a model of spatial use of caves accounting for variation over time.

Working at Petroglyph Cave, Belize, her study evaluated the chronology of the site by analyzing ceramic styles. She found that entrances and light zones were utilized at earlier time periods than dark zones. At later time periods, utilization progressed deeper into the cave's interior and the cave's latest use occurred in the deepest chambers. This same pattern was also observed in the Actun Tunichil Muknal cave system (Helmke 1999), which led Jaime Awe and Christophe Helmke (2005) to suggest that this was a general pattern of cave use.

Reents-Budet offered two explanations for the phenomenon. The first was that ancient caving technology was slow to develop and until the Late Classic period the Maya were not capable of accessing remote areas. The second hypothesis suggested that differential spatial usage over time reflected changes in ritual practice. At Chechem Ha, early carbon dates, deep stratigraphy, and early ceramics from Chamber 2 has demonstrated that caving technology was sufficiently sophisticated for traveling deep within caves at very early dates. Clearly technology was not the issue, but rather the empirical observations made by both Reents-Budet and Helmke were the result of changes in ritual practice.

This chapter articulates local and global findings within the site and discusses ritual practice during major temporal periods. Artifact patterning, modifications to the site, and *use-intensity* within the cave demonstrate that there are distinct changes over

time in the use of the space. The form and condition of ceramic artifacts also vary among temporal periods as well. Data from the Chamber 2 excavations illustrate that there was variation in the use of space, as well as fluctuations in the intensity of usage. This chapter synthesizes and evaluates this variation within a temporal framework and defines periods of heavy or sparse usage and disuse of the site.

The final discussion reviews the evidence for elite use of the cave. Based on comparative data explored in Chapter 1, it is unlikely that Chechem Ha was used by anyone but community leaders or ritual specialists prior to the consolidation of power in the region and thereafter by elites. Data collected from the site supports this argument.

7.2 Ceramics and *Use-intensity*

Of the 1901 sherds recorded as surface finds and from excavations, 470 were temporally diagnostic (Table 7-1). Of these 4% were from the Jenney Creek complex of the Middle Preclassic period, 5% from the Barton Creek complex Late Preclassic Period, only two sherds dated to the later part of the Late Preclassic Mt. Hope Complex, 39% to the Terminal Preclassic/Early Classic Floral Park/Hermitage period, 2% to the early Late Classic Tiger Run complex, and 51% to the Late Classic Spanish Lookout complex (Figure 7-1). By evaluating the ceramic chronology, it appears that the cave was used most intensively during the Terminal Preclassic/Early Classic period and later at the end of the Late Classic period. However, this is not the whole story.

Use-intensity indices based on charcoal counts suggest that the heaviest cave use was in the Middle Preclassic and Early Classic periods, but little charcoal was found in Late Classic deposits (See Figures 5-30 and 5-31). While the two data sets are in

agreement that cave use is reduced in the Late Preclassic and intensively utilized during the Early Classic, there is disagreement for other periods. The ceramic data do not reflect the intensity of Middle Preclassic usage and possibly exaggerate use in the later half of the Late Classic. These discrepancies may be explained by changes in ritual practice.

Ceramic offerings were not a major focus of practice during the Middle Preclassic period and charcoal distributions in Chamber 2 suggest that more people participated in rituals at this time. Both the charcoal and ceramic data also agree that there was little or no cave use during the first part of the Late Classic but present a much different view for the end of the period. During the second half of the Late Classic (A.D. 700 to A.D. 900) there are a large number of ceramic sherds and vessels imported into the cave but few charcoal flecks accompany the deposits, suggesting a change in practice.

7.3 Middle Preclassic Period

Surface finds of Jenney Creek complex ceramics were rare and were distributed throughout the site. Figure 7-2 is a map of the cave illustrating the locations of ceramics from this period found in surface contexts. The few surface finds from this period are unlikely to be accurate indications of the spatial aspects of early cave use as they have probably been moved by ancient or modern people. For instance a single sherd possibly dating to this period is found on Ledge 8 sandwiched between Late Classic sherds. It is the only example of early material located on any of the ledges, suggesting that it was moved by the ancient Maya from elsewhere in the cave during the Late Classic period.

Ceramic sherds from this early period are primarily found in subsurface deposits located in two areas, the cave entrance and Chamber 2. In the entrance a single sherd

dating to this period was horizontally embedded in the basal surface of Unit 02-04 (See Chapter 4 Section 4.11.2). Charcoal discovered beneath the sherd dated to the Middle Preclassic period (770 B.C. to 400 B.C.). Medium-sized boulders were found both beneath and on top of the surface. The presence of boulders beneath the surface suggests either that there was natural rock in the cave entrance prior to its use or that the rock was placed in the entrance during an earlier in-filling event or entrance blockage. Because the unit was placed in the only entrance to the cave and this was not the earliest date of usage, it is clear that the excavation did not reach the earliest levels. Therefore it is possible that the boulders below the surface Middle Preclassic surface were part of an activity occurring prior to 770 B.C.

Early facet Jenney Creek sherds were also excavated from the lower levels (Levels 8-10) of Chamber 2. The Chamber 2 examples as identified by Joseph Ball and Jennifer Taschek (Ball and Taschek, 2005 personal communication) are of the KXM tradition whereas those in other parts of the cave, dating to the late facet, are SBM tradition (See Chapter 5). Both the earliest ceramics and earliest radiocarbon-dated deposits were found in this area. Although basal layers from units and test pits placed in other areas of the cave were dated, no usage dated as early as that in Chamber 2. This area also incurred some of the most intensive usage of the site's overall history between 1320 B.C. and 820 B.C. At this time ritual practice entailed the movement of speleothems, the opportunistic use of spalls as containers or incensarios, the construction of a small stone circle, the importation of ceramic sherds and of corn as evidenced by the corn kernel recovered from the flotation of the Level 9 deposit. The presence of corn suggests that early cave use included agricultural rites.

The spatial use of the chamber implies that during this time there were small groups using the chamber that produced less compaction of sediments than in later periods. Charcoal density clouds were distributed throughout the chamber in Levels 9-13. Activities occurred in front of the stalactite chandelier and in the central area of the chamber suggesting that the stalactite attracted early users to the area. Cave use began gradually as indicated by the increasing charcoal indices from Levels 10-13. This phase ended by 820 B.C.

Other areas of Middle Preclassic use dating to the later facet of the period from 800 B.C. to 300 B.C. were limited to the floor areas of Tunnels 1 and 2 suggesting that the cave was fully explored at that time but rituals occurring in these areas were ephemeral in the archaeological record. Charcoal was collected from a sub-surface deposit in the back part of Tunnel 1 adjacent to the keyhole entrance descending to the Dead End chamber dating to the late facet of the period between 550 B.C. and 350 B.C.

There is a gap in cave use in the early facet of this period as indicated by the radiocarbon dates (Table 7-2). This is a short 20-year period that lasts from 820 B.C. to 800 B.C. Although it appears to be a very narrow time frame, the earlier of the bracketing dates (800 B.C. to 510 B.C.) falls at a place in the calibration curve that does not allow the date to be trimmed (See Appendix IV). It is also important to bear in mind that the 20-year window is the *minimum* time period that may be inferred from the probability ranges. The discontinued use of Chamber 2, its early unique ceramic assemblage in the lowest levels of the excavation, and the possible infilling event at the cave entrance prior to 770 B.C. collectively support the argument for a disruption in use.

7.4 Late Preclassic Period

The data for the Late Preclassic period are broken into two ceramic phases, the Barton Creek complex (300 B.C. to 100 B.C.) and the Mt. Hope complex (100 B.C. to A.D. 250). There were few ceramics from surface contexts dating to the Barton Creek complex. These were distributed throughout the site and no spatial pattern was discernable (Figure 7-3). Like the Jenney Creek finds, their locations are not likely to represent the spatial aspects of early use due to probable artifact movement.

Based on the findings for both the Middle Preclassic and Late Preclassic contexts, single ceramic sherds were imported into the site at these early periods as opposed to partial or whole vessels. The practice of importing single sherds into the site has been noted at Actun Tunichil Muknal in Late Classic contexts (Moyes 2001) but the Chechem Ha data demonstrate that this tradition can be traced to deeper antiquity. This practice is not without precedent. The custom may be related to modern practices in which Maya ritual practitioners collect and curate small or broken objects from special contexts to use as sacred objects in the development of ritual power (Brown 2000). Alternatively, the practice may be a method of linking ritual spaces or the rituals themselves to one another. The curation of ritual objects not only links places or events in space but may link them temporally as well. At Blackman Eddy, sherds that refit from the same vessel were found in two distinct ritual deposits in Structure B1-5th dating to the Middle Preclassic period (Brown 2003:124-127).

In the cave, ceramic sherds from the early part of the Late Preclassic period were primarily found in subsurface contexts in Chamber 2 (Level 6) and the Dead End cache. Based on the radiocarbon date from Level 6, in Chamber 2 the sherds did not enter the

deposit prior to A.D. 210 suggesting that they may have been a late manifestation of the type, may have been curated by the ancient Maya, or were re-deposited in the area from elsewhere in the cave.

The area that incurred the heaviest usage during this period was the Dead End in Tunnel 1 located at the end of the tunnel farthest from the entrance. This area had been plugged with sediment and a cache was located under a dome in the ceiling where the blocking of the area was initiated at the rear of the excavation. The ceramic chronology from the sealed cache agreed well with the two radiocarbon dates from the deposit that indicate that the area was modified between 410 B.C. and 200 B.C. The ceramic chronology suggests that blocking of the tunnel and sealing of the cache occurred in a single event at the end of the period. A similarly dated subsurface sample was collected from nearby Elevated Passage 4. There are four overlapping dates ranging from 350 B.C. to 40 B.C., one from a subsurface deposit in Tunnel 1, one from a subsurface deposit in Tunnel 2, and two collected from the surface of the Stela Chamber that most likely dated between 240 B.C. and 40 B.C. These early dates as well as comparative material suggest that the stela may have been erected at this time though it cannot be firmly established.

There was little evidence for activity in Chamber 2. The accumulation of bat guano in the chamber occurred sometime between 820 B.C. and A.D. 210. The deposit dated to 350 B.C. to 40 B.C. There was little charcoal and few ceramic sherds were located within the Level 7 matrix suggesting that the chamber fell into disuse for a long period of time. The charcoal density distribution and light compaction suggests that people were moving through the area and only lingering occasionally beneath Ledge 10. However, there was no activity on the ledge in the Late Preclassic.

Later in the period during the Mt. Hope phase, only two sherds were located within the entire site in either surface or subsurface contexts (Figure 7-4). The first was only tentatively dated and was located on the Tunnel 1 floor and the other more securely dated was found in Crawl 3, the ritual sweatbath. Interestingly there is only one radiocarbon date that falls into this period (120 B.C. to 250 A.D.). It was collected from the deepest subsurface deposit in Crawl 3, which suggests that the area was modified at this time.

In viewing the radiocarbon dates for the rest of the site (Table 7-2) this is the only date that occurred at the time period that fell between the temporal periods for the Level 7 and Level 6 layers of the excavation. The lack of ceramic material in the excavated deposits and accumulation of bat guano in Chamber 2 coupled with so few dates suggests that there was little cave use in the latter part of the period between 40 B.C. and A. D. 210 and that probably the only area used during this time was the ritual sweatbath. The entrance to the site was likely to have been left open as there is no evidence to suggest that it had been in-filled or blocked off during this period.

7.5 Terminal Preclassic/Early Classic Period

There were a large number of ceramic sherds and vessels found in surface contexts dating to the Terminal Preclassic/Early Classic correlating with the Floral Park/Hermitage complexes dating approximately A.D. 200 to A.D. 600 (Figure 7-5). Many of these vessels were typed as Dos Arroyos Orange Polychrome dishes. Surface finds were concentrated on Ledge 10 where half of the total assemblage for this period

was found. Ledge 10 is the highest ledge in the cave and the most treacherous to access. This is the first compelling evidence for the use of the site's ledges.

Use-intensity indices derived from charcoal deposits in Chamber 2 were highest during the Classic period. Excavated Levels 1-5 all dated to the Early Classic period (A.D. 240 to A.D. 560) and Level 6 beginning in the Terminal Preclassic and moving into the Early Classic period (A.D. 210 to A.D. 440). Peak intensity occurred in Level 6 and intensity waned over time. Charcoal distributions in Chamber 2 suggested that people were standing beneath Ledge 10 and that there was a general shift in usage to the south side of the chamber.

The use of hearths became part of ritual practice at this time. In Level 6, two hearths were constructed against the north wall, one of which was placed directly above the Middle Preclassic stone circle. An obsidian blade was found in the hearth. This was the earliest evidence of the use of hearths in the cave. A sherd-lined hearth was also placed in Tunnel 1 below Ledge 7 and an Early Classic hearth was excavated in the rear of Tunnel 1 adjacent to a keyhole entrance that frames the descent to the Dead End chamber. The hearth was lined with potsherds and contained charred *Brosimum alicastrum* or ramon seeds.

By the Early Classic period all of the cave's stalagmites had been broken and used or removed from the site. Level 6 was the most recent excavated level to contain a stalagmite although stalactite fragments were still found higher up in the Chamber 2 excavation.

At this time, Crawl 3, the ritual sweatbath, contained a formal Early Classic hearth (A. D. 250-430) placed on five stones. The large amount of charcoal in the hearth

suggests that the feature was used on multiple occasions and not as a single event.

Although there were only two Early Classic sherds in the crawl, this probably belies the amount of usage that the area received.

Much of the rest of the ceramic surface assemblage was found on the Tunnel 1 floor in the mid-section of the tunnel approaching Chamber 2 where Ledge 10 is located. A few sherds were found on Ledge 11. The back part of the eastern branch of Tunnel 1 was used and sherds dating to this period were also found in Elevated Passages 3 and 4 and in the Dead End Chamber in a small crevice in the wall in front of the mud plug. There was no evidence for the use of Tunnel 2 from either surface or subsurface contexts.

7.6 Late Classic Period

The ceramic chronology for the Late Classic period is divided into the early Tiger Run complex (A.D. 600 to A.D. 700) and a late Spanish Lookout complex (A.D. 700 to A.D. 900 A.D.). Few sherds dated to the early part of the period. Of these, half are types that are also found in the early facet Spanish Lookout assemblages (Gifford 1976:226). The largest cluster of Tiger Run material was located on Ledge 5, a small shelf with difficult access (Figure 7-5).

The radiocarbon dates show a gap between A.D. 560 and A.D. 680 (Table 7-2). No dates from other areas of the cave overlap the gap. The gap agrees with the ceramic evidence that shows little material from the Tiger Run complex, suggesting that the cave fell into disuse during this time. Further, excavations in the entrance passage demonstrated that the cave had been blocked with boulders (See Chapter 4 Section 4.11.2). They revealed an Early Classic use-floor dating as late as A.D. 430. Boulders

and sediment covered the use-floor indicating that the cave was in filled after this date. A fragile crust or cave powder formed on the top of the use-surface and at some point was covered over by sediment and rock, probably during removal of the blockage.

Additionally, there is no sedimentation in Chamber 2 after the Early Classic period. Blocking of the entrance during the early part of the Late Classic period would help to explain this curious phenomenon. Not only would the lack of human usage reduce sedimentation, but by blocking the entrance, the cave would also be inaccessible to bats responsible for producing the guano that comprises a major component of the cave's sediments.

The cave received a great deal of use during the end of the Late Classic period. Of the entire assemblage, Spanish Lookout style vessels were the most numerous, comprising 51% of the total. Ceramics from this time period are distributed throughout the site with the exception of the end of the eastern branch of Tunnel 1 in the Dead End area (Figure 7-6). Deposits on Ledges 1, 2, 4, 6, 7, 8, and 9 all date to this period. While ledges began to be used in the Early Classic period, the tradition of the placement of whole vessels in high places was not commonly practiced prior to the Late Classic. Tunnel 2 was also heavily utilized during this period and contained large whole and partial jars and bowls. In Elevated Passage 3 and on Ledge 6 jars contained offerings of maize dating between A.D. 680 and A.D. 900. The small size of the cobs suggests that these were young cobs and that the offering is likely the result of "first fruits" or harvest rites (Morehart 2005:175).

Although some sherds could be found on the floors of both Tunnels 1 and 2 beneath overhangs or in niches and alcoves, what characterizes this time period were the

large numbers of whole or partially intact vessels placed on high ledges. Large jars were the vessel form of choice in these areas. In Elevated Passage 1 there are some of the largest examples. Twelve were whole or partial vessels; one contained maize starch grains and two contained corn.

The ceramic deposit with the highest diversity of vessel forms and types dated to this period. It is found in Crawl 3, the ritual sweatbath. Whole and partial Late to Terminal Classic jars, dishes, and vases were deposited throughout the crawl. These included types associated with elite contexts demonstrating that the sweatbath was used by local elites.

Although the Stela Chamber received little or no usage from the Late Preclassic to the Late Classic period, at least one visit was made to the area to deposit the Pedregal Modeled censor fragments. These artifacts were likely to have been part of a rite involving the termination of the stela and possibly the cave itself.

Chamber 2 was seldom used during this period. A few ceramic vessels were left on Ledge 9 in what appears to be a single event. Charcoal was found below the ledge and sherds were deposited in the niche created by an overhang on the south wall adjacent to Alcove 5. Sherds were also found beneath a similar overhang on the north wall. There was no sedimentation in the chamber during the Late Classic period and the amount of charcoal present in the area did not suggest intense usage.

The late facet of Late Classic (A.D. 700-900) cave use has a number of distinct characteristics as compared with other periods. First, there is a large amount of ceramic material imported into the cave during a relatively short period of time. More than half of the cave's entire ceramic assemblage is imported into the site in less than 200 years.

Granted there are almost certainly many unexcavated subsurface artifacts dating to earlier time periods, but based on the broad horizontal excavations in Chamber 2, we would not expect to find a large number of sherds that date prior to the Early Classic period.

Although the artifact assemblage is extensive there is surprisingly little charcoal accompanying the Late Classic deposits. There are no carpets of charcoal flecks covering the Chamber 2 floor as are found in earlier periods. What this suggests is that rituals, though materially intense are abbreviated. A few charcoal flecks were found on ledges suggesting that torch-bearers were attending rituals in these areas but the sparse distribution of flecks indicates that they were not spending long periods of time. The data patterning indicate that few people bearing numerous ceramic offerings were visiting the cave for short durations. The large number of ceramic sherds and vessels deposited during a short time span suggest that they made relatively frequent trips as compared with other temporal periods.

The artifact assemblage is more widely distributed throughout the site than in any other time period. The only area that does not appear to be used is the rear of the eastern branch of Tunnel 1. While the use of the ledges and elevated passages suggests an emphasis on verticality during this period, what we are also seeing is the use of more esoteric and private venues. The small and inaccessible spaces used for many of the rituals of the period further suggest that few people were involved in rituals but that they occurred with greater ritual frequency.

The last radiocarbon date A.D. 720 to A.D. 960 collected from Ledge 6 suggests the cave's latest usage. This date most probably falls between A.D. 770 and A.D. 900.

About this time the entrance was permanently blocked by boulders and was not rediscovered until the 20th century.

7.7 Changes in Ritual Practice Proceeded by Hiatus

A number of changes in ritual practice can be proposed based on changes in the spatial patterns of cave use, the artifact assemblage, and modifications to the site. Changes in practice are punctuated by gaps in both the radiocarbon dates and ceramic sequences that are likely to represent hiatuses in cave use. The first change occurs very early in the sequence. Initially, cave ritual was conducted at the cave's center in Chamber 2. This area was probably attractive due to the presence of the large stalactite chandelier that dominates the chamber. The centrality of the area may have also been a factor in the choice of activity areas (Moyes 2001; 2005). KXM type sherds were found in the lowest levels of the Chamber 2 excavations. Spalls were opportunistically used as containers and corn was imported into the cave. The area was used intensively and rites involved the deposition of small sherd fragments and the movement of speleothems. The ritual venue surrounding the active stalactite as well as the early use of speleothems suggest that rainmaking or other water related rituals were conducted at this time. The discovery of corn in the chamber also suggests that these may have been early agricultural rites.

There was a short hiatus in radiocarbon dates between 820 B.C. and 800 B. C. Chamber 2 fell out of use by 820 B.C. and the cave entrance was possibly blocked sometime prior to 770 B.C. KXM-type sherds were found in early Chamber 2 deposits while SBM-type ceramic sherds dating after 800 B.C were found in sub-floor deposits elsewhere in the cave. The sub-floor ceramic assemblage as well as early radiocarbon

dates collected in both Tunnels 1 and 2 indicated that the tunnel floors were explored during the late facet of the Middle Preclassic period after the initial use of Chamber 2. Rites conducted during this time are difficult to detect but sherd deposition and the scattering of jute shells occurred in the entrance passage and possibly Chamber 1. These artifacts types are both found at surface sites in ritual contexts at this time as well (Brown 2003:116).

There is little ceramic evidence for intensive use of the site during the Late Preclassic period but radiocarbon dates suggest a focus on the caves deepest regions. Activities in the cave during the Late Preclassic were labor intensive. The importation and erection of the stela was likely to have occurred in the late facet of the period, but the most labor intensive activity occurred during the Late Preclassic when the end of Tunnel 1 at the Dead End area was blocked. The event began with the caching of ceramic sherds and intense burning of the cache area. Clay containing artifacts was used to wall up at least 3m of the tunnel. The clay was probably excavated from the Dead End chamber floor.

There was very little usage at the end of the period. From 40 B.C. to A. D. 210, the cave sat almost dormant. The one event of note during this period was the construction of the ritual sweatbath in Crawl 3 sometime between 120 B.C. and A.D. 250. It is possible that the area came into use just prior to the Early Classic period.

Following this period of little utilization, was a relatively abrupt and dynamic change in both cave use and ritual practice. After sitting almost dormant for over 1,000 years, Chamber 2 incurred its most intensive usage of its entire 2,000-year history.

Ledge 10 became the favored area of deposition and hearths were placed throughout the cave. The formal hearth in the sweatbath was in use by this time.

In the Early Classic period, the emphasis of cave ritual shifted from labor intensive activities to rites involving portable objects and there was a substantial increase in ceramic artifacts imported into the site. Petén-style polychrome dishes and small wide-mouthed decorated jars became the most abundant offerings. After the initial spurt of activity, Chamber 2 *use-intensity* began to taper off. The latest radiocarbon date for the area's deposits was between A.D. 400 to A.D. 560.

Beginning in A.D. 560 there is a gap in the radiocarbon dates lasting until A. D. 680 suggesting a 120 year hiatus in cave use. Few ceramic sherds dated to this period. The cave entrance was blocked preventing sedimentation to take place. This hiatus was followed by another change in ritual practice, which occurred in the later part of the Late Classic period.

After A.D. 680, cave use was resumed but in different form. Artifacts were placed on high ledges and in passages located above the tunnel floors. These are restricted spaces that are small and often difficult to access. More artifacts were imported into the site than in all other temporal periods combined. The importation of whole or partially intact large jars and basins were the hallmark of cave use for this period. The ritual sweatbath was afforded special treatment and many intact vessels were placed in the crawl. The styles and decorations suggest that these were elite wares. The stela was likely to have been terminated and the cave entrance blocked by A. D. 960.

7.8 Global Changes Spatial Use

The pattern of spatial use of the cave shifts over its 2000 year history from open areas to smaller enclosed spaces that are progressively difficult to access. The earliest use in the Early Middle Preclassic period occurs on the floor of Chamber 2, one of the larger and most easily accessed areas of the cave. Based on radiocarbon dates from the base of subsurface deposits, the deepest areas of the cave do not appear to have been explored prior to 800 B.C.

In the Late Preclassic activity shifts to the most remote but still open areas including the Stela Chamber, which is the largest space in the cave. The end of the Late Preclassic period was punctuated by the construction of the ritual sweatbath in the restricted Crawl 3. The ledges were not used until the beginning of the Early Classic period. Ledge 10, which contained nearly one quarter of the cave's entire artifact assemblage, was used almost exclusively during this period. Rituals continued to be performed on the Chamber 2 floor, probably simultaneously with the activity on the ledge. By the Late Classic period activities occurred primarily on restricted high ledges and elevated passages throughout the cave. The size of the space limited the number of participants in any ritual performance; therefore the use of restricted spatial areas suggests that there were fewer participants. The light charcoal scatters in these areas support this conclusion. These data suggest that over time, cave rites became increasingly esoteric and that the cave was used by small groups bringing in more objects of larger size. Rites were of shorter duration but perhaps more frequent as the accumulation of ceramic material during this period and its wide distribution throughout the cave suggests.

7.9 Evidence for Elite Usage

Evidence from Chechem Ha supports claims by Awe and his colleagues (2005) that the cave was used by Maya elites. As discussed in Chapter 1, studies of ancient Mesoamerican cave use suggest a close relationship between caves and elite ritual. These spaces were likely to have represented the quintessential private ritual venue for Maya elites, contributing to their mystique. One can understand the socio/political contexts for such a practice. As Abner Cohen (1974) concluded from his research on power relationships and symbolic action in complex societies:

...highly privileged groups almost everywhere place great emphasis on 'privacy' as means of preventing general publics from discovering the organizational mechanisms that enable these groups to develop and maintain their privileged position. In all political systems, the men at the top develop a 'mystique' which raises them above the multitude, validates their status in the eyes of their publics and also convinces the men themselves of their own 'right' to their superior position in the society (Cohen 1977:16)

Brady (1989), Prufer (2002), and Rissolo (2001) have all presented arguments that the morphology of caves suggests whether their use may be for public ceremonies or private rituals. A single cave may contain both public and private areas. Public areas are in light zones whereas the private areas are in dark zones or areas that are spatially restricted.

The restricted morphology of Chechem Ha alone suggests that it was used by elites. The boulders in the cave entrance suggest that originally the cave had a larger entrance that was restricted or blocked as early as the Middle Preclassic period, probably during or shortly after its initial use.

The dark zone of the cave begins at the entrance to the tunnel system. The tunnels are narrow and not only the tunnel itself but the use of niches, alcoves, ledges and

crawl spaces prohibited access. In terms of size the large Stela Chamber was the area best-suited for large public rites. However, it is also the farthest area from the entrance and probably one of the most esoteric spaces in the cave. This is indicated by the few artifacts including charcoal flecks found in the chamber. Therefore, the data preclude its use as a public area for large ceremonies despite its size.

Labor-intensive activities that occurred during the early facet of the Late Preclassic period included the blockage of the end of Tunnel 1, the construction of the ritual sweatbath, and the probable stela erection, suggest elite usage of the site. Awe and his colleagues (2005), following Andrea Stone (1995:130), suggest that, like stela, uprighted stones were exclusively reserved for rituals conducted by those of elite status. According to Stone, the vertical thrust of the monuments is significant because "the ancient Maya attached notions of sanctity and status to verticality." I would add that because these stela-like configurations occur almost exclusively in the dark zones of caves it is unlikely that anyone but an elite or ritual specialist would either construct features or conduct rituals in such esoteric sacred areas. Also, because the Chechem Ha stone is similar in size and form to the Late Preclassic stelae found throughout the Maya area--and particularly similar to the early Cuello stela in northern Belize-- it was likely to have had a similar function.

In his discussion of the Preclassic stelae of the Guatemala Coastal Pacific area, Bove (n.d.) reminds us that their function is speculative, but offers several alternatives. He suggests they may either have served as astronomical/calendrical markers or may have had a political function as dedicatory banner stones of accession to power (rulership), functions that are understood to be operating later among the Classic period

Maya stela. But he concludes that these early stelae relate to ethnicity due to their spatially clustered site distribution. None of these functions are mutually exclusive due to the close relationship between ideology, cosmology and rulership.

Although the Chechem Ha stela is clearly not an astronomical marker, it was likely to have been a dedicatory feature due to its early postulated date. A claim on the cave itself would have been advantageous to elites interested in establishing their right to rule because of what the space represented in terms of land rights as well as the potential special relationship that could be established with the powerful deities dwelling within. If the stela functioned as a dedicatory monument, it makes sense that the effigy censor fragments were placed in the Stela Chamber in termination rites during the Terminal Classic period when the cave entrance was finally blocked. It is hardly accidental that censor fragments such as these were only found near the stela.

The presence of a ritual sweatbath also suggests elite use. According to Mark Child's (2005) preliminary reports, ritual sweat bathing was established as an elite cult behavior during the Early Classic period. Although the sweatbath in the cave was constructed at the end of the Preclassic period, it appears to be a possible early manifestation of this cult. By the Late Classic period, the ceramic assemblage also reflected elite use in that some types located in the crawl were found solely in elite contexts at local surface sites. Taken as a whole, the material found at Chechem Ha as well as the modifications to the site reflect the general pattern of behavior for those of elevated status in the Maya lowlands.

Table 7.1. Temporally diagnostic ceramics from surface and subsurface contexts.

Temporally Diagnostic Ceramics from Surface and Subsurface Contexts	
Jenny Creek	18
Barton Creek	23
Mt. Hope	2
Hermitage/Floral Park	181
Tiger Run	11
Spanish Lookout	235
Total n=	470

Table 7-2. Table of radiocarbon dates in chronological order for the Maya levels. Gaps between dates are highlighted.

AZ Lab #	Period	Area	Radiocarbon Age	Calibrated Date 2 Sigma	Alternative Probabilities
AA57293	LC	Ledge 6	1187±33	AD 720-960	
AA57288	LC	Ledge 4	1210±31	AD 690-900	AD760-900(85.4%)
AA59754	LC	Ledge 6	1224±38	AD 680-900	
AA59753	LC	EP3	1239±36	AD 680-890	
AA57291	LC	Ledge 7	1244±31	AD 680-890	Hiatus 3- AD 560-AD 680
AA57271	EC	Ch2_excl3	1587±34	AD 400-560	
AA57290	EC	Ledge 10	1605±32	AD 390-540	
AA57310	EC	T1	1607±32	AD 380-540	
AA57307	EC	T1	1638±42	AD 260-540	
Beta170074	EC	Ch2_excl1	1660±40	AD 250-540	AD250-470(88.7%)
AA57301	EC	Entrance	1685±32	AD 250-430	
AA59755	EC	Crawl 3	1696±36	AD 250-430	
AA57272	EC	Ch2_excl2	1673±34	AD 250-440	
AA57273	EC	Ch2_excl4	1668±34	AD 250-440	
AA57274	EC	Ch2_excl5	1685±39	AD 240-440	
AA57289	EC	Ledge 10	1714±33	AD 240-420	
AA57299	EC	T1	1716±36	AD 240-410	
AA57275	TPC/EC	Ch2_excl6	1744±40	AD 130-420	AD210-420(92.6%)
AA57311	TPC	Crawl 3	1944±71	120 BC-AD 250	Hiatus 2- 40 BC-AD 210
AA57291	LPC	Stela Ch.	2096±33	200 BC- AD 0	200-40 BC (94%)
AA57276	LPC	Ch2_excl7	2120±34	350-40 BC	210-40 BC (88.2%)
AA57306	LPC	T1	2156±34	360-60 BC	
AA57308	LPC	T2	2130±34	360-40 BC	240-40BC (84.3%)
AA57312	LPC	Stela Ch.	2135±32	360-50 BC	240-50BC (81.9%)
AA57309	LPC	EP4 (T1)	2275±34	400-200 BC	
AA57313	LPC	Dead End Cache	2295±34	410-200 BC	
AA57314	LPC	Dead End	2309±37	410-200 BC	
AA57298	MPC	T1	2339±42	800-200 BC	550-350BC(81.1%)
AA57302	MPC	T1	2432±33	600-400 BC	
AA57300	MPC	Entrance	2465±33	770-400 BC	
AA57296	MPC	T2	2517±37	800-510 BC	Hiatus1- 820BC-800BC
AA57278	EMPC	Ch2_excl9	2755±35	1000-820BC	
AA57279	EMPC	Ch2_excl10	2760±34	1000-820BC	
AA57282	EMPC	Ch2_excl13	2847±34	1130-910BC	
Beta170518	EMPC	Ch2Level12	2780±40	1010-820BC	
AA57277	EMPC	Ch2_excl8	2826±34	1130-890 BC	
AA57280	EMPC	Ch2_excl11	2865±33	1190-920BC	1130-920BC (93.9%)
AA57281	EMPC	Ch2_excl12	2931±62	1320-930BC	1320-970BC(93.5%)
LC=Late Classic		TPC=Terminal Preclassic	MPC=Middle Preclassic		
EC=Early Classic		LPC=Late Preclassic	EMPC=Early Middle Preclassic		

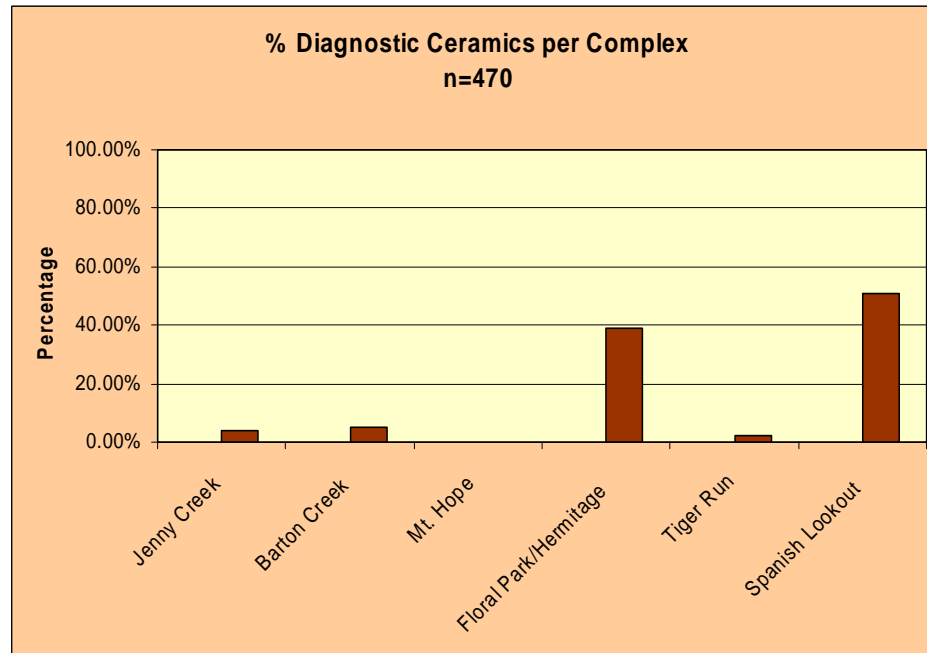


Figure 7-1 Percentage of diagnostic ceramics per temporal period.

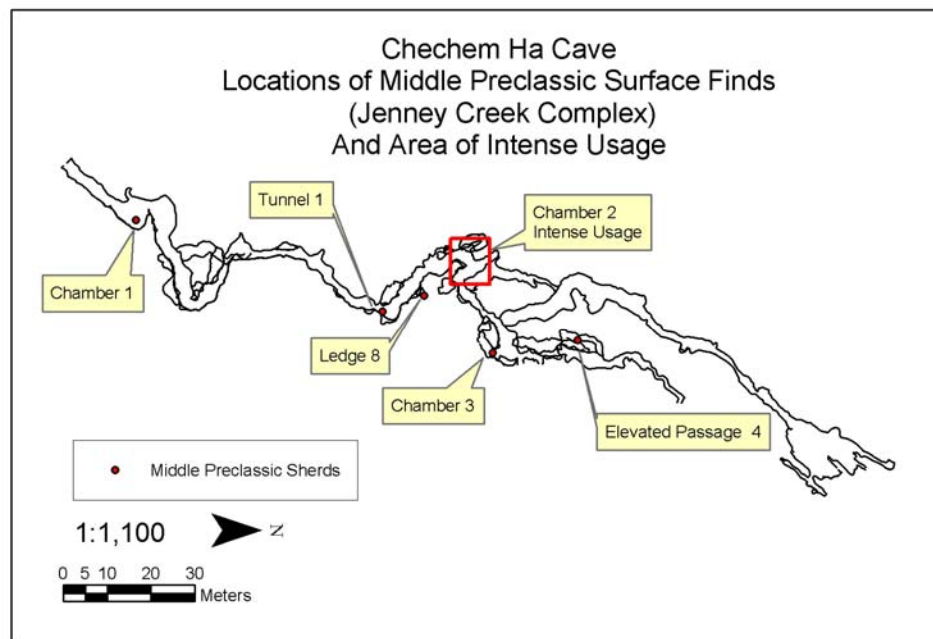


Figure 7-2. Map illustrates surface finds of Middle Preclassic ceramics and the area of most intense cave use at this time.

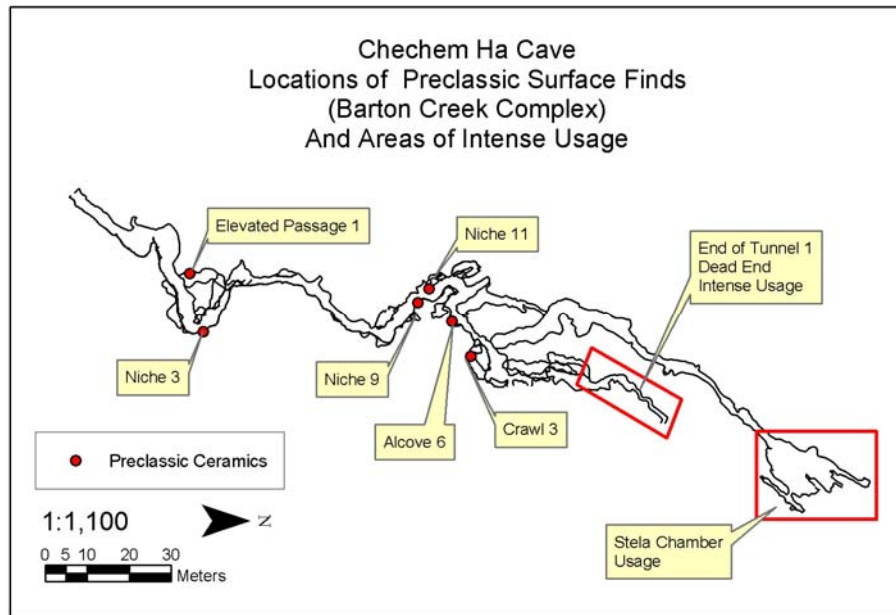


Figure 7-3. Map illustrates surface finds of Late Preclassic (early facet) ceramics and areas of activity at this time.

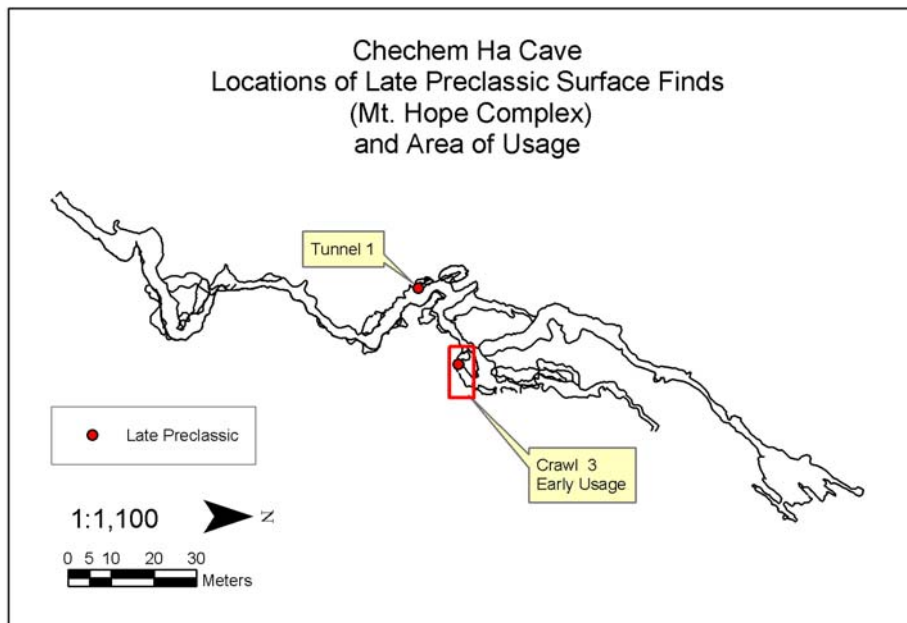


Figure 7-4. Map illustrates surface finds of Late Preclassic (late facet) ceramics and area of activity at this time.

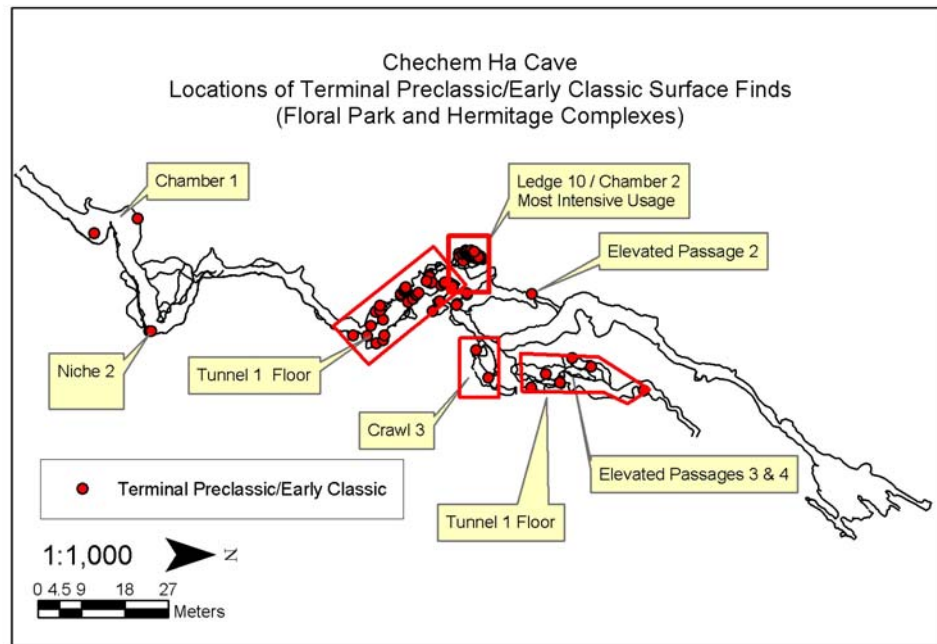


Figure 7-5. Map illustrates surface finds of Terminal Preclassic/Early Classic ceramics and areas of most intense use during the period.

