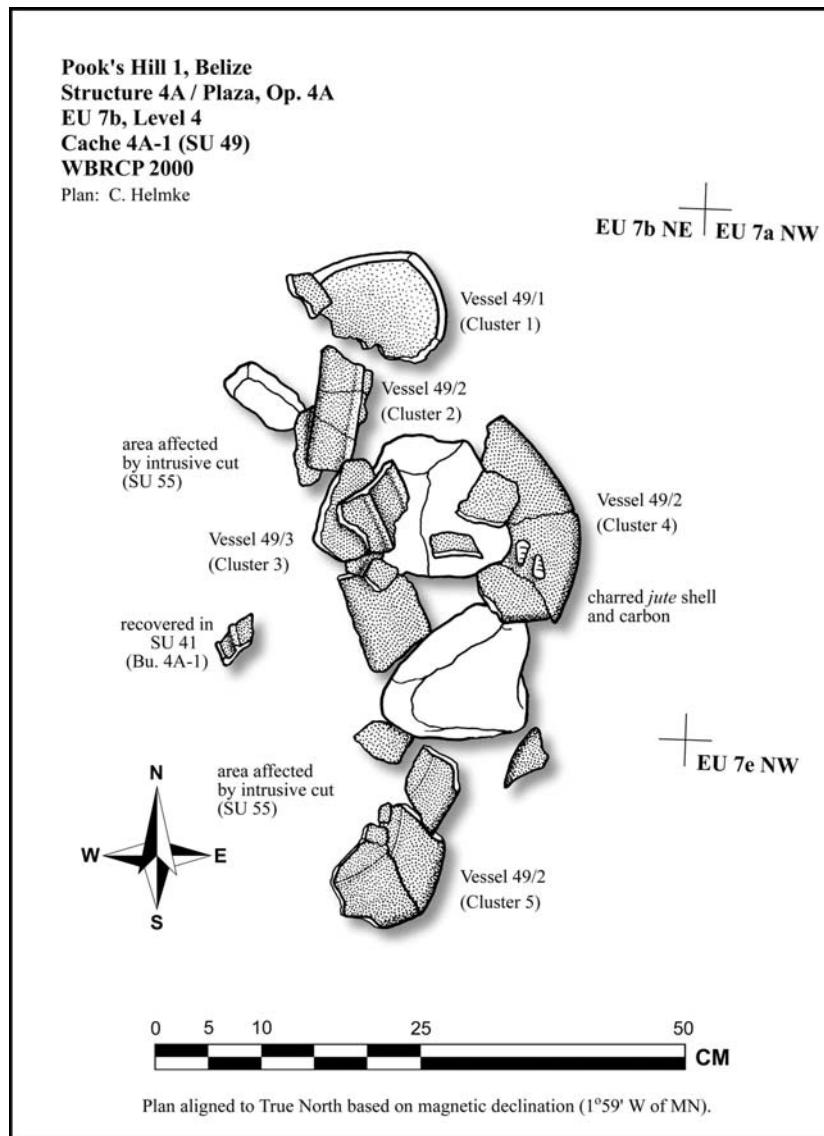


The Western Belize Regional Cave Project

A Report of the 2000 Field Season



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This volume is dedicated to Dr. Howard Hecker

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EXCAVATION AND SURVEY AT ACTUN NAK BEH AND THE CAHAL UITZ NA CAUSEWAY, CAYO DISTRICT, BELIZE

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INTRODUCTION

Actun Nak Beh and the Cahal Uitz Na causeway were investigated by the Western Belize Regional Cave Project (hereafter WBRCP) during the 2000 field season. The cave, Actun Nak Beh, is located in the Roaring Creek valley along the northern base of the Maya Mountains (Figure 1). A 240-meter *sacbe* (Awe and Helmke 1998; Colon and Ehret 1999) connects the cave to a large surface site known as Cahal Uitz Na. Several caves and surface sites in the Roaring Creek Valley have been explored and documented by the WBRCP since 1996. Excavation and survey work at Actun Nak Beh and its adjacent *sacbe* were conducted to complement the research conducted at other Precolumbian settlements and cave sites within the valley (Awe 1998; Awe et al. 1998; Helmke et al. 1999). This paper summarizes the 2000 Actun Nak Beh and Cahal Uitz Na causeway investigations, and provides a contextual basis for sub-regional cave site comparisons, and settlement and cave site relationship studies anticipated for the future.

SURVEY

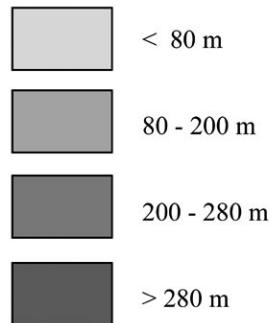
A plan map of the interior and exterior of Actun Nak Beh was completed, and tied into the 1998 survey data of Cahal Uitz Na and surrounding cave sites (Conlon and Ehret 1999). The map was created using tape and compass. The exterior of the cave is composed of two entrances, Entrance 1 and Entrance 2. Entrance 1, the main entrance, is characterized by a 5 to 7 meter high overhang, which extends out from the cave wall approximately 1 to 5 meters. A breakdown slope of large (1 to 2 meter) limestone boulders, rocks, and pebbles extends 40 degrees upward at the northernmost point of the entrance. Just east of the base of the breakdown is a small (1 x 2 m) opening that extends into the interior of the cave. The second entrance, Entrance 2, is approximately 20 meters south of Entrance 1, and around a small eastward curve in the limestone cliff face. This entrance is approximately 1 meter in diameter, and is partially blocked by a large one-meter wide limestone rock that protrudes from the ground surface. The interior of the cave has a “horseshoe” shape, with two entrances and a “loop” of passages connecting them.

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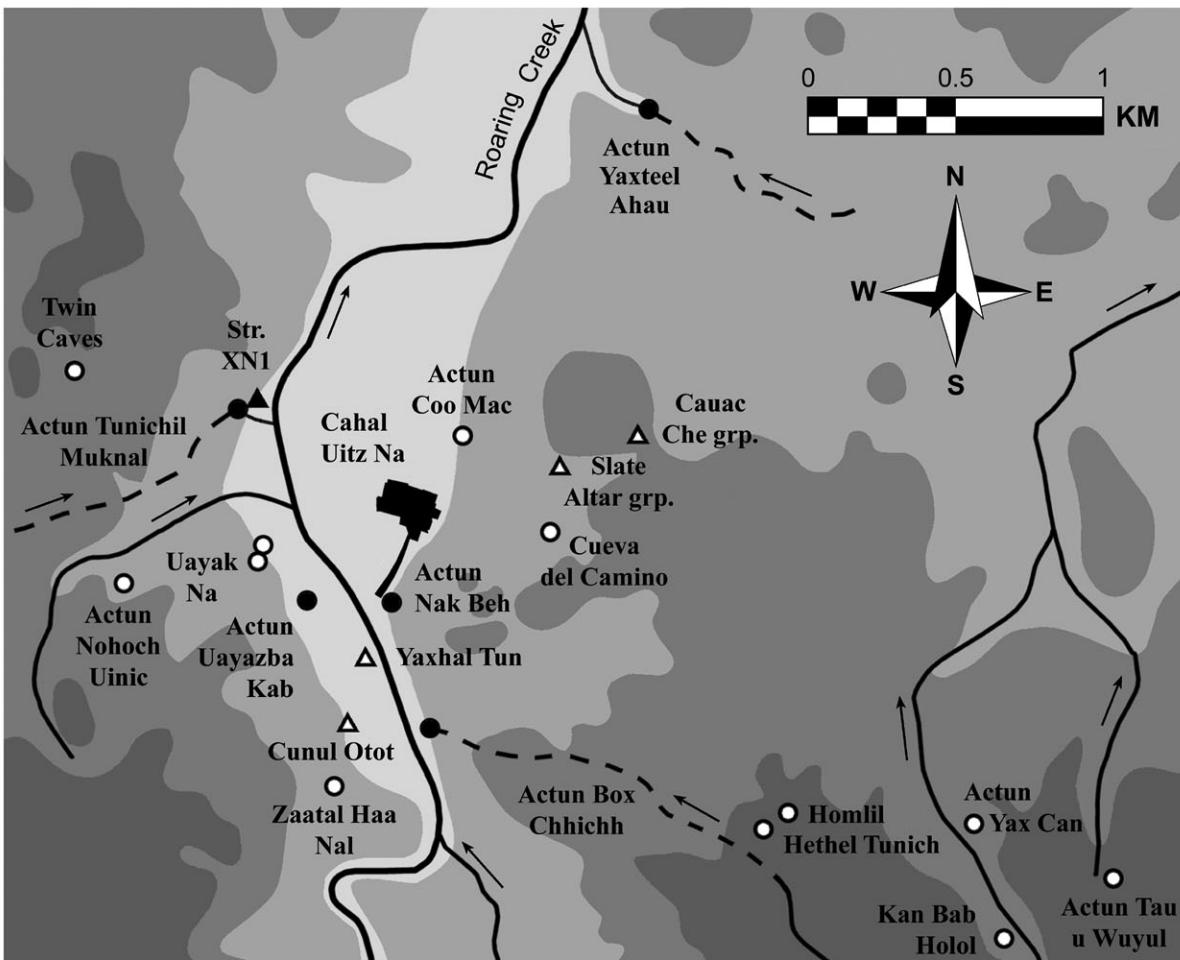
Archaeological Sites

- ▲ surface site
location secure
- △ surface site
location approx.
- cave site
location secure
- cave site
location approx.
-  outline of the site core of
Cahal Uitz Na

Elevations



Scale 1:25 000



Archaeological sites of the Upper Roaring Creek Valley, Cayo, Belize.