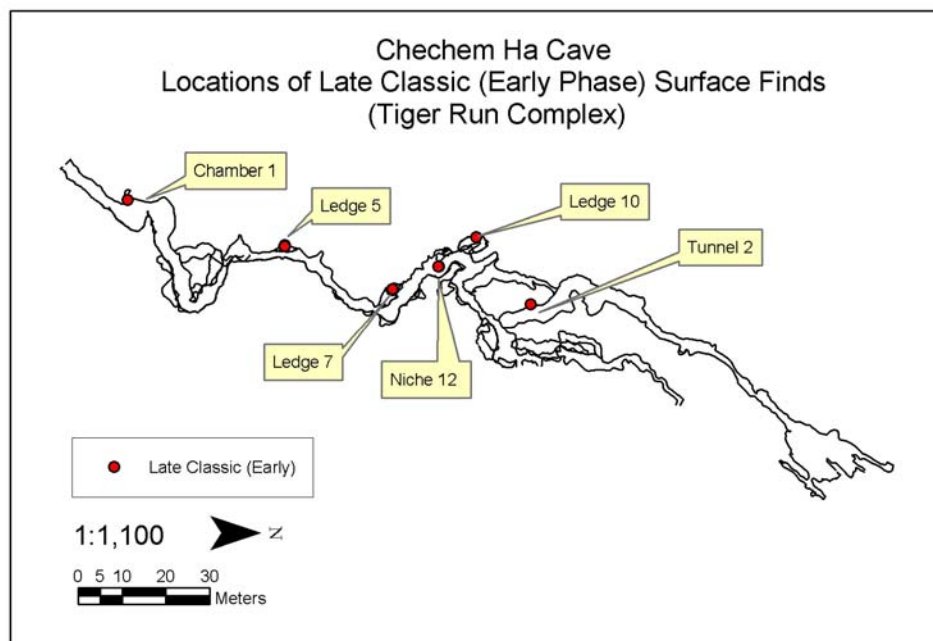


Figure 7-6. Map illustrates surface finds of Late Classic (Early Phase) ceramics. Many of these date potentially later in the period.

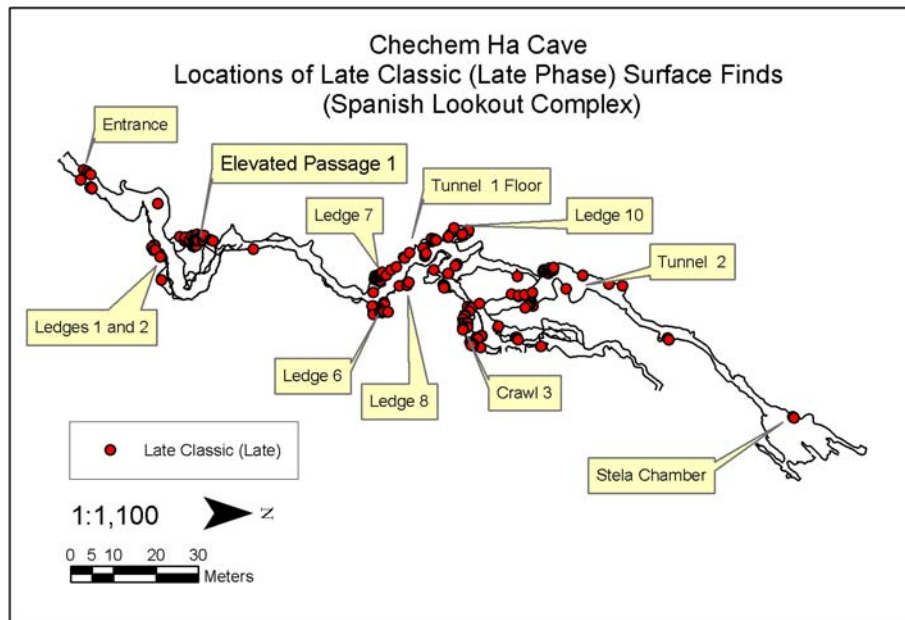


Figure7-7. Map illustrates surface finds of Late Classic (Late Phase) ceramics. No particular area of intense use is designated.

Chapter 8

Conclusions

8.1 Introduction

The data presented thus far illustrate that patterning of cave use changes radically over time at Chechem Ha Cave. Early rites were conducted in larger open areas and involved no modifications to the space, but by the Late Preclassic period large-scale modifications were initiated. The beginning of the Classic period brings with it the most intense usage of the cave's 2,000 year history. Cave use peaks at the beginning of the period and diminishes over the Early Classic. By the Late Classic most activity areas are small and increasingly difficult to access suggesting that rites were increasingly esoteric. Fewer people may have participated in particular cave rites in the Late Classic but small groups may have visited the cave more frequently bringing larger and more numerous offerings with them.

Three gaps in cave use were identified by evaluating the radiocarbon dates, *use-intensity* indices, and ceramic data. Each of these was followed by changes in the use of space, *use-intensity*, the artifact assemblage, or modifications to the site. Current ritual theory suggests that changes in ritual practice often correlate with socio/political change (Aldenderfer 1993; Cohen 1974; Ortner 1989a, 1989b; Packard 1981; Saitta 1997; Schachner 2001; Whiteley 1988). Change may be driven by a number of factors including environmental stress, social disruption, or immigration. This final chapter examines and discusses the factors likely to have influenced ritual practice at Chechem Ha: 1) population fluctuations, 2) environmental stress, and 3) socio/political change or upheavals.

This chapter begins by evaluating the relationship between local settlement and cave use. It is followed by a summary of the changes in practice at the site and how these

related to local, regional, and environmental histories. This is followed by a discussion on the implications of early cave use and its relationship to the development of hierarchy. Next is a discussion of the role of cave ritual during times of environmental stress. Finally, patterns in cave use described at Chechem Ha are compared with those found at other cave sites and some general patterns of cave use are suggested. The chapter concludes with a summary of the study's most important contributions.

Examples from Africa serve as models for understanding the advantages and disadvantages of attaining power based on control of the natural environment. These are apt models because of the similar environments and agricultural technologies shared by many African societies and the ancient Maya. From African examples we may better understand how the acquisition of power via environmental control may be a double-edged sword. When environmental circumstances are favorable, those who associate themselves with the fertility and fecundity of the earth are able to gain power through ideological credibility. Faith in the ritual powers of the ruler allows those in power to extend their control. Conversely, environmental catastrophe has the opposite effect and a number of structural mechanisms must be in place within the system to protect those who control the elements from being deposed or becoming victims of regicide.

8.2 Settlement and Cave Use Proxies

When compared with data from surface surveys the ceramic chronology from Chechem Ha Cave demonstrates that cave ceramics provide only a rough proxy for settlement in the local area. The histogram in Figure 8-1 shows two data sets of from local settlement surveys juxtaposed with the global set from Chechem Ha. The first

survey set is compiled from Jennifer Ehret's preliminary survey of 242 mounds at Xunantunich (in Ashmore et al. 1994:283) and the second is from Cynthia Robin's survey of 100 mounds at the nearby Chan site (Robin et al. 2004:45). Their data represent the percentage of mounds containing a particular ceramic complex. The sets are not in total agreement as settlement estimates at the Chan site fluctuate less than those from Xunantunich. However, both sets generally agree that there was a substantial population in the area in the Middle Preclassic period that diminished during the Late Preclassic and begin to rise in the Early Classic. Settlement in the Late Classic increased substantially and there was a small population present in the Postclassic in areas around Xunantunich and at a single structure at the Chan site.

The comparative ceramic data set from Chechem Ha is based on the percentage of the number of vessels representing each complex within the site. In Figure 8-1 the top illustration shows the breakdown of ceramics into temporal periods the way I have typed them in this dissertation and the bottom chart plots the data using the traditional method of typing. This is done so that the cave data may be evenly compared with the survey data.

In the settlement surveys there are clearly substantial occupations in the area during the Middle Preclassic period, but few ceramics were found in the cave dating to this period. Both settlement and cave use dropped off in the Late to Terminal Preclassic and all data sets show increases between the Early to the Late Classic Periods. There is no evidence, ceramic or otherwise, of cave use in the Postclassic, whereas the survey data indicate that there was a small occupation in the area.

The *use-intensity* data (Figure 8-2) show heavy cave usage in the Middle Preclassic period and correlate well with settlement surveys that indicate that there was heavy settlement in the area. However, the *use-intensity* indices illustrate some of the most intensive utilization in the Early Classic period when settlement was not at its peak. During peak settlement there was little *use-intensity* of the cave based on the charcoal counts, but the ceramic data illustrate that many large objects were imported into the site at that time. Based on either the ceramic counts or on *use-intensity* indices the Chechem Ha data suggest that due to changes in ritual practice, cave usage is not a reliable proxy measure for population growth or decline or vice versa.

However, the cave data are very useful for evaluating changing social conditions. Although ceramic chronologies based on types are often used for dating in archaeological surveys there are inherent problems with this method. As discussed in Chapter 3, some types may be prevalent throughout more than one time period (LeCount 2004), and due to the temporal resolution of production ranges, chronologies are not fine grained enough to pick up minor fluctuations in settlement. The use of radiocarbon dates alone does not solve this problem either due to wide statistical probability ranges. But, by correlating gaps in radiocarbon dates with excavation, ceramic, and use-frequency data, it is possible to define periods of hiatus in cave use that may be correlated with broader contexts.

8.3 Cave Use, Political Development, and the Environment

The earliest likely dates for initial human use of Chechem Ha Cave are contemporaneous with the Cunil phase at Cahal Pech and with early radiocarbon dates from Blackman Eddy (Garber et al. 2004). Therefore, it can be concluded that the

earliest settlers in the valley were cave users. The first hiatus in cave use was between 820 B.C. and 800 B.C. It is the most difficult to correlate with other events because so little is known about the Early Middle Preclassic period. We do know that the local area was populated very early in the period based on settlement survey data from both Chan and Xunantunich, but do not now know the ethnicity of this group.

Joseph Ball and Jennifer Taschek (2003) proposed, based on ceramic data, that the earliest settlers in the Belize Valley were either non-Maya or were Maya other than those living in northern Belize. There is growing independent evidence to suggest that they may be correct. Garber and his colleagues (2004:28) argue that because the earliest dated Kanocha phase ceramics represent a well-developed technology and because there is no evidence for ceramic experimentation, it is unlikely that the technology was developed in situ. Additionally, non-local exotics were encountered in Kanocha phase levels (as well as Cunil phase levels at Cahal Pech), which suggests interregional interactions. Additionally, there is evidence of conflict at the site of Blackman Eddy at this early time (Brown and Garber 2003). Brown and Garber suggest that the placement of Blackman Eddy on a hilltop in a defensive position may correlate with very early warfare. Conflict was evidenced at Structure B1-4th, as the building was desecrated during the Middle Preclassic period approximately 650 B.C. Ball and Taschek (2004) explain this as early ethnic tensions. While the desecration of Structure B1-4th occurs later than the proposed early blockage of the cave, the evidence demonstrates that warfare and social unrest were present during the Early Middle Preclassic period. Considering the political climate and evidence for early conflict, there is an increased probability that

the initial settlers blocked the entrance during an early period of social unrest.

Alternatively, the early users may have wished to restrict the entrance for other reasons.

The change in ritual practice that included the culmination of high intensity initial cave usage by 820 B.C., the alteration in spatial use of the cave, and the change in the ceramic assemblage after this time add to the growing body of evidence that early settlers may have been either ethnically diverse or have come from different Maya groups than those that followed. The Chechem Ha data support Ball and Taschek's suggestion that early immigrants came from the Gulf Coast of Mexico bringing along their cultural traditions. These groups would have had very strong ritual cave traditions that appear to be the precursors of later elite Maya cave rites. Though there are no paintings or petroglyphs at Chechem Ha, the ritual themes of water and maize found in the earliest deposits echo the Olmec cave themes of water and agricultural fertility illustrated on the El Rey Monument from Chalcatzingo.

During the Late Preclassic period modifications to the cave were labor intensive, suggesting that the users were able to organize and carry out large projects. The small uncarved stela was likely to have been erected during this hiatus and Crawl 3 was modified to create the ritual sweatbath. These activities are associated with elite practices and occur during the temporal period associated with the emergence of elite rulership in the Belize Valley. According to Cheetham (2004:138), this was a time when local chiefs were competing for power. At surface sites, the first stelae were erected (Awe and Grube 2001; Cheetham 2004:134-136), the first ballcourts constructed (Healy et al. 2004b:211), and large Late Preclassic temples were built at several sites (Brown 2003; Ford 2004; Cheetham 2004:138). At Blackman Eddy ritual deposits underwent a transformation

from the communal ritual deposits of the Middle Preclassic period that included evidence of feasting to a restricted form of ritual caching featuring ceramic vessels as the primary offerings (Brown 2003:141).

This period of labor intensive activity corresponds to a highly fluctuating weather pattern of increasing and decreasing rainfall (Figure 8-3). The stela in Chamber 2 may have been placed during an increasingly wet period lasting from about 200 B.C. to 0 A.D, but the blocking of the Dead End of Tunnel 1 occurred during a dry period lasting from approximately 300 B.C. to 150 B.C that appears to be more severe but of shorter duration than that of the 9th century A.D. The peak of this dry period was either at 182 B.C. using the 15% correction or 260 B.C. using the 13.9% correction.

Hiatus 2 was a period of sparse usage (A.D. 40 to A.D. 210) during the Terminal Preclassic period during which time the cave was not blocked. Both the Chan and Xunantunich settlement surveys show a decrease in mound occupation during this time period. It is clearly not a local phenomena but much more widespread because A.D. 150 to A.D. 200 is the time of the Preclassic Abandonment. This period of hiatus was recently discussed by Richardson Gill (2000: 314-318) but originally proposed by Richard Hansen to explain the collapse of El Mirador (1990). Hansen compiled a list of sites that showed abandonment, population decrease, or hiatus that spanned the Maya area during this time. One explanation for the phenomenon derives from paleoclimate information, which suggests this was a period of drought (Dahlin 1983; Gill 2000:314-315; Hodell et al. 2001).

At the time of this writing, there is no archaeological evidence from sites in the Macal Valley to suggest warfare in the region during the Hiatus 2 period, so it seems

unlikely that cave use was affected by conflict during this period of sparse usage.

Populations at Xunantunich were reduced considerably at this time and at the Chan farmstead they were slightly reduced but more stable.

Both regional and local climate data indicate that drought was likely to have played a role in reduced populations at Xunantunich and elsewhere. The local evidence of climatic stress supports this explanation. In his speleothem study, J. Webster inferred a dry peak occurring in A.D. 214 (See Figure 8-3). Using his more exact 13.9% hard water correction, the dry period was centered at A.D. 150. Both corrections suggest that a dry period correlates with Hiatus 2. However, it is of interest that the peak occurs at the end of the hiatus. At the beginning, rainfall was very high but levels dropped continually over the Terminal Preclassic period. One might expect that cave use would increase at this time in response to decreasing rainfall but it does not. This can be explained by the drop in population of the area at this time.

By the Early Classic period, elite trappings have been elaborated at nearby surface sites. At Las Ruinas de Arenal there was a large building program in which Group A, Structure 30-4th was built as a burial place incorporating a slab-vaulted burial chamber. In group B, Structures 1-2nd and 2-2nd were constructed, a ballcourt was added, and 2 uncarved stela erected. An elite interment of an adult male in a slab-lined crypt with elaborate grave goods was found in Structure 1-2nd (Taschek and Ball 1999:28-29). Populations at both Xunantunich and Chan rose but did not surpass levels of the Middle Preclassic period.

At the end of Hiatus 2, there is very distinct change in practice beginning about A.D. 210 at the Terminal Preclassic/Early Classic transition. At this time Chamber 2,

that had been either sporadically used or completely ignored as a ritual venue since the early facet of the Middle Preclassic period (820 B.C.), became the focal area for ritual activity. As suggested above, the active stalactite and presence of speleothems in the chamber suggests that water-related rituals occurred in the area. Ledge 10, a restricted space that is difficult and dangerous to access, was used for the first time. The offerings of choice were decorated plainware jar sherds and large Petén-style polychrome dish fragments. The emphasis on ceramic vessels and caching of these objects reflects the general pattern of ritual deposition observed at Blackman Eddy in the Late Preclassic period.

According to the *use-intensity* indices, the period of transition between the Terminal Preclassic and Early Classic is the time that the cave was most heavily used in its 2,000 year history. Chamber 2 remained the primary focus of ritual throughout the Early Classic period. The area of Tunnel 1 leading up to the chamber also received heavy usage but its close spatial proximity to Chamber 2 suggests that this area was associated with the Chamber 2 rites. The hearth in the ritual sweatbath dated to the Early Classic suggesting that rituals were conducted in this area but it is difficult to infer the amount of usage. Only two ceramic vessels in the area were diagnostic of the period but perhaps rites did not include the use or deposition of these objects. Arguably, Chamber 2 appears to provide a good overall proxy for cave use for the period. As the Early Classic period wore on, density maps and compaction data suggest that increasingly fewer people were using Chamber 2. The *use-intensity* data (See Figure 5-30) also illustrate that cave use tapers off over the Early Classic. Considering that local settlement increases (see Figure 8-1), this would not be expected if cave use were predicated on population.

Following this period of waning cave use was Hiatus 3, a period of complete disuse when the cave was blocked off for some time between A.D. 560 and A.D. 680. This period overlaps the Classic Hiatus Phenomenon (A.D. 534 to A.D. 593) discussed in Chapter 2. A hiatus in building construction was noted locally at the site of Blackman Eddy (Brown 2003:148) and at Las Ruinas de Arenal (Joseph Ball and Jennifer Taschek, personal communication 2005). Although Gill argued for a drought during this period, local climate data illustrates that moisture was within an average range during the entire Hiatus 3 period (See Figure 8-3). No drought appeared to precede it either. In fact, the hiatus followed one of the wettest episodes in local Maya history, so it is likely that the hiatus was due to other causes.

There is little epigraphy in the Belize Valley but there are numerous texts available for the closest large centers of and Naranjo. In Chapter 2, Table 2-1 is an abbreviated compilation of deciphered texts spanning the Early to Late Classic periods. War events, skirmishes, births, and accessions are included in the table. Events spanning Hiatus 3 are highlighted in gray. Hiatus 3 encompasses the temporal period in which the wars between Tikal, Naranjo, and Caracol occurred. Tikal was defeated by Caracol by A.D. 562, at the beginning of Hiatus 3. Following Tikal's defeat there was a war between Caracol and Naranjo that lasted until A.D. 680 when Caracol went into a hiatus lasting until at least A.D. 700. Martin and Grube (2000:95) place the Caracol hiatus from A.D. 680 to A.D. 798. Naranjo continued its domination until the Late Classic period and is mentioned on texts from Xunantunich in the early 9th century. The cave was blocked off (A.D. 560-680) throughout the time during which conflicts arose between Caracol and Naranjo (A.D. 596-680).

It is unlikely that this is a coincidence. First of all, epigraphic evidence demonstrates that caves are objects of aggression in war events (Brady and Colas 2005). Also, recall that Chechem Ha is located approximately halfway between the two sites and could easily be pillaged by either side (See Figure 2-3). Although we do not know exactly where Maya wars were fought it makes sense that soldiers moving between the sites frequented rural areas between them creating a war zone. Because the cave was re-opened soon after the fall of Caracol marking the end of the skirmishes, it appears that it was blocked as a defensive maneuver.

After A.D. 680 there is another distinct change in ritual practice and intensification of use. Ceramic counts at Chechem Ha mirror the increase settlement but *use-intensity* indices do not (See Figure 8-2). There is little charcoal in areas of Late Classic use suggesting that people are not lingering in these locales. The pattern of ritual activity shifts to the placement of large whole or partial vessels on high, hard to reach ledges, elevated passages, or enclosed alcoves. Although a large number of objects are imported into the site, the use of small restricted spatial areas and the sparse charcoal scatters in these areas suggest that fewer individuals participated in more frequent rituals.

At Las Ruinas de Arenal, the last of the major building episodes occurred approximately from A.D. 730 to A.D. 900 (Taschek and Ball 1999) and the nearby site of Minanhá fluoresced between A.D. 675 and A.D. 810 in a period of rapid growth (Iannone et al. 2004a). Iannone argued that a royal court existed in the Late Classic period. Settlement at both Xunantunich and the Chan sites reached their apogee during the Late Classic as did many other sites the Belize Valley.

There is a growing amount of data that suggests that Naranjo had considerable influence in the Belize Valley at this time. Xunantunich Stela 8, as interpreted by Christophe Helmke, carries a depiction of the last Naranjo king and exhibits a Naranjo emblem glyph (Houston et al. 1992:507; Martin and Grube 2000:83). Evidence based primarily on ceramic assemblages suggests that Naranjo extended its political power to other sites in the Belize Valley as well (Ball 1993, Reents-Budet 1994). At the site of Baking Pot, evidence of a Late Classic relationship with the larger site is suggested by Naranjo-style vessels found in burials (Audet and Awe 2004:57-58). Some Late Classic Naranjo-style ceramics and related iconography are also found at Chechem Ha in Crawl 3.

There is evidence to suggest that elite or royal power in the region was waning by the Late to Terminal Classic period (A.D. 800-950). Martin and Grube (2000:99) noted that at Caracol a number of monuments depict pairs of lords engaged in conversation or performing ceremonies together. They interpret this as the sharing of power with other elites in an attempt to hold the social structure together.

An uncarved, 2-m-high stela was found at the Chan site near the end of the period. Cynthia Robin and her colleagues (2005:344) suggested that this late stela at such a small community shrine indicated that by the end of the Classic period the power of the Maya elites was waning and the trappings of power, such as stela erection, were being co-opted by leaders of smaller communities. Similarly, based on changes in distribution of polychrome elite wares at Xunantunich, LeCount (1996, 1999) suggested that elites were sharing power with lesser nobility and local community leaders.

At Minanhá the structures of the royal court were buried sometime between A.D. 810 and A.D. 900 and an impoverished group of low-lying platforms with perishable structures was erected in their place. The manner of burial was peculiar because it appeared to be hurried using boulder-sized materials, although carefully executed. Similarly, the royal palace structure at Xunantunich was abandoned in what appeared to be an orderly fashion or possible termination event (Yaeger 1997:36) by the end of the ninth century. Floors were swept clean and some areas were carefully filled in. The method of abandonment appears to be very similar to that discovered in the royal palace at Minanhá. LeCount and her colleagues (2002:45) pointed out that there was no evidence for warfare or violence at the site. Las Ruinas also records a termination at about this time. The cache contained Pedregal Modeled cylindrical censer stands that dated to A.D. 780-1030 and were similar to the ones found in the Stela Chamber at Chechem Ha.

The latest radiocarbon date at Chechem Ha fell between A.D. 720 and A.D. 960. It was sampled from a small corn cob collected from within an intact jar found on Ledge 6. A similar deposit of small corn cobs within a jar located in Elevated Passage 3 dated to A.D. 680-890. There is an 85.4% chance that the Ledge 4 material dated to A.D. 760-900. Other Late Classic dates range from A.D. 680-900. Also, some of the Late Classic ceramics in Crawl 3 are diagnostic to the Terminal Classic period as are the Pedregal Modeled censor strand fragments found in the Stela Chamber. This suggests that much of the Late Classic cave use occurred during later part of the Late Classic and possibly into the Terminal Classic period.

In order to better understand the termination of local surface sites warfare and drought may be considered as driving factors of collapse. In the Upper Belize Valley there is no evidence of warfare so it does not appear to be a driving factor in the collapse of the social system of the local area. Climatologists have supported drought theories as the driving factor in the Maya collapse but David Webster (2002) has argued that a long drought may have been more or less catastrophic in specific areas depending on geographic differences, microenvironments, and social circumstances such as population density and the ambitions of Maya kings. He makes a case for a bottom-up approach evaluating local data rather than inferring local reconstructions from regional studies.

J Webster's climatic reconstruction confirms that droughts were indeed occurring in the area during the Late to Terminal Classic period. According to Webster's local data, there is a long dry period between A.D. 700 and A.D. 1225 with spikes one standard deviation above average at A.D. 809, 928, 1126, and 1206. Using the 15% correction Webster's data is in general agreement with the results from Lake Chichancanab (Hodell et al. 2001) but using the 13.9% correction dry periods centered at A.D. 750, 870, 1070, and 1150 are in even closer agreement, which suggests that the latter correction may be a bit more accurate. Both corrections show dry peaks during the Late to Terminal Classic periods, although the later correction places them about 50 years earlier. The peaks occurring during the Late Classic period suggest that severe drought occurred in at least two episodes during an already dry period, one at A.D. 750 and the other at A. D. 870.

Because Late Classic cave use occurred after A.D. 680 it is reasonable to suggest that the cave was reopened in ritual response to the dry conditions. Ritual practice in the cave supports this argument as there are at least two instances of what appear to be first

fruit rites, one on Ledge 6 and the other in Elevated Passage 3. Based on the study by Freidel and Shaw (2000) these types of harvest rites correlate with dry conditions. This is the only temporal period during which there was evidence that these rites occurred within the cave.

The final event in cave-use was the blocking of the site's entrance sometime between A.D. 720 and A.D. 960, which was the latest radiocarbon date range. Although the cave had been blocked previously, it was never reopened by the Maya following this final blockage. The final blockage may have been some form of ritual termination and appeared to have been conducted with the same care as the termination rites observed at nearby surface sites.

Brady and Colas (2005) consider the blockage of caves or passages to be a type of desecration though they suggest that other types of termination are possible. Their model proposes that ancient looters blocked caves or passages following desecration of the interior. However, in the Chechem Ha instance there is no evidence for looting in antiquity. Archaeologically, we would expect to find destruction of the site and perhaps evidence of heavy burning. However, when Chechem Ha was reopened following its final blockage, whole vessels sat on the tunnel floors, in elevated passages, and on ledges. Sherds were neatly stacked and artifacts were placed in discrete caches beneath overhangs along the floors of the tunnels. One might argue that looting may have occurred in antiquity prior to the final Late Classic blockage, but there was no evidence to suggest intense burning in subsurface deposits in the entrance or elsewhere except within hearths. These were easily identified by their constrained areas that were often lined with sherds and some contained plant remains as well.

Termination and dedication rituals were identified and defined by David Freidel and his colleagues while excavating at Cerros (Freidel 1986a; Garber 1983; Robertson 1983) and were expanded on by Linda Schele and David Freidel (Schele and Freidel 1990; Freidel and Schele 1989). The practice references the Maya belief that structures are alive, animate, and can be imbued with sacred power or soul by rituals and offerings. These rites manifest in the archaeological record as subsurface caches and ritual deposits found in and around structures. Evidence from surface sites indicates that buildings and temples were often "terminated" before falling into disuse or prior to the rebuilding of the structures.

Termination that occurred as an act of war has been identified as "desecratory" termination (Suhler and Freidel 1998) as opposed to other types that are referred to as "reverential" practices. Although both forms are similar in that they may include burning, destruction of structures or structural damage, and breaking of objects; desecratory termination is thought to be perpetrated on a site by a foreign group during warfare and involves more extreme destruction (Ambrosino et al. 2003; Pagliaro et al. 2003). Reverential termination is performed by the community before abandoning a building as part of the life, death, and rebirth of the structure. If conducted during a time of war this type of termination could be considered to be a defensive practice though it still may still involve burning and breakage. Evidence from the Macal Valley suggests that there may be an additional type of reverential termination that is an act of building preservation exemplified by the careful infilling of the nearby royal residential structures at Minanhà Group J in the Late Classic period (Iannone et al. 2004). Iannone has

suggested that the careful covering of the structures may indicate that people expected to return to the building at some point in the future.

Hiatus 1, Hiatus 3, and the final blockage suggest cave terminations that are most strongly related to the referential type and were intended as a method of preservation. Blocking the cave during times of unrest would be a good defense strategy for preserving its contents. Rather than representing a desecration of the cave, it appears that Chechem Ha was protected by the cave blockages that hid its entrance. Because the cave was blocked and unblocked on several occasions this further demonstrates that both the cave and its contents were of value.

8.3.1 Summary

In correlating socio/political and environmental data with changes in ritual practice within the cave, it can be concluded that no single factor drives these changes. Although the close relationship between caves and water rites suggests that climate may drive ritual practice, the evidence for this occurs primarily in the Late Classic period. The last major period of cave use follows the culmination of the war between Naranjo and Caracol. After sitting dormant since about A.D. 560, the cave was reopened after A.D. 680. The time frame corresponds to drought conditions in the local area and the types of rites conducted during this period suggest that these were periodic rites conducted in response to climatic stress.

However, climatic stress cannot account for all increases in ritual intensity because the intense cave use at the beginning of the Terminal Preclassic moving into Early Classic periods is most likely not predicated on the lack of rainfall. During this

time precipitation falls within average ranges and continually increases to high average amounts over the Early Classic period. At this time the political function of cave ritual becomes apparent. The activities initiated within the cave mirror elite activity found in surface contexts such as stela erection and ritual sweatbathing. These types of activities as well as the introduction of Petén-style polychrome vessels provide evidence that cave use was connected to aspirations of rising elites. Cave rites were particularly intense at the beginning of the period and tapered off as the period progressed. In the following sections I argue that the ever increasing rainfall and its entailing agricultural success served to enhance the power of ritual specialists during this time, increasing their social capital. This allowed the group to consolidate and expand their influence.

The blocking of the cave entrance at least three times over its history bolsters this argument. It implies that caves and their contents were important political spaces that warranted protection from rival factions or foreign groups. This is made particularly clear in Hiatus 3 that can be traced to the beginning of a war in the region.

Finally, cave use is not entirely disconnected from population fluctuations. This makes sense because disruptions in ritual schedules, building programs, and population movement would be expected during periods of social or political unrest. What is of note is that in the Chechem Ha case, the earliest immigrants to the area were cave users. This suggests that cave data provide a good indication of when an area was settled. Conversely in the Postclassic small populations continued to live in the area but the site was not reopened. Therefore population flux based on cave data must be viewed with caution. Because of changes in ritual practices there is not a reliable one to one correspondence.

8.4 Implications of Early Cave Use

Olmec iconography illustrates some of the earliest concepts about cave usage in Mesoamerica demonstrating the importance of caves to early leadership. Not only are Olmec kings depicted emerging from caves (Grove 1973), but in the El Rey monument they are also seen as oracles within the cave controlling rain and fertility (Angulo 1987:133-158; Gay 1966; Grove 1984:110-111; Reilly 1994; 1995:41-42). As Schele argued years ago, Olmec kings were depicted as controlling the cave portal between the Middle World and the Underworld from which all life originated. According to Schele (1987:16), "...control of that portal was the most critical and important power in Precolumbian Mesoamerica."

Cross cultural models from Africa add to the body of data that allow us to understand the mechanism by which power may be acquired via control over human interactions with the natural environment and how sacred sites are developed through ritual practice. African models show that spiritual ties to the land are a path to social power. These may be found in the oral histories from the Buha communities of Tanzania. Like the Maya, the Buha were dependent on rainfall for crop fertility and conceived of the landscape as alive and animate (Giblin and Maddox 1996; Wagner 1996).

The Buha *muteko* is an institution of earth priesthood belonging to particular lineages that claim to be the first settlers of the land (Wagner 1996:181-185). Ritual power is passed down from father to son. When the land was first settled, the *muteko* was responsible for establishing a rapport with the earth spirits. *Muteko* performed rituals for these spirits and directed the human community in environmental matters. Success

meant that the family could lay down roots but failure meant death or immigration. Acting as the intermediary between the earth spirits and humans the *muteko* began to acquire social power. For instance, to join the community required the *muteko's* permission. These spiritual leaders also exercised authority over resource disputes and boundary conflicts.

Rites for earth spirits conducted by the *muteko* were associated with specific locations such as on hills, at auspicious places in rivers, near boulders, springs, ponds, anthills, or in caves. These sites came to be regarded as shrines that were the homes of particular spirits. This illuminates the process by which sacred sites in the landscape are created and demonstrates the importance of creating ancestral ties to the land as a path to power in developing social systems. It suggests that ritual ties to sacred sites are ancient, dating back to the initial settlement. In this model sacred spaces in the landscape are established at early periods of initial settlement and continue to be regarded as sacred via social memory.

This example helps to identify a process by which caves may have become elite sacred spaces in Mesoamerica. García-Zambrano's (1994) ethnohistoric model indicates that when immigrants entered an area they wished to settle, the leader began to conduct rituals in a particular cave to establish the "cosmogonic referents that legitimized the settlers' rights for occupying that space or for the ruler's authority over that site" (1994:218). According to this model, the early cave users were community leaders or ritual specialists that mediated between humans and the natural environment. It also suggests that there were *foundational* caves that related to initial land claims of early

leaders. The practice of cave ritual was the method that established particular lineage ties to the land.

The implication of García-Zambrano's work is that caves were a primordial symbolic resource that provided ties to the land for early leaders. It is unlikely that elites "coopted" foundational caves in the sense that they were appropriated from non-elites, because community leaders were already supervising cave rites. In other words, it was through ritual practice that early ritual specialists created sacred caves. Early ritual specialists had a powerful tool in hand that could be used to extend their social power. The cave itself and ritual power associated with it became a resource that was instrumental in enabling the rise of the elites.

Chechem Ha was likely to have been a *foundational* cave. As previously discussed, radiocarbon dates of earliest usage of Chechem Ha Cave correspond to the earliest dates for the settlement of the region collected at site of Blackman Eddy. Surveys of the Upper Belize Valley have found ceramic sherds dating to the early facet of the Middle Preclassic period indicating that people were living in the vicinity of the cave at this time. The Early Middle Preclassic period in Belize dates as early as 1100 B.C, the end of the Late Preceramic or Archaic period. In Belize, the end of this period is marked by the transition to full-time sedentism evidenced by settled villages and stone architecture, the adoption of ceramic technology, and participation in long distance trade networks (Lohse 2005:449).

Based on excavations conducted at Blackman Eddy and Cahal Pech it appears that an elite class developed in the Belize Valley at an early time as monumental architecture and elite iconography was in place by the end of the Middle Preclassic period. According

to Brown (2003:116) water symbolism was already part of the ideology of the Middle Preclassic elite.

At Chechem Ha, the earliest rites occurring around the active stalactite in Chamber 2 were water-related and included the movement of speleothems. Later in the Middle Preclassic the presence of corn suggests the development of agricultural rites. The types of rituals occurring at such early dates provide evidence that the cave was used by the earliest settlers as a water and/or agricultural fertility shrine. Based on cross-cultural examples, it is hardly surprising that the development of early rites were those that tied settlers to the land.

8.5 The Early Classic Apogee in Cave Use

Following the Middle Preclassic period, cave use was sparse for close to 1,000 years. Then in the Early Classic period the heaviest *use-intensity* of the cave's history occurred in Chamber 2. Following Hiatus 2 there was distinct change in practice beginning about A.D. 210. The presence of the active stalactite and pile speleothems in the chamber suggests that water-related rituals occurred in the area. Ledge 10, a restricted space that is difficult and dangerous to access was used for the first time. The offerings of choice were decorated plainware jar sherds and large Petén-style polychrome dish fragments. The emphasis on ceramic vessels and caching of these objects reflects the general pattern of ritual deposition observed at Blackman Eddy in the Late Preclassic period. Beginning about A.D. 214 (using Webster's standard 15% correction or A.D. 150 using the 13.9%), rainfall steadily increased over the Early Classic period until about A.D. 450 (or A.D. 550 with the 13.9% correction) (See Figure 2-9).

So if the rites of this period were water-related rituals related to agricultural success as the data suggests, why would cave use increase during this wet period and why would the area of heaviest activity be in Chamber 2? By examining models of rainmaking as a method for the development of power the finding begins to make sense. Recall from the discussion in Chapter 1 on African chiefdoms and kingships that rainmaking was an important aspect in the development of authority. The history of the Bashu is of interest because it provides an example of how under particular environmental and technological conditions rainmaking can be an important political resource for the development and maintenance of power. Among the Bashu, chiefs claimed power to control the natural environment (Packard 1981). Therefore, much like the ancient Maya, the Bashu political system is intricately intertwined with the ritual system. As Packard demonstrated, Bashu ideology also plays a major role in shaping political action.

All Bashu chiefs are thought to be the descendents of the earliest settlers that established ritual ties to the land (Packard 1981:67-71). Initially there were various types of ritual specialists that dealt with particular aspects of crop fertility. Among these were clan chiefs that magically controlled rain. Rain was believed to originate from the nearby snow-capped mountains where clouds could be seen moving off. The authority of the rain chiefs was based on their effective use of rain stones. These stones were quartz crystals that came from the mountains and were thought to represent solidified rain.

By the beginning of the nineteenth century, the rain chiefs begin to achieve power over the other ritual specialists. Rain chiefs who were able to end drought were the most highly revered. Payments made to them for supplying rain permitted them to establish

alliances with lineage heads and other ritual leaders. As early rain chiefs acquired power they were able to move into a position of coordinators of other ritual specialists and acquired an ideological association with the general condition of the land.

The early rain chiefs possessed specialized individual ritual powers whereas later Bashu chiefs were primarily responsible for the general condition of the land, which entailed coordinating the ritual life of the community. The region's geography and its relationship to the environment played a major role in both limiting and expanding political control. Packard (1981:70) noted that the localized nature of rainfall patterns and the distribution of thunderstorms may have caused the power of individual rain chiefs to be associated with specific local areas and thus have conceptual limits on their powers. When a regional environmental crisis such as drought occurred, rain chiefs had to consolidate their authority to end the crisis. Under these conditions, it enabled a powerful rain chief, Luvango, to arrest ritual control of a larger political sphere establishing the Bashu institution of chiefship as it existed in the 1800's (Ibid.:107). According to Packard, in Bashu ideology this consolidation of power created a more stable environment and decreased the likelihood of famine.

Alternatively, during time of plenty, wider ritual coordination was difficult (Packard 1981:107). During these prosperous times individual families attempted to increase their spheres of influence by competing for the support of local ritual leaders. So, we may conclude that fragmentation is most apt to occur in prosperous times whereas consolidation can follow periods of stress. We may also conclude that demonstrating one's ability to make rain under any conditions is an effective path to ritual power that may be parlayed into political capital via alliance building.

The high rainfall predicted for the Terminal Preclassic period suggests that this was a prosperous time for Maya farmers as well as the elites who aligned themselves with water control. Based on the models of African societies, this was an ideal situation in which leaders could extend their ritual powers by demonstrating their prowess in rainmaking and take credit for agricultural success. It has been demonstrated that in the cave, use-frequency was at its peak during the early part of this period. It is possible that as elites consolidated their power, cave rites became increasingly esoteric. Alternatively, it is possible that as rainfall increased, rites in Chamber 2 became less frequent as the need for them decreased. By the end of the Early Classic period rainfall estimates had increased to more than 50% over the average and toward the end of the period may have exceeded ideal amounts. Recall that in tropical areas there are optimal amounts of rainfall that when exceeded can erode soils and wash crops away.

8.6 A Late Classic Drought Cult

Data from Chechem Ha indicate that after A.D. 680 and the cessation of the tensions between Naranjo and Caracol, there is a distinct change in ritual practice and intensification of cave use. The Late Classic rituals entailed the placement of large partial or whole vessels, primarily jars, in hard-to-reach areas. While jars sherds are also the most common artifact in the Early Classic assemblages, they are almost always highly fragmented whereas the condition of these artifacts in the Late Classic tends towards whole vessels, some of which contained offerings of maize. Activity areas during this period include elevated shelves, restricted niches and alcoves, or other remote areas.

This change in practice is not limited to Chechem Ha but is widespread phenomena in Belizean cave sites. Whole or partial vessels which often include medium to large jars, large bowls or dishes dating to the Late Classic to Terminal Classic Spanish Lookout Complex (Tepeu II and III) are found in similar contexts in many sites. They are reported by the Western Belize Regional Cave Project in the Entrance Chambers and Main Chamber at Actun Tunichil Muknal (Griffith 1998; Moyes 2001), Barton Creek Cave (Mirro 2001), Flour Camp Cave (Ishihara 2001), Laberinto de las Tarantulas (Helmke et al. 1999), and Yaxteel Ahau (Mirro and Halperin 2000; Owen and Gibbs 1999). In his survey of 48 caves in southern Belize, Prufer (2002) also found numerous examples containing partial or whole Late Classic vessels placed in difficult-to-access or remote areas. The pattern was also noted at Edward Quiroz Cave in the Chiquibul region of southern Cayo District (Pendergast 1971) and at Rio Frio Cave in the Mountain Pine Ridge (Pendergast 1970). In the Caves Branch area, Graham and her colleagues (1980) illustrated a number of Late Classic jars and bowls from the high ledge at Footprint Cave and numerous intact Late Classic jars and dishes were found in Alcoves I and II at Actun Polbiche in the Sibun Hills (Pendergast 1974). Patricia McAnany and her colleagues (2003), also working in the Sibun area, reported large Late to Terminal Classic vessels found in inaccessible areas at Pottery Cave.

The pattern represents a distinct Late Classic cave cult likely to have been associated with dry or drought conditions. Given the deep antiquity of Maya beliefs that associate caves with gods that control water; in a time of environmental crisis caves would have been the logical ritual venue to propitiate these deities. The ubiquitous presence of intact or partial jars in these assemblages is also suggestive.

Ethnographically, jars are divided into three functional groups: narrow mouth jars for carrying water, wide mouth jars for storage, and ollas with wide collars and low necks used for cooking (Thompson 1958:121-123; Reina and Hill 1978:26). Smaller varieties are used as water bottles around the house. Wide-mouthed jars may be used for storing water, maize seed, and a variety of other things or may be used for brewing *balche*. However, large jars also have cosmological connotations.

Ethnographic evidence reported by Tarn and Prechtel (1986:176) from Lake Atitlan in Guatemala point out that Maria Castellana, a female creatrix, is associated with the moon, which is thought to hold rainwater and is envisioned as a large olla. During rainy season the moon/olla turns sideways until the water spills out. Images in the Dresden codex suggest that this is an ancient belief. On page 74 is an illustration of the primordial flood that Taube has associated with the original Maya creation event (Figure 8-4). An old woman, named in the codex as *Chac Chel* and identified by Taube (1988a:146; 1995:71) as Goddess O, the Moon Goddess, hangs in the sky. In her hands there is an inverted olla pouring water. The Black Chac as a warrior is shown below her. She is depicted similarly on page 43b. Likewise in the Madrid Codex flood pages she is seen in a similar stance on pages 10b and 29b. On page 30a of the Madrid both she and Chac are in similar poses pouring water from inverted jars (Figure 8-5). Because she is pictured in the cave paintings at Naj Tunich, Brady (1989:47-49) has long argued that this female deity is associated with caves.

Evidence for the ritual association of jars as offerings to rain deities is also found farther a field. Among the Aztecs, globular jars were used as offerings to

the Rain God Tlaloc (Luján 1998:180). Globular jars containing three or four greenstone beads associated with large bowls were found in six caches in the Templo Mayor (Figure 8-6) and are considered to be dedicatory caches that reflect the primordial creation of the world (Zantwijk, R. van 1981). Note the similarity of this configuration to the jar and bowl arrangements found on Ledge 6 (Figure 4-62), Ledge 9 (Figure 4-76) and in the south end of Tunnel 2 (Figures 4-138, 4-143, 4-144, 4-146) all of which date to the Late Classic period.

The central Mexican jars were found on their sides with the bowls beneath their mouths. Both Seler (1990:book 2:281) and Krickeberg (1975:152) have suggested that the beads represented droplets of precious water. Leonardo Luján (1998:180) suggested, based on Mexica myths, that this cache configuration represents the celestial pouring of water from the sky by Tlaloc. In myth, Tlaloc lives in a four-roomed chamber with tubs of water in each room. He orders his assistants to gather water from the tubs in vessels to scatter on the ground. When it thunders the assistants are breaking the vessels with clubs.