(The Plan is oriented to UTM Grid Meridian North)

Figure 1: Map of the Roaring Creek Valley.

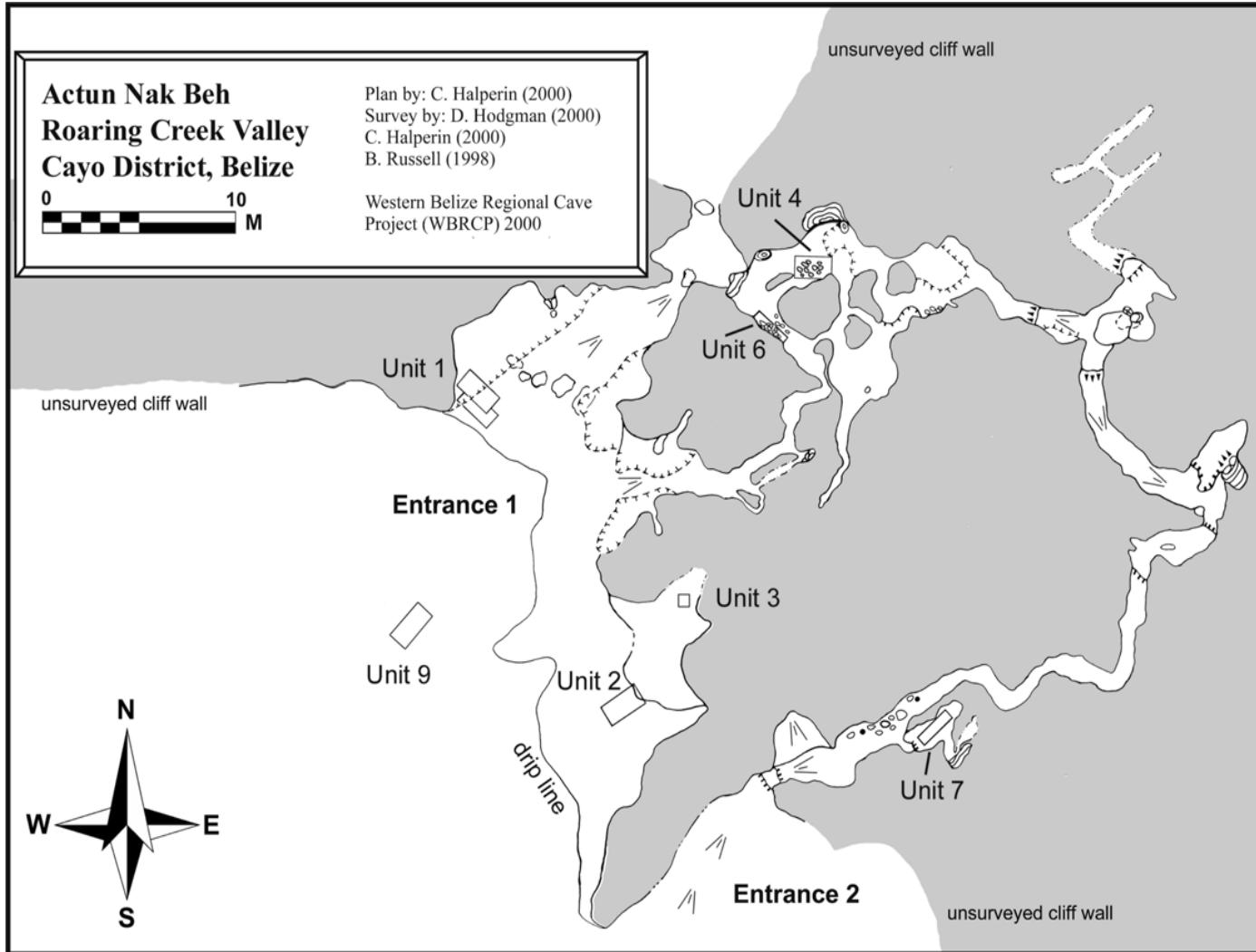


Figure 2: Map of Actun Nak Beh.

The investigations revealed at least two general areas with concentrations of cultural remains: one near Entrance 1 (Chamber 1) and the other near Entrance 2 (Chamber 5). These two areas were the only parts of the cave that contained artifacts on the surface: a few potsherds (CH1 and CH5), half of a mano fragment (just outside CH5), and a chert biface (CH1). Also, the survey and subsequent mapping of the interior passages of the cave recorded a large number of river cobbles. These stones do not form naturally within caves, and are too heavy (as much as 30 pounds each) to have been imported into the cave by natural processes. The interior of the cave shows no signs of architectural modification, and contains a number of active and inactive formations (see Appendix 1).

EXCAVATIONS

The principal objectives of excavations at Actun Nak Beh were to determine function, nature, and temporal span of cave and causeway usage. Cahal Uitz Na and Actun Nak Beh were discovered in 1996 by the WBRCP (Awe and Helmke 1998). The project documented visible monuments and structures from Cahal Uitz Na's site core in 1997 (Awe and Helmke 1998). The site was surveyed (Conlon and Ehret 1999) and test excavations were initiated at the site's ballcourt and in two of the plazas in 1998 (Ehret and Conlon 1999; Ferguson 1999). Actun Nak Beh was reconnoitered in 1996 and 1997, and a sketch map of the cave was produced in 1998 (Helmke et al 1999). Unlike many nearby caves, this site contained few artifacts laying on the surface of either the interior or exterior of the cave. There was also considerable evidence of looting at Cahal Uitz Na and in Actun Nak Beh. Excavations in the cave were therefore necessary for the reconstruction of any past cultural activity.

Excavation units were placed in three areas of Actun Nak Beh: outside the cave at the main entrance (Entrance 1), inside the cave within the dark zone, and at three locations on the adjacent *sacbe*. The division of the three areas serves to organize discussion and comparison of different aspects of the site.

Test units were placed in a non-random fashion within each of the three locations. Datum points were established for each unit, and tied into the site map using tape and compass procedures for the cave units and theodolite survey for the *sacbe* units. Units were excavated at natural levels when possible, and arbitrary 20cm or 10cm levels when no natural stratigraphy could be detected. All levels were screened with a 1/4-inch metal screen except the first level, the humus, in units outside of the cave. One liter composite soil samples were taken in each level of the cave units for flotation (see Pearsall 2000).

The description of excavations below provides information on context for artifact analysis and site interpretation. These data include: 1) location of the unit, 2) why the unit was opened, 3) a level-by-level account of findings, and 4) how these finds relate to those from other units.

Cave Exterior

Four units, Units 1, 2, 3, and 9, were placed at the main entrance of the cave in the light zone. Unit 1 was situated at the northwestern edge of the main entrance, halfway

underneath a 1 m overhang of the cave wall and at the foot of the breakdown slope. Unit 2 was placed adjacent to the southern cave wall at the opposite end of the main entrance from Unit 1. Although both units were underneath the cave ceiling, drips of water flowing along the wall and ceiling would enter into these areas during heavy rainstorms. Unit 3 was located underneath a small crawl space just north of Unit 2, and Unit 9 was located between Unit 1 and Unit 2 outside of the cave drip-line.

Unit 1

Unit 1 was a 2 x 1 m unit that was opened to determine if there were burials along the edge of the cave wall. Burials were uncovered by the WBRCP at the nearby dry cave, Actun Uayazba Kab, in 1997 and 1998 in an alcove along the cave wall (Gibbs 1998; Ferguson and Gibbs 1999). It was presumed that similar activities might have occurred at Actun Nak Beh. At a few centimeters below surface, human remains were encountered, and the unit was extended to the south with a 2 x 0.8 m extension. Discussion of the unit will combine both the original unit and its extension as one entity unless specified otherwise.

The matrix was composed of alluvial, brown-orange silt-clay throughout most of the unit. Due to this uniformity, excavations were conducted primarily by arbitrary 20 cm levels. Small, unidentifiable sherds were encountered in Levels 1 ($n = 2$) and 2 ($n = 9$) while no ceramics were found in Levels 3 and 4. Four quartz crystal fragments were found in Level 2, and animal and jute shell remains were encountered in Levels 1 through 4. Some burning activity occurred in Levels 2 through 4 with a concentration of charcoal flecks among rocks in the SE corner of the original unit in Level 4. Tinfoil found in Levels 3 and 4 may suggest a modern association or intrusion with these remains.