Indeed, independent evidence indicates that Tlaloc is associated with jars. In sixteenth century documents the Temple of Tlaloc is depicted with jars sitting atop the parapets (Codex Ramirez 1944, plate 19, Durán 1971, plate 30). In the Aztec principal festival dedicated to Tlaloc, a jar referred to as a "cloud jar" was covered with blue pigment and rubber (Sahagun 1981:Book II:88). It was used to contain the hearts of sacrificial Tlaloc impersonators so that they could be transported to the middle of the lake and offered to the water.

Because the evidence from the Aztec caches suggests that jar and bowl configurations reference rain rites, this may help to explain similar configurations found in the Maya area particularly since, at Chechem Ha, the configuration occurs during a very dry period of Maya environmental history. Although some of the large jars found in Maya caves in the Late Classic period are certainly for storage of offerings, others lidded, or non-lidded likely reference water poured from the sky. In Late Classic rituals these objects are likely relate to Maya mythology that equates rain and water deities with these vessels.

8.7 Caves and Collapse

The nature of cave use in the Late Classic period is indicative of the power sharing that occurred throughout the Maya lowlands in the Late Classic period (Stuart 1993; Grube 1995). As Martin and Grube (2000:99) note, during the Terminal Classic period, "the centrality of the king as 'divine lord' and sole source of political authority seems critically undermined; a wider elite class must co-operate as never before to hold a strained society together." Power sharing has been demonstrated locally at Xunantunich by LeCount (1996; 1999). Her data indicate that during the Late Classic period until approximately A.D. 800 the possession of fancy polychrome pottery was almost exclusively an elite prerogative. However, during the Terminal Classic these types were shared with lesser elites and local community leaders. LeCount interpreted this finding as representing a last-ditch measure by elites to increase social integration at a time when the social fabric was unraveling.

Rites conducted at Chechem Ha appear to reflect this process in that they were more frequent or were conducted by more groups although the sparse charcoal scatters found exclusively in Late Classic ritual areas suggest that there was less elaboration in the rituals conducted. Elsewhere, the extensive use of caves during this period also suggests a cave cult that is more widespread than that of all other periods. This is a good indication that more groups were allowed or encouraged to use the sites in the Late Classic than in previous eras.

One must ask why power sharing became necessary at this late date in Maya history. Drought theorists would argue that the society was under the most extreme environmental stress to have occurred during the Classic period. If the drought theorists are correct, environmental catastrophe was the driving force behind the political upheaval. James Webster's local rainfall reconstruction bears this out. What Webster was able to demonstrate was that the dry period was prolonged lasting over 500 years from A.D. 700 to A.D. 1225. The termination of the cave as well as the sites surrounding it corresponded with dry peaks in the rainfall reconstruction. The cave data suggests that we are seeing responses to the environmental crises.

This crisis likely entailed the rejection of elite rulership and its associated ideology. The Maya political collapse most likely entailed the disassociation of political leaders with natural processes such as rain making, agricultural fertility, and the perceived cosmic order. It follows that rites that were the prerogative of Maya kings or other elites may have been rejected outright. This is not a new idea. Years ago J. Eric Thompson (1954:266-269) proposed that the Maya collapse resulted from the alienation

between the elite and the peasants leading to a peasant revolt. In Thompson's model, the peasants rejected the elite ideology of warfare and gods of war.

Dennis Puleston (1979) suggested that elite ideology had a limitation on its duration based on cyclical time. The co-occurrence of unusual stress on the political system with the end of the thirteen-katun (256-year) temporal cycle was in Bateson's (1972:480) terms, an epistemological error which became a self-validating myth producing a general sense of fatalism. According to Puleston:

It would seem that the first to respond to the arrival of the fateful katun were the elite, who apparently began to pull out of energy- and time-consuming ritual projects. I would suggest that at this point behavioral and attitudinal changes spread outward in the system and, presumably in a classic demonstration of the principle of hypercoherence (Flannery 1972), began to affect the social, political, and economic structure. What were at first minor disruptions in the system gained momentum; changes that had a negative effect on the stability of the system as a whole could only be taken as evidence for the truth of the central assumption; and in a very real sense the prophecies of the katun were self-fulfilling. In this case, however, unlike that of the previous cycle, there was essentially no recovery (Puleston 1979:70).

The idea of the loss of faith in the state ideology and religion as a component, if not a cause of the collapse, has been advanced by numerous scholars (Lopiparo 2001; Lucero 2002, Masson 2000:274; Miller 1993; Webb 1973; Webster 2002). According to Webb, cult centers would have no reason for existence except in the belief in the cult itself and would be subject to collapse if any set of circumstances successfully challenged

the belief. Therefore, if theocratic rulers met crises by devoting more and more shrinking resources to cult ends with no improvement of conditions, (such as the monument construction and stela erection during the Late Classic period), their "believability" would suffer and the cult would collapse (Webb 1973:389). Similarly, in her study of Late Classic Maya art, Mary Ellen Miller (1993:410) concluded that by the end of the period "...the disjunction between what was known of the cosmos and what was happening may have been so profound that faith ebbed among the Maya."

Lopiparo (2001:49) argued that "ideological currency" was the only commodity that elites had to offer commoners. She explained the collapse by invoking Gramsci's concept of "ideological consent" (Salamini 1981:33), which states that change in political systems first occurs in the minds of the masses. Lucero (2002:822) asserts that, "rulers were probably blamed for all the mishaps occurring as a result of climate change, as well as for decreasing resources." Webster argued that internal and external stresses lead to the ideological resistance that caused the decline of the royal institutions. According to his model, as social conditions deteriorated, both commoners and lesser elites could point to the kings as scapegoats (Webster 2002:329, 343-347).

Some additional insights may be attained by comparing African responses to environmental crises to ancient Maya responses. There are a number of African examples of the relationship between kings or chiefs and rain making, which are instructive as to the consequences of natural catastrophes for leaders. African examples replicate similar socio/political conditions as those in which Maya kings found themselves on the eve of the collapse.

Like the Bashu described in Chapter 1, many other African political systems provide structural outlets for shifting blame for environmental catastrophe away from the rulers. For instance, Hilda Kuper (1952) reported that one of the primary functions of the Swasi kings of Botswana is rain making. The ruler is spiritually assisted by his ancestors who appear in dreams as snakes. During their rain rites both the king and the populace observed behavioral taboos. The origins of drought were typically explained as "disobedience or disloyalty of the people; anger of royal ancestors, breach of taboos, or hostility between the rulers" (Kuper 1952: 42-45).

Gerald Hartwig (1976:144-149), working among the Kerebe of northwest Tanzania, noted that while rain making capabilities added to the kings prestige when successful, he could be deposed should he fail over an extended period of time. In practice, the king could take credit for successes but in the event of drought, a distinguished rainmaker from a non-royal clan would be called to court to perform rites using the king's ritual paraphernalia. The rainmaker could then be blamed in the case of failure.

The Kimba chiefs of Tanzania, located near Lake Rukwa are also credited with the power to make or withhold rain (Shorter 1972:106-107). The real power is in the hands of the chief's ancestors who are corporeally represented by the chief. Sufficient rainfall during the wet season is taken as a sign that a chief enjoys the favor of his ancestors but in the case of drought, a chief may lose his position because it is assumed that this favor was lost. If deposed, chiefs are not usually killed but exiled to other chiefdoms. Shorter reported that in 1775, the nearby Bungu people deposed their chief during a drought in which Lake Rukwa dried up completely.

The African examples demonstrate the precarious association of leadership with the natural environment and illustrate some of the structural mechanisms that may protect the leader in times of environmental stress. In the most extreme cases, an unpopular king could be killed in a political coup timed with a serious drought or famine as in the case of one Jukun king of Nigeria (Young 1966). Among the Jukun, the king's health was so mystically connected to the well-being of the people and their crops that any sickness or infirmity perceived in the king constituted grounds for institutional regicide. There exists a seven-year rule of thumb regarding the typical length of kingship that Young believes correlates to the seven-year drought cycles of the region.

The African cases illustrate that having attained the power of divine kingship and faith of the populace, it is not an easy matter to shirk the responsibilities of the office. The loss of faith in rulers associated with environmental forces is common. This is often mitigated but when mitigation is not possible, in the best-case scenarios kings are deposed or replaced whereas in the worst cases they are killed. Based on these cross-cultural examples, it makes sense that because Maya leaders used similar strategies in establishing and maintaining power through water control, loss of faith in the leadership was a predictable response to environmental stress. What one does not see in the African examples is that loss of faith in a particular ruler leads to the failure of rulership itself or for that matter the collapse of the entire social structure. The African populace loses faith in the individual not the structure.

African social systems often exhibit a number of socially acceptable mechanisms built into belief systems designed to deflect blame for environmental catastrophe by re-assigning failures to others including the populace, ritual specialists, or rival chiefs.

These institutions no doubt developed as a response to regular drought and famine cycles that have continually ravaged the continent. A number of scholars have drawn links between these unpredictable environments in relationship to the development of ideological beliefs and to the transformation of political structures (Maddox et al. 1996).

Many of the examples of how responsibility for catastrophe may be deflected away from kings or chiefs came from Tanzania where there is a long history of calamitous droughts and excessive rains (Giblin and Maddox 1996:1). A recent paleoclimate study from Lake Masoko in southwest Tanzania, using charcoal flecks from the lake core as a proxy for climate change, demonstrated that after 1560 cal. yr BP, there are increased forest fires (Thevenon et al. 2002). The fires coincided with the arrival of Iron Age Bantu-speaking people who practiced slash and burn agriculture. Although immigrants were responsible for modifying the environment for farming and iron-smelting, the authors argue that the extent of forest clearance and burning recorded in Lake Masoko were likely to have involved relatively drier conditions as well as anomalies in the periodicity of rainfall events.

Historical information beginning in the eighth century A.D. from northwestern and east Africa describe major droughts and famines since 1680 (Nicholson 1978; 1979). According to ethnohistoric information, both east and western Africa were wetter prior to this time which signaled the long decline towards their present aridity. Tyson and Lindesay (1992:276) noted that during the Little Ice Age, lasting from approximately A.D. 1300 to A.D. 1850, southern Africa had a drier climate with increased incidence of droughts. Today there is a quasi bi-decadal pattern in rainfall variability between wet and dry periods (Tyson 1986) and cyclical droughts in southeast Africa have been linked to

the El Niño Southern Oscillation (ENSO) (Brook et al. 1999; Cane and Zebiak 1985; Washington and Downing 1991). The Sahelian zone suffers long episodes of dry conditions that can last for decades and are mirrored in the Kalahari and southern Africa (Weisburd and Raloff 1985). The rainfall problem is compounded because it is not only the amount of rainfall that is important but the timing within the crop cycle affects agricultural success as well.

Those who argue that loss of faith in the institution of Maya kingship was a mechanism that contributed to the failure of the ancient Maya political system must ask why it was that ancient Maya systems could not accommodate ritual failure. The answer may be in its development. The iconography of the Classic period illustrates that Maya kings were preoccupied with developing and maintaining power. Demonstrating their right to rule and legitimacy was a major concern that was addressed in much of the elite propaganda for public consumption such as images on stela or friezes on buildings. It was not until the Late Classic period when environmental catastrophe was at hand that power sharing, a common strategy among African kings, occurred among apical as well as lesser elites. By then, as history has demonstrated, power sharing strategies did not rescue the failing kingly institution.

One of the major differences between the African kingships and Maya kingships is in the environmental contexts in which they developed. Africa was plagued by constant drought and famine from a very early inception of its institutions of divine kingship. Therefore, the social structure of African kingly institutions developed numerous mechanisms within the belief systems and political structures that accommodated ritual failures. On the other hand, recall that among the Maya, the

Terminal Preclassic to Early Classic periods during which the ancient Maya kings rose to their height of power were some of the wettest eras associated with the entire ancient Maya civilization. The stresses inherent in the African systems did not exist in the Maya area for hundreds of years. There was no need to accommodate for catastrophic environmental stress or the accompanying ritual failure associated with it. There was no evidence for power sharing during the Early Classic period and in fact the era is marked by power expansion (Martin and Grube 2000). In the end, Maya kings may have become overly entrenched, their power too great, and their political structures too rigid to accommodate ritual failure.

There is an additional factor in play as well. J. Webster's (2000) rainfall reconstruction indicates that the Late Classic dry period continued until about A.D 1225. It may be that the duration of this stressful period prevented any possible reconstruction of the political system. Although loss of faith no doubt played a major role, the length of the dry period had to have been a factor in severely damaging or destroying the political economy. While farmers may have been able to subsist in dry conditions it is unlikely that enough surplus could have been generated to support a royal court. Freidel (1986b) has long argued that the collapse of the Southern Lowland political regime was integrally related to economic failure.

8.8 Changing Regional Patterns of Cave Use

Cave studies to date show that there is a regional difference in Postclassic cave use between the Southern and Northern Maya Lowlands. The Chechem Ha data fits an emerging pattern of cave use in the Southern Lowlands in which usage is essentially

discontinued after the ninth century. While most caves in Belize exhibit Late Classic usage almost none are used in the Postclassic period. When Postclassic use is present, it is ephemeral and usually limited to light or twilight areas. For instance, a few Postclassic sherds were located in the twilight chambers at the entrance of Actun Tunichil Muknal, but none were found in the dark zones. In the Barton Creek Valley two Postclassic sherds were found in Cueva Migdalia (Helmke and Ishihara 2002). In the Sibun area, Polly Peterson (2006), working with the Xibun Archaeological Research Project (XARP) reported two pine torches found at the small Pine Torch Rockshelter that dated to A.D.1295-1414. Handprints dating to the Terminal Classic or Early Postclassic were located just inside the entrance of Actun Ik in the study area. However, in her entire survey of the Sibun caves, out of almost 8,000 diagnostic sherds, only 9 were attributed to the Postclassic period. This indicates that cave use at this time was ephemeral at best, yet there is considerable evidence for at least minor Postclassic settlement throughout Belize. Additionally, revisions of the Terminal Classic ceramic chronology indicated that many types originally attributed to the Postclassic period have been demonstrated to be Postclassic (Jaime Awe, personal communication 2006).

Similarly in his extensive survey in southern Belize, Keith Prufer (2002:171) noted that there was little evidence for Postclassic cave use. Three vessels were found in SC1, a small cave with no dark zone. They were covered with mud and silt and may have washed in from the entrance. Prufer also reported charcoal that produced a Postclassic radiocarbon date from Zecklebal Ka'abl Pek, a small cave with no dark zone, but no Postclassic ceramics accompanied the find. Prufer noted that this evidence may have represented transient groups though there were people living in the area at the time

of Spanish contact. When we examine the evidence for Postclassic cave use in Belize, we find that it could not begin to rival or even emulate Classic period activity. Evidence suggests that Postclassic use was limited to single visitations to light or twilight areas.

One might argue that the cessation of cave use was an artifact of depopulation, but growing evidence from Belize does not bear this out. For instance, Elizabeth Graham (1994:324-326) noted that the Sibun area was at one time littered with Mayapan-style effigy censer fragments but that few remain today due to disturbance by modern commercial agriculture. She also found Postclassic ceramics at nearby surface sites. This led her to suggest that the area was part of a Late Postclassic trade route linking the Belize Valley and the Petén to coastal resources.

Sites near Chechem Ha such as the Chan site, Xunantunich, and Las Ruinas all had small Postclassic occupations. Also approximately half a kilometer north of Chechem Ha is the Postclassic to Historic period site of Tipu (Jones et al. 1986) that showed a continuous occupation through the Early Postclassic (Aimers 2004:67). Because we do not know which caves were used by which particular sites it is not possible to draw a one to one correspondence, but the general pattern suggests that cave use associated with elite ritual was discontinued following the collapse. This further demonstrates the exclusivity of these sites.

While there is little cave use in the Southern Lowlands, Postclassic cave use is frequent in the Northern Lowlands. For instance, at the Late Postclassic site of Mayapán in Yucatan, a cave runs beneath the Temple of Kukulcan (Brown 2005:391). In his extensive survey of the Yalahau region and in his survey of the literature for the area, Dominique Rissolo (2001) reports Postclassic usage that includes feature constructions,

paintings, and ceramic sherds. Wyllis Andrews IV (1970) discovered Postclassic remains in the sealed passages of Balankanche. Additionally, Andrea Stone (1995:54-55) reported Late Postclassic and Colonial period drawings at the cave of Dzibichen near Yalcoba.

The differential Postclassic use may be explained by the differences in the political systems between the Northern and Southern lowlands. Years ago David Freidel (1986b:424-425) noted that by the Early Classic period Southern Lowland political religion focused on the notion of royal bloodlines that transferred power through "pure" descent lines. He suggested that this reinforced notions of ethnic purity among all participating nobility. The northern areas shared a basic cosmology but did not emphasize sacred royal bloodlines or the incarnation of kings as Maya supernaturals. The evidence suggests that the northern groups celebrated individual rulers rather than whole dynasties and eschewed the obsession with "pure" bloodlines that the notion of ethnic and cultural purity entailed. This is borne out in a recent synthetic analysis of Terminal Classic Puuc sites in which the authors conclude that rulers may not have had the time to establish firm religiously legitimized dynasties that could rule their subjects unquestionably (Carmean et al. 2004:442).

Freidel (1986b:425) suggested that this difference in ideologies between the northern and southern groups gave the north an adaptive advantage in times of crises. This is no doubt true, but what we may also be seeing is an outright rejection of the Southern Lowland Maya kingship as the patterns of cave use suggest. According to existing models of the political differences between the two, this would have been avoided in northern political systems due to this difference in ideology.

The pattern of cave use can be better understood if we accept that caves were integrally connected with those of elevated status and were essentially an elite prerogative. At the time of the collapse of Maya kingship in the Lowlands we would expect a discontinuation of usage-- particularly in the use of dark zones. In this model, extensive cave use would be expected to continue in Yucatan in the Postclassic period where elite institutions (Pollock 1962:1; Carmean et al. 2004)) continued well into the Colonial period when Maya ritual literally "went underground" due to Spanish repression (Farriss 1984:290; Tozzer 1941:76, note 340, 108, note 496). This finding further supports the notion that ideology, in particular the loss of faith in the kingship, contributed heavily to the political collapse of the Southern Lowlands. Aimers (2004:192) understands the Postclassic period as an adjustment or "correction" to the highly stratified nature of Maya society and Masson (2000:274) has gone as far as to consider it "an aftermath of tyranny."

8.9 Contributions

This dissertation has made theoretical, methodological, and factual contributions to ritual studies, cave studies, and Maya cultural history. In Chapter 1 I proposed that studies of cave ritual would benefit by placing ancient cave rites within their cultural, political, and environmental contexts. I argued that the use of ethnographic analogy has masked changes in ritual practice and homogenized our models of ritual cave use from the Early Preclassic period to the present. While useful in understanding the symbolic meanings of caves, the overuse of analogy emphasizes the continuities in meaning and ignores temporal changes in practice. Because of the changes over time in the Maya

socio/cultural and political systems, in many cases analogies based on modern Maya people may be less useful in understanding the ancient socio/political systems than those from other modern or historically documented cultures that have affinities with the ancient Maya in their ecologic adaptations, economies, or political structures.

By pioneering new methodologies based on the principles of Behavioral Archaeology, new types of data were generated that were aimed at examining how and when the cave was used. The most useful was the employment of charcoal deposits as a proxy for cave *use-intensity*. The development of this technique led to the first archaeological study that addressed changes in ritual intensity over time. Because changes in ritual practice involved the use of ceramics in cave ritual, charcoal deposits proved to be a good, independent, indirect proxy. This is particularly true for early time periods when the importation of objects into the cave was minimal. Results demonstrated that ritual intensity fluctuated considerably over the cave's history and often did not correlate with fluctuations in local settlement patterns.

The primary goal of the research was to examine the social and environmental contexts that correlated with ritual transformations over the 2,000 years of cave use. It was possible to demonstrate that ritual practice in the cave changed radically in form and intensity becoming increasingly elaborated with the development of social complexity throughout the Preclassic and into the beginning of the Early Classic period. By the end of the Early Classic cave use had dwindled. It was not until the Late Classic dry period that cave use increased exponentially. Ritual transformations punctuated by hiatuses in use were most likely caused by social upheavals. No one factor was responsible for changes in practice but environmental stability or stress was shown to be a major

contributing factor in the forms and intensity of usage. This agrees with observations made elsewhere that have documented the close relationship between the environment and the development of ideologies and socio/political structures in agricultural societies dependent on rainfall for crop success or failure.

Finally, this work demonstrated that caves were not only sacred spaces but were politically charged as well. Changes in cave rites correlated with regional political development and reflected local historical events. From their earliest usage, caves were a nexus of power. The association of caves with rain making and fertility can be shown to be ancient and can be traced to the Olmec. At Chechem Ha, spatial patterns and the use of speleothems in the earliest cave rituals were indications that rainmaking and fertility rites likely occurred at this time. These early cave rites enabled individuals or kin-groups to forge ties to the land and to establish ritual control of the natural environment.

Control of cave ritual was a vital element in the rise of elites and ultimately the kingship due to the connection with rain making and the power of the sacred earth. African examples illustrated how effective ritual control of the environment can be in the development, consolidation, and maintenance of power. By examining the temporal changes in how the cave was used and integrating these changes into the existing social and environmental contexts it becomes apparent that although caves may have always been venues associated with water rites, the political function of these rites clearly changed over time. In terms of elite manipulation, in eras of crop success, the rites were an important resource in gaining and solidifying social power whereas in times of drought they became a means of coping with ritual failure.

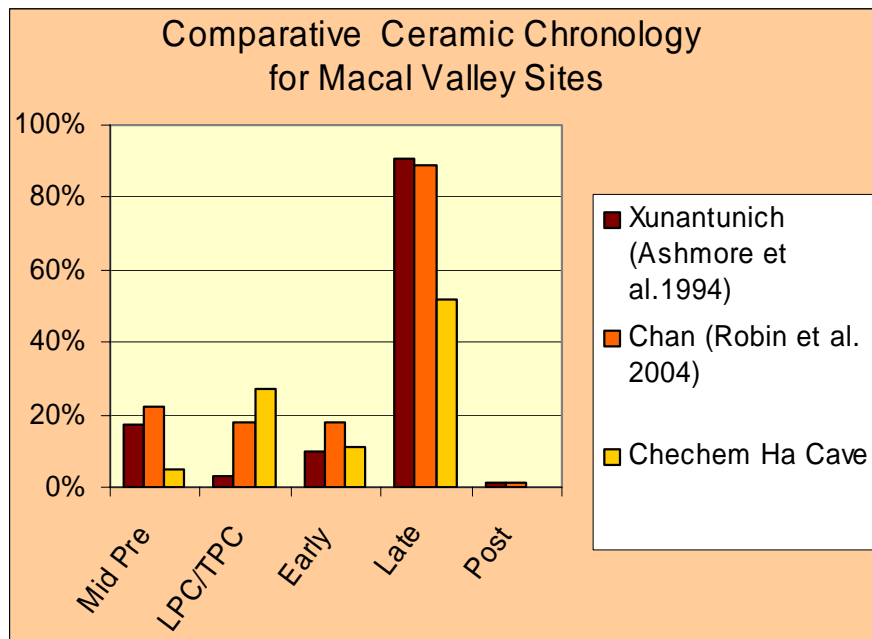
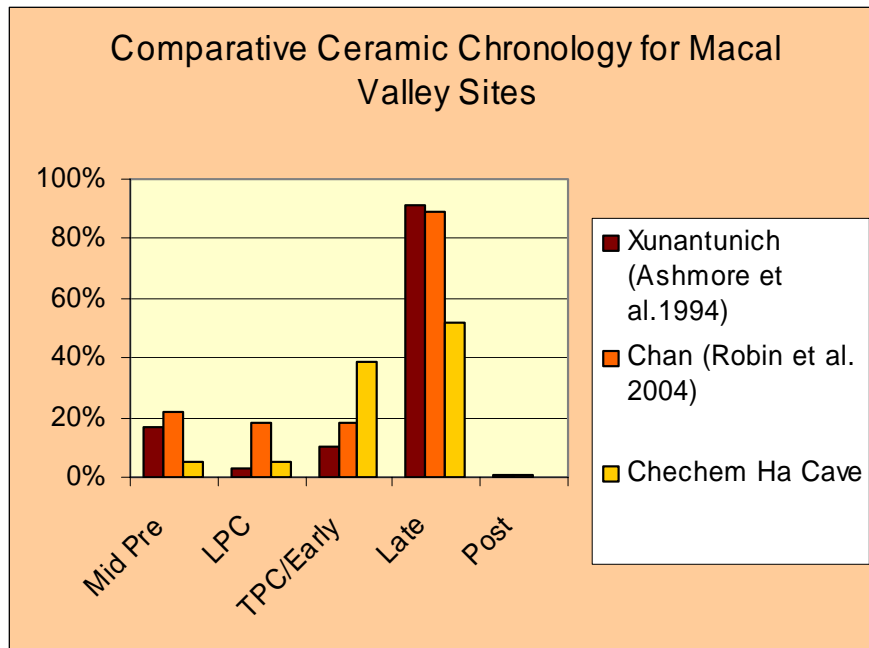


Figure 8.1 Distribution of Chechem Ha Cave ceramics as compared with local settlement surveys based on ceramic typologies. The top chart uses the suggested chronology for Chechem Ha in which Floral Park style jars are considered to be Terminal Preclassic/Early Classic. The chart below is based on conventional typologies.

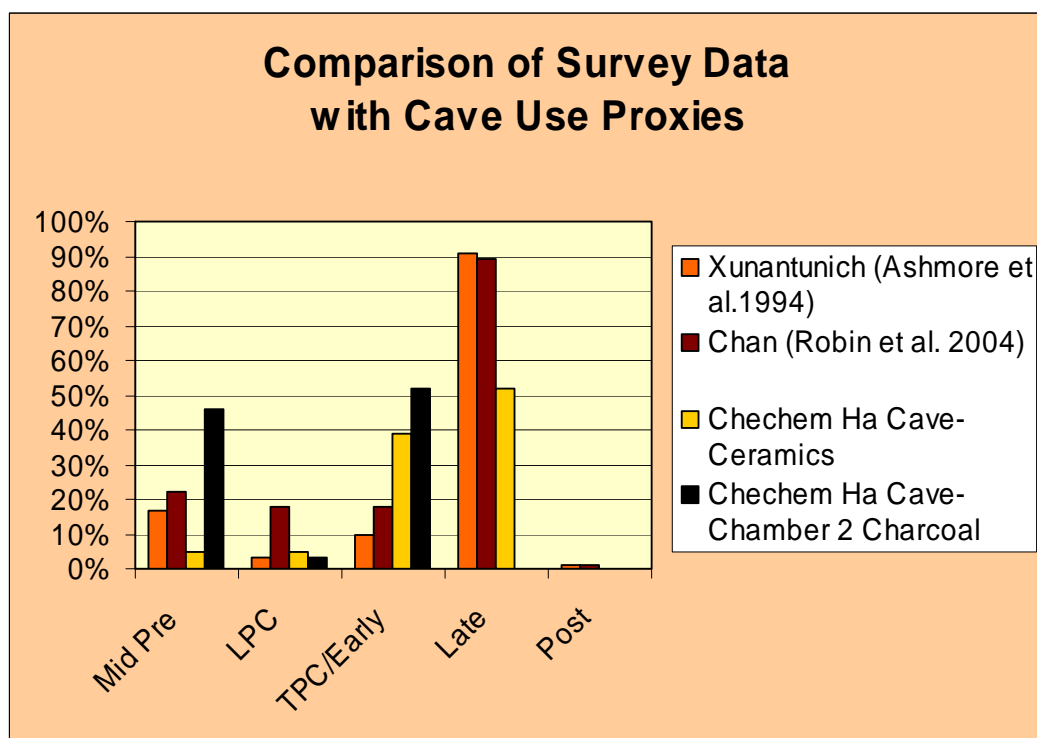


Figure 8-2. The histogram illustrates the ceramic survey data from Xunantunich, the Chan site, and Chechem Ha Cave (using my suggested ceramic chronology shift), with the use-frequency indices from Chamber 2 illustrated by temporal period.

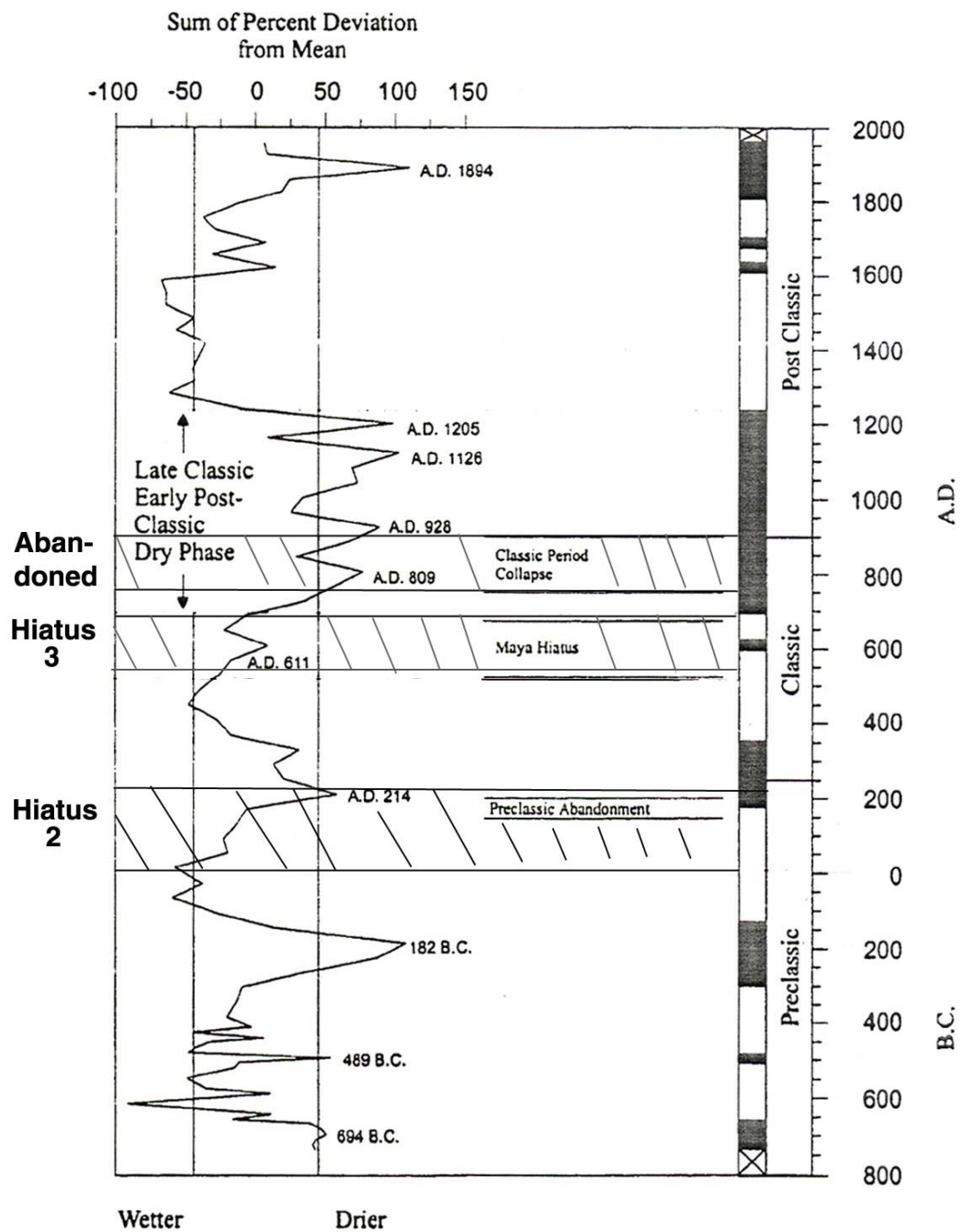


Figure 8-3. Webster's rainfall approximations overlaid with Hiatuses 2 and 3 as well as the proposed temporal ranges for abandonment of Chechem Ha.



Figure 8-4. Page 74 of the Dresden Codex illustrating the great flood. Goddess O hangs in the sky pouring water from her celestial jar.

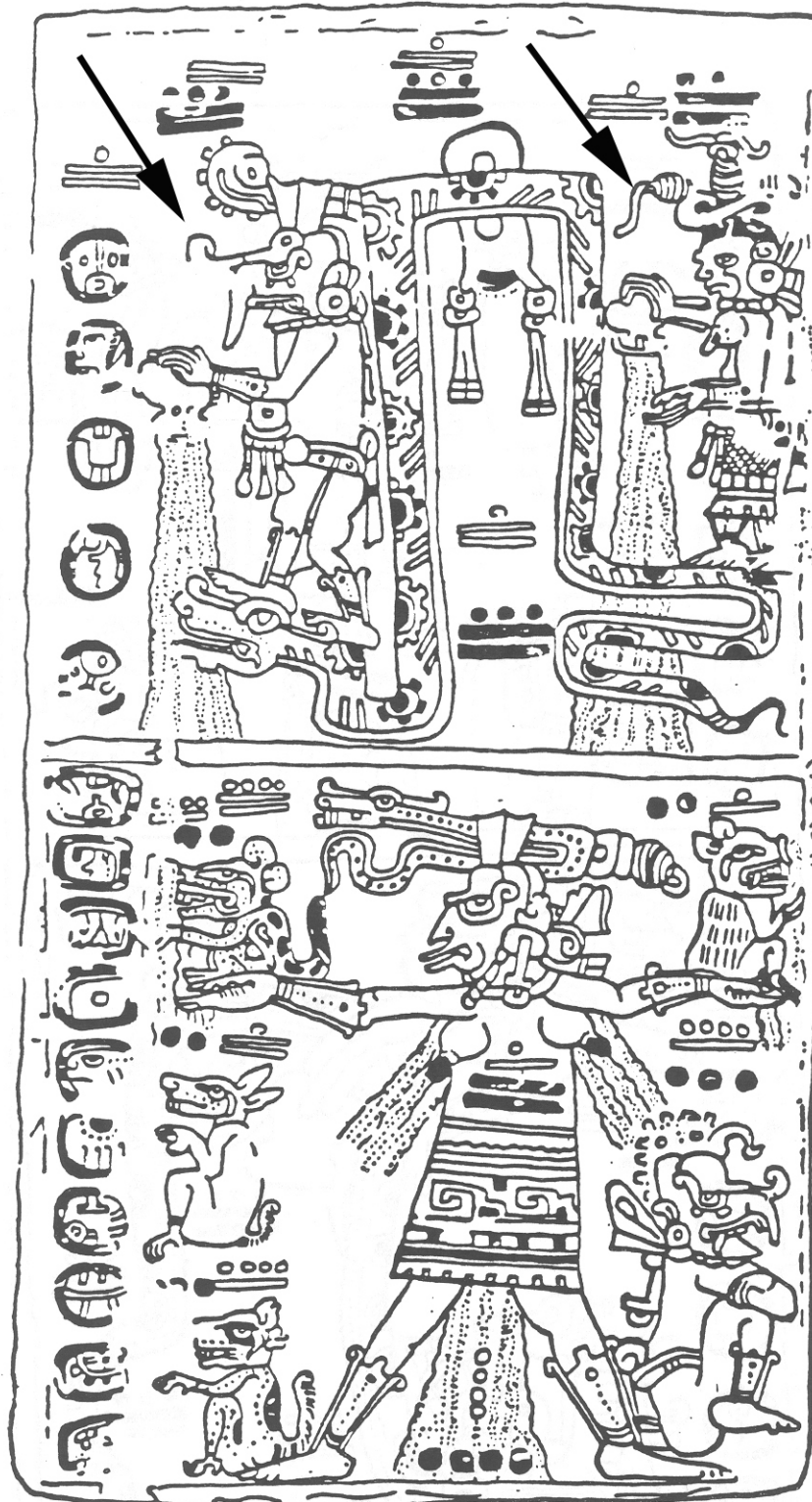


Figure 8-5. Page 30a (top) of the Madrid Codex. Arrow point to Goddess O (on right) and Chac the Rain God (on left) hanging in the sky pouring water from jars.

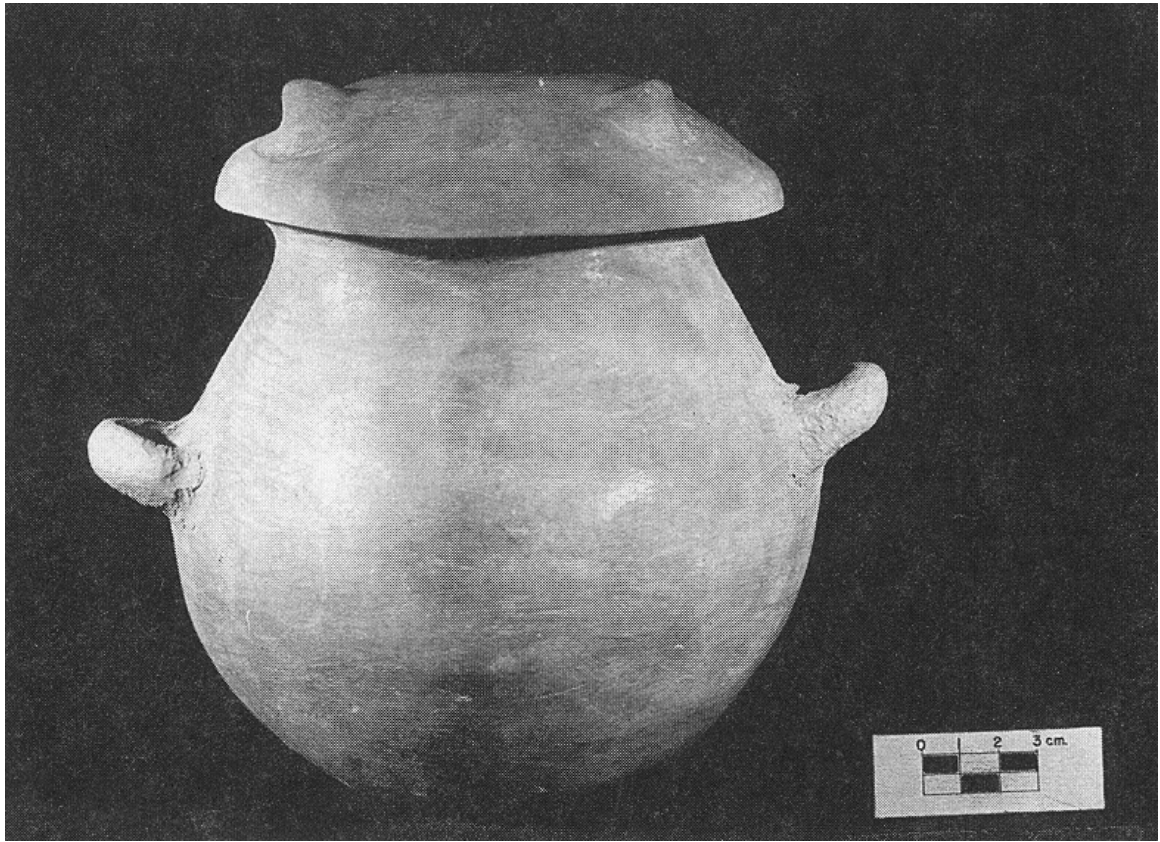


Figure 8-6. Globular jar and bowl configuration found in dedicatory caches at the Templo Mayor (Luján 1998:180, Figure 15.7).

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Appendix I

Sites with caves located beneath surface architecture.