Level 5 contained a higher frequency of unidentifiable ceramic sherds ($n = 26$), lithics, a higher frequency of jute shells ($n = 118$), and animal remains. Evidence of a floor was encountered beginning at 1.25 m depth below datum (DBD) 6 (approximately 40 cm below the surface of the ground). Designated as Floor 1, it consisted of a 10 cm thick layer of ballast of small limestone rocks (3 to 10 cm) and river cobbles and pebbles. Just below the ballast was a layer of ash. Ceramic dating indicates that Floor 1 was constructed during Tepeu 3 phase (ca. A.D. 800 - 900).

Level 6, beginning at about 1.30 m DBD, contained a darker clay matrix with hard limestone and charcoal inclusions. In the southeastern section of the unit, was a concentration of rocks which turned out to be the capstones of a burial. Among the rocks were an obsidian blade fragment, 5 jute shells, and pottery of the Spanish Lookout and New Town Complexes. Some of the sherds belonged to the same vessel, a Belize Molded-carved vase (Helmke and Halperin, this volume). Other artifacts from this level included a broken mano fragment, and a large piece of quartz crystal. At the bottom of this level at 1.50 m DBD, Floor 2 was encountered. Below the floor was a layer of ballast, a few slate fragments, and charcoal. The core extended into both Levels 7 and 8. Ceramics found in these levels range from the early to later phases of the Late Classic period, suggesting a Spanish Lookout phase of construction. The capstones in the southern portion of the unit and more Belize

Molded-carved sherds also extended through level 7, most likely as an intrusive feature into Floor 2.

Burial 2 was uncovered in Level 8, at 1.80 m DBD, below the capstones in the southern area of the unit's extension. It contained the partial remains of one adult individual. These bones were poorly preserved, and included a thoracic vertebra and rib bones. The matrix surrounding the burial was brown clay, and the northern and central portion of the unit contained limestone rocks, river pebbles and charcoal inclusions as in the previous level. A slate pendant, three obsidian prismatic blade fragments, and Late Classic period ceramics were also uncovered in association with the interment.

Burial 3, which contained the disarticulated remains of two adult individuals and one juvenile, was uncovered in Level 9 at 1.90 m DBD, below Floor 2 (Figures 3 and 4). These bones were found among two chert flakes, a sliver of quartz crystal, and 7 sherds of a Benque Viejo Polychrome vase and other Late Classic period bowl and vase sherds in the northern and central portion of the unit extension. Charcoal was scattered throughout the burial; nevertheless, none of the bones appeared to be charred. Similar to Burial 2, the bones were poorly preserved and almost impossible to remove. Due to time constraints, the unit was completed at 2.10 m DBD.

Unit 2

Unit 2 was a 2 x 1 meter unit that sat underneath a seasonally active flowstone formation. It was opened in order to investigate the nature of a concentration of modified freshwater shell, *Pachychilus indorum* (locally known as jute), found in a small pool of water formed from flowstone activity. Similar to Unit 1, the matrix throughout all levels of the unit was an alluvial, brown-orange silt-clay, and excavation levels were conducted primarily at 20 cm arbitrary levels until Level 6 when there was a change in matrix (Figure 5). Pieces of plastic and glass uncovered within the first two levels indicated that the hundreds of jute from these two levels were in a disturbed context. The excavation was downsized to a 1 x 1 meter in the western portion of the unit at the beginning of Level 4 due to the lack of artifacts and time constraints.

The first ceramics were discovered at the bottom of Level 3 at approximately 58 cm below the modern ground surface. Ceramics were encountered through Levels 3 to 7 and range in chronology from the Late Classic to Early Classic. Only one sherd (Level 5), however, dates to the Early Classic, suggesting that deposition of artifacts occurred primarily during the Late Classic.

Evidence of two construction phases (plaster floors), Floor 1 and Floor 2, plus ceramics, charcoal, slate fragments, chert flakes, and obsidian blades, were discovered in Levels 4 and 5. Floor 1 was uncovered in Level 4 and was characterized by small chunks of plaster located just above a scatter of limestone rocks about 1 to 7 cm in diameter. Most of the ceramics found within this level were associated with the pebbles and rocks and date to the Spanish Lookout phase. Floor 2 was found in Level 5 and consisted of small pebbles and plaster chunks (3 to 15 cm) above limestone rocks (1 to 7 cm), and a few river cobbles.

Ceramics found below the floor range from the Early Classic to the Late Classic period. These floors were most likely an extension of Floors 1 and 2 from Unit 1, which is supported by their relatively similar date. The low frequency and uniformity of plaster in Levels 4 and 5, however, suggests that the floors were either poorly preserved or poorly constructed. Burning activity was also apparent in the first 6 cm of Level 5.