<u>Site</u>	<u>Country</u>	<u>Publication</u>
Dos Pilas	Guatemala	Brady et al. 1997 Brady and Ashmore 1999
Utatlan	Guatemala	Freidel et al. 1993 Brady and Veni 1992
La Lagunita	Guatemala	Ichon and Arnauld 1985
Mixo Viejo	Guatemala	Brady and Veni 1992
Esquipulas	Guatemala	Brady and Veni 1992
Chichen Itza	Mexico	Thompson 1938
El Cayo	Mexico	Lee and Hayden 1988
La Pasadita	Mexico	Golden 1998
Ix Chel	Belize	Reeder et al. 1995
Las Cuevas	Belize	Digby 1958
Pusilha	Belize	Joyce 1929
Ma'ax Na	Belize	Shaw et al. 1999

Data Recording Sheets

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BV99

CERAMICS

NAME _____

CAVE Chechem Ha _____

GRID # _____

PAGE- _____

AREA _____

DESCRIPTION- _____

ARTIFACT #	USER ID	TYPE/VARIETY-	MONOCHROME
1.		GROUP-	BICHROME
2.		WARE-	POLYCHROME
3.		COMPLEX-	PLAINWARE
4.			INTERIOR EXTERIOR
5.		% OF VESSEL PRESENT	CHARRING
6.		1-30 / 30-60 / 60-90 / 100	FIRE CLOUDING
7.		OTHER:	
8.		% OF FLOWSTONE COVERAGE-	VESSEL INTERIOR
9.		1-30 / 30-60 / 60-90 / 100	
10.		OTHER:	

FORM-	JAR	PLATE	RESIDUE-	YES / NO
	DISH			
	BOWL		PLANT REMAINS	YES / NO
	SHOE POT		#	
	VASE		OBJECT- SLATE/ROCK/SPELEO.	
	OTHER			

SIZE- SMALL / MED / LARGE	KILL HOLE	YES	NO

RIM SHERD / BODY SHERD / BOTH

RIM DIAMETER-	CM	RIM THICKNESS-	MM	WIDTH	CM

HEIGHT-	CM	BODY THICKNESS-	MM

BASE-	CM DIAMETER	FLANGES, RIDGES, ANGLES
ROUNDED		MEDIAL FLANGE
SLIGHTLY ROUNDED		BASAL FLANGE
PEDESTAL		BASAL ANGLE
RING		BASAL RIDGE
FLAT		Z ANGLE
INCURVED		
TRUNCATED CONICAL		NECK
HOLLOW DOUBLE PEDESTAL		HIGH
		LOW

RIM	DECORATIONS
DIRECT	STRIATIONS
EXT. THICK	HOR / VERT / DIAG
INT. THICK	UL-LR
EXT. FOLDED	IMPRESSED
INT. FOLDED	INCISED
HOR. EVERT	PUNCTATED
OUTFLARED	APPLIQUED
EVERTED	OTHER
	LOCATION

SLIP COLOR	INT.	EXT.
RED		
ORANGE		
LT. ORANGE		
ORANGE/RED		
BLACK		
BROWN		
CREAM		
OTHER		
SCRATCHES		
MUNSELL#		

SURFACE	THICK SLIP	THINSLIP

PASTE	RED	PINK	OTHER

CORING	YES / NO	CORE COLOR

MUNSELL#

TEMPER-FINE / COURSE / UNTEMPERED
HARD/SOFT
CALCITE
HEMATITE
QUARTZITE

SIZE-	MM

Appendix III

1.Ceramic Counts

Area in Cave	Jars	Bowls	Dishes	Insen- arios	Vases	Other	Undeter- mined	Total MNA	Total #sherds	Breakage
Entrance Passage	8	8	0	0	0	0	0	16	16	0
Chamber 1	2	2	2	0	0	0	0	6	22	3
Chamber 2, Alcove 5	13	4	1	0	0	0	>185	18	>211	4
Chamber 3	8	4	0	0	0	0	53	12	67	1
Elevated Passage 1	28	7	4	0	0	0	33	39	140	14
Elevated Passage 2	1	1	1	0	0	0	17	3	21	1
Elevated Passage 3	11	1	1	0	0	0	2	13	24	2
Elevated Passage 4	4	1	0	0	0	0	19	5	45	2
Niche 1	2	0	0	0	0	0	9	2	15	4
Niche 2	4	0	0	0	0	0	0	4	11	2
Niche 3	0	1	2	0	0	0	0	3	4	1
Niche 5	1	0	0	0	0	0	1	1	2	0
Niche 6	0	0	1	0	0	0	1	1	2	0
Niche 7	2	1	1	0	0	0	24	4	28	0
Niche 7.5	2	0	0	0	0	0	15	2	17	0
Niche 8	1	0	0	0	0	0	6	1	7	0
Niche 8.5	2	0	0	0	0	0	0	2	2	0
Niche 9	4	1	2	0	0	0	60	7	67	0
Niche 10	7	1	5	0	0	0	32	13	46	1
Niche 11	2	1	0	0	0	0	1	3	4	0
Niche 12	6	2	3	0	0	0	45	11	57	1
Niche 13	5	0	1	0	0	0	60	6	66	0
Niche 14	1	0	0	0	0	0	25	1	26	0
Niche 15	1	2	1	0	0	0	28	4	32	0
Niche 16	3	1	1	0	0	0	0	5	6	0
Alcove 1	0	0	0	0	0	0	1	0	1	0
Alcove 2	1	0	0	0	0	0	0	1	1	0
Alcove 3	9	5	1	0	0	0	48	15	76	5
Alcove 4	0	0	0	0	0	0	18	0	18	0
Alcove 6	7	1	0	0	0	0	5	8	18	2
Tunnel 1	6	4	2	0	0	0	10	12	22	2
Tunnel 2-South Leg	23	9	6	0	0	0	0	38	82	4
Tunnel 2-Descent	6	4	1	0	0	0	0	11	35	2
Stela Chamber	2	0	0	3	0	0	0	5	19	3
Crawl 1	1	0	0	0	0	0	0	1	1	0
Crawl 2	7	0	0	0	0	0	1	7	8	0
Crawl 3	17	11	5	1	1	0	22	35	142	8
Crawl 4	3	0	0	0	0	0	6	3	19	2

1.Ceramic counts continued

Area in Cave	Jars	Bowls	Dishes	Insen- arios	Vases	Other	Undeter- mined	Total MNA	Total #sherds	Breakage
Ledge 1	9	0	0	0	0	0	0	9	14	3
Ledge 2	1	0	0	0	0	0	1	1	6	1
Ledge 3	2	0	0	0	0	0	1	2	4	1
Ledge 4	8	2	0	0	0	0	0	10	27	6
Ledge 5	2	1	2	0	0	0	1	5	21	2
Ledge 6	8	4	1	0	0	0	6	10	19	0
Ledge 7	15	6	3	0	0	0	63	24	94	4
Ledge 8	1	6	0	0	0	0	9	7	20	3
Ledge 9	4	2	0	0	1	0	16	7	25	1
Ledge 10	129	10	13	0	0	0	209	152	421	24
Ledge 11	6	0	2	0	0	1	4	9	14	1
Dead End Chamber	2	2	0	0	0	0	47	4	53	1
Dead End Trench Cache	0	2	0	0	0	0	10	12	14	2
Total MNA	387	107	62	4	2	1		563		113
Total Sherds							1094		2074	

2. Type-variety Identifications by Area

Area	Type	Complex	Group	Ware	ID
Entrance					
jar		Spanish LO	Mt. Maloney	Pine Ridge Carbonate	JA
bowl	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	RI
bowl	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	HM
bowl	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	HM
bowl	Belize Red	Spanish LO	Belize	Volcanic Ash	HM
Unit 02-01					
Level 1					
bowl	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	KS
bowl	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	KS
bowl	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	KS
bowl	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	KS
bowl	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	KS
bowl	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	KS
bowl	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	KS
bowl	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	KS
bowl	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	KS
bowl	Dolphin Head Red	Spanish LO	Dolphin Head	Pine Ridge Carb	KS
bowl	Dolphin Head Red	Spanish LO	Dolphin Head	Pine Ridge Carb	KS
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	KS
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	KS
jar	Tu-Tu Camp Striated	Spanish LO	Tu-Tu Camp	Uaxactun Unslip	KS
jar	Alexanders Unslipped	Spanish LO	Cayo	Uaxactun Unslip	KS
jar	Alexanders Unslipped	Spanish LO	Cayo	Uaxactun Unslip	KS
Level 2					
bowl	Sierra Red:Society Hall Var	Barton Creek	Sierra	Paso Caballo Waxy	JB
bowl	Sierra Red:VarUnsp	Barton Creek	Sierra	Paso Caballo Waxy	JB
Unit 02-04					
Level 3					
bowl	Reforma Incised	Jenny Creek	Savana Or.	Mars Orange	KS
Chamber 1					
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
bowl	Reforma Incised: Muknal Var	Jenney Creek (late)	Savana Or.	Mars Orange	RI
bowl	Uacho Black-on Orange:VarUnsp	Tiger Run	Saxche	Peten Gloss	RI
jar	NegromanPI:NegromanVar	Floral Park	Chan Pond	Tumbac	JA
jar	NegromanPI:NegromanVar	Floral Park	Chan Pond	Tumbac	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
BVAR Unit 5					
Surface					
bowl	Dolphin Head Red:Dolphin Head	Spanish LO	Dolphin Head	Pine Ridge Carb	RI
bowl	Belize Red: Belize Var?	Spanish LO	Belize	Volcanic Ash	RI
Level 1					
jar	Sapote Striated:VarUnsp	Barton Creek	Sapote	Uaxactun Unslip	RI
jar	Hoya Punctated (A.Chase)				RI

bowl	Sotero Red Brown: Sotero Variety?	Tiger Run	Sotero	Unspecified	RI
bowl	Belize Red: Belize Var?	Spanish LO	Belize	Volcanic Ash	RI
Level 2					
jar	Sapote Striated:VarUnsp	Barton Creek	Sapote	Uaxactun Unslip	RI
bowl	Belize Red: Belize Var?	Spanish LO	Belize	Volcanic Ash	RI
bowl	Samporerro Red:SamporerroVar?	Jenney Creek	Joventud	Flores Waxy	RI
bowl	Aguacate Or:AguateVar(HappyHome?)	Floral Park	Aguate	Holmul Orange	RI
bowl	Sierra Red:VarUnsp	Barton Creek	Sierra	Paso Caballo Waxy	RI
bowl	Savana Orange:VarUnsp(ash)	Jenney Creek	Savana	Mars Orange	RI
bowl	Sierra Red:VarUnsp (maroon)	Barton Creek	Sierra	Paso Caballo Waxy	RI
Level 3					
bowl	Samporerro Red:Variety Unsp?	Jenney Creek	Joventud	Flores Waxy	RI
Tunnel 1					
dish	Sierra Red/VarUnsp	Barton Creek	Sierra	Paso Caballo	JB
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Aguacate Orange?	Floral Park	Aguacate Gr.	Holmul Orange	JA
jar	Aguacate Orange?	Floral Park	Aguacate Gr.	Holmul Orange	JA
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
jar	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	JA
jar	Alexanders Unslipped?	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Chan Pond Unslipped:Chan Pond	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped:Chan Pond	Floral Park	Chan Pond	Tumbac	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
Elevated Passage 1					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped:CayoVar	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped:CayoVar	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped:CayoVar	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped:VarUnspecified	Spanish LO	Cayo	Uaxactun	JA
jar	Dolphin Head Red	Spanish LO	Dolphin Head	Pine Ridge Carb	JA

Elevated Passage 1 Cont..					
jar	Alexanders Unslipped:AlexVar	Spanish LO	Cayo	Uaxactun	JA
bowl	Alta Mira Fluted	Barton Creek	Sierra	Paso Caballo	RI
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	JA
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	JA
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	JA
bowl	Dolpin Head Red	Spanish LO	Dolphin Head	Pine Ridge Carb	JA
dish	Dolpin Head Red	Spanish LO	Dolphin Head	Pine Ridge Carb	JA
dish	Cameron Incised	Late Classic	Tinaha		RI
dish	Silver Creek Impressed:SilCrVar	Spanish LO	Dolphin Head	Pine Ridge Carb	JA
Ledge 1					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	HM
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	HM
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	HM
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	HM
Ledge 2					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	HM
Niche 1					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
Niche 2					
jar	Negroman Pl:Negroman Var	Floral Park	Chan Pond	Tumbac	JA
jar	?	Floral Park	Chan Pond	Tumbac	JA
jar	?	Floral Park	Chan Pond	Tumbac	JA
Niche 3					
bowl	Sierra Red: Var Unspecified	Barton Creek	Sierra	Paso Caballo	JA
Niche 5					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
Ledge 4					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
Ledge 5					
bowl	Sotero?	Tiger Run	Sotero	Unspecified	HM
dish	UachoBlackonOrange:VarUnsp	Tiger Run	Saxche	Peten Gloss	RI
dish	UachoBlackonOrange:VarUnsp	Tiger Run	Saxche	Peten Gloss	RI
Alcove 2					
jar	Negroman Pl:Negroman Var	Floral Park	Chan Pond	Tumbac	KS
Niche 7					
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	JA
Alcove 3					
jar	NegromanPl:NegromanVar	Floral Park	Chan Pond	Tumbac Unslip	JA
jar	NegromanPl:NegromanVar	Floral Park	Chan Pond	Tumbac Unslip	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	RI

Alcove 3 Cont...					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped:CayoVar	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped:CayoVar	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped:CayoVar	Spanish LO	Cayo	Uaxactun Unslip	JA
bowl	SavanaOrange:RejollaVar	Jenny Creek	Savana	MarsOrange	RI
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
dish	Dos Arroyos Orange Polychrome/VarUn	Hermitage	Dos Arroyos	Peten Gloss	RI
jar	Balanza Black:Var Unsp	Hermitage	Balanza	Peten Gloss	RI
Ledge 6					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
bowl	Xunantunich BlackonOrange:Uns	Spanish LO	Chunhuitz	Vinaceous Tawny	RI
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
Ledge 7					
jar	Cayo Unslipped:CayoVar	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped:CayoVar	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped?	Floral Park	Chan Pond	Tumbac	JA
jar	Mount Maloney Black	Spanish LO	Mt Maloney	Pine Ridge Carb	JA
jar	Mount Maloney Black	Spanish LO	Mt Maloney	Pine Ridge Carb	JA
bowl	Mount Maloney Black	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
bowl	Mount Maloney Black	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
bowl	Mount Maloney Black	Spanish LO	Mt Maloney	Pine Ridge Carb	JA
bowl	Sotero Red-Brown:SoteroVar	Tiger Run	Sotero	Unspecified	JB/JT
dish	Saturday Creek Poly:VarUnsp	Tiger Run	Saturday Creek	Peten Gloss	RI
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
Ledge 8					
bowl	Mt Maloney?	Spanish LO	Mt Maloney?	Pine Ridge Carb	RI
bowl	Mt Maloney ?	Spanish LO	Mt Maloney?	Pine Ridge Carb	RI
bowl	Garbutt Creek Red: PaslowVar??	Spanish LO	Garbutt Creek	Garbutt Creek	RI
bowl	Crisanto Black,SampoperroRed?	Jenny Creek	Joventud	Flores Waxy	RI

Niche 7.5					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
Niche 8					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
Niche 8.5					
jar	?	Spanish LO	?	Uaxactun Unslip	JA
Niche 9					
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
bowl	Paila Unslipped:VarUnsp?	Barton Creek	Paila	Uaxactun	JA
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
Niche 10					
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Negroman PI: Negroman Variety	Floral Park	Chan Pond	Tumbac	JA
jar	Negroman PI: Negroman Variety	Floral Park	Chan Pond	Tumbac	JA
jar	Alexanders Unslipped:AlexVar	Spanish LO	Cayo	Uaxactun Unslip	JA
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
dish	Boleto BlackOrange:VarUnsp	Hermitage	Actuncan	Peten Gloss	RI
Niche 11					
bowl	Sierra Red: Var Unspecified	Barton Creek	Sierra	Paso Caballo	JA
jar	Negroman PI	Floral Park	Chan Pond	Tumbac	JA
Niche 12					
jar	Negroman PI	Floral Park	Chan Pond	Tumbac	JA
jar	Negroman PI	Floral Park	Chan Pond	Tumbac	JA
jar	Negroman PI: Negroman Variety	Floral Park	Chan Pond	Tumbac	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
dish	Sotero Red-Brown:Sotero Var ??	Tiger Run	Sotero	Unspecified	JA
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
Niche 13					
jar	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	JA
jar	Pucte Brown: VarUnsp	Hermitage	Pucte	Peten Gloss Ware	JA
jar	Old River Unslip:Old River??	Mt. Hope	Old River	Uaxactun	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
dish	Pucte Brown:VarUnsp	Hermitage	Pucte	Peten Glosss	JA

Ledge 10 Cont..					
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	HM
jar	Chan Pond Unslipped?	Floral Park	Chan Pond	Tumbac	HM
jar	Chan Pond Unslipped?	Floral Park	Chan Pond	Tumbac	HM
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Balanza Black:Var Unsp	Hermitage	Balanza	Peten Gloss	JA
jar	Balanza Black:Var Unsp	Hermitage	Balanza	Peten Gloss	JA
jar	Balanza Black:Var Unsp	Hermitage	Balanza	Peten Gloss	JA
jar	Balanza Black:Var Unsp?	Hermitage	Balanza	Peten Gloss	JA
jar	Pucte Brown?	Hermitage	Pucte	Peten Gloss Ware	HM
jar	Pucte Brown?	Hermitage	Pucte	Peten Gloss Ware	HM
jar	Pucte Brown?	Hermitage	Pucte	Peten Gloss Ware	HM
jar	Pucte Brown?	Hermitage	Pucte	Peten Gloss Ware	HM
jar	Pucte Brown:VarUnsp	Hermitage	Pucte	Peten Gloss Ware	HM
jar	Pucte Brown	Hermitage	Pucte	Peten Gloss Ware	HM
jar	Monkey Falls Striated ?	Floral Park	Monkey Falls	Uacaxtun Unslipped	JA
bowl	Garbutt Creek Red	Spanish LO	Garbutt Creek	Pine Ridge Carbonate	JA
bowl	Uacho Black-on Orange:VarUnsp	Tiger Run	Saxche	Peten Gloss	RI
bowl	Pucte Brown	Hermitage	Pucte	Peten Gloss Ware	HM
bowl	Balanza Black:VarUnsp	Hermitage	Balanza	Peten Gloss Ware	RI
bowl	Pucte Brown?	Hermitage	Pucte	Peten Gloss Ware	HM
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	JA
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	JA
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	HM
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
Chamber 2, North Wall Overhang					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Negroman PI	Floral Park	Chan Pond	Tumbac	JA
jar	Negroman PI?	Floral Park	Chan Pond	Tumbac	JA
bowl	Mount Maloney Black	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
dish	Dolphin Head Red?	Spanish LO	Dolphin Head	Pine Ridge Carb	JA
Chamber 2, North Wall Overhang Cont...					
dish	?	Hermitage		Peten Gloss	JA
Chamber 2, Alcove 5					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Achote Black:VarUnsp	Spanish LO	Achote	Peten Gloss	JA
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI

Ledge 10 Cont..					
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	HM
jar	Chan Pond Unslipped?	Floral Park	Chan Pond	Tumbac	HM
jar	Chan Pond Unslipped?	Floral Park	Chan Pond	Tumbac	HM
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Balanza Black:Var Unsp	Hermitage	Balanza	Peten Gloss	JA
jar	Balanza Black:Var Unsp	Hermitage	Balanza	Peten Gloss	JA
jar	Balanza Black:Var Unsp	Hermitage	Balanza	Peten Gloss	JA
jar	Balanza Black:Var Unsp?	Hermitage	Balanza	Peten Gloss	JA
jar	Pucte Brown?	Hermitage	Pucte	Peten Gloss Ware	HM
jar	Pucte Brown?	Hermitage	Pucte	Peten Gloss Ware	HM
jar	Pucte Brown?	Hermitage	Pucte	Peten Gloss Ware	HM
jar	Pucte Brown?	Hermitage	Pucte	Peten Gloss Ware	HM
jar	Pucte Brown:VarUnsp	Hermitage	Pucte	Peten Gloss Ware	HM
jar	Pucte Brown	Hermitage	Pucte	Peten Gloss Ware	HM
jar	Monkey Falls Striated ?	Floral Park	Monkey Falls	Uacaxtun Unslipped	JA
bowl	Garbutt Creek Red	Spanish LO	Garbutt Creek	Pine Ridge Carbonate	JA
bowl	Uacho Black-on Orange:VarUnsp	Tiger Run	Saxche	Peten Gloss	RI
bowl	Pucte Brown	Hermitage	Pucte	Peten Gloss Ware	HM
bowl	Balanza Black:VarUnsp	Hermitage	Balanza	Peten Gloss Ware	RI
bowl	Pucte Brown?	Hermitage	Pucte	Peten Gloss Ware	HM
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	JA
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	JA
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	HM
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
Chamber 2, North Wall Overhang					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Negroman PI	Floral Park	Chan Pond	Tumbac	JA
jar	Negroman PI?	Floral Park	Chan Pond	Tumbac	JA
bowl	Mount Maloney Black	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
dish	Dolphin Head Red?	Spanish LO	Dolphin Head	Pine Ridge Carb	JA
dish	?	Hermitage		Peten Gloss	JA
Chamber 2, Alcove 5					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Achote Black:VarUnsp	Spanish LO	Achote	Peten Gloss	JA
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI

Ledge 11					
comal,lid?	Cayo Unslipped?	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped?	Spanish LO	Cayo	Uaxactun	JA
jar	Chan Pond Unslipped?	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	JA
dish	?	Spanish LO	Palmer	Peten Gloss	JA
Niche 16					
jar	Cayo Unslipped?	Spanish LO	Cayo	Uaxactun	JA
jar	Negroman Pl: Negroman Variety	Floral Park	Chan Pond	Tumbac	JA
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
Alcove 6					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Alexanders Unslipped:AlexVar	Spanish LO	Cayo	Uaxactun	JA
jar	Tu-Tu Camp Striated	Spanish LO	Tu-Tu Camp	Uaxactun Unslip	JA
bowl	Sierra Red?	Barton Creek	Sierra	Paso Caballo	JA
	Mountain Pine Red:Old Jim Var?				RI
Crawl 2					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
Chamber 3					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped:Cayo Variety	Spanish LO	Cayo	Uaxactun	JA
jar	Negroman Pl	Floral Park	Chan Pond	Tumbac	JA
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
bowl	Garbutt Creek Red	Spanish LO	Garbutt Creek	Garbutt Creek	RI
bowl	Joventud Red(mimic)	Jenney Creek	Joventud	Yesoso	JB
Crawl 3					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA

Crawl 3 Cont...					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped?	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped?	Spanish LO	Cayo	Uaxactun	JA
jar	Mt. Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	JB/JT
bowl	Xunantunich BlackonOrange:Uns	Spanish LO	Chunhuitz	Vinaceous Tawny	RI
censer bowl	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
censer bowl	Cayo Unslipped:VarUnspecified	Spanish LO	Cayo	Uaxactun	JA
censer bowl	Cayo Unslipped:VarUnspecified(buff)	Spanish LO	Cayo	Uaxactun	JA
deep bowl	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
deep bowl	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
bowl	Anonal Polychrome	Spanish LO			JB/JT
bowl	Quacco Creek Red:QuaccoCrVar	Mount Hope	Quacco Creek	Paso Caballo	JB
dish	Zacatel Cream-Polychrome	Spanish LO	Palmar	Peten Gloss	RI
dish	Palmar Orange:Danta Variety	Spanish LO	Palmar	Peten Gloss	JB/JT
vase	Cabrito Cream-Polychrome:Guajiro	Spanish LO	Palmar	Peten Gloss	JB/JT
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	JA
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	JA
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	JA
dish	RepastoBlackonRed:VarUnsp	Barton Creek	Sierra	Paso Caballo Waxy	J.Awe,RI
Elevated Passage 3					
jar	Mt. Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped?	Spanish LO	Cayo	Uaxactun	JA
jar	Negroman Pl:Negroman Var	Floral Park	Chan Pond	Tumbac	HM
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	RI
Elevated Passage 4					
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
bowl	Joventud Red(mimic)	Jenney Creek	Joventud	Yesoso	JB
Dead End Chamber					
jar	Balanza Black:Var Unsp	Hermitage	Balanza	Peten Gloss	RI
Dead End Cache					
bowl	Sierra Red:VarUnsp	Barton Creek	Sierra	Paso Caballo Waxy	JB
dish	Laguna Verde Incised?				JB
Elevated Passage 2					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Balanza Black:Var Unsp	Hermitage	Balanza	Peten Gloss	RI

Tunnel 2 South- Groups 1 and 2					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped:CayoVar	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped:CayoVar	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped:CayoVar	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped:CayoVar	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped:CayoVar	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped:CayoVar	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped:CayoVar	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped:CayoVar	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Cayo Unslipped:CayoVar	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	Alexanders Unslipped:AlexVar	Spanish LO	Cayo	Uaxactun	JA
jar	Tu-Tu Camp Striated	Spanish LO	Tu-Tu Camp	Uaxactun Unslip	JA
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
bowl	Tinaha Red: Tinaja Variety	Spanish LO			JB/JT
bowl	Dolphin Head Red	Spanish LO	Dolphin Head	Pine Ridge Carbonate	RI
dish	Vaca Falls Red	Spanish LO	Vaca Falls	Pine Ridge Carbonate	HM
dish	Palmar Orange:Danta Variety	Spanish LO	Palmar	Peten Gloss	JB/JT
Tunnel 2 Descent					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped:CayoVar	Spanish LO	Cayo	Uaxactun Unslip	JA
jar	?	Middle Preclassic?			JA
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
bowl	Mt Maloney	Spanish LO	Mt Maloney	Pine Ridge Carb	RI
dish	Silver Creek Impressed:SilCrVar	Spanish LO	Dolphin Head	Pine Ridge Carbonate	JA
Stela Chamber					
censer	Pedregal Modeled	Spanish LO			JAwe
censer	Pedregal Modeled	Spanish LO			JAwe
censer	Pedregal Modeled	Spanish LO			JAwe

Chamber 2 Excavations					
Level 1					
jar	NegromanPI:Negroman	Floral Park	Chan Pond	Tumbac	JA
?		Late Classic		Slate Ware	JB/JT
dish		Late Classic		Peten Gloss	JB/JT
body	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	JA
body	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	JA
body	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	JA
body	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	JA
body	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	JA
Level 2					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Negroman PI	Floral Park	Chan Pond	Tumbac	JA
jar	Negroman PI	Floral Park	Chan Pond	Tumbac	JA
jar	Negroman PI	Floral Park	Chan Pond	Tumbac	JA
jar	Negroman PI	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond	Floral Park	Chan Pond	Tumbac	JA
bowl	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	JA
body	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	JA
body	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	JA
body	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	JA
body	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	JA
body	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	JA
Level 3					
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Cayo Unslipped	Spanish LO	Cayo	Uaxactun	JA
jar	Chan Pond	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond	Floral Park	Chan Pond	Tumbac	JA
body	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	JA
body	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	JA
body	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	JA
body	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	JA
body	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	JA
body	Mt. Maloney	Spanish LO	Mt. Maloney	Pine Ridge Carbonate	JA
Level 4					
jar	Negroman PI	Floral Park	Chan Pond	Tumbac	JA
jar	Negroman PI	Floral Park	Chan Pond	Tumbac	JA
jar	Negroman PI	Floral Park	Chan Pond	Tumbac	JA
jar	Negroman PI	Floral Park	Chan Pond	Tumbac	JA

Level 4 Cont..					
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
Level 5					
jar	Negroman PI	Floral Park	Chan Pond	Tumbac	JA
jar	Negroman PI	Floral Park	Chan Pond	Tumbac	JA
jar	Negroman PI	Floral Park	Chan Pond	Tumbac	JA
jar	Negroman PI	Floral Park	Chan Pond	Tumbac	JA
jar	Negroman PI	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JA
jar	Early Mt. Maloney Black	Hermitage	Mt. Maloney	Pine Ridge Carbonate	JB/JT
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	JB/JT
deep bowl	Aguacate Orange	Floral Park	Aguacate Group?	Holmul Orange	JA
deep bowl	Aguacate Orange	Floral Park	Aguacate Group?	Holmul Orange	JA
deep bowl	Aguacate Orange	Floral Park	Aguacate Group?	Holmul Orange	JA
body	Aguacate Orange	Floral Park	Aguacate Group?	Holmul Orange	JA
body	Aguacate Orange	Floral Park	Aguacate Group?	Holmul Orange	JA
body	Aguacate Orange	Floral Park	Aguacate Group?	Holmul Orange	JA
body	Balanza Black?	Hermitage	Balanza	Peten Gloss	JA
body	Pucte Brown?	Hermitage	Pucte	Peten Gloss	JA
Level 6					
jar	NegromanPI:Negroman	Floral Park	Chan Pond	Tumbac	JB/JT
jar	NegromanPI:Negroman	Floral Park	Chan Pond	Tumbac	JB/JT
jar	Chan Pond Unslipped	Floral Park	Chan Pond	Tumbac	JB/JT
body	Balanza Black:VarUnsp	Hermitage	Balanza	Peten Gloss Ware	JB/JT
body	Aguacate Orange	Floral Park	Aguacate Group	Holmul Orange	JB
dish	Dos Arroyos Orange Polychrome	Hermitage	Dos Arroyos	Peten Gloss	JB
body	Polvero Black:Lechugal Incised	Barton Creek	Polvero	Paso Caballo Waxy	JB/JT
body	Polvero Black	Barton Creek	Polvero	Paso Caballo Waxy	JB/JT
body	Polvero Black	Barton Creek	Polvero	Paso Caballo Waxy	JB/JT
body	Polvero Black	Barton Creek	Polvero	Paso Caballo Waxy	JB/JT
body	Polvero Black	Barton Creek	Polvero	Paso Caballo Waxy	JB/JT
body	Polvero Black	Barton Creek	Polvero	Paso Caballo Waxy	JB/JT
body	Polvero Black	Barton Creek	Polvero	Paso Caballo Waxy	JB/JT

Level 6 Cont..					
body	Polvero Black	Barton Creek	Polvero	Paso Caballo Waxy	JB/JT
body	Polvero Black	Barton Creek	Polvero	Paso Caballo Waxy	JB/JT
Level 7					
jar	NegromanPI:Negroman	Floral Park	Chan Pond	Tumbac	JB/JT
Level 8					
jar	NegromanPI:Negroman	Floral Park	Chan Pond	Tumbac	JB/JT
body	Kirkpatrick Incised	Jenney Creek	Quemado	Mars Orange	JB/JT
body	Kirkpatrick Incised	Jenney Creek	Quemado	Mars Orange	JB/JT
body	Quemado Smudged-Black	Jenney Creek	Quemado	Mars Orange	JB/JT
body	Quemado Smudged-Black	Jenney Creek	Quemado	Mars Orange	JB/JT
Level 9					
jar	Jocote Orange-brown	Jenney Creek	Jocote	Tumbac	JB/JT
jar	Jocote Orange-brown	Jenney Creek	Jocote	Tumbac	JB/JT
jar	Jocote Orange-brown	Jenney Creek	Jocote	Tumbac	JB/JT
Level 10					
jar	Jocote Orange-brown	Jenney Creek	Jocote	Tumbac	JB/JT
jar	Luminoso Burnished	Jenney Creek	Jocote	Tumbac	JB/JT
	kaolin white ware	Jenney Creek		undesignated paste-ware	JB/JT
Ceramic identifications by:					
JA=Jim Aimers					
Jawe=Jaime Awe					
JB=Joseph Ball					
RI=Reiko Ishihara					
HM=Holley Moyes					
KS=Kay Sunahara					
JT=Jennifer Taschek					

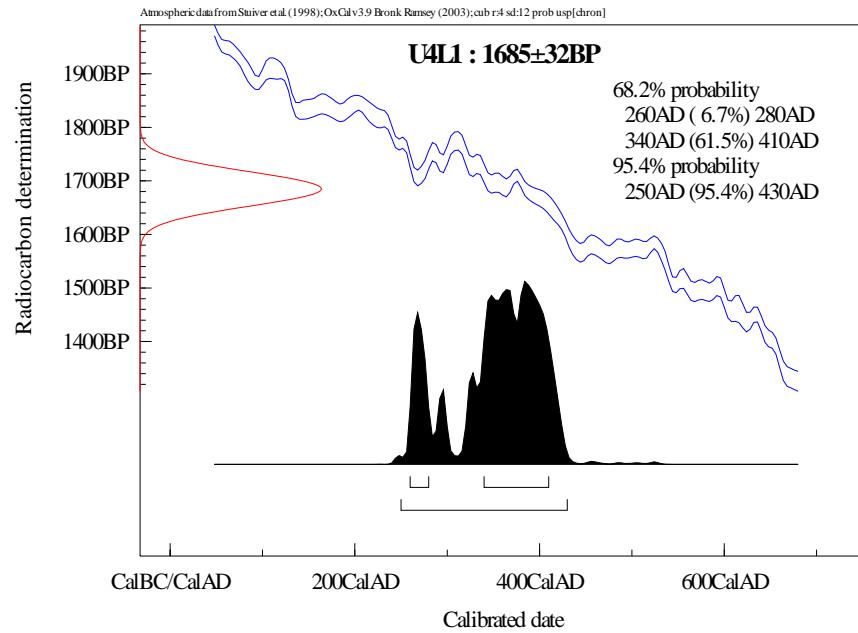
Appendix IV- AMS Dates Calibrated in OxCal 3

Table of dates in chronological order

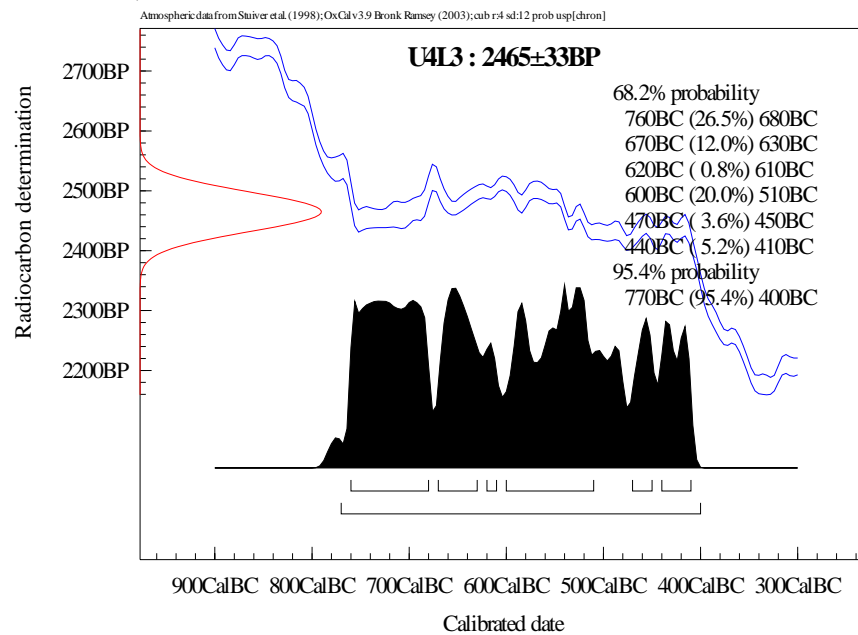
AZ Lab #	Period	Area	Radiocarbon	Calibrated Date	Alternative
			Age	2 Sigma	Probabilities
AA57293	LC	Ledge 6	1187±33	AD 720-960	AD770-900 (83.3%)
AA57288	LC	Ledge 4	1210±31	AD 690-900	AD760-900(85.4%)
AA59754	LC	Ledge 6	1224±38	AD 680-900	
AA59753	LC	EP3	1239±36	AD 680-890	
AA57291	LC	Ledge 7	1244±31	AD 680-890	
AA57271	EC	Ch2_excL3	1587±34	AD 400-560	
AA57290	EC	Ledge 10	1605±32	AD 390-540	
AA57310	EC	T1	1607±32	AD 380-540	
AA57307	EC	T1	1638±42	AD 260-540	
Beta170074	EC	Ch2_excL1	1660±40	AD 250-540	AD250-470(88.7%)
AA57301	EC	Entrance	1685±32	AD 250-430	
AA59755	EC	Crawl 3	1696±36	AD 250-430	
AA57272	EC	Ch2_excL2	1673±34	AD 250-440	
AA57273	EC	Ch2_excL4	1668±34	AD 250-440	
AA57274	EC	Ch2_excL5	1685±39	AD 240-440	
AA57289	EC	Ledge 10	1714±33	AD 240-420	
AA57299	EC	T1	1716±36	AD 240-410	
AA57275	TPC/EC	Ch2_excL6	1744±40	AD 130-420	AD210-420(92.6%)
AA57311	TPC	Crawl 3	1944±71	120 BC-AD 250	
AA57291	LPC	Stela Ch.	2096±33	200 BC- AD 0	200-40 BC (94%)
AA57276	LPC	Ch2_excL7	2120±34	350-40 BC	210-40 BC (88.2%)
AA57306	LPC	T1	2156±34	360-60 BC	
AA57308	LPC	T2	2130±34	360-40 BC	240-40BC (84.3%)
AA57312	LPC	Stela Ch.	2135±32	360-50 BC	240-50BC (81.9%)
AA57309	LPC	EP4 (T1)	2275±34	400-200 BC	
AA57313	LPC	Dead End Cache	2295±34	410-200 BC	
AA57314	LPC	Dead End	2309±37	410-200 BC	
AA57298	MPC	T1	2339±42	800-200 BC	550-350BC(81.1%)
AA57302	MPC	T1	2432±33	600-400 BC	
AA57300	MPC	Entrance	2465±33	770-400 BC	
AA57296	MPC	T2	2517±37	800-510 BC	
AA57278	EMPC	Ch2_excL9	2755±35	1000-820 BC	
AA57279	EMPC	Ch2_excL10	2760±34	1000-820 BC	
AA57281	EMPC	Ch2_excL12	2931±62	1320-930 BC	1320-970BC(93.5%)
Beta170518	EMPC	Ch2Level12(L11)	2780±4	1010-820BC	
AA57277	EMPC	Ch2_excL8	2826±34	1130-890 BC	
AA57280	EMPC	Ch2_excL11	2865±33	1190-920 BC	1130-920BC (93.9%)
AA57282	EMPC	Ch2_excL13	2847±34	1130-910 BC	
AA57283	Archaic	Ch2_excL14	5713±38	4690-4450BC	
AA57285	E.Holocene	Ch2_excL16	8830±100	8250-7600BC	
AA58763	E.Holocene	Ch2_excL15	9628±50	9220-8800BC	
AA58762	E.Holocene	Ch2_excL14	9851±50	9600-9220BC	
AA57284	Term.Pleistocene	Ch2_excL15	10191±51	10,400-9600BC	
AA57286	Pleistocene	Ch2_excL17	14638±72	16200-15000BC	