Level 6 contained a broken obsidian blade, some bits of charcoal, slate fragments, and ceramic sherds. A lower frequency of artifacts was encountered in Level 7 with only small ceramic sherds. The unit was closed after digging 20 cm below Level 7, which was sterile.

Unit 3

Unit 3 was a 0.5 x 0.5 meter test pit placed in a 4 x 5 meter, eastward-sloping crawl-space, which contained an overhang less than a meter high. This area was accessed by a small 1 x 1 meter opening in the cave wall and was dimly lit. The purpose of the test pit was to determine if the area had been used during the Classic period. Its surface was littered with used batteries and gas cans from modern day usage of the cave. Similar to Units 1 and 2, the matrix was also of an alluvial soil. Small (< 4 cm) ceramic sherds, faunal remains, and charcoal were uncovered throughout the first three levels (each arbitrary level was 20 cm). Only two diagnostic (one Early Classic and one Late Classic period) sherds were found. Due to a low frequency and variety of artifacts, it appears that this area was not used extensively. The cultural materials appeared to have washed into the crawl space through water erosion. No artifacts were found below Level 3, and excavations in this area were terminated.

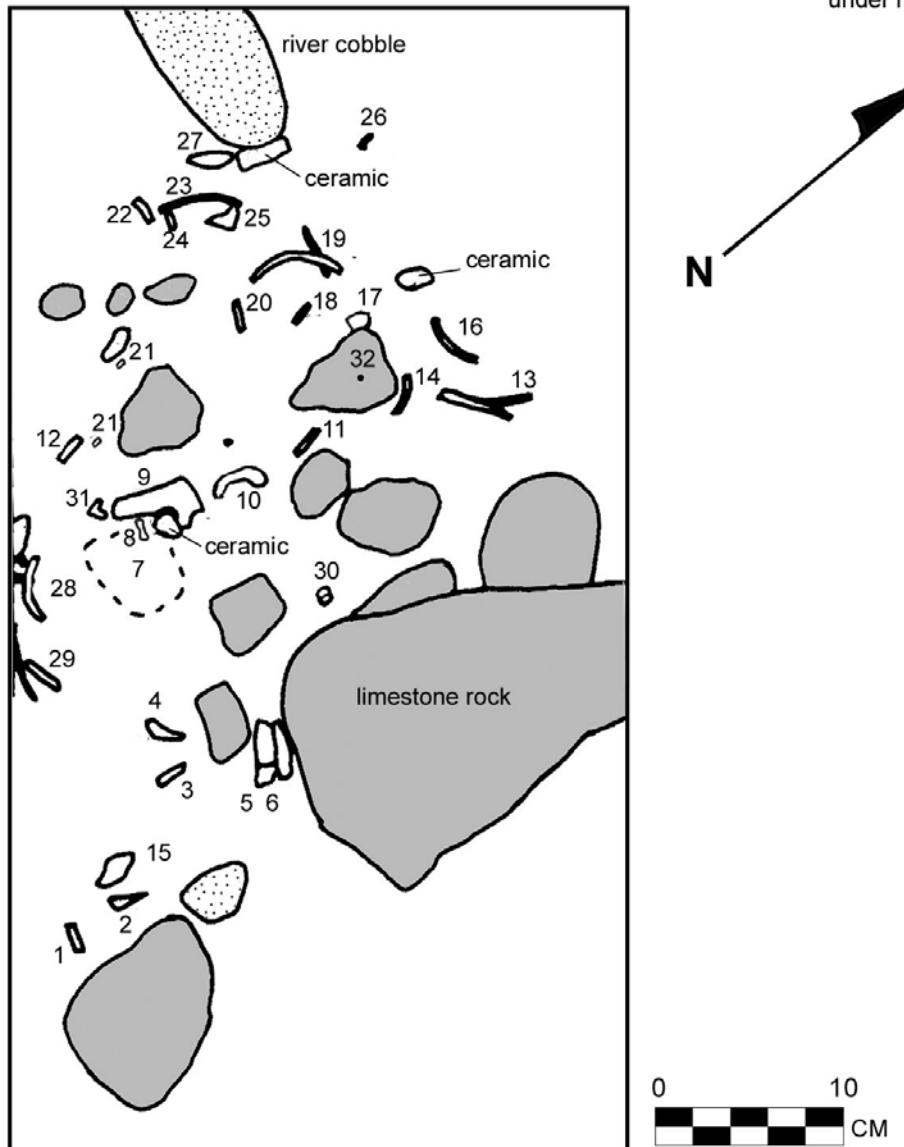
Unit 9

Unit 9 was a 1 x 2 meter unit located between the end of the *sacbe* and dripline of the overhang in Entrance 1. The primary objective was to determine how far the plaster floor uncovered in Unit 1 and 2 extended, and if a platform was constructed between the *sacbe* and cave entrance. The matrix of Unit 9 was also primarily comprised of an alluvial brown-orange, silt-clay, and taken down in 20 cm arbitrary levels. Small (< 3 cm) ceramic sherds were uncovered in Level 3 and continued until