Entrance Passage

1. Unit 02-04 Level 2, Surface Crust

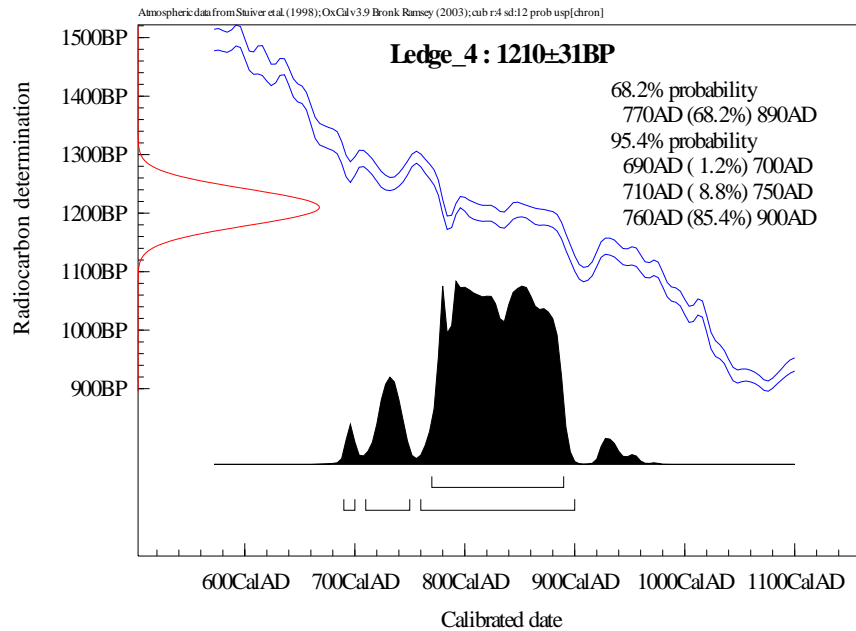


2. Unit 02-04 Level 3, beneath Middle Preclassic sherd.



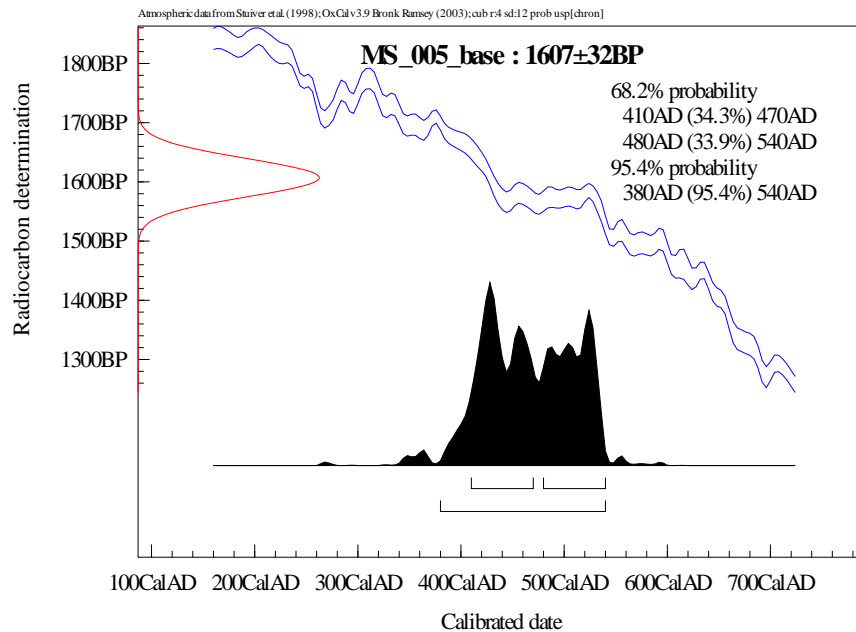
Ledge 4

3. Ledge 4 charcoal collected from Stone Circle 2.



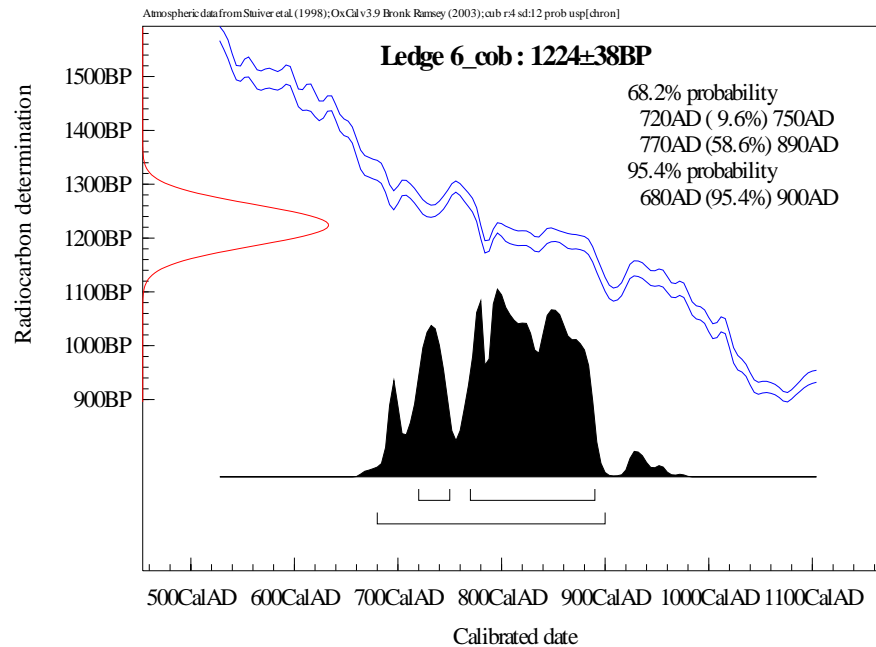
Alcove 6- Shovel Test Pit 005

4. Collected .27m below surface from STP_005 adjacent to Alcove 6.

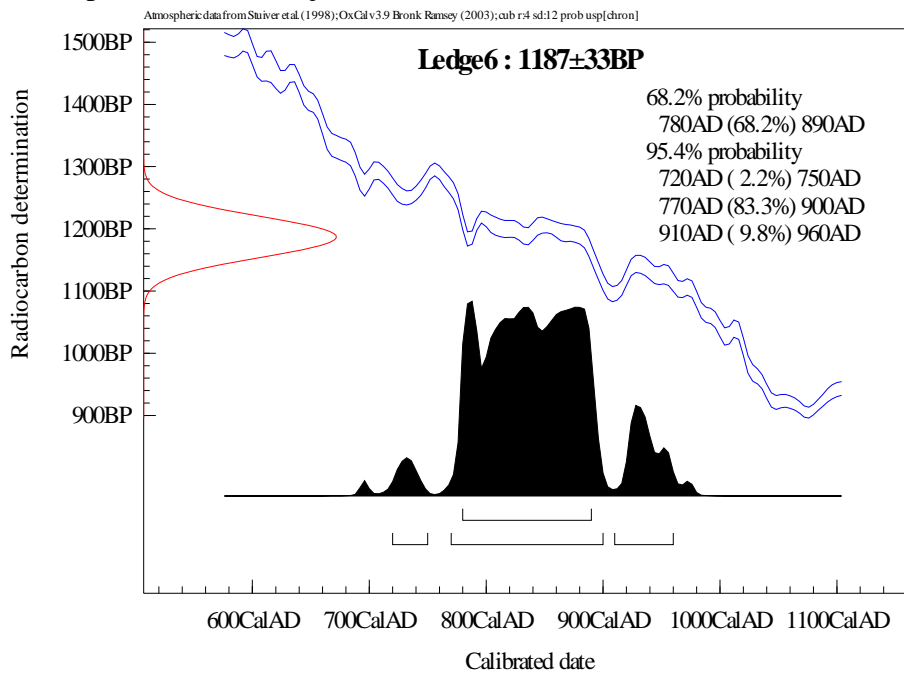


Ledge6

5. Corn cob from interior of vessel.

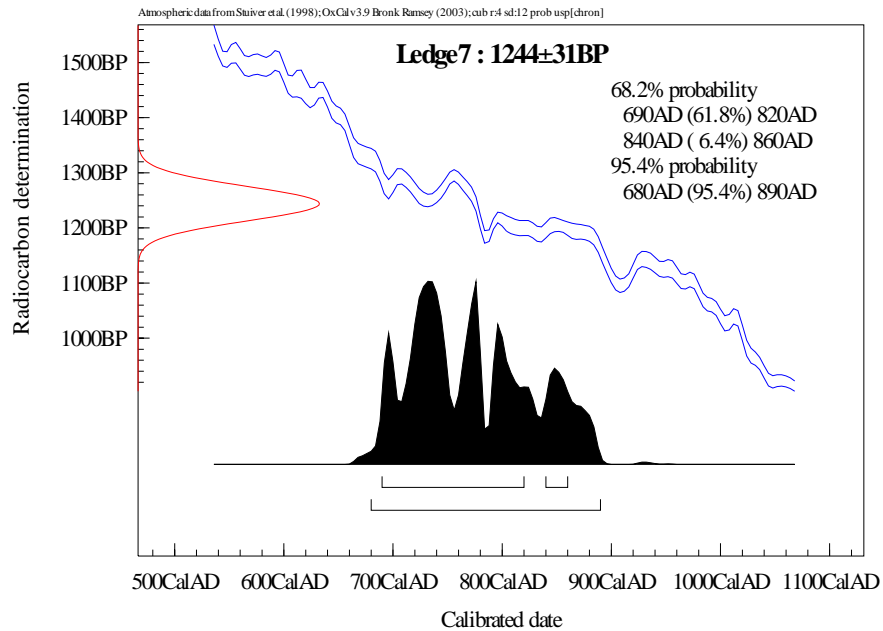


6. Charcoal sample from beneath jar.



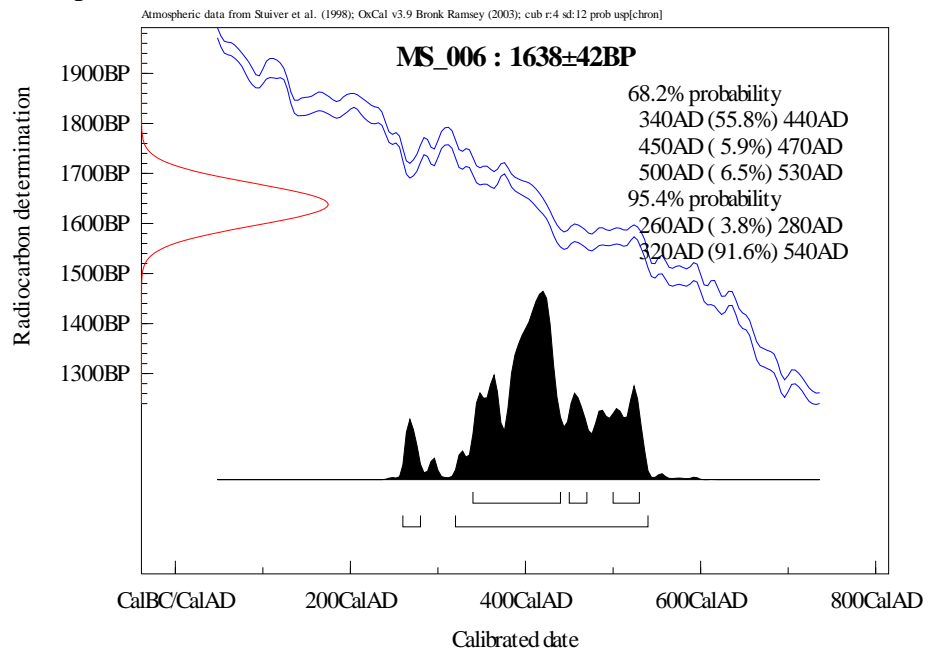
Ledge 7

7. Charcoal sample collected from beneath rock.

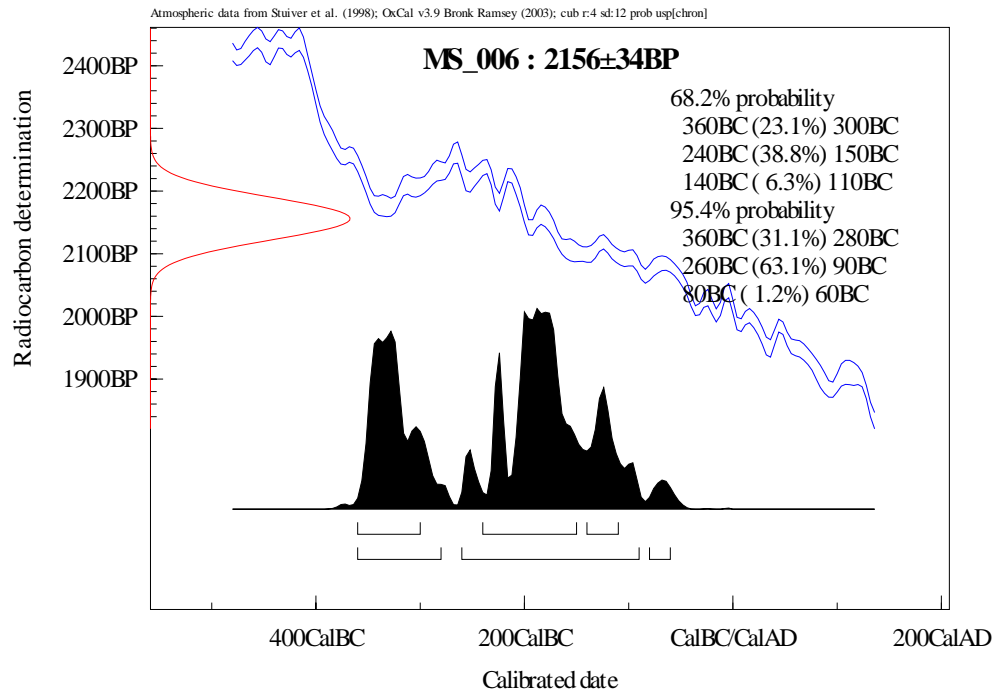


Shovel Test Pit 006

8. Charcoal sample collected from hearth .05m below surface.

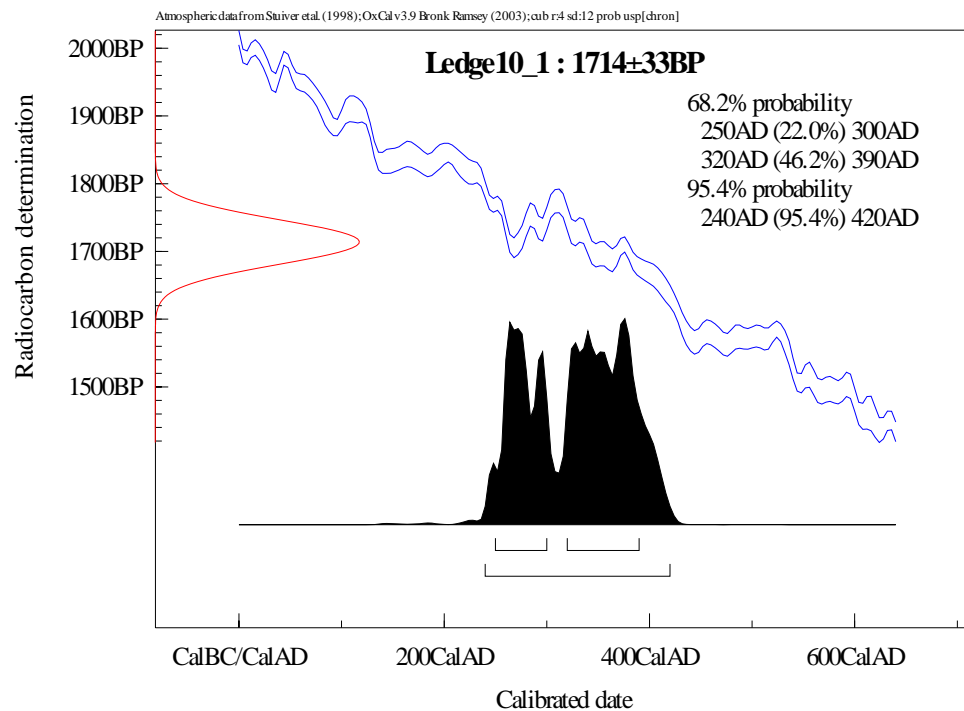


9. Charcoal from base of pit .25m below surface.

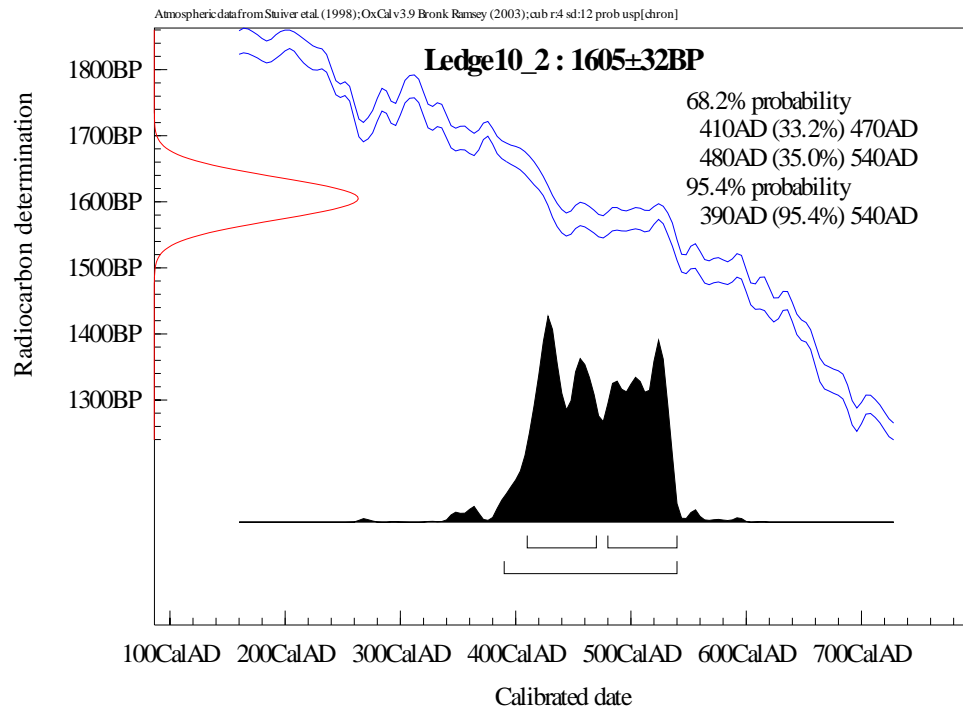


Ledge 10

10. Ledge 10, charcoal collected from base of pottery stack #11.

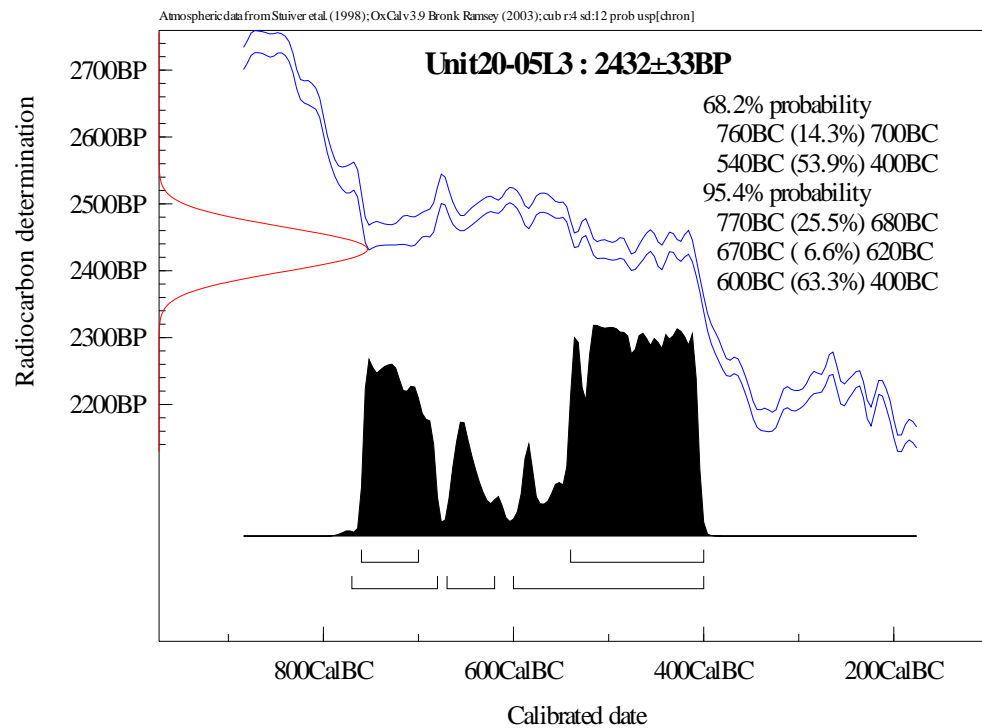


11. Ledge 10, charcoal collected from base of pottery stack #12.



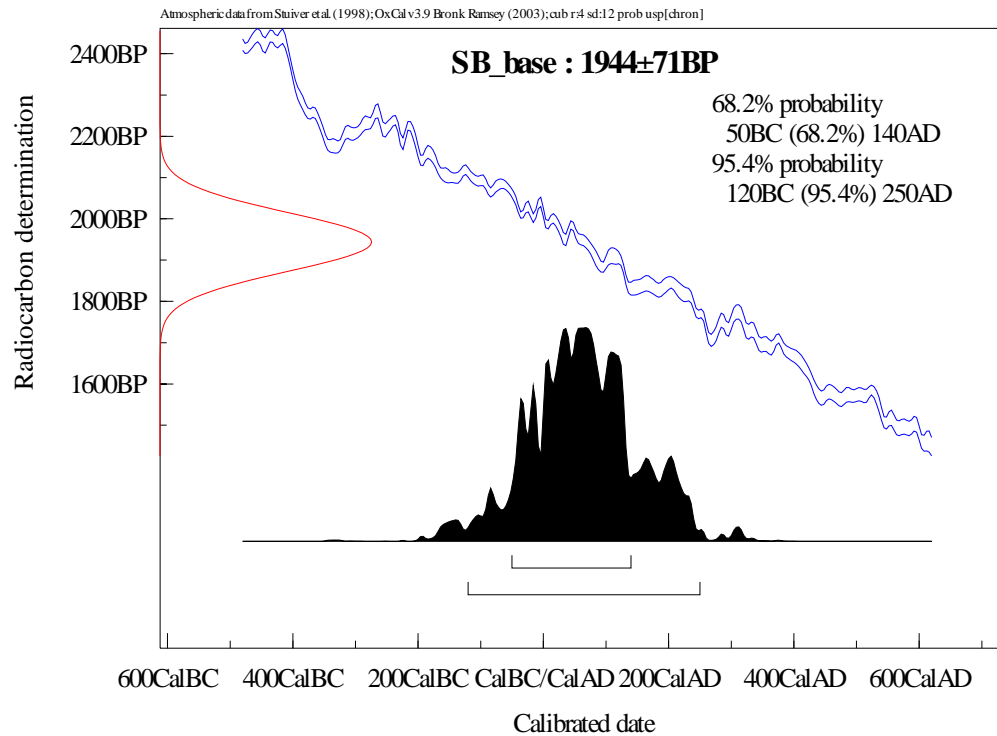
Chamber 3

12. Charcoal from surface of Unit 02-05 Level 3.

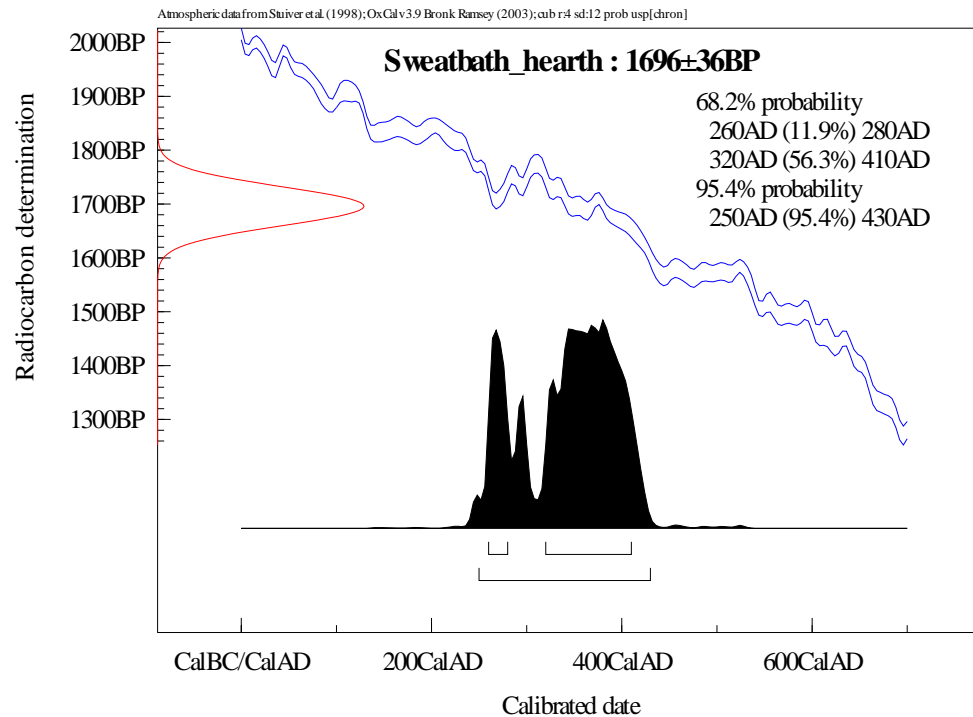


Crawl 3

13. Wood charcoal collected from Shovel Test Pit #016, 7cm below surface.

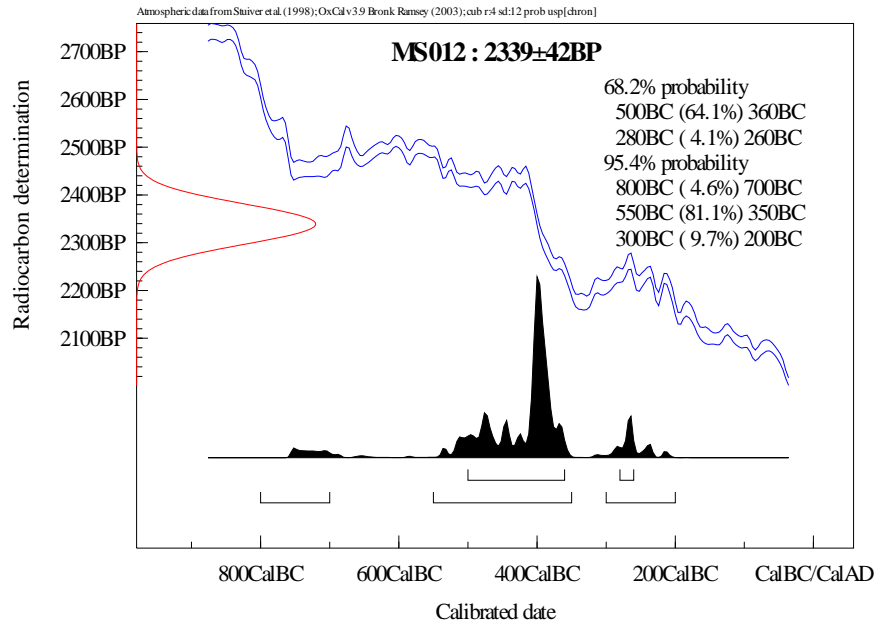


14. Wood charcoal collected from hearth feature.



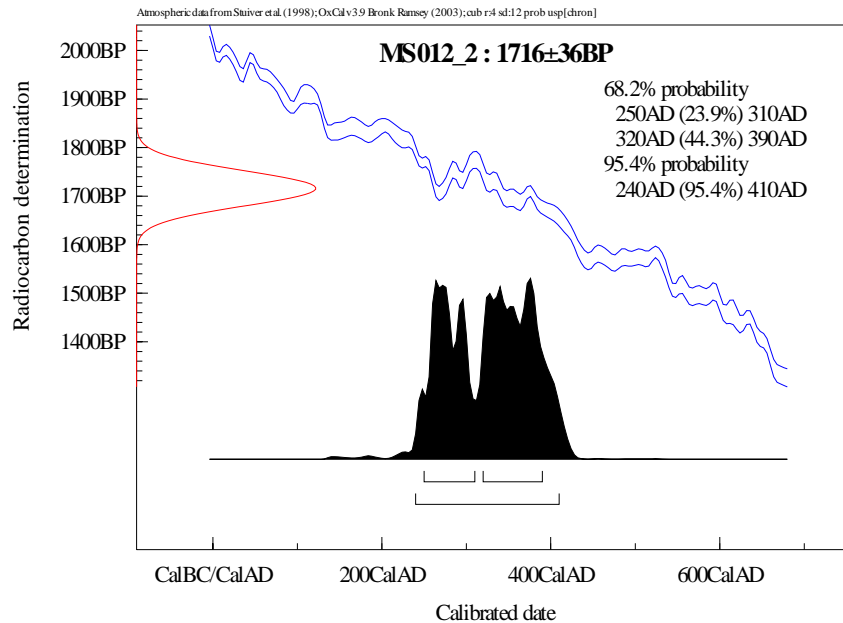
Tunnel 1- Adjacent to Keyhole Entrance of Descent to Deadend

15. Wood charcoal from Shovel Test Pit #020 base of hearth feature .28m below surface.



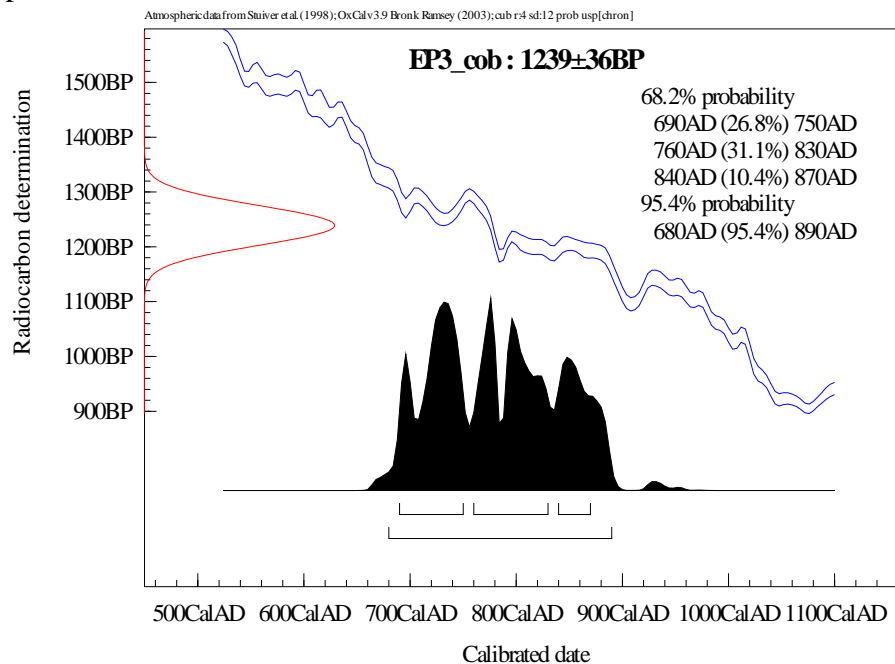
Tunnel 1- Adjacent to Keyhole Entrance of Descent to Deadend

16. Charcoal collected from .05m below surface of Shovel Test Pit #020, Hearth 1.



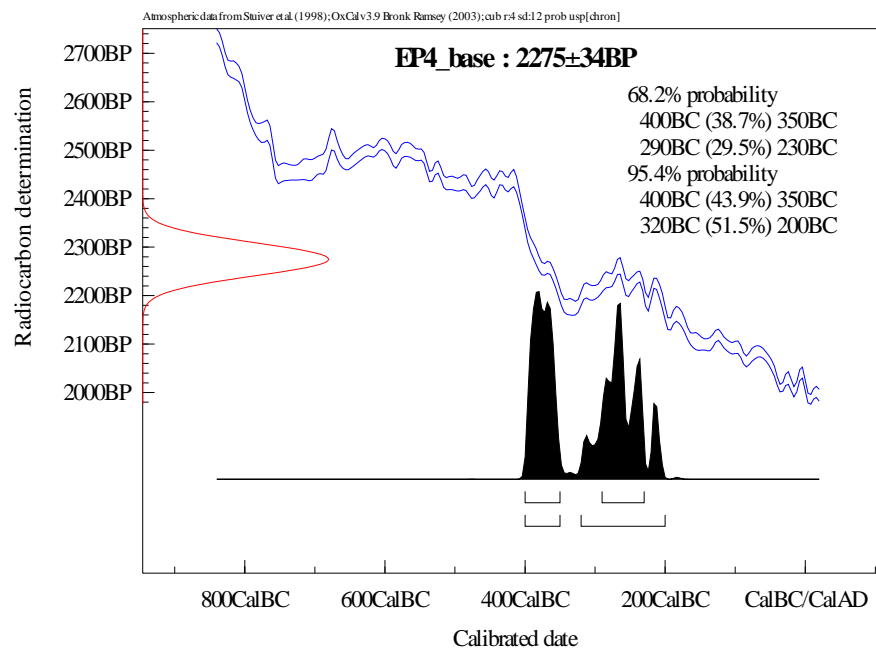
Elevated Passage 3

17. Well-preserved corn cob collected from Late Classic vessel.



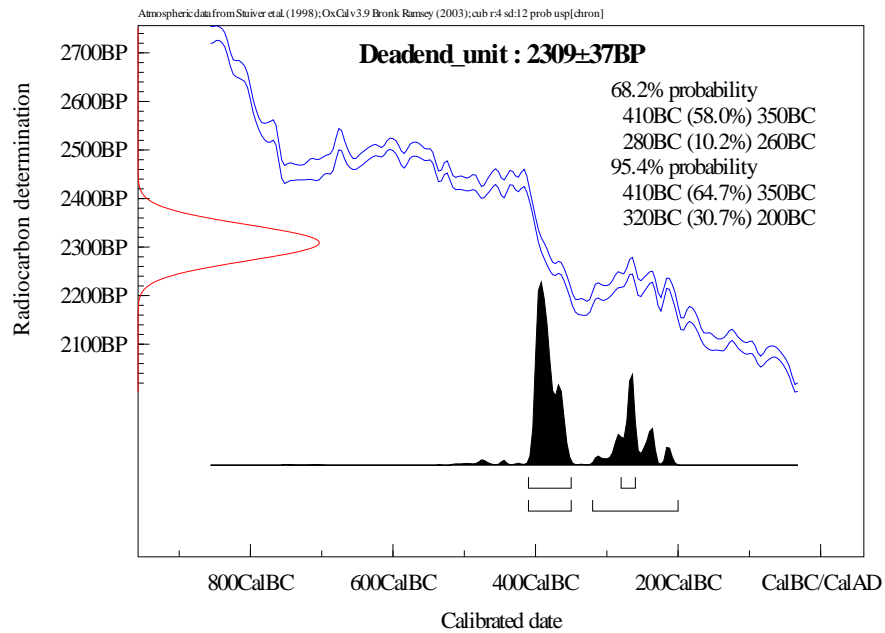
Elevated Passage 4

18. Charcoal collected from .07m below surface Shovel Test Pit #015.

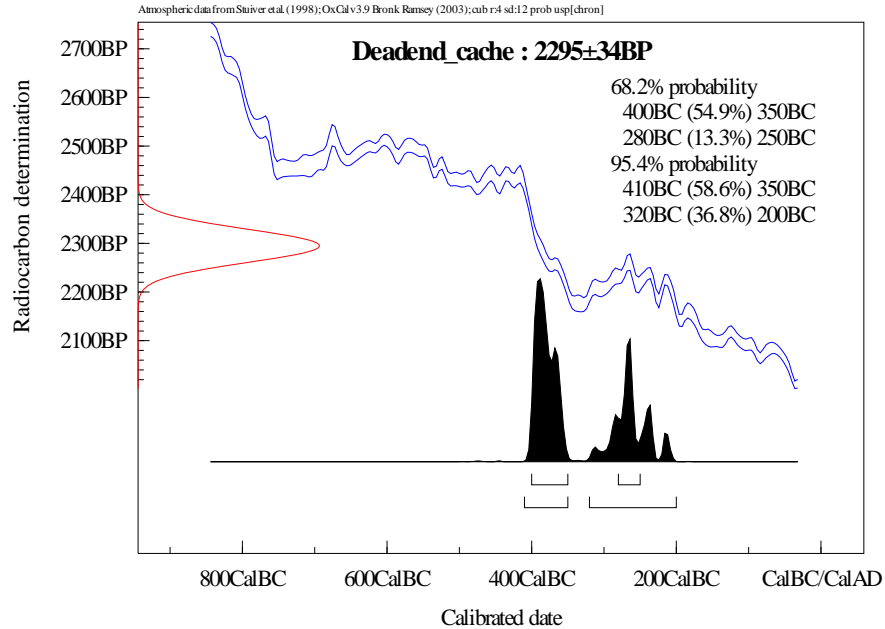


Dead End

19. Charcoal collected .46m below surface from Unit 02-02.

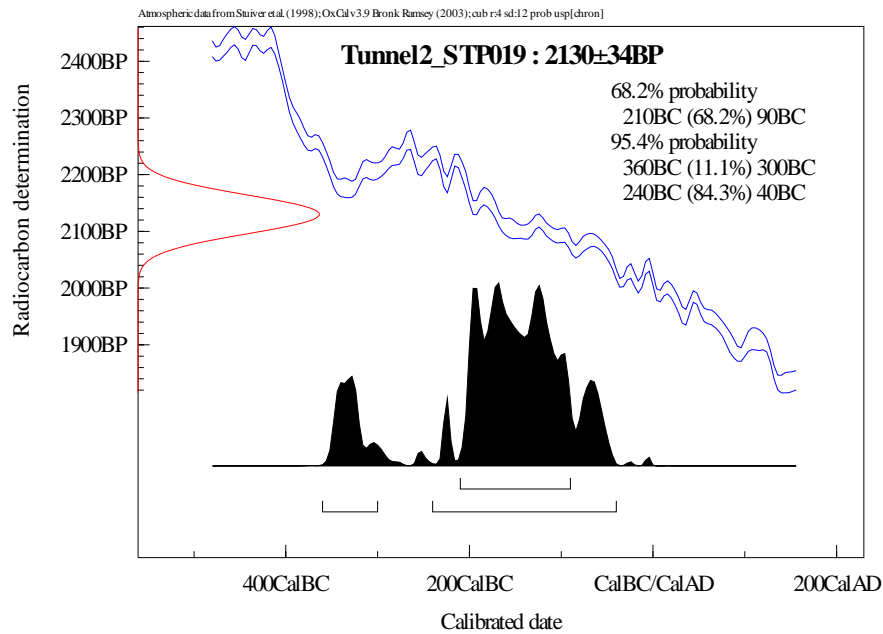


20. Charcoal collected from Dead End cache.

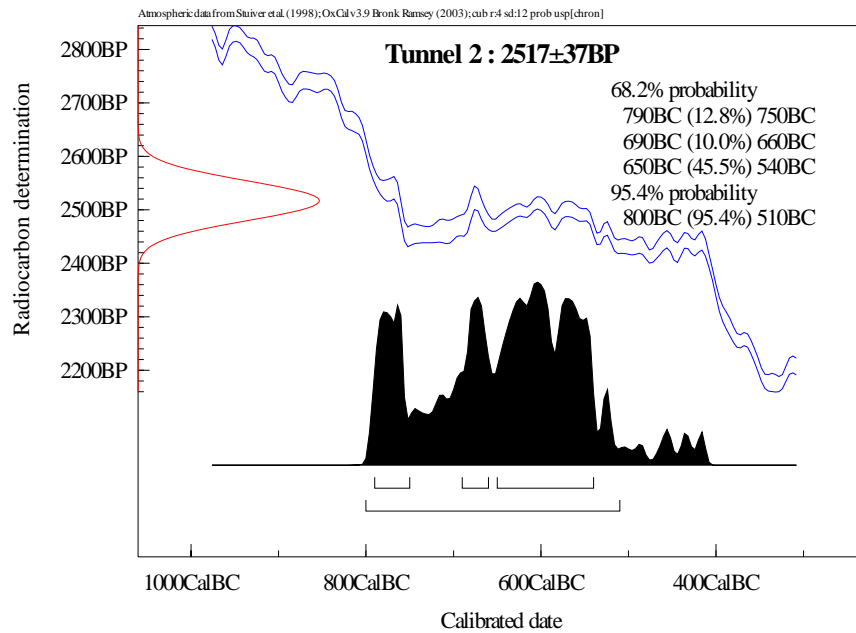


Tunnel 2

21. Wood charcoal collected from Tunnel 2, Shovel Test Pit 019, .11m below surface.

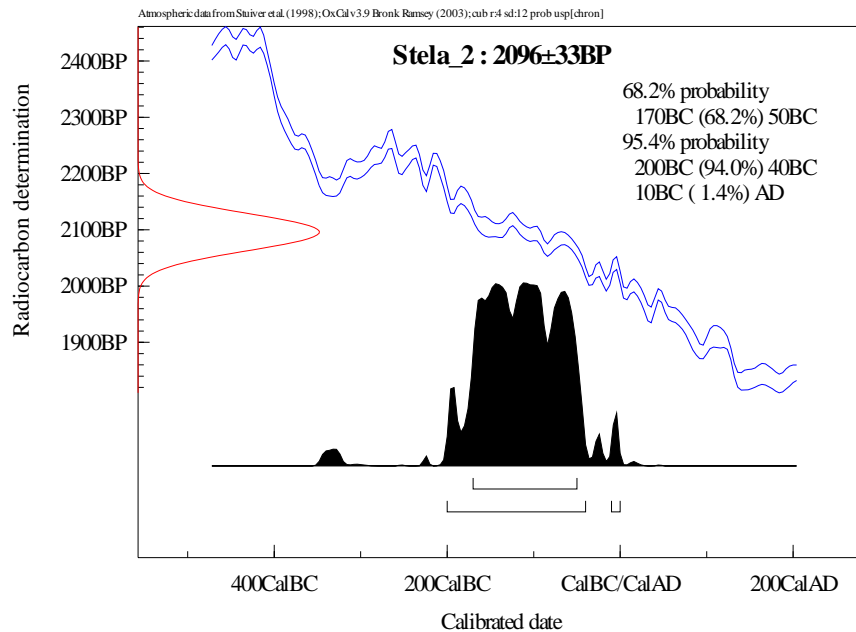


22. Tunnel 2, wood charcoal surface collected beneath jar.

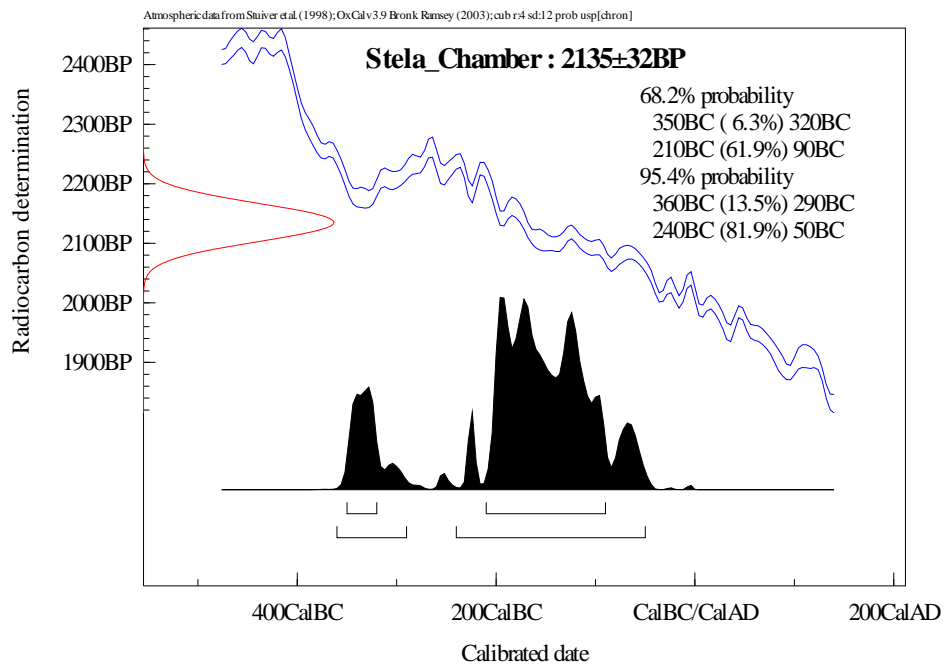


Stela Chamber

23. Wood charcoal surface collected adjacent to west wall near entrance.

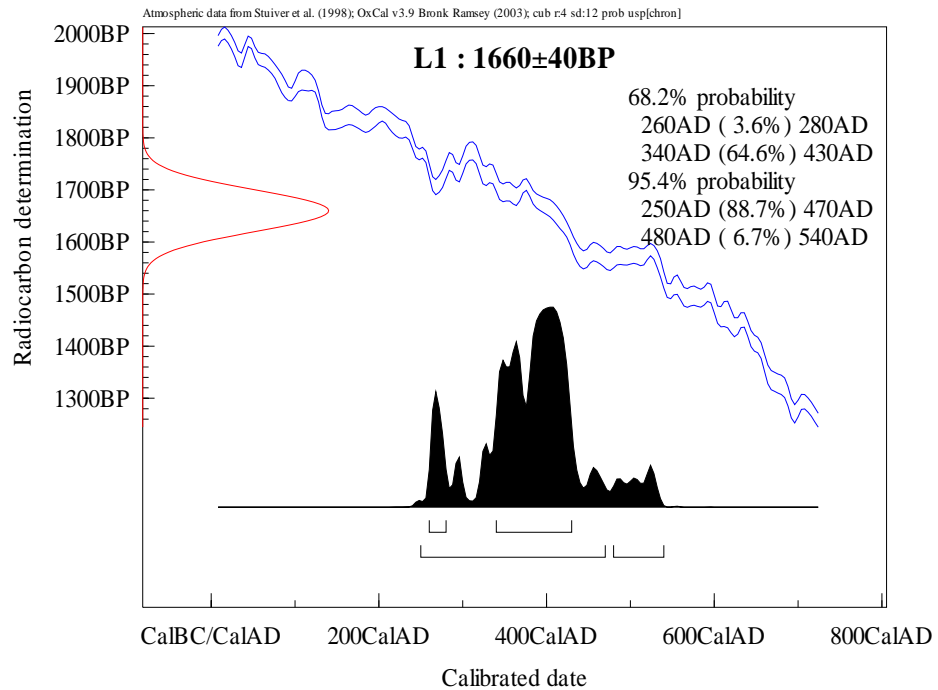


24. Wood charcoal surface collected from Stela Chamber.

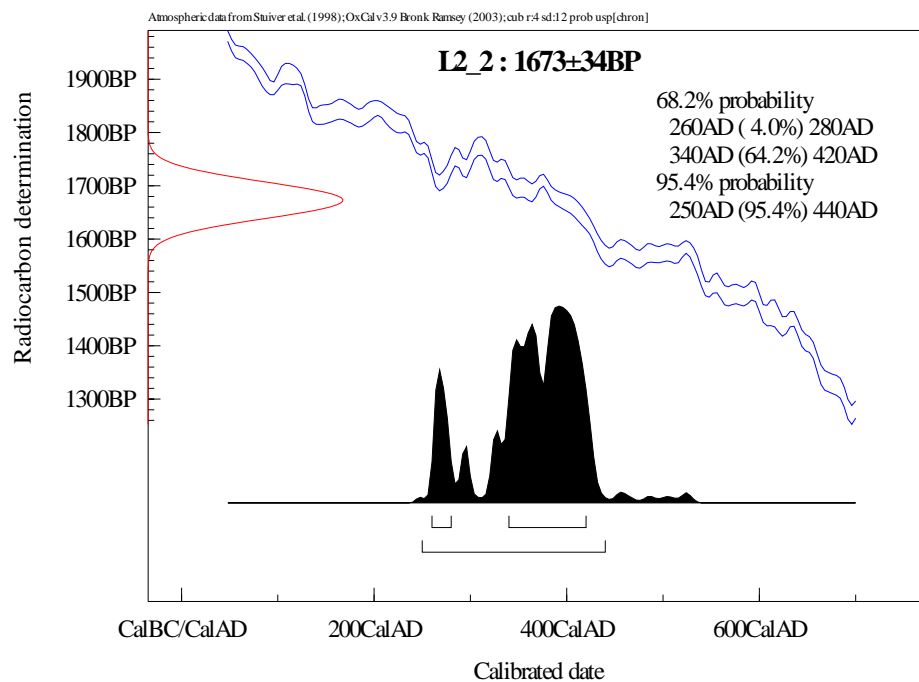


Chamber 2 Excavations

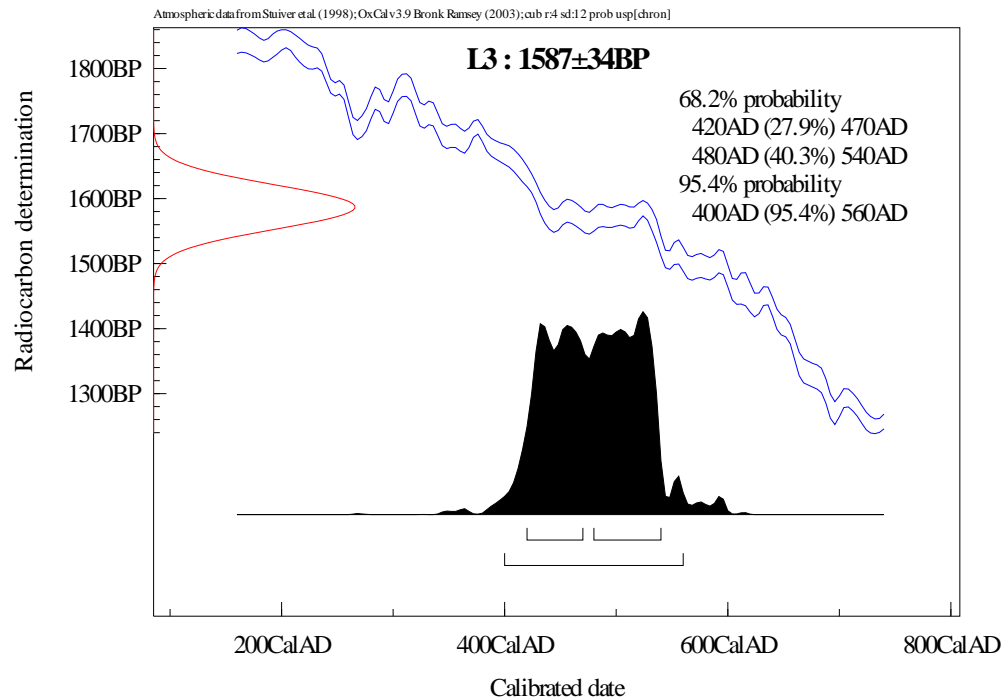
25. Chamber 2, 2002 excavations Unit 02-06 Level 1.



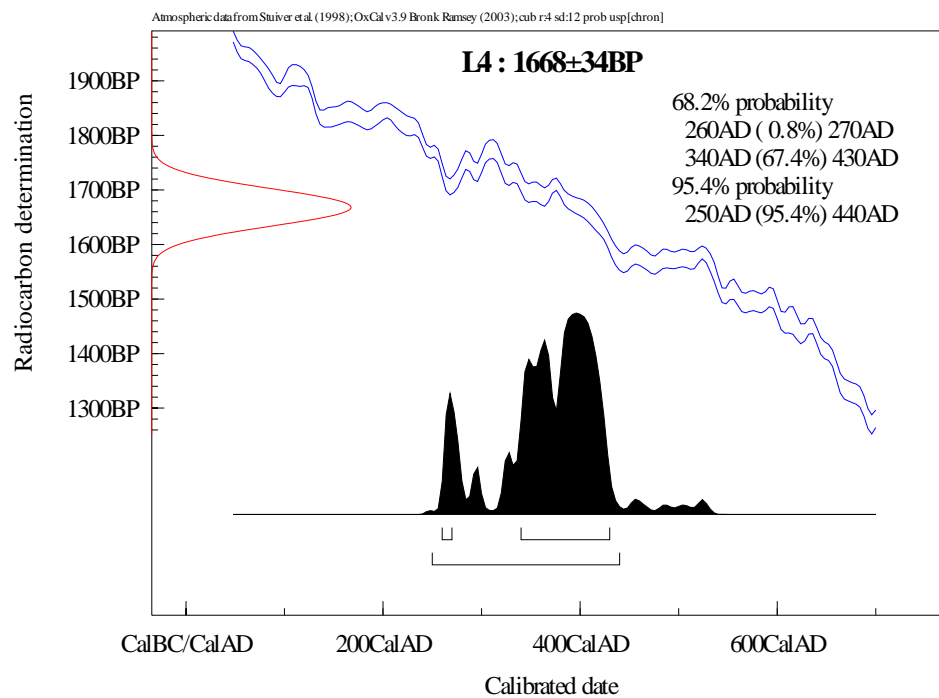
26. Chamber 2, 2003 excavations Level 2.



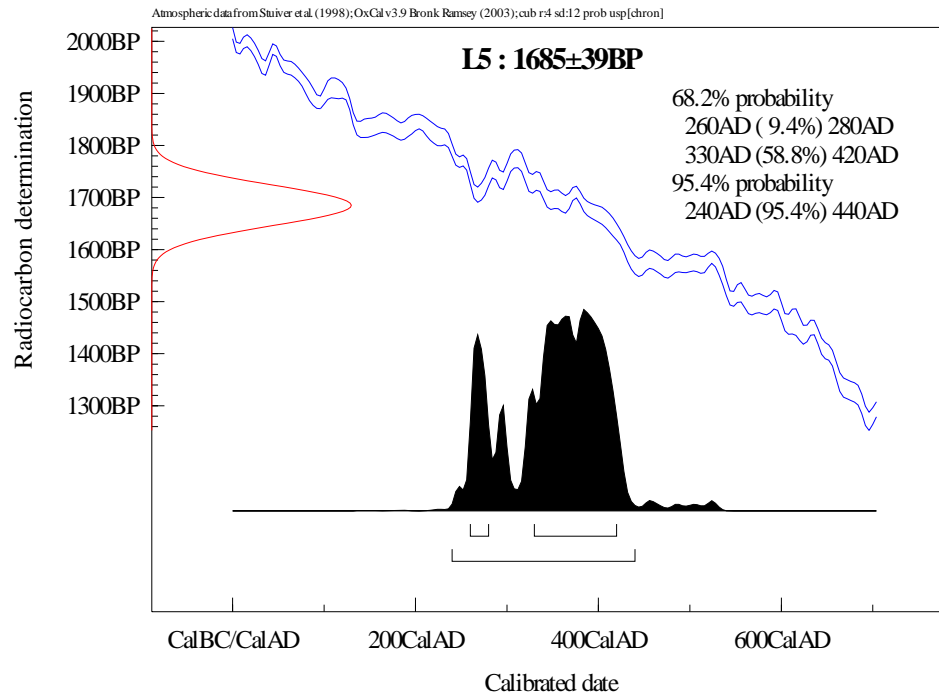
27. Chamber 2, 2003 excavations Level 3.



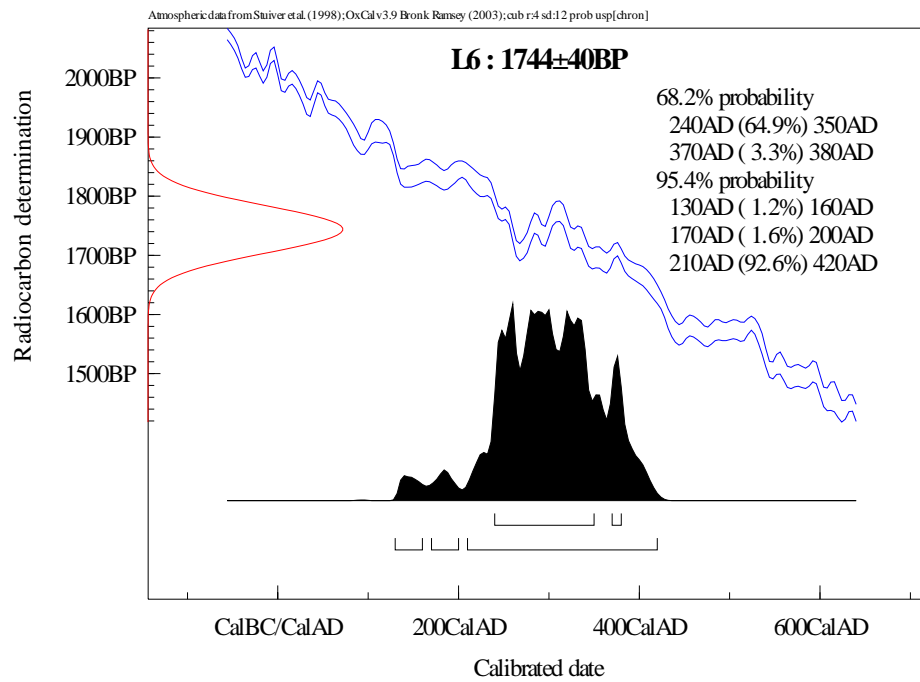
28. Chamber 2, 2003 excavations Level 4.



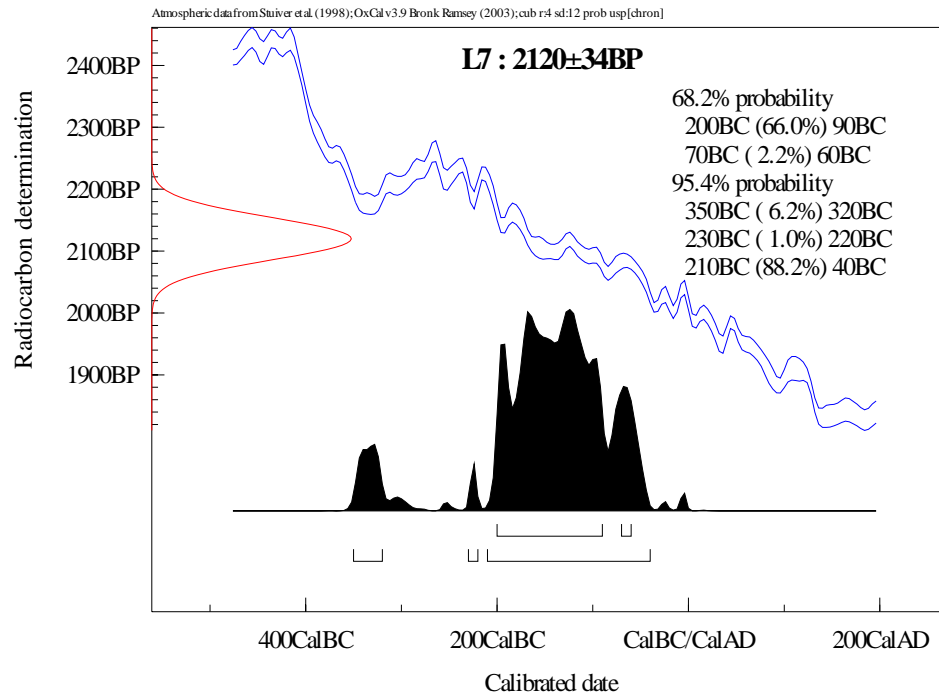
29. Chamber 2, 2003 excavations Level 5.



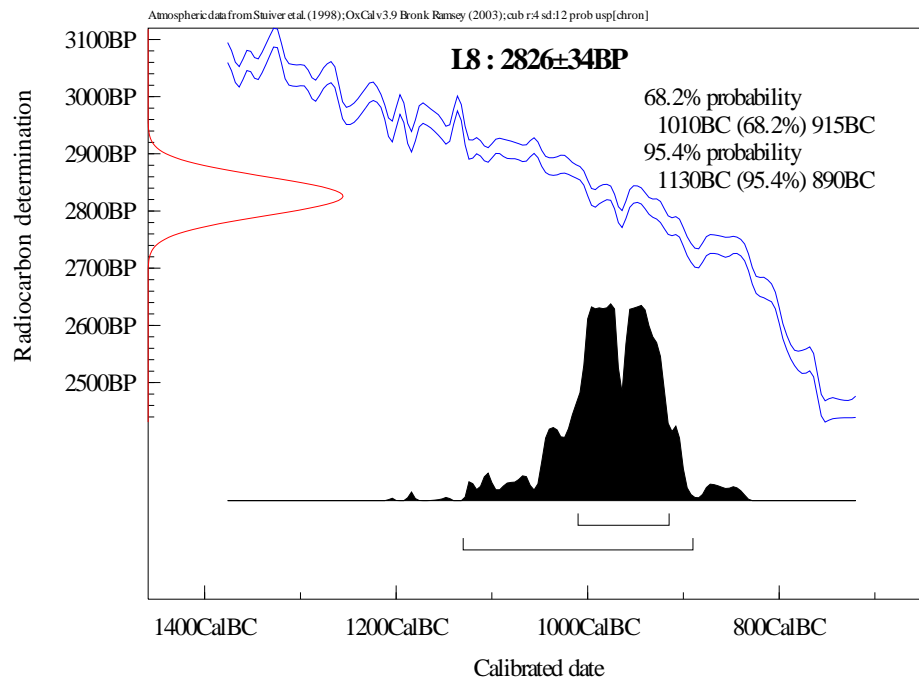
30. Chamber 2, 2003 excavations Level 6.



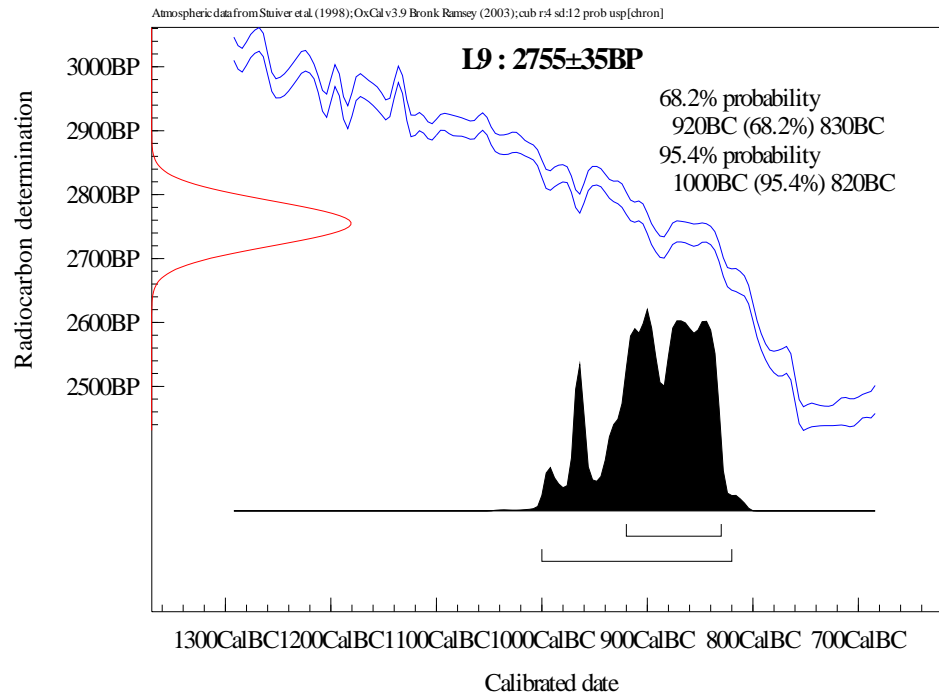
31. Chamber 2, 2003 excavations Level 7.



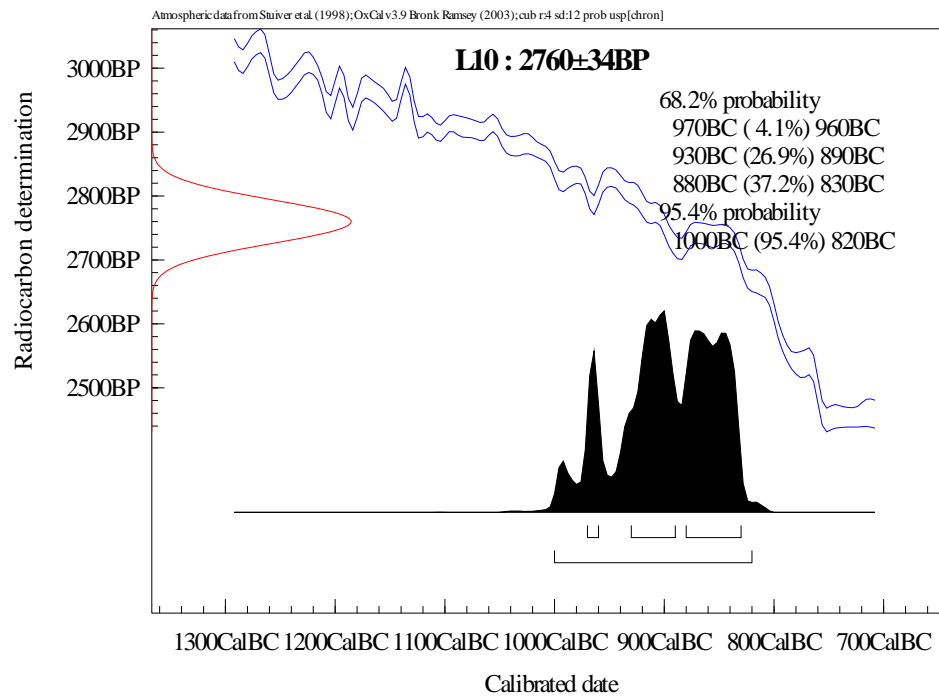
32. Chamber 2, 2003 excavations Level 8.



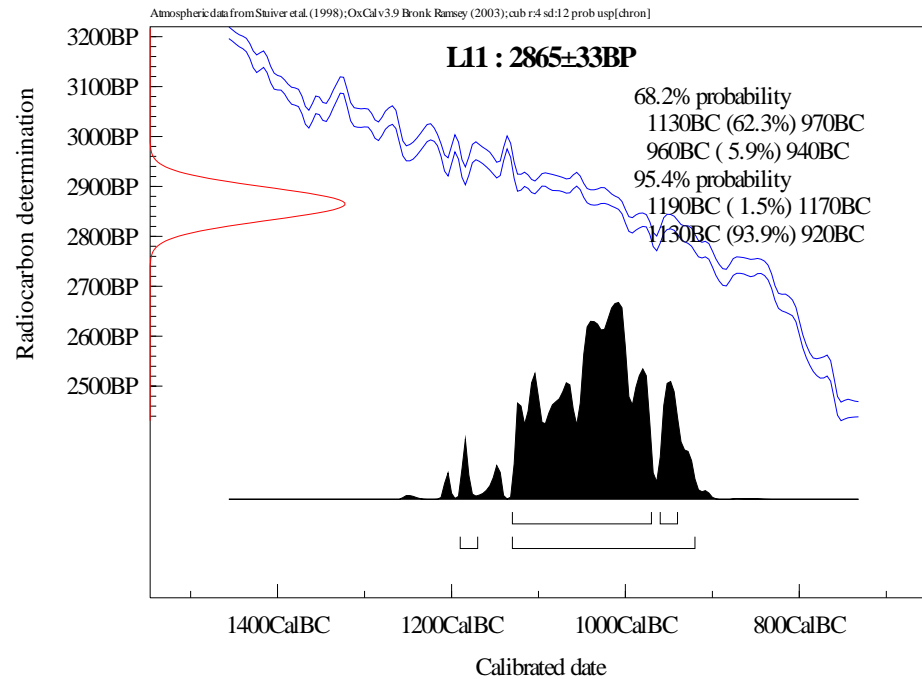
33. Chamber 2, 2003 excavations Level 9.



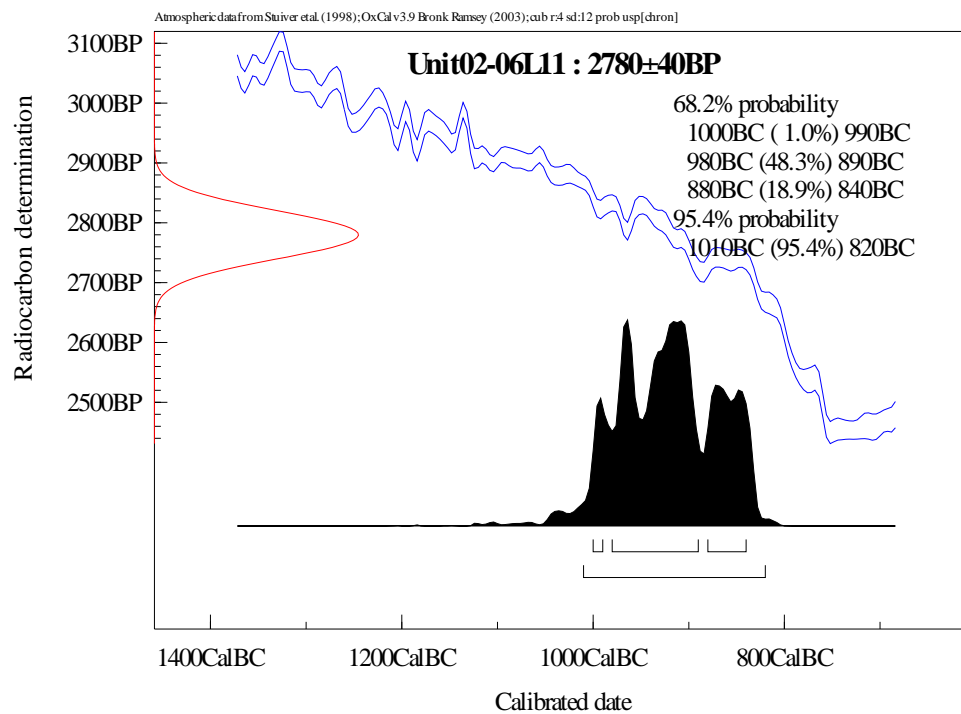
34. Chamber 2, 2003 excavations Level 10.



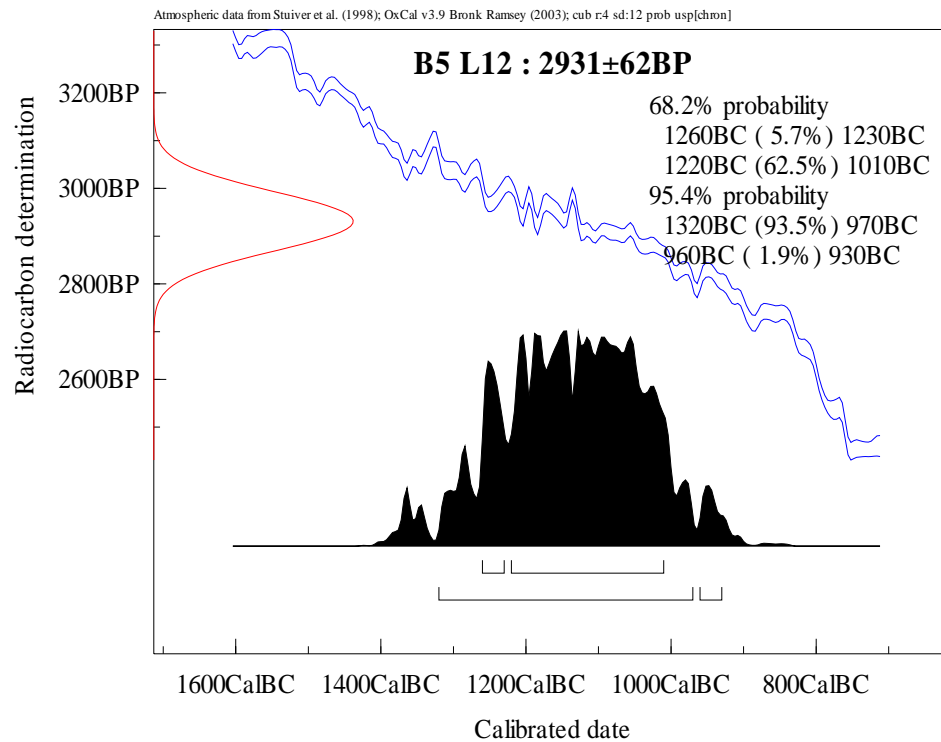
35. Chamber 2, 2003 excavations Level 11.



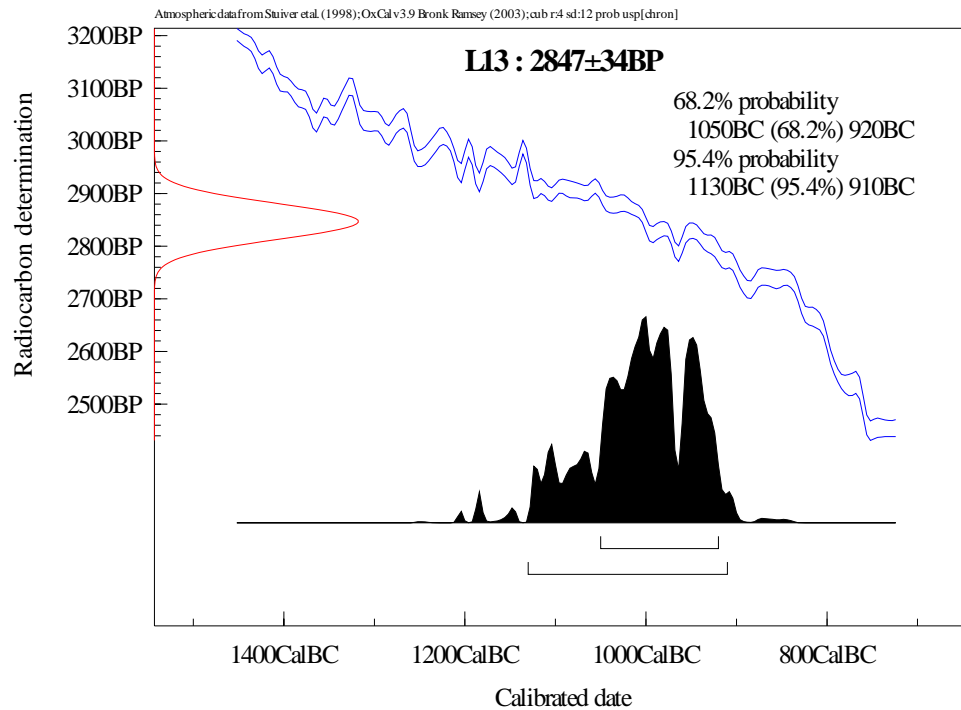
36. Chamber 2, 2002 excavations Level 11 (equivalent to Level 12 in 2003 excavations).



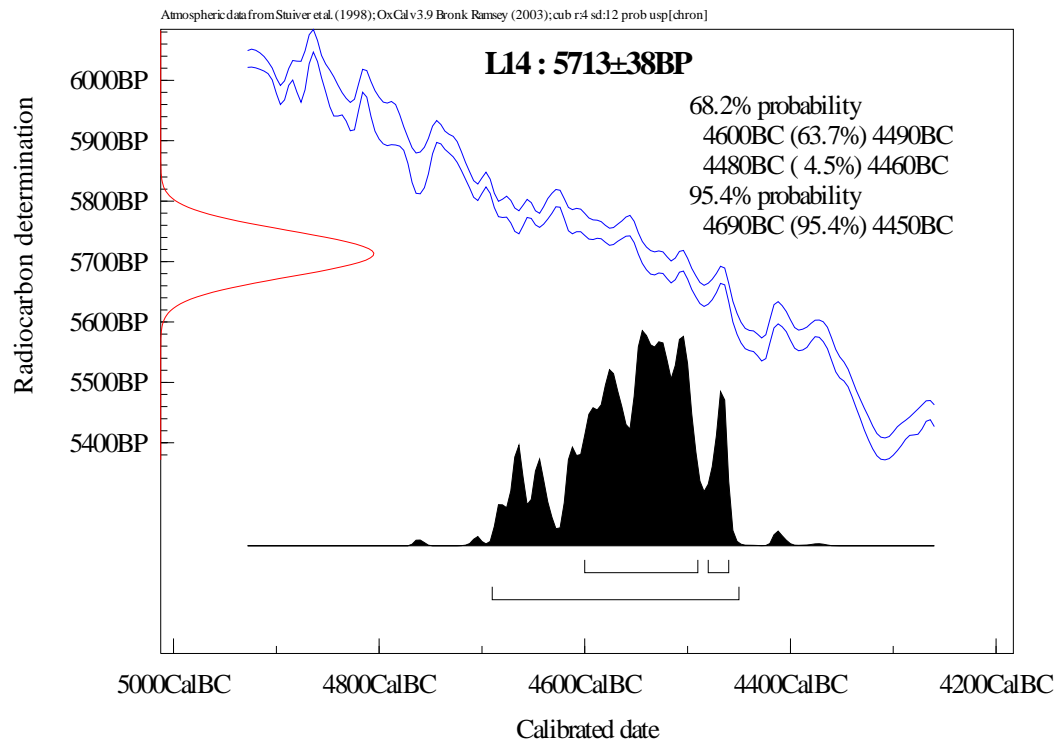
37. Chamber 2, 2002 excavations Level 12.



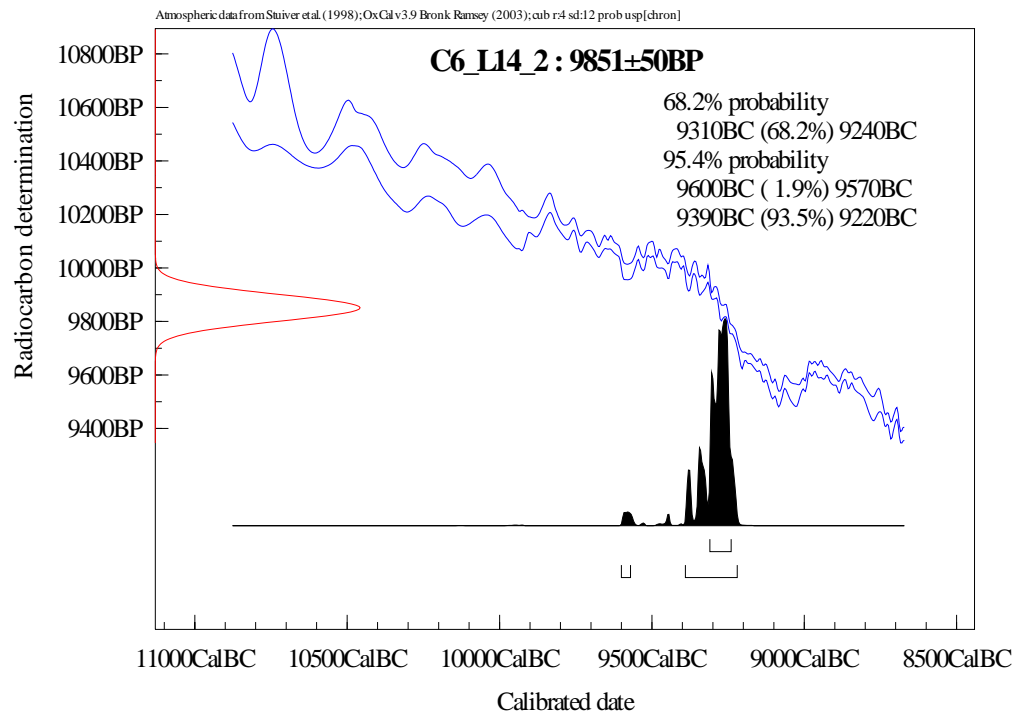
38. Chamber 2, 2002 excavations Level 13.



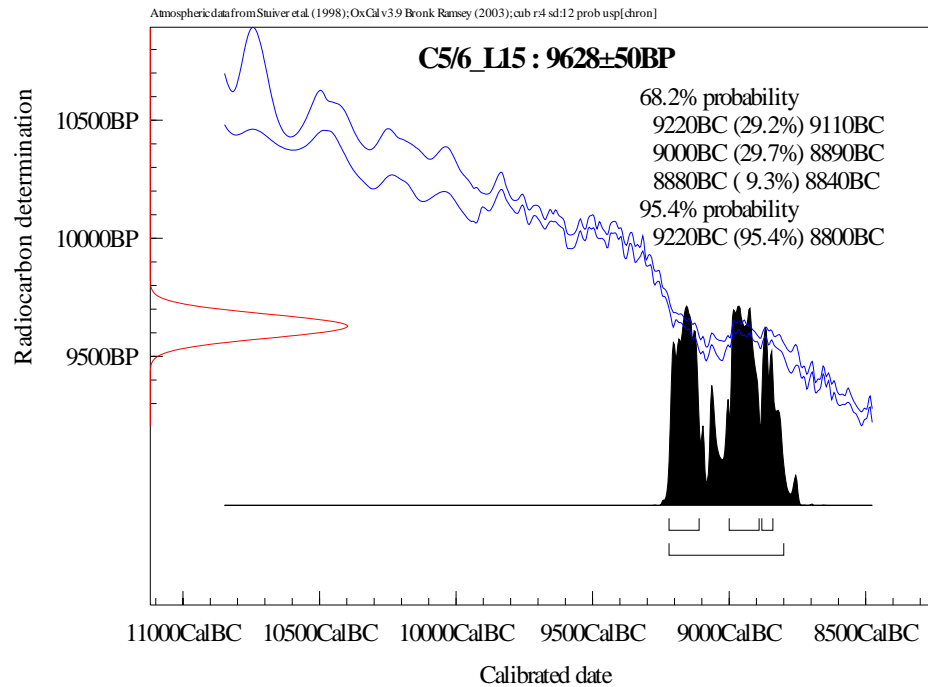
39. Chamber 2, 2002 excavations Level 14.



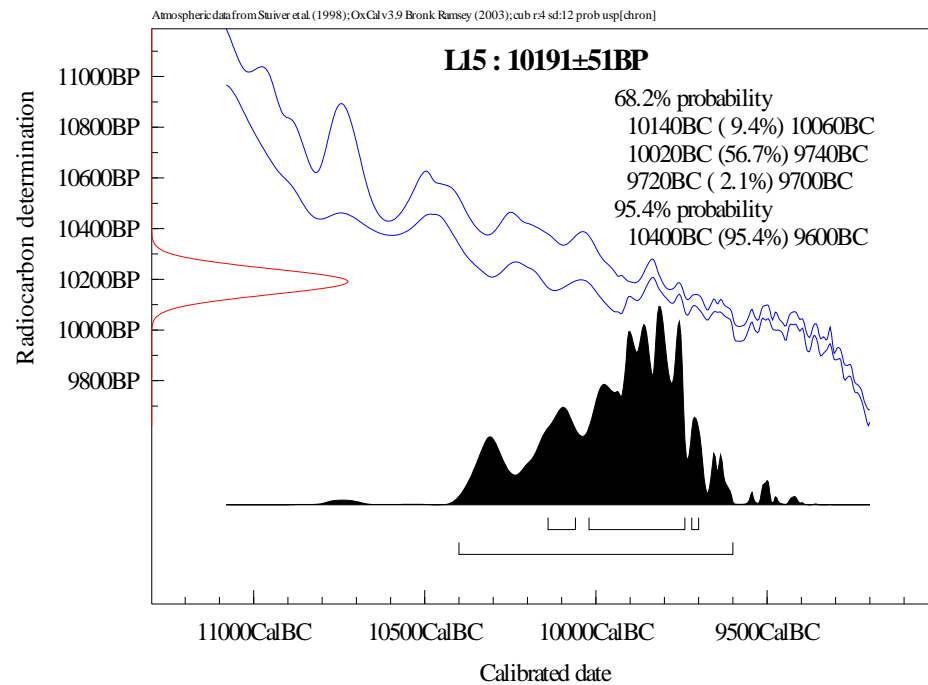
40. Chamber 2, 2002 excavations Level 14, date #2.



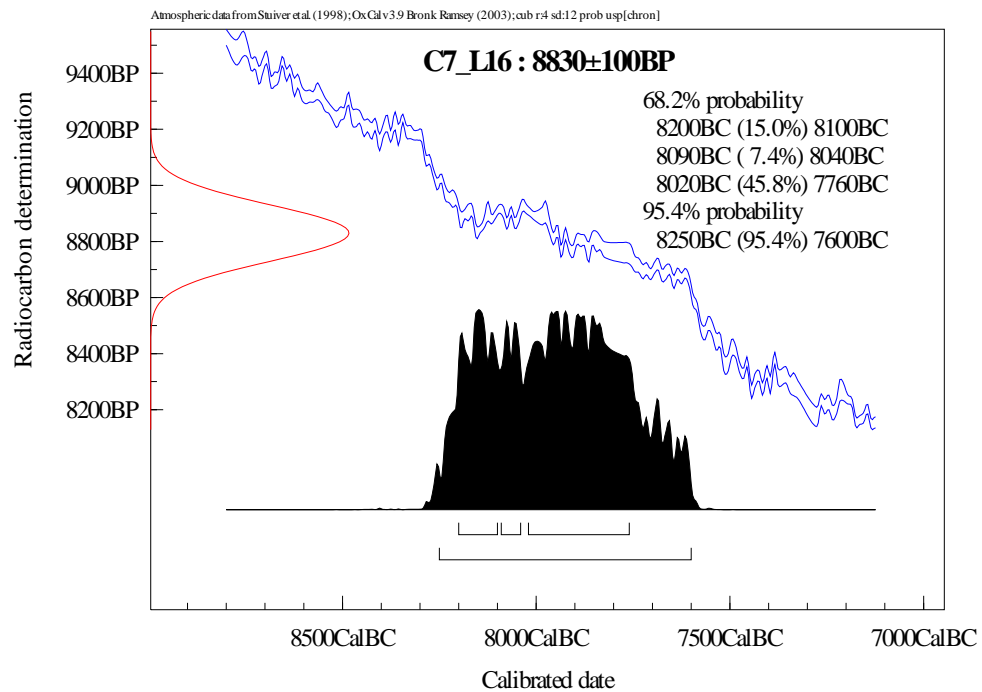
41. Chamber 2, 2002 excavations Level 15.



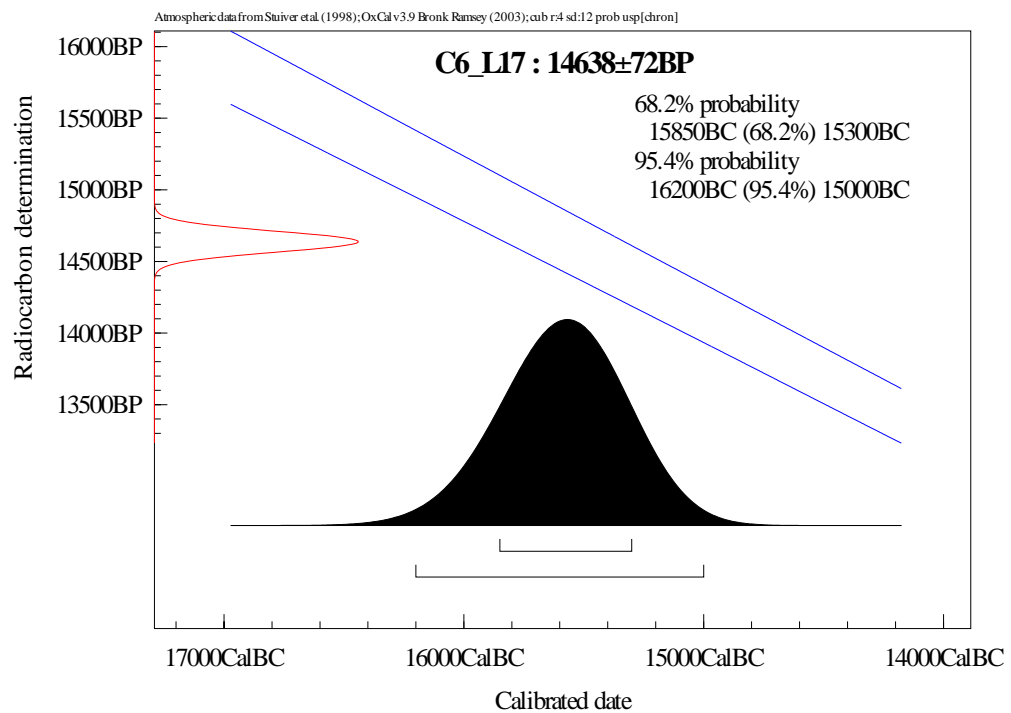
42. Chamber 2, 2002 excavations Level 15, date#2.



43. Chamber 2, 2002 excavations Level 16.



44. Chamber 2, 2002 excavations Level 17.



Appendix V

Sediment Analyses

Ph, LOI, Color, Texture

1. Table of results of pH and Loss on Ignition (LOI), infield color and color dry.

Lab#	Unit/Area		pH	LOI	Color/Field	Color/Dry
BZ1	C4	L2	7.6	22.8	7.5YR3/2	10yr 4/1
BZ2	C4	L3	7.5	22	7.5YR3/2	10yr 3/2
BZ3	C4	L4	7.5	22.2	7.5YR3/2	10yr 3/2
BZ4	C4	L5	7.6	22.4	7.5YR3/2	10yr 2/1
BZ5	C4	L6	7.4	23.2	7.5YR3/2	10yr 4/2
BZ6	C4	L7	7.7	17.05	7.5YR4/4	10yr 5/3
BZ7	C4	L8	7.5	21.3	7.5YR3/2	10yr 3/2
BZ8	C4	L9	7.6	22.3	7.5YR3/2	10yr 3/1
BZ9	C4	L10	7.6	22.2	7.5YR3/2	10yr 2/1
BZ10	C4	L11	7.8	24.6	7.5YR3/2	10yr 2/1
BZ11	C4	L12	7.8	25.2	7.5YR3/2	10yr 2/2
BZ12	C4	L13	7.6	27.3	7.5YR4/4	10yr 4/2
BZ13	C4	L14	8	29.6	7.5YR4/6	10yr 3/2
BZ14	C4	L15	8	30	7.5YR4/6	10yr 5/3
BZ15	C4	L16	7.9	30.4	7.5YR5/6	10yr 5/2
BZ16	Crawl 3 wall top		7.2	19.4		10yr 4/4
BZ25	Crawl 3 wall base		6.5	16.85		10yr 6/6
BZ26	Unit 02-05 L2 (yellow)		6.9	19.25		10yr 6/4
BZ21	Dead End back tunnel		7.8	20.7		10yr 3/4
BZ18	Road-surface		6.7	14.25		10yr 3/2
BZ19	Road-20cm below surface		6.6	10.95		10yr 3/6
BZ20	Road-40cm below surface		7.2	11.05		10yr 4/6
BZ22	A Horizon -beside cave entrance		7.1	31.1		10yr 2/1
BZ23	B Horizon-beside cave entrance		7.2	26.8		10yr 2/1
BZ17	Bat Guano Sample (Actun Chapat)		5.3	57.7		
BZ24	bedrock	C4-L17		40.5		

2. Results of texture analysis of cave sediments.

Lab#	Unit/Area	Level	Course	Fine<2mm	Total Wt.	Sand	Silt	Clay	Texture
BZ1	C4	L2	2.69	224.6	227.29	44.6	7.1	48.3	Clay
BZ2	C4	L3	3.7	329.2	332.9	17.7	10.4	71.9	Clay
BZ3	C4	L4	2.6	245.5	248.1	29.2	8.3	62.4	Clay
BZ4	C4	L5	5.19	217.21	222.4	27.1	5	67.9	Clay
BZ5	C4	L6	62.4	247.4	309.8	36.3	22.1	41.6	Clay
BZ6	C4	L7	10.7	280.5	291.2	34.2	35.3	30.5	Clay Loam
BZ7	C4	L8	3.6	197.2	200.8	14.4	9	76.6	Clay
BZ8	C4	L9	0	172.58	172.58	18.8	0	81.2	Clay
BZ9	C4	L10	0	257.6	257.6	11.3	8.8	79.9	Clay
BZ10	C4	L11	1.12	281.43	282.55	27.7	3.5	68.8	Clay
BZ11	C4	L12	0.62	232.22	232.84	38.6	1.6	59.8	Clay
BZ12	C4	L13	62.95	228.44	291.39	26.9	9.7	63.5	Clay
BZ13	C4	L14	33.3	269.7	303	43.4	10.2	46.4	Clay
BZ14	C4	L15	113.14	178.08	291.22	37.8	15.8	46.4	Clay
BZ15	C4	L16	147.99	252.1	400.09	42.5	9.7	47.7	Clay
BZ21	Dead End back tunnel		0.77	284.69	285.46	16.0	9.0	75.0	Clay

Elemental Analyses

3. Data tables of elemental analyses.

			%	%	%	%	%
Lab#	Unit/Area		SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO
BZ1	C4	L2	36.59	17.37	5.82	10.74	1.41
BZ2	C4	L3	37.44	18.49	6.33	9.17	1.47
BZ3	C4	L4	37.57	18.08	6.2	9.94	1.41
BZ4	C4	L5	38.22	18.61	6.31	7.86	1.46
BZ5	C4	L6	27.09	10.87	3.74	21.68	1.24
BZ6	C4	L7	25.37	9.51	3.27	25.2	1.27
BZ7	C4	L8	39.26	19.44	6.61	5.75	1.61
BZ8	C4	L9	41.65	20.47	6.95	3.14	1.68
BZ9	C4	L10	44.01	19.14	6.5	3.05	1.65
BZ10	C4	L11	40.48	20.58	7.07	2.35	1.61
BZ11	C4	L12	42.44	19.11	6.83	2.06	1.5
BZ12	C4	L13	32.4	14.01	4.16	17.3	1.24
BZ13	C4	L14	28.53	13.31	4.54	18.17	1.16
BZ14	C4	L15	30.03	12.73	4.19	18	1.39
BZ15	C4	L16	24.99	11.95	3.89	22.47	1.28
BZ16	Crawl 3 wall top		30.46	9.33	3.28	19.37	0.85
BZ25	Crawl 3 wall base		49.56	12.91	4.61	7.51	0.95
BZ26	Unit 02-05 Level2 (yellow)		46.57	12.13	4.57	8.64	0.97
BZ21	Dead End back tunnel		35.22	17.36	6.05	10.23	1.52
BZ17	Bat Guano (Actun Chapat)		9.76	6.54	1.77	14.7	0.88
BZ18	Road-surface		71	8.94	2.82	0.54	0.2
BZ19	Road-20cm below surface		67.69	13.29	4.8	0.43	0.29
BZ20	Road-40cm below surface		61.81	17.01	6.55	0.46	0.37
BZ22	A Horizon -beside cave entrance-Surface		41.61	16.16	5.43	2.61	0.9
BZ23	B Horizon-beside cave entrance-6cm Below Surface		39.49	20.74	7.33	2.32	1.15

Table cont.