Level 6. No diagnostic ceramics were encountered among the low frequency (less than 13 small sherds per level) of highly eroded sherds in this unit. The only other artifacts from this unit were two chert flakes and slate debitage from Level 4 and a chert flake from Level 5. Due to the paucity of artifacts and absence of architecture, the unit was downsized to a 1 x 1 m in Level 4 at the northern end, and closed at the end of Level 6 at approximately 1.50 m below the modern ground surface.

Cave Interior

Three units were placed in the interior, dark zone of the cave. Unit 4 is located within Chamber 1, a small chamber that contains flowstone formations that slowly drip water after heavy rains. Unit 6 was set up in the passageway just over a meter before reaching Chamber 1. Unit 7 was placed in Chamber 5, a 2 x 1 meter chamber, approximately 15 meters from Entrance 2. In order to access the chamber, one must climb through a small 0.50 m diameter hole, and drop down over a meter to the dirt floor of the chamber.

- | | | | |
|---------------------------|---------------------------|------------------|----------------------------------|
| 1. meta-carpal or tarsal | 9. mandible | 17. talus | 25. vertebrae |
| 2. meta-carpal or tarsal | 10. first rib | 18. unidentified | 26. phalange |
| 3. unidentified | 11. unidentified | 19. rib | 27. unidentified |
| 4. meta-carpal or tarsal? | 12. meta-carpal or tarsal | 20. unidentified | 28. infant rib |
| 5. vertebrae | 13. 2 ribs | 21. tooth | 29. ribs |
| 6. sacrum? | 14. rib | 22. unidentified | 30. lumbar vertebrae |
| 7. unidentified pelvis? | 15. unidentified | 23. rib | 31. vertebrae |
| 8. phalange | 16. rib | 24. unidentified | 32. skull fragment
under rock |

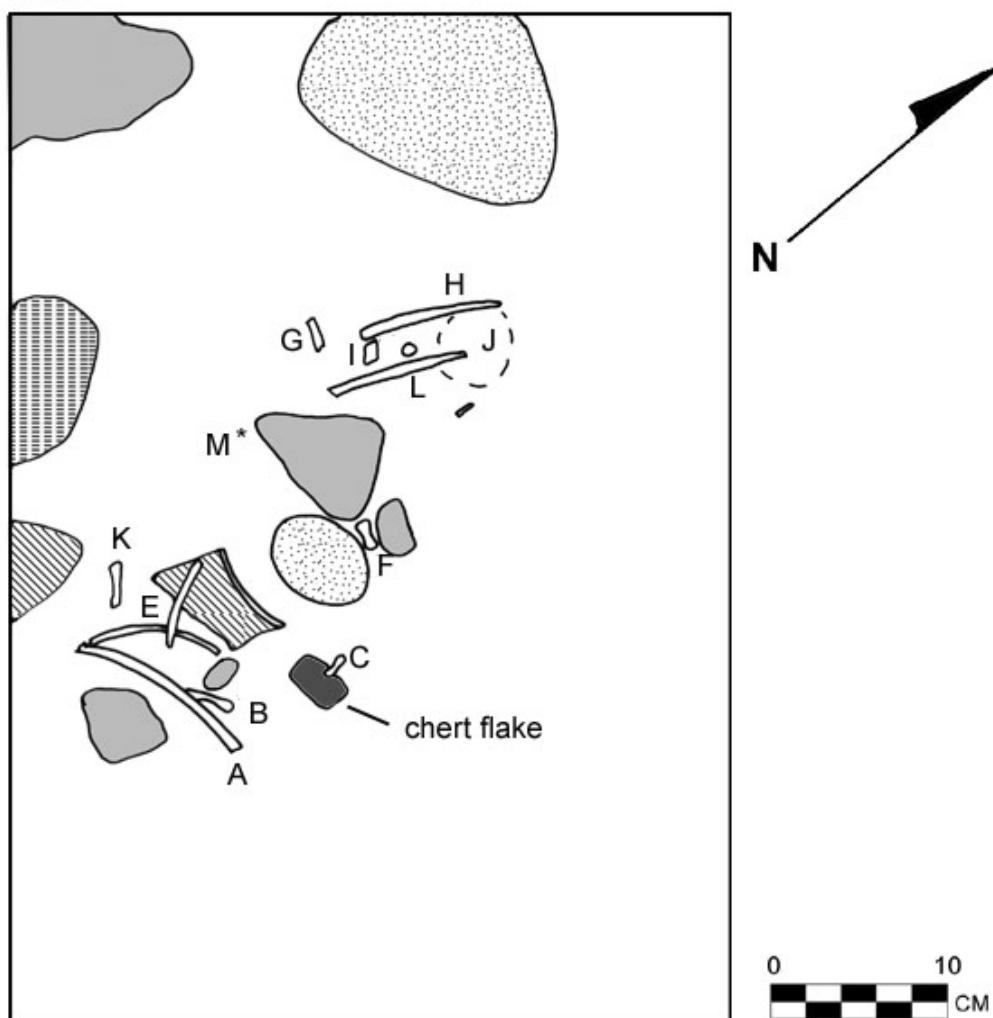
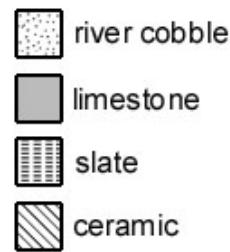