			%	%	%	%	%
Lab#	Unit/Area		Na2O	K2O	Cr2O3	TiO2	MnO
BZ1	C4	L2	0.14	1.15	0.02	0.73	0.19
BZ2	C4	L3	0.05	1.11	0.01	0.82	0.19
BZ3	C4	L4	0.005	1.12	0.02	0.79	0.2
BZ4	C4	L5	0.05	1.19	0.01	0.84	0.19
BZ5	C4	L6	0.09	0.77	0.01	0.49	0.1
BZ6	C4	L7	0.13	0.62	0.01	0.37	0.08
BZ7	C4	L8	0.04	1.15	0.02	0.88	0.17
BZ8	C4	L9	0.02	1.2	0.01	0.96	0.19
BZ9	C4	L10	0.04	1.35	0.03	0.97	0.17
BZ10	C4	L11	0.005	1.22	0.01	0.99	0.18
BZ11	C4	L12	0.06	1.24	0.02	0.99	0.17
BZ12	C4	L13	0.07	1.12	0.01	0.61	0.17
BZ13	C4	L14	0.005	0.95	0.01	0.56	0.19
BZ14	C4	L15	0.02	1.09	0.01	0.53	0.15
BZ15	C4	L16	0.005	0.98	0.01	0.46	0.17
BZ16	Crawl 3 wall top		0.06	0.95	0.01	0.42	0.05
BZ25	Crawl 3 wall base		0.02	0.88	0.02	0.65	0.02
BZ26	Unit 02-05 L2 (yellow)		0.005	0.74	0.02	0.57	0.07
BZ21	Dead End back tunnel		0.03	1.89	0.01	0.74	0.12
BZ17	Bat Guano (Actun Chapat		0.06	1.56	0.005	0.31	0.005
BZ18	Road-surface		0.04	1.1	0.02	0.65	0.02
BZ19	Road-20cm below surface		0.03	1.37	0.02	0.7	0.01
BZ20	Road-40cm below surface		0.09	1.67	0.01	0.79	0.005
BZ22	A Horizon -beside cave entrance		0.005	0.78	0.01	0.81	0.15
BZ23	B Horizon-beside cave entrance		0.04	0.62	0.01	0.97	0.21

Table cont.

			%	%	%	%Wt.
Lab#	Unit/Area		P2O5	SrO	BaO	Nitrogen
BZ1	C4	L2	1.64	0.005	0.01	0.14
BZ2	C4	L3	1.21	0.005	0.01	0.15
BZ3	C4	L4	0.73	0.005	0.01	0.15
BZ4	C4	L5	1.03	0.005	0.02	0.16
BZ5	C4	L6	9.45	0.03	0.01	0.13
BZ6	C4	L7	16.13	0.06	0.01	0.12
BZ7	C4	L8	2.04	0.005	0.02	0.16
BZ8	C4	L9	0.61	0.005	0.01	0.18
BZ9	C4	L10	0.45	0.005	0.01	0.18
BZ10	C4	L11	0.20	0.005	0.02	0.18
BZ11	C4	L12	0.15	0.005	0.01	0.19
BZ12	C4	L13	1.29	0.005	0.01	0.09
BZ13	C4	L14	1.35	0.005	0.01	0.08
BZ14	C4	L15	1.71	0.005	0.01	0.08
BZ15	C4	L16	1.75	0.005	0.005	0.06
BZ16	Crawl 3 wall top		9.63	0.04	0.01	0.47
BZ25	Crawl 3 wall base		4.25	0.005	0.01	0.32
BZ26	Unit 02-05 L2 (yellow)		4.70	0.01	0.01	0.13
BZ21	Dead End back tunnel		4.28	0.005	0.01	0.12
BZ17	Bat Guano (Actun Chapat)		5.21	0.005	0.005	5.01
BZ18	Road-surface		0.04	0.005	0.02	0.32
BZ19	Road-20cm below surface		0.02	0.01	0.03	0.15
BZ20	Road-40cm below surface		0.03	0.01	0.03	0.09
BZ22	A Horizon -beside cave entrance		0.18	0.005	0.01	0.87
BZ23	B Horizon-beside cave entrance		0.06	0.005	0.005	0.43

Table cont.

			ppm	ppm	ppm		
Lab#	Unit/Area		Cu	Nb	Zr		
BZ1	C4	L2	70	13	193		
BZ2	C4	L3	60	16	199		
BZ3	C4	L4	50	15	194		
BZ4	C4	L5	60	18	214		
BZ5	C4	L6	190	12	133		
BZ6	C4	L7	300	11	122		
BZ7	C4	L8	80	17	224		
BZ8	C4	L9	60	15	240		
BZ9	C4	L10	60	18	246		
BZ10	C4	L11	50	17	251		
BZ11	C4	L12	50	20	257		
BZ12	C4	L13	60	12	153		
BZ13	C4	L14	60	12	149		
BZ14	C4	L15	60	13	128		
BZ15	C4	L16	60	9	110		
BZ16	Crawl 3 wall top		230	11	174		
BZ25	Crawl 3 wall base		90	13	336		
BZ26	Unit 02-05 L2 (yellow)		120	12	254		
BZ17	Bat Guano (Actun Chapat)		210	9	63		
BZ21	Dead End back tunnel		120	14	187		
BZ18	Road-surface		30	16	304		
BZ19	Road-20cm below surface		30	16	266		
BZ20	Road-40cm below surface		20	18	278		
BZ22	A Horizon -beside cave entrance		40	17	245		
BZ23	B Horizon-beside cave entrance		40	18	258		

4. Comparison of Miller's (1996) elemental analysis of bedrock from the Vaca Plateau with the Chechem Ha rock.

Comparative Samples			%	%	%	%	%
Lab#		Unit/Area	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO
BZ27	rock	C4-L6	no data	no data	no data	no data	no data
BZ28	rock	C4-L15	no data	no data	no data	no data	no data
BZ24	bedrock	C4-L17	5.89	3.15	0.71	47.41	1.08
Miller (1990)	bedrock		0	0	0	68.2	25.7
			%	%	%	%	%
			Na ₂ O	K ₂ O	Cr ₂ O ₃	TiO ₂	MnO
Lab#		Unit/Area					
BZ27	rock	C4-L6	no data	no data	no data	no data	no data
BZ28	rock	C4-L15	no data	no data	no data	no data	no data
BZ24	bedrock	C4-L17	0.005	0.68	0.005	0.11	0.005
Miller (1990)	bedrock		5.9	no data	no data	no data	no data
			%	%	%	ppm	ppm
Lab#		Unit/Area	P ₂ O ₅	SrO	BaO	Cu	Nb
BZ27	rock	C4-L6	no data	no data	no data	no data	no data
BZ28	rock	C4-L15	no data	no data	no data	no data	no data
BZ24	bedrock	C4-L17	0.08	0.005	0.005	40	8
Miller (1990)	bedrock		no data	no data	no data	no data	no data
			ppm	%Wt.			
			Zr	Nitrogen	LOI	pH	
Lab#		Unit/Area					
BZ27	rock	C4-L6	no data	0.01	no data	no data	
BZ28	rock	C4-L15	no data	0.03	no data	no data	
BZ24	bedrock	C4-L17	28	no data	40.5	no data	
Miller (1990)	bedrock		no data	no data	no data	no data	

5. Table of exploratory data comparing sediments within cave to outside soils. These data do not include parent material (bedrock) or guano samples. Shows minimum, maximum, median, and average of all values collected from interior sediment (n=19) vs. exterior soil (n=5) deposits compared with total sample (n=24). Elements are presented as percentage by weight and trace elements in parts per million.

	%	%	%	%	%	%	%
	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	Na ₂ O	K ₂ O
Total							
max	71.00	20.74	9.70	25.20	1.68	0.30	1.89
average	41.53	15.53	5.50	9.23	1.16	0.05	1.09
median	39.26	16.7	5.82	7.86	1.27	0.04	1.12
min	24.99	8.94	2.82	0.43	0.20	0.01	0.62
range	46.01	11.8	6.88	24.77	1.48	0.30	1.27
range/min	1.84	1.32	2.44	57.60	7.40	59.00	2.05
Within Cave							
max	49.56	20.58	7.07	2.61	1.68	0.14	1.89
average	36.20	15.55	5.31	1.34	1.35	0.04	1.09
median	37.44	17.36	5.82	1.12	1.41	0.04	1.12
min	24.99	9.33	3.27	0.43	0.85	0.01	0.62
range	24.57	11.25	3.80	2.18	0.83	0.14	1.27
range/min	0.98	1.21	1.16	5.07	0.98	27.00	2.05
Outside Cave							
max	71.00	20.74	9.70	2.61	1.15	0.30	1.67
average	58.38	15.47	6.11	1.34	0.57	0.08	1.11
median	64.75	16.43	5.99	1.12	0.44	0.04	1.10
min	39.49	8.94	2.82	0.43	0.20	0.01	0.62
range	31.51	11.80	6.88	2.18	0.95	0.30	1.05
range/min	0.80	1.32	2.44	5.07	4.75	59.00	1.69

Table cont.

	%	%	%	%	%	%
	Cr2O3	TiO2	MnO	P2O5	SrO	BaO
Total						
max	0.03	0.99	0.21	16.13	0.06	0.03
average	0.01	0.72	0.13	2.62	0.01	0.01
median	0.01	0.74	0.17	1.25	0.01	0.01
min	0.01	0.37	0.01	0.02	0.01	0.01
range	0.02	0.62	0.21	16.11	0.06	0.03
range/min	2.00	1.68	41.00	805.50	11.00	5.00
Within Cave						
max	0.03	0.99	0.20	16.13	0.06	0.02
average	0.01	0.70	0.15	3.29	0.01	0.01
median	0.01	0.73	0.17	1.64	0.01	0.01
min	0.01	0.37	0.02	0.15	0.01	0.01
range	0.02	0.62	0.18	15.98	0.06	0.02
range/min	2.00	1.68	9.00	106.53	11.00	3.00
Outside Cave						
max	0.02	0.97	0.21	0.18	0.01	0.03
average	0.01	0.78	0.08	0.07	0.01	0.02
median	0.01	0.79	0.02	0.04	0.01	0.02
min	0.01	0.65	0.01	0.02	0.01	0.01
range	0.01	0.32	0.21	0.16	0.01	0.03
range/min	1.00	41.00	41.00	8.00	1.00	5.00

Table cont.

	ppm	ppm	ppm
Total	Cu	Nb	Zr
max	300.00	20.00	336.00
average	82.92	14.71	213.13
median	60	15	219
min	20.00	9.00	28.00
range	280.00	11.00	308.00
range/min	14.00	1.22	11.00
Within Cave			
max	300.00	20.00	336.00
average	96.32	14.11	198.11
median	60.00	13.00	194.00
min	50.00	9.00	110.00
range	250.00	11.00	226.00
range/min	5.00	1.22	2.05
range/min	1.00	0.13	0.24
Outside Cave			
max	40.00	18.00	304.00
average	32.00	17.00	270.20
median	30.00	17.00	266.00
min	20.00	16.00	245.00
range	20.00	2.00	59.00

6. Exploratory data for elemental analysis for 16 elements. Box and whisker plots below.

Case Processing Summary

VAR00001		Cases					
		Valid		Missing		Total	
		N	Percent	N	Percent	N	Percent
SiO ₂	1.00	19	100.0%	0	.0%	19	100.0%
	2.00	5	100.0%	0	.0%	5	100.0%
Al ₂ O ₃	1.00	19	100.0%	0	.0%	19	100.0%
	2.00	5	100.0%	0	.0%	5	100.0%
Fe ₂ O ₃	1.00	19	100.0%	0	.0%	19	100.0%
	2.00	5	100.0%	0	.0%	5	100.0%
CaO	1.00	19	100.0%	0	.0%	19	100.0%
	2.00	5	100.0%	0	.0%	5	100.0%
MgO	1.00	19	100.0%	0	.0%	19	100.0%
	2.00	5	100.0%	0	.0%	5	100.0%
Na ₂ O	1.00	19	100.0%	0	.0%	19	100.0%
	2.00	5	100.0%	0	.0%	5	100.0%
K ₂ O	1.00	19	100.0%	0	.0%	19	100.0%
	2.00	5	100.0%	0	.0%	5	100.0%
Cr ₂ O ₃	1.00	19	100.0%	0	.0%	19	100.0%
	2.00	5	100.0%	0	.0%	5	100.0%
TiO ₂	1.00	19	100.0%	0	.0%	19	100.0%
	2.00	5	100.0%	0	.0%	5	100.0%
MnO	1.00	19	100.0%	0	.0%	19	100.0%
	2.00	5	100.0%	0	.0%	5	100.0%
P ₂ O ₅	1.00	19	100.0%	0	.0%	19	100.0%
	2.00	5	100.0%	0	.0%	5	100.0%
SrO	1.00	19	100.0%	0	.0%	19	100.0%
	2.00	5	100.0%	0	.0%	5	100.0%
BaO	1.00	19	100.0%	0	.0%	19	100.0%
	2.00	5	100.0%	0	.0%	5	100.0%
Cu	1.00	19	100.0%	0	.0%	19	100.0%
	2.00	5	100.0%	0	.0%	5	100.0%
Nb	1.00	19	100.0%	0	.0%	19	100.0%
	2.00	5	100.0%	0	.0%	5	100.0%
Zr	1.00	19	100.0%	0	.0%	19	100.0%
	2.00	5	100.0%	0	.0%	5	100.0%

Descriptives					Statistic	Std. Error
SiO2	VAR00001	1.00	Mean		36.2042	
			95% Confidence Interval for Mean	Lower Bound	32.7543	1.64208
				Upper Bound	39.6541	
			5% Trimmed Mean		36.0852	
			Median		37.4400	
			Variance		51.232	
			Std. Deviation		7.15768	
			Minimum		24.99	
			Maximum		49.56	
			Range		24.57	
			Interquartile Range		11.62	
			Skewness		.021	.524
			Kurtosis		-.835	1.014
			2.00		56.3200	6.61269
Al2O3	1.00	1.00	Mean		15.5474	.88065
			95% Confidence Interval for Mean	Lower Bound	13.6972	
				Upper Bound	17.3976	
			5% Trimmed Mean		15.6132	
			Median		17.3600	
			Variance		14.735	
			Std. Deviation		3.83867	
			Minimum		9.33	
			Maximum		20.58	
			Range		11.25	
			Interquartile Range		6.98	
			Skewness		-.247	.524
			Kurtosis		-1.515	1.014
			2.00		15.2280	1.97131
Fe2O3	1.00	1.00	Mean		9.7548	
			95% Confidence Interval for Mean	Lower Bound	20.7012	
				Upper Bound	15.2711	
			5% Trimmed Mean		16.1600	
			Median		19.430	
			Variance		4.40798	
			Std. Deviation		8.94	
			Minimum		20.74	
			Maximum		11.80	
			Range		7.76	
			Interquartile Range		-.399	.913
			Skewness		.315	2.000
			Kurtosis		5.3116	
			2.00		4.6708	.30500
CaO	1.00	1.00	Mean		5.9524	
			95% Confidence Interval for Mean	Lower Bound	5.3273	
				Upper Bound	5.8200	
			5% Trimmed Mean		1.768	
			Median		1.32947	
			Variance		3.27	
			Std. Deviation		7.07	
			Minimum		3.80	
			Maximum		2.34	
			Range		-.193	.524
			Interquartile Range		-1.616	1.014
			Skewness		5.3860	
			Kurtosis		3.2297	.77665
			2.00		7.5423	
CaO	2.00	2.00	Mean		5.4206	
			95% Confidence Interval for Mean	Lower Bound	5.4300	
				Upper Bound	3.016	
			5% Trimmed Mean		1.73664	
			Median		2.82	
			Variance		7.33	
			Std. Deviation		4.51	
			Minimum		3.13	
			Maximum		-.650	.913
			Range		.189	2.000
			Interquartile Range		11.7174	
			Skewness		8.1471	1.69939
			Kurtosis		15.2877	
			2.00		11.5049	
CaO	2.00	2.00	Mean		9.9400	
			95% Confidence Interval for Mean	Lower Bound	54.871	
				Upper Bound	7.40748	
			5% Trimmed Mean		2.06	
			Median		25.20	
			Variance		23.14	
			Std. Deviation		12.42	
			Minimum		.369	.524
			Maximum		-1.167	1.014
			Range		1.2720	.48952
			Interquartile Range		-.0871	
			Skewness		2.6311	
			Kurtosis		1.2444	
			2.00		.5400	
CaO	2.00	2.00	Mean		1.198	
			95% Confidence Interval for Mean	Lower Bound	1.09461	
				Upper Bound	.43	
			5% Trimmed Mean		.61	
			Median			
			Variance			
			Std. Deviation			
			Minimum			
			Maximum			
			Range			
			Interquartile Range			
			Skewness			
			Kurtosis			
			2.00			

Si02

Stem-and-Leaf Plots

Si02 Stem-and-Leaf Plot for
VAR00001= 1.00

Frequency Stem & Leaf

1.00	2 . 4
3.00	2 . 578
3.00	3 . 002
6.00	3 . 567789
4.00	4 . 0124
2.00	4 . 69

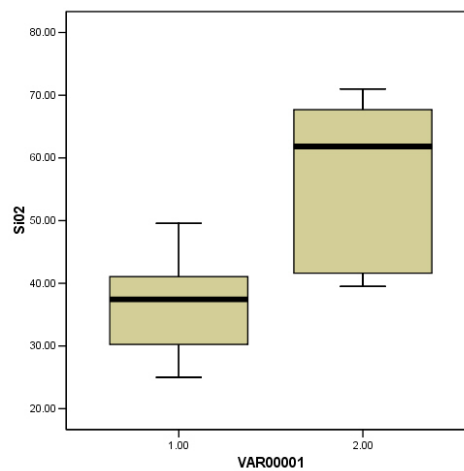
Stem width: 10.00
Each leaf: 1 case(s)

Si02 Stem-and-Leaf Plot for
VAR00001= 2.00

Frequency Stem & Leaf

1.00	3 . 9
1.00	4 . 1
.00	5 .
2.00	6 . 17
1.00	7 . 1

Stem width: 10.00
Each leaf: 1 case(s)



Al203

Stem-and-Leaf Plots

Al203 Stem-and-Leaf Plot for
VAR00001= 1.00

Frequency Stem & Leaf

2.00	0 . 99
7.00	1 . 0122234
8.00	1 . 77888999
2.00	2 . 00

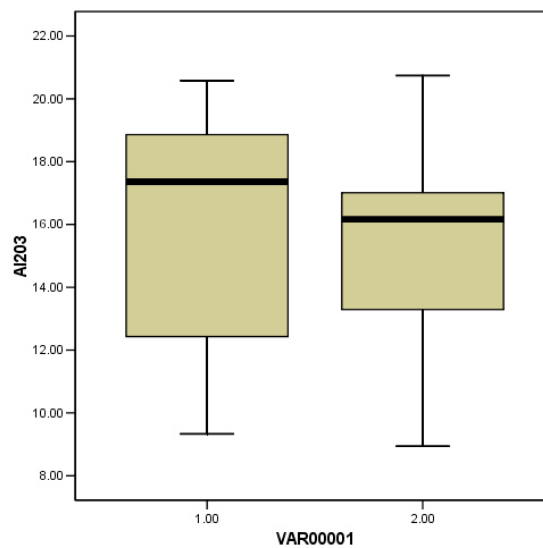
Stem width: 10.00
Each leaf: 1 case(s)

Al203 Stem-and-Leaf Plot for
VAR00001= 2.00

Frequency Stem & Leaf

1.00	0 . 8
3.00	1 . 367
1.00	2 . 0

Stem width: 10.00
Each leaf: 1 case(s)



Fe203

Stem-and-Leaf Plots

Fe203 Stem-and-Leaf Plot for
VAR00001= 1.00

Frequency Stem & Leaf

4.00	3 . 2278
5.00	4 . 11556
1.00	5 . 8
8.00	6 . 02335689
1.00	7 . 0

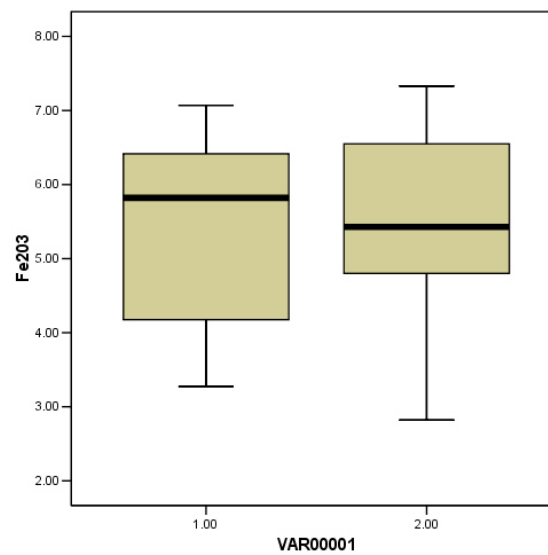
Stem width: 1.00
Each leaf: 1 case(s)

Fe203 Stem-and-Leaf Plot for
VAR00001= 2.00

Frequency Stem & Leaf

2.00	0 . 24
3.00	0 . 567

Stem width: 10.00
Each leaf: 1 case(s)



CaO

Stem-and-Leaf Plots

CaO Stem-and-Leaf Plot for
VAR00001= 1.00

Frequency Stem & Leaf

4.00	0 . 2233
6.00	0 . 577899
2.00	1 . 00
4.00	1 . 7889
2.00	2 . 12
1.00	2 . 5

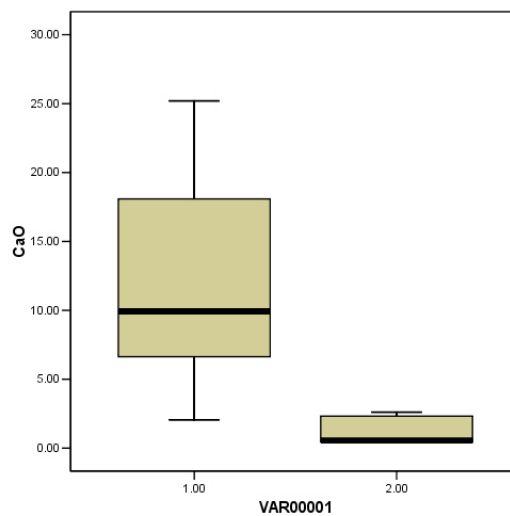
Stem width: 10.00
Each leaf: 1 case(s)

CaO Stem-and-Leaf Plot for
VAR00001= 2.00

Frequency Stem & Leaf

3.00	0 . 445
.00	1 .
2.00	2 . 36

Stem width: 1.00
Each leaf: 1 case(s)



MgO

Stem-and-Leaf Plots

MgO Stem-and-Leaf Plot for
VAR00001= 1.00

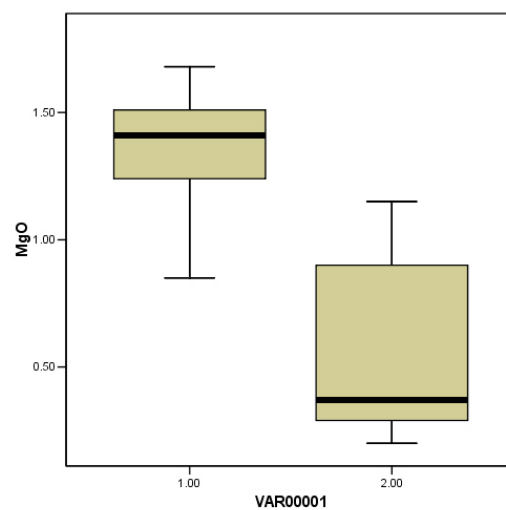
Frequency	Stem & Leaf
3.00	0 . 899
10.00	1 . 1222234444
6.00	1 . 556666

Stem width: 1.00
Each leaf: 1 case(s)

MgO Stem-and-Leaf Plot for
VAR00001= 2.00

Frequency	Stem & Leaf
3.00	0 . 223
1.00	0 . 9
1.00	1 . 1

Stem width: 1.00
Each leaf: 1 case(s)



Na2O

Stem-and-Leaf Plots

Na2O Stem-and-Leaf Plot for
VAR00001= 1.00

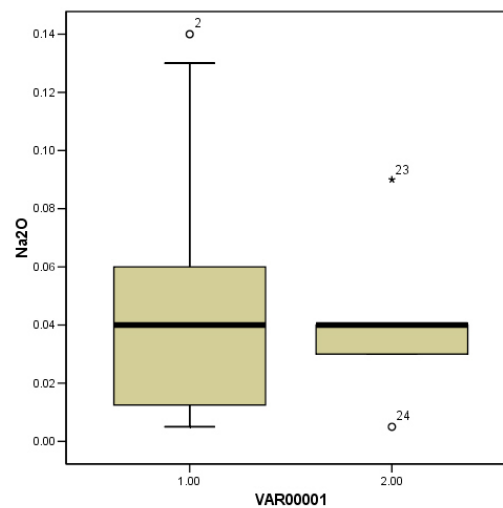
Frequency	Stem & Leaf
11.00	0 . 00000222344
6.00	0 . 556679
1.00	1 . 3
1.00	Extremes (>=.14)

Stem width: .10
Each leaf: 1 case(s)

Na2O Stem-and-Leaf Plot for
VAR00001= 2.00

Frequency	Stem & Leaf
1.00	Extremes (<=.005)
1.00	3 . 0
.00	3 .
2.00	4 . 00
1.00	Extremes (>=.090)

Stem width: .01
Each leaf: 1 case(s)



K2O

Stem-and-Leaf Plots

K2O Stem-and-Leaf Plot for
VAR00001= 1.00

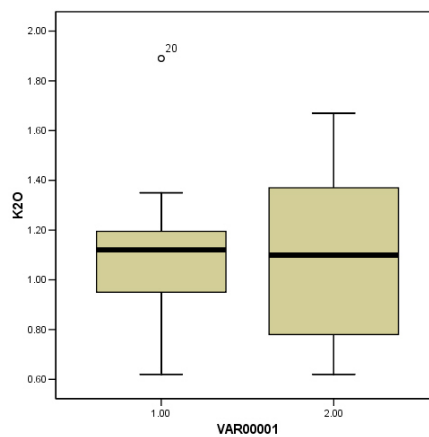
Frequency	Stem & Leaf
1.00	6 . 2
2.00	7 . 47
1.00	8 . 8
3.00	9 . 558
1.00	10 . 9
6.00	11 . 122559
3.00	12 . 024
1.00	13 . 5
1.00	Extremes (>=1.89)

Stem width: .10
Each leaf: 1 case(s)

K2O Stem-and-Leaf Plot for
VAR00001= 2.00

Frequency	Stem & Leaf
2.00	0 . 67
2.00	1 . 13
1.00	1 . 6

Stem width: 1.00
Each leaf: 1 case(s)



Cr2O3

Stem-and-Leaf Plots

Cr2O3 Stem-and-Leaf Plot for
VAR00001= 1.00

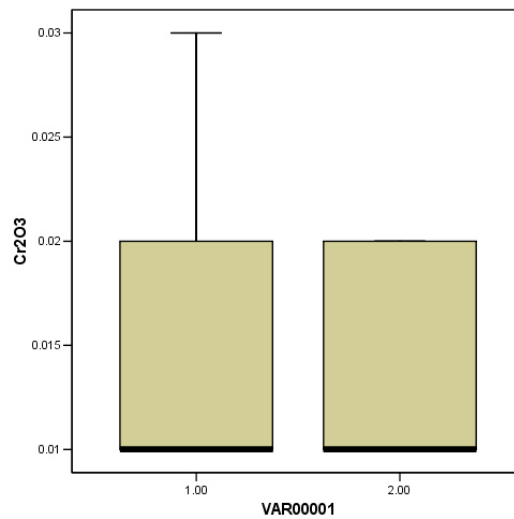
Frequency	Stem & Leaf
12.00	1 . 00000000000000
.00	1 .
6.00	2 . 000000
.00	2 .
1.00	3 . 0

Stem width: .01
Each leaf: 1 case(s)

Cr2O3 Stem-and-Leaf Plot for
VAR00001= 2.00

Frequency	Stem & Leaf
3.00	1 . 000
.00	1 .
2.00	2 . 00

Stem width: .01
Each leaf: 1 case(s)



TiO2

Stem-and-Leaf Plots

TiO2 Stem-and-Leaf Plot for
VAR00001= 1.00

Frequency Stem & Leaf

1.00	3 . 7
3.00	4 . 269
3.00	5 . 367
2.00	6 . 15
3.00	7 . 349
3.00	8 . 248
4.00	9 . 6799

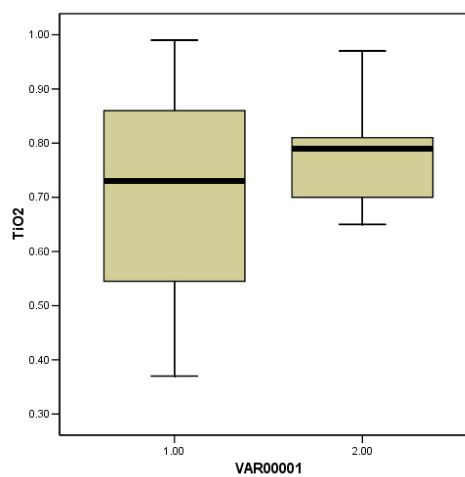
Stem width: .10
Each leaf: 1 case(s)

TiO2 Stem-and-Leaf Plot for
VAR00001= 2.00

Frequency Stem & Leaf

1.00	6 . 5
2.00	7 . 09
1.00	8 . 1
1.00	9 . 7

Stem width: .10
Each leaf: 1 case(s)



MnO

Stem-and-Leaf Plots

MnO Stem-and-Leaf Plot for
VAR00001= 1.00

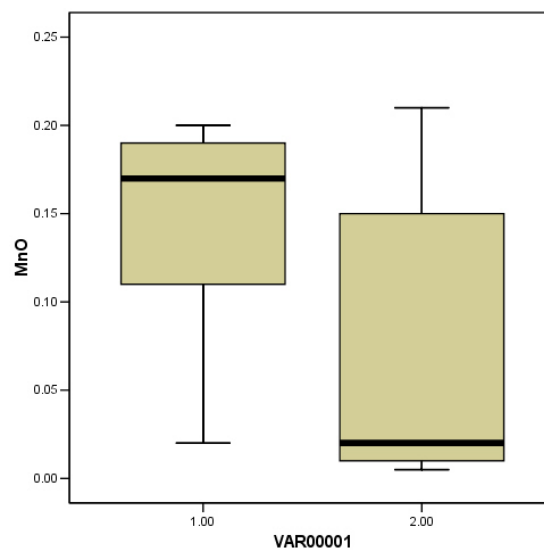
Frequency	Stem & Leaf
1.00	0 . 2
3.00	0 . 578
2.00	1 . 02
12.00	1 . 577777899999
1.00	2 . 0

Stem width: .10
Each leaf: 1 case(s)

MnO Stem-and-Leaf Plot for
VAR00001= 2.00

Frequency	Stem & Leaf
3.00	0 . 012
1.00	1 . 5
1.00	2 . 1

Stem width: .10
Each leaf: 1 case(s)



P2O5

Stem-and-Leaf Plots

P2O5 Stem-and-Leaf Plot for
VAR00001= 1.00

Frequency Stem & Leaf

```

5.00      0 . 12467
7.00      1 . 0223677
1.00      2 . 0
.00       3 .
3.00      4 . 227
3.00 Extremes  (>=9.5)

```

Stem width: 1.00
Each leaf: 1 case(s)

P2O5 Stem-and-Leaf Plot for
VAR00001= 2.00

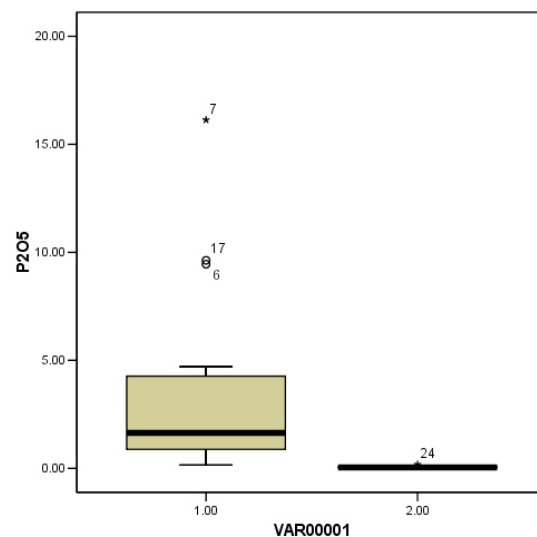
Frequency Stem & Leaf

```

3.00      0 . 234
1.00      0 . 6
1.00 Extremes  (>=.18)

```

Stem width: .10
Each leaf: 1 case(s)



SrO

Stem-and-Leaf Plots

SrO Stem-and-Leaf Plot for
VAR00001= 1.00

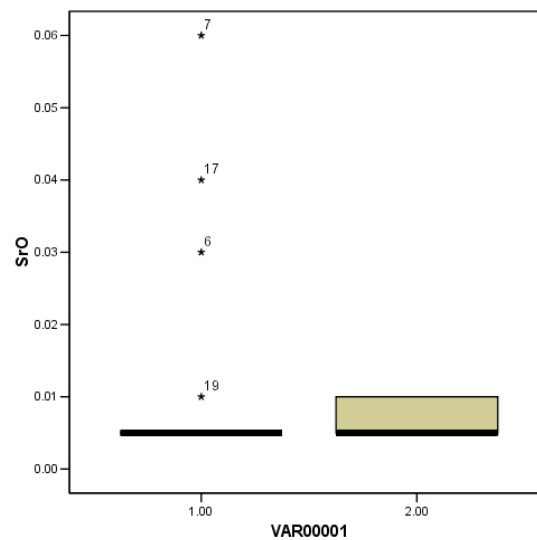
Frequency	Stem & Leaf
15.00	5 . 0000000000000000
4.00	Extremes (>=.0100)

Stem width: .00
Each leaf: 1 case(s)

SrO Stem-and-Leaf Plot for
VAR00001= 2.00

Frequency	Stem & Leaf
.00	0 .
3.00	0 . 555
2.00	1 . 00

Stem width: .01
Each leaf: 1 case(s)



BaO

Stem-and-Leaf Plots

BaO Stem-and-Leaf Plot for
VAR00001= 1.00

Frequency Stem & Leaf

1.00 Extremes (= < .005)

15.00 1 . 0000000000000000

3.00 Extremes (>= .020)

Stem width: .01

Each leaf: 1 case(s)

BaO Stem-and-Leaf Plot for
VAR00001= 2.00

Frequency Stem & Leaf

1.00 0 . 5

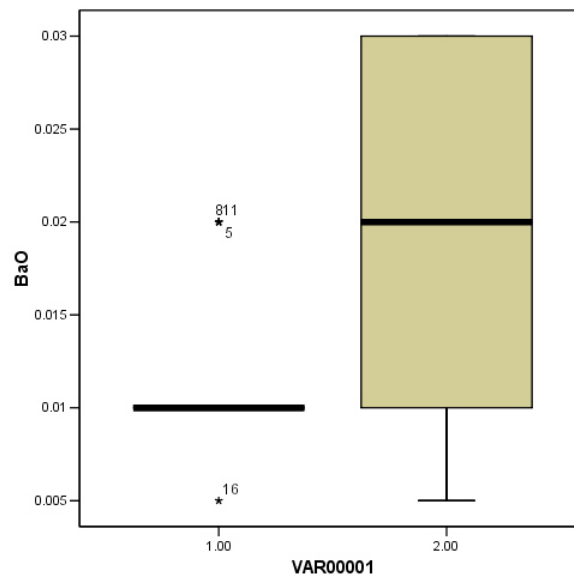
1.00 1 . 0

1.00 2 . 0

2.00 3 . 00

Stem width: .01

Each leaf: 1 case(s)



Cu

Stem-and-Leaf Plots

Cu Stem-and-Leaf Plot for
VAR00001= 1.00

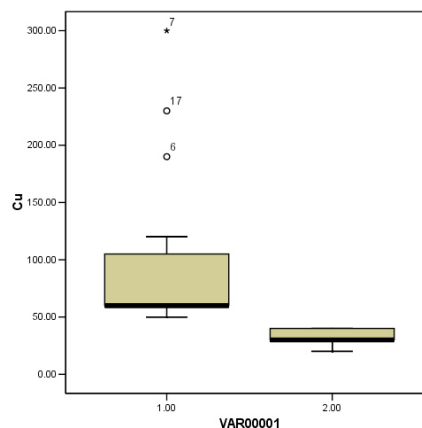
Frequency	Stem & Leaf
3.00	5 . 000
8.00	6 . 00000000
1.00	7 . 0
1.00	8 . 0
1.00	9 . 0
.00	10 .
.00	11 .
2.00	12 . 00
3.00	Extremes (>=190)

Stem width: 10.00
Each leaf: 1 case(s)

Cu Stem-and-Leaf Plot for
VAR00001= 2.00

Frequency	Stem & Leaf
1.00	2 . 0
2.00	3 . 00
2.00	4 . 00

Stem width: 10.00
Each leaf: 1 case(s)



Nb

Stem-and-Leaf Plots

Nb Stem-and-Leaf Plot for
VAR00001= 1.00

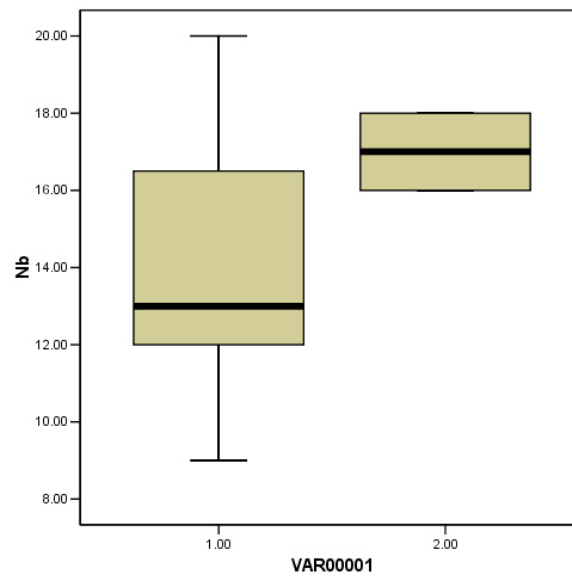
Frequency	Stem & Leaf
1.00	0 . 9
10.00	1 . 1122223334
7.00	1 . 5567788
1.00	2 . 0

Stem width: 10.00
Each leaf: 1 case(s)

Nb Stem-and-Leaf Plot for
VAR00001= 2.00

Frequency	Stem & Leaf
2.00	16 . 00
1.00	17 . 0
2.00	18 . 00

Stem width: 1.00
Each leaf: 1 case(s)



Zr

Stem-and-Leaf Plots

Zr Stem-and-Leaf Plot for

VAR00001= 1.00

Frequency Stem & Leaf

5.00	1 . 12234
6.00	1 . 578999
4.00	2 . 1244
3.00	2 . 555
1.00	3 . 3

Stem width: 100.00

Each leaf: 1 case(s)

Zr Stem-and-Leaf Plot for

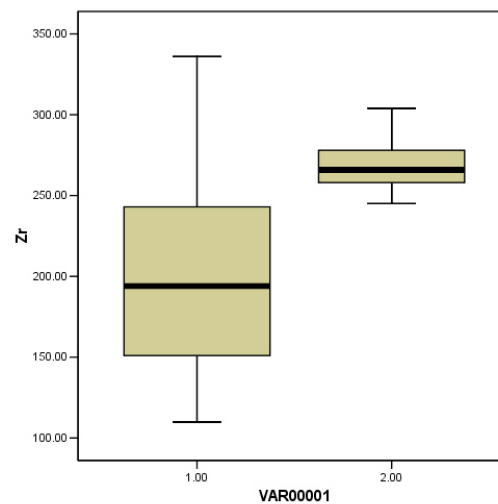
VAR00001= 2.00

Frequency Stem & Leaf

1.00	2 . 4
3.00	2 . 567
1.00	3 . 0

Stem width: 100.00

Each leaf: 1 case(s)



7. Results of ANOVA showing the difference between inside sediments and outside soils. Outliers have been removed.

Oneway

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
SiO ₂	Between Groups	1575.312	1	1575.312	22.656	.000
	Within Groups	1251.553	18	69.531		
	Total	2826.865	19			
Al ₂ O ₃	Between Groups	8.301	1	8.301	.658	.428
	Within Groups	226.971	18	12.610		
	Total	235.272	19			
Fe ₂ O ₃	Between Groups	.268	1	.268	.155	.698
	Within Groups	31.120	18	1.729		
	Total	31.388	19			
CaO	Between Groups	249.854	1	249.854	7.620	.013
	Within Groups	590.189	18	32.788		
	Total	840.042	19			
MgO	Between Groups	2.545	1	2.545	34.703	.000
	Within Groups	1.320	18	.073		
	Total	3.866	19			
Na ₂ O	Between Groups	.001	1	.001	.598	.449
	Within Groups	.021	18	.001		
	Total	.021	19			
K ₂ O	Between Groups	.005	1	.005	.065	.802
	Within Groups	1.517	18	.084		
	Total	1.523	19			
Cr ₂ O ₃	Between Groups	.000	1	.000	.000	1.000
	Within Groups	.001	18	.000		
	Total	.001	19			
TiO ₂	Between Groups	.002	1	.002	.052	.822
	Within Groups	.529	18	.029		
	Total	.531	19			
MnO	Between Groups	.030	1	.030	8.297	.010
	Within Groups	.066	18	.004		
	Total	.096	19			
P ₂ O ₅	Between Groups	8.971	1	8.971	5.110	.036
	Within Groups	31.603	18	1.756		
	Total	40.574	19			
SrO	Between Groups	.000	1	.000	5.690	.028
	Within Groups	.000	18	.000		
	Total	.000	19			
BaO	Between Groups	.000	1	.000	7.671	.013
	Within Groups	.001	18	.000		
	Total	.001	19			
Cu	Between Groups	4961.250	1	4961.250	11.607	.003
	Within Groups	7693.750	18	427.431		
	Total	12655.000	19			
Nb	Between Groups	18.050	1	18.050	2.504	.131
	Within Groups	129.750	18	7.208		
	Total	147.800	19			
Zr	Between Groups	14824.013	1	14824.013	5.318	.033
	Within Groups	50170.938	18	2787.274		
	Total	64994.950	19			

Appendix VI

Drawings of Incensarios

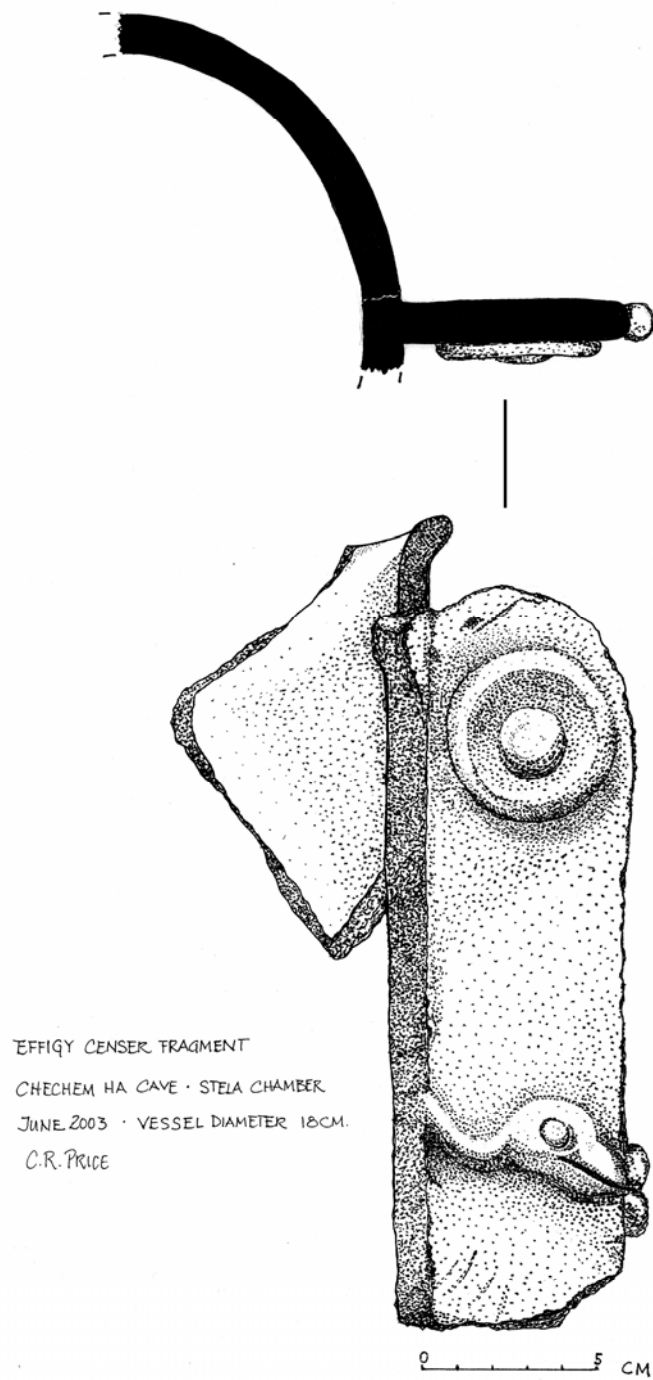
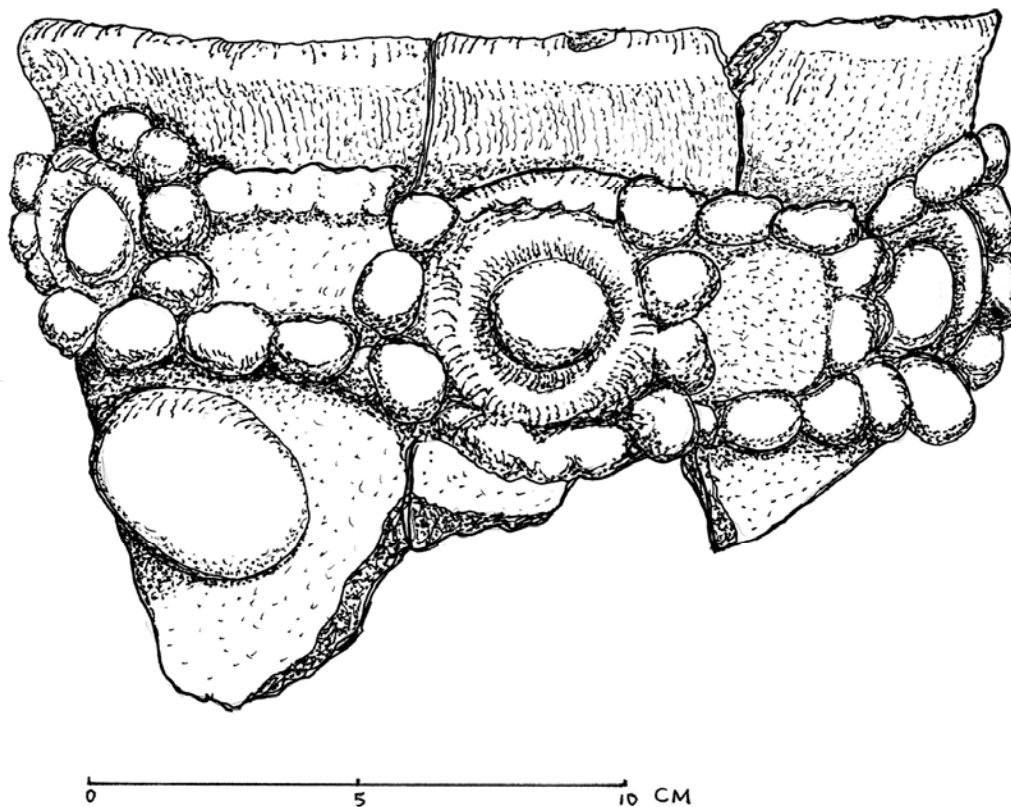


Figure 1. Vessel flange with bird head and geometric design.



EFFIGY CENSER RIM DIAMETER 18 CM
CHECHEM HA CAVE JUNE 2003
STELA CHAMBER
C.R. PRICE

Figure 2. Reconstructed rim of censer.

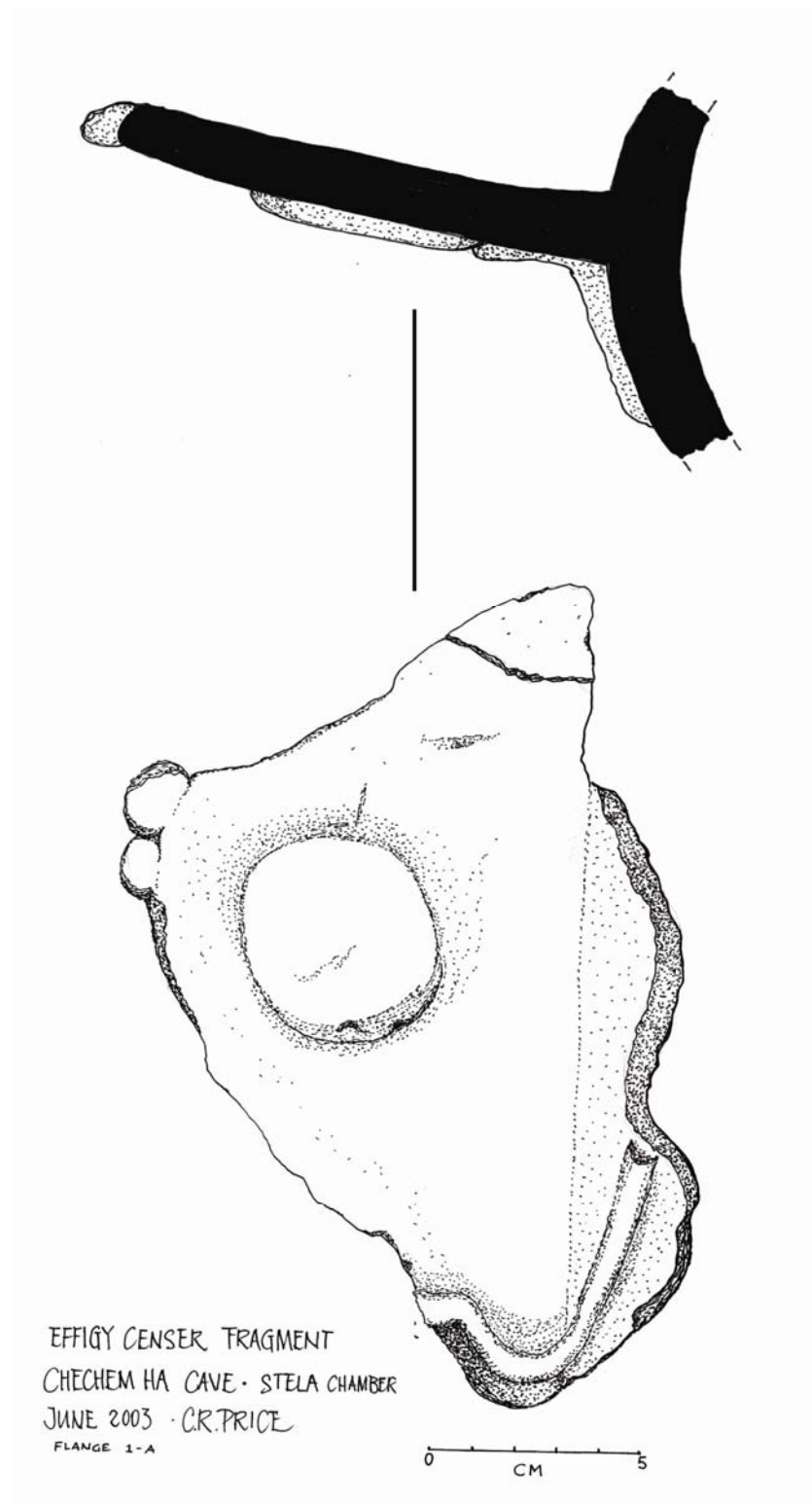


Figure 3. Censer flange fragment.

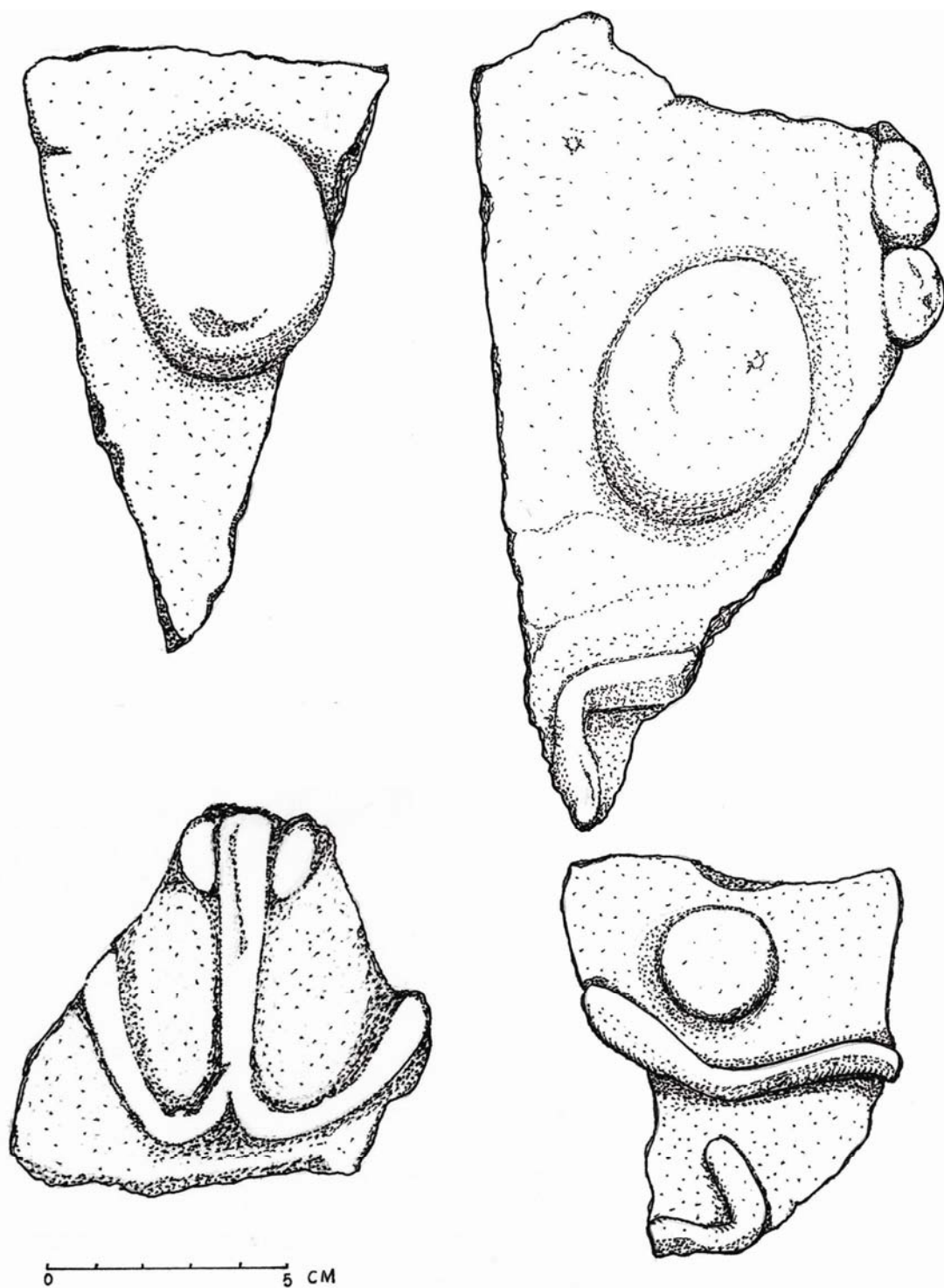


Figure 4. Censer fragments.

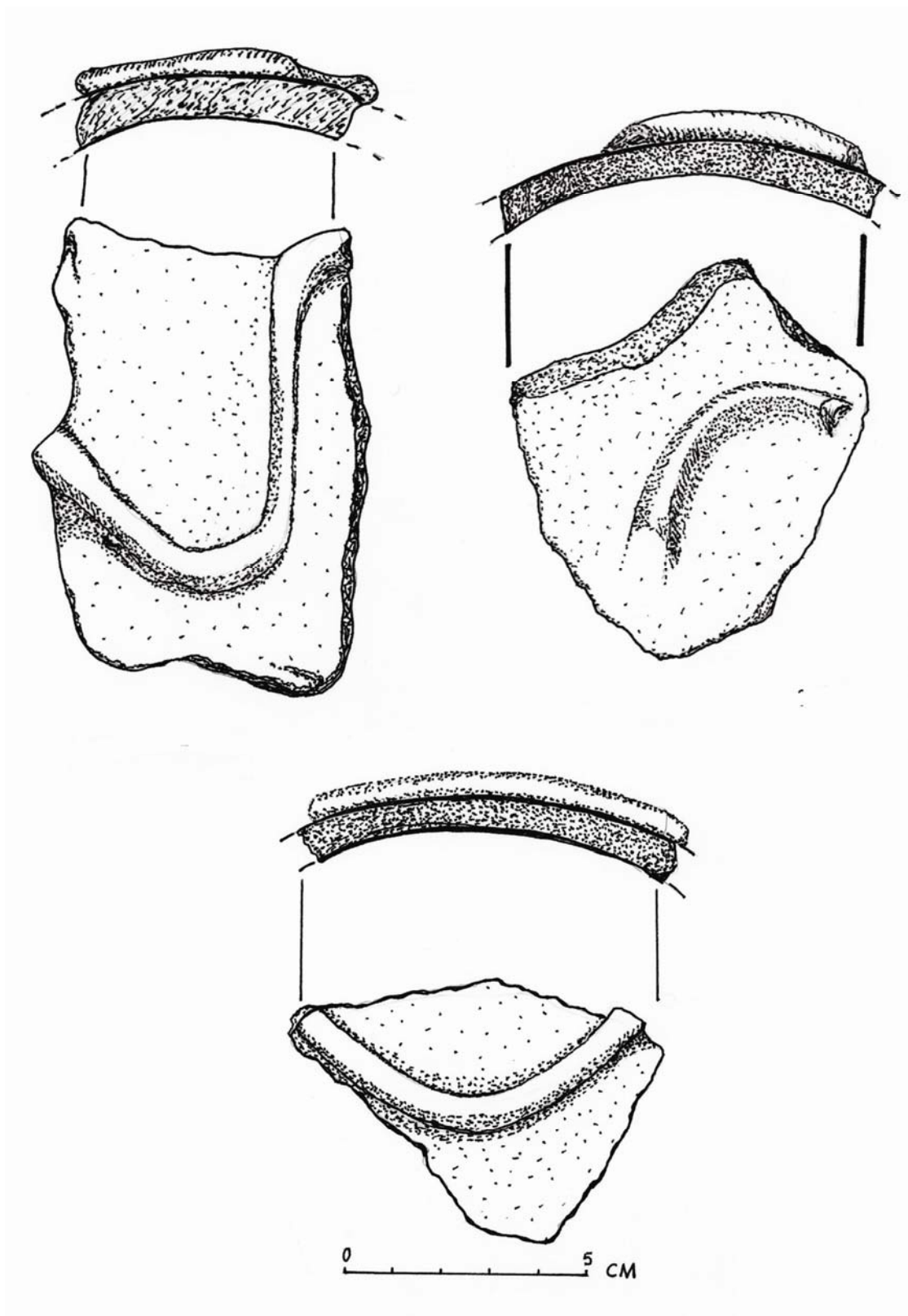
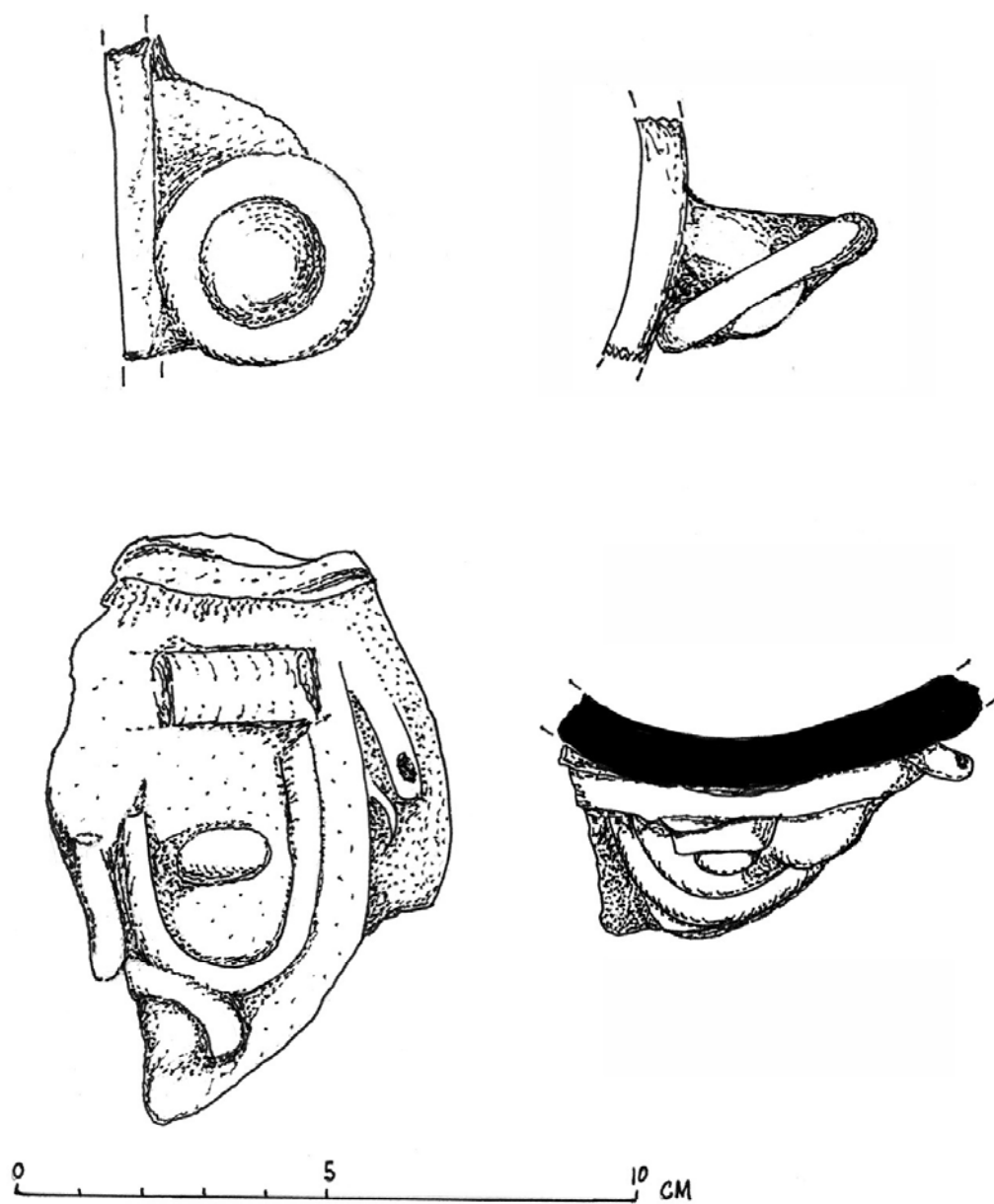


Figure 5. Censer fragments.



EFFIGY CENSER FRAGMENTS
 VESSEL BODY 18 CM. DIAMETER
 CHECHEM HA CAVE · STELA CHAMBER
 JUNE 2003 C.R. PRICE

Figure 6. Censer fragments.

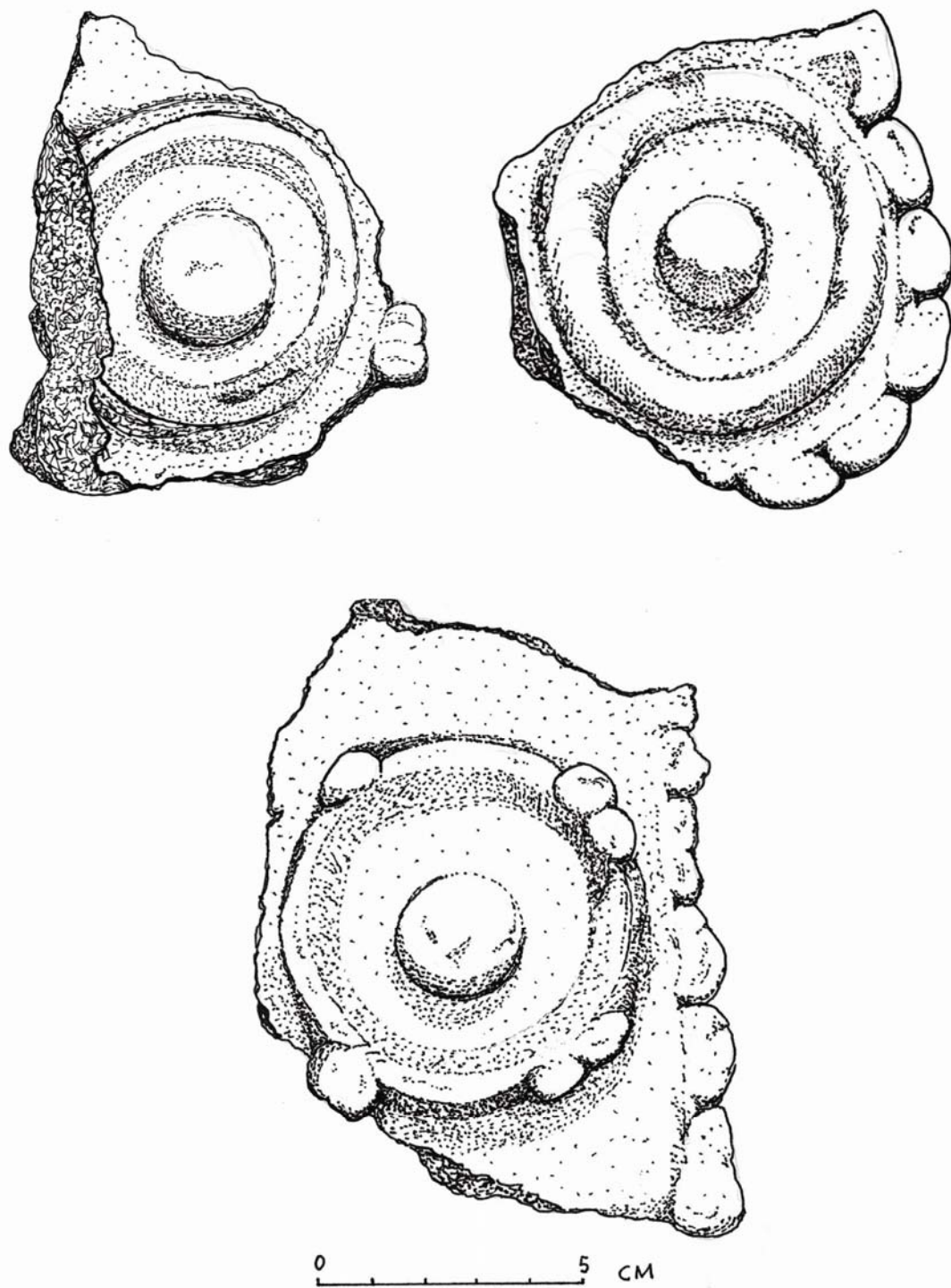
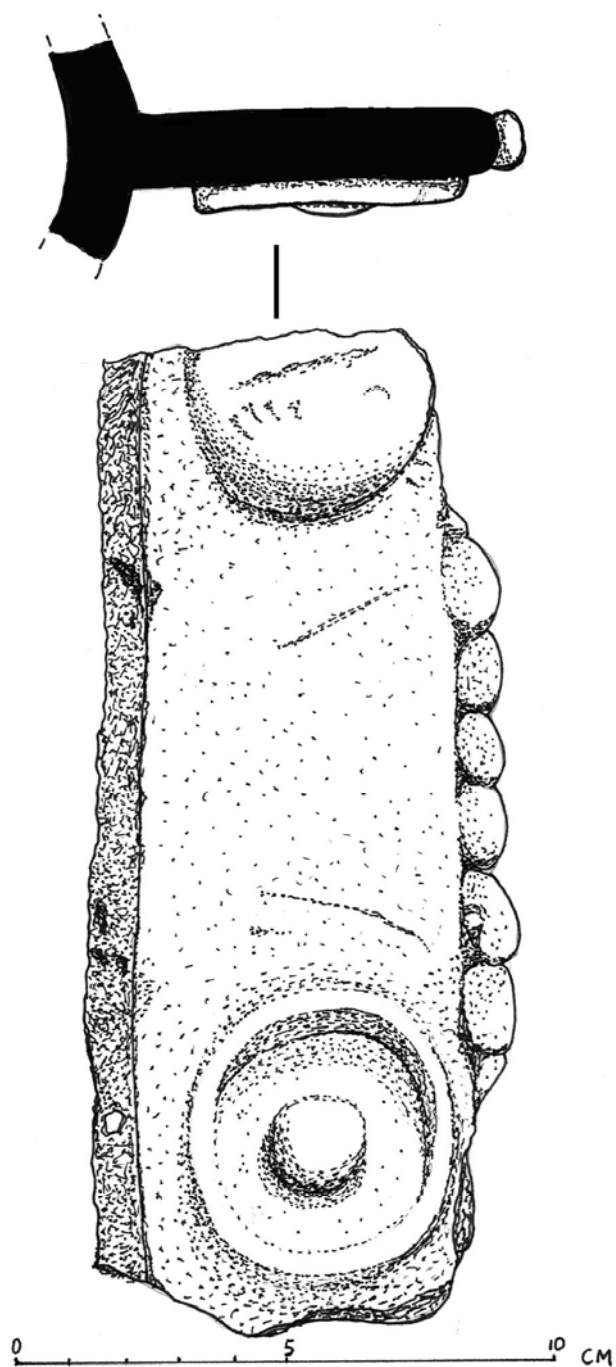


Figure 7. Censer fragments.



EFFIGY CENSER FRAGMENT
CHECHEM HA CAVE • STELA CHAMBER
JUNE 2003 C.R. PRICE

Figure 8. Censer flange fragment.

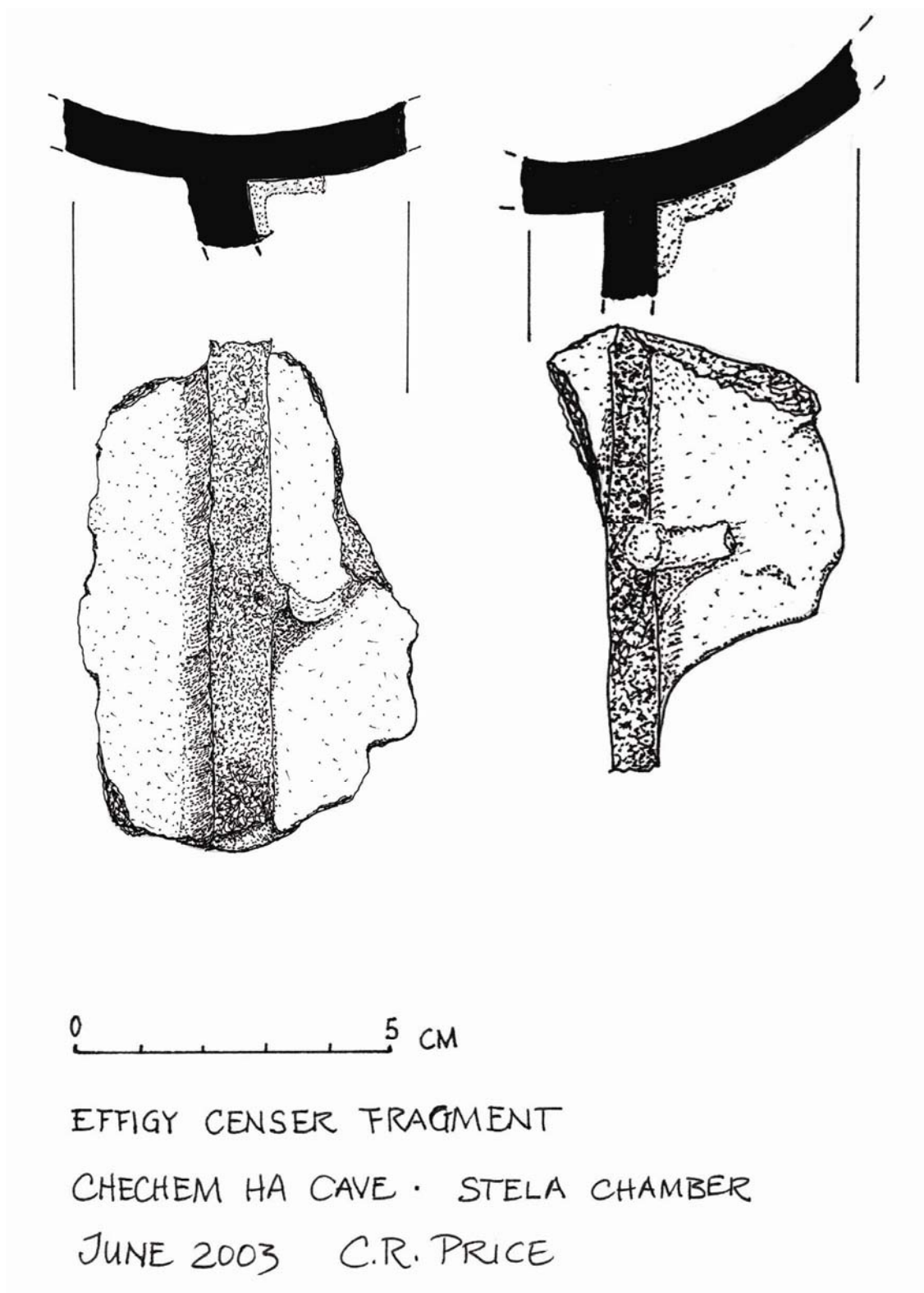
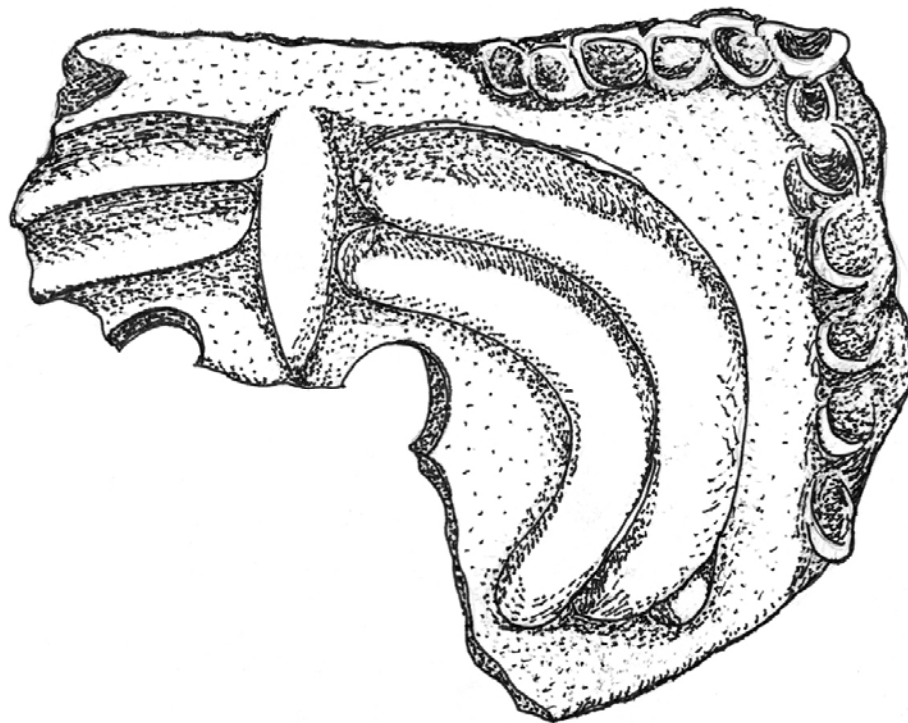


Figure 9. Censer flange fragments.



EFFIGY CENSER FRAGMENT
CHECHEM HA CAVE • STELA CHAMBER
JUNE 2003 • C.R. PRICE

Figure 10. Censer fragment with iconographic element.

Appendix VII

Residual Density Analyses

1. Description of method developed by Nathan Craig, University of California, Santa Barbara, 2003

Compute Density Surfaces: Observed

Establish a search radius for input to the density calculation based on the maximum distance of the nearest feature.

1. Use the <http://www.commenspace.org/> nearest feature avenue script (NearesFeature.ave) to calculate the minimum distance from one fragment of carbon to another for the observed distribution.
2. Determine mean, standard deviation, median, modal, and quartile minimum distances for the observed distribution of carbon using the field statistics function in any standard GIS package.
3. Examine the spread of the data to evaluate if it is normal distribution.
4. Record the maximum value for the nearest feature as this will be used as the search radius during the following density calculation.
5. Using the maximum distance of the nearest feature as the search radius will ensure that no single object density “islands” will be produced. Following these procedures, density values will always be based on the presence of more than one object.

Calculate density

1. Use the calculate density function included with the Spatial Analyst extension in either ArcView 3.X or ArcGIS 8.X to calculate the density of the observed set of points. The user will be prompted to provide a search radius and an output cell size. Use the largest value of a nearest feature that was recorded in the previous step as the search radius for the density calculation, and use an output cell size that is appropriate to the scale of analysis being undertaken. We will call this “Observed Density.”
2. Select a single point from the observed data set and calculate the density of this lone object using the same search radius and output cell size as before.
3. Determine the maximum value of this data set produced from a single object. We will call this value the “Observed Area Term.”
4. Using the Raster Calculator tool kit provided with the Spatial Analyst extension divide Observed Density by the Observed Area Term in order to factor out the area effects resulting from the search radius and cell size.
5. The resulting grid is what we call the “Observed Density Count.”

Compute Density Surfaces: Expected

Establish a search radius for input to the density calculation

1. Using the Animal Movements Extension or another random points generating script or extension produce a random distribution of points that have the same number of elements as the observed set. This program will only operate if the shapefile is has been projected. Projection can be turned on and off to run the program.
2. Using the nearest feature Avenue script compute the nearest distances between objects.
3. Examine the spread of the data to evaluate if it is a normal distribution.
4. Calculate the nearest neighbor statistic to test if the distribution is aggregated. If the distribution is aggregated create a new randomly distributed set of points and test for aggregation again. Repeat this process until a random unaggregated expected set is constructed.
5. Record the maximum value for the nearest feature of the expected set to be used as the search radius during the following density calculation.

Calculate Density

1. Use the calculate density function included with the Spatial Analyst extension in either ArcView 3.X or ArcGIS 8.X to calculate the density of the randomly distributed expected set of points. The user will be prompted to provide a search radius and an output cell size. Use the largest value of a nearest feature that was recorded in the previous step as the search radius for the density calculation, and use the same output cell size that has been used in all of the other density calculations generated during this procedure. We will call this product “Expected Density.”
2. Select a single point from the expected data set and calculate the density of this lone object using the same search radius and output cell size as before. Note that if the observed dataset not normally distributed then the search radii for the observed and expected sets are going to be different even though the output cell size remains the same. Since the search radius for the expected set is different from the observed set, the Expected Area Term must be re-calculated for a single point using this new search radius.
3. Determine the largest value of this data set as this will be used as the Expected Area Term for the expected set.
4. The Raster Calculator tool kit provided with the Spatial Analyst extension divide Expected Density by the Expected Area Term in order to factor out the area effects resulting from the search radius and cell size.
5. The resulting grid is the Expected Density Count.

Residual density surface

1. Since the goal of this analysis is to fine areas that have distributions of charcoal that are more dense than one would expect use the Raster Calculator to subtract the Expected Density Count from the Observed Density Count to produce what we call the “Density Difference” surface. This resulting raster field shows zones

that have relatively more or fewer objects of a given class than would be expected in a random distribution. When displayed using the standard deviation stretch with a two color ramped palette the distribution of pixels showing more or less of some object than expected at random is exceptionally clear.

2. Results of Nearest Neighbor analyses for observed and expected sets.

Observed Data							
Level	Total	Minimum	Maximum	Observed R	Z Value	Observed	Observed
	Charcoal	Distance	Distance	NearNeighbor		Cluster/	AreaTerm
						Random	
1	265	0.0033	0.7349	0.459665	-16.827	Cluster	0.589
2	770	0.0053	0.2959	0.725934	-14.521	Cluster	3.635
3	2155	0.0033	0.2626	0.70922	-25.837	Cluster	4.616
4	1779	0	0.2846	0.670977	-26.549	Cluster	3.93
5	3341	0.0013	0.37	0.694609	-33.770	Cluster	2.325
6	8357	0	0.173	0.752831	-42.933	Cluster	10.635
7	836	0.0032	0.3061	0.632949	-20.046	Cluster	3.397
8	1304	0.004	0.2904	0.638912	-24.811	Cluster	3.774
9	2919	0	0.0694	0.65795	-35.141	Cluster	66.089
10	3537	0.0003	0.1993	0.60664	-44.755	Cluster	8.014
11	1390	0.0009	0.228	0.627894	-26.416	Cluster	6.123
12	1591	0.0009	0.2896	0.607595	-29.896	Cluster	3.795
13	917	0.0016	0.2477	0.56136	-24.922	Cluster	8.455
14	172	0.001	0.2677	0.582566	-10.473	Cluster	4.442
Expected Data							
Level	Total	Minimum	Max	Expected R	Z Value	Expected	Expected
	Points	Distance	Distance	NearNeighbor		Uniform	AreaTerm
1	265	0.029	0.3592	1.078311	2.438801	Uniform	2.467
2	770	0.0012	0.2637	1.039023	2.071541	Uniform	9.155
3	2155	0.0218	0.1582	1.145114	9.834737	Uniform	12.719
4	1779	0.0218	0.143	1.14606	11.78552	Uniform	15.566
5	3341	0.021	0.1109	1.255787	28.284443	Uniform	25.881
6	8357	0.021	0.068	1.47823	83.6358	Uniform	68.839
7	836	0.0226	0.218	1.079346	4388918	Uniform	6.698
8	1304	0.0215	0.1281	1.157468	10.819782	Uniform	19.398
9	2919	0.0211	0.105	1.256716	26.53391	Uniform	28.872
10	3537	0.0211	0.1023	1.305483	34.756412	Uniform	30.416
11	1390	0.0213	0.1316	1.184244	13.141066	Uniform	18.38
12	1591	0.0213	0.1354	1.179771	13.717829	Uniform	17.363
13	917	0.0214	0.1714	1.117897	6.829934	Uniform	10.835
14	172	0.0341	0.3182	1.178058	4.467431	Uniform	3.144

Appendix VIII

Artifact Photos from Chamber 2 Excavations

1. **Level 1** diagnostic ceramics. Mt. Maloney group on left (James Aimers personal communication), center sherd is a slateware and sherd on right is Late Classic cream polychrome (Joseph Ball and Jennifer Taschek, personal communication 2005).



2. **Level 1** speleothems.





3. **Level 2** ceramics. Mt. Maloney bowl sherd on bottom row far left.



4. **Level 2** speleothems. All are soda straws.



5. **Level 3** ceramic sherds. Photo on right of sherds collected from depression in bedrock.



6. **Level 3** stalactites.



7. **Level 4** ceramics and a stalactite collected from drainage pit.



8. **Level 5** ceramic sherds. Top center, Dos Arroyos Orange Polychrome, bottom right 2 sherds of Aguacate Orange (Joseph Ball and Jennifer Taschek personal communication 2005).



9. **Level 5** stalactites.



10. Level 6 ceramics and speleothems.



11. Level 8 ceramics. Two sherds on left are Quemado incised, three on right Quemado Smudged-black and large sherd at top is Negroman Punctate-incised (Joseph Ball and Jennifer Taschek personal communication 2005).



12. Speleothems found in Level 8.



13. Level 9 sherds. Three sherds from the same Jocote Orange-brown jar (Joseph Ball and Jennifer Taschek personal communication 2005).



14. Level 10 ceramic sherds. Sherd on left is Luminoso burnished and sherd on right a rare undesignated kaolin white ware (Joseph Ball and Jennifer Taschek, personal communication 2005).



Figure 15. Level 11 speleothems.



Figure 16. Level 13 speleothems.



Figure 16. Level 14 speleothems.



Figure 17. Level 15 speleothems.



Figure 18. Level 16 speleothems (matrix). Figure 19. Level 16 speleothems (surface).



Figure 20. Level 17 speleothems (matrix).



Figure 21. Level 17 speleothems (surface).



Figure 22. Speleothems on Level 18, bedrock surface.