Burial 3 (top)
 Unit 1, Northern part of extension, Level 9
 Actun Nak Beh
 Roaring Creek Valley, Cayo District, Belize
 Map by: Sherry Gibbs and Oscar Chi
 28 July 2000

Figure 3: Unit 1, Burial 3 (top).

- A. rib
- B. meta-carpal or tarsal
- C. phalange
- D. infant rib
- E. rib
- F. phalange
- G. unidentified
- H. rib

- I. unidentified
- J. unid bone mass
- K. phalange
- L. radius?
- M. tooth *



Burial 3 (bottom)
 Unit 1 ext. Northern corner, Level 9
 Actun Nak Beh
 Roaring Creek Valley, Cayo District, Belize
 Map by: Sherry Gibbs
 2 August 2000

Figure 4: Unit 1, Burial 3 (bottom).

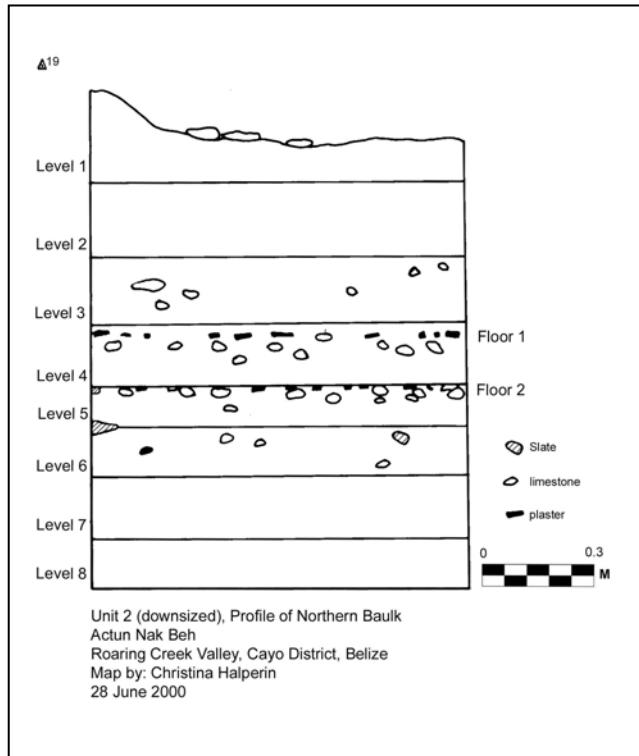


Figure 5: Unit 2, Profile.

Unit 4

Unit 4 started out as a 1 x 1 meter unit, and extended to a 2 x 1 after human remains were encountered (Figure 6). The surface of the unit consisted of loose, orange soil and large river cobbles (10 to 25 cm in size). The river cobbles were probably imported into the cave by humans due to the morphology of the cave, which does not permit erosion of large rocks from the outside. Originally, we believed that this area was the site of looting activity due to the loose soil compared to the compact clay in the remaining part of the chamber. Upon excavation, however, it was apparent that the disturbance could have also been the result of a large rodent. The purpose of this unit was to explore the nature of the imported rocks and possible looting activity.

The surface of the unit yielded a grayish purple chert adze, four chert flakes, and two slate debitage fragments along with the pile of river cobbles. In the loose orange soil of Level 1, more chert and slate flakes, Early Classic basal flange sherds, a scatter of human remains, and twenty obsidian blade fragments and points were encountered. Many of the ceramics sherds were part of the same vessel, suggesting that they have been broken inside the cave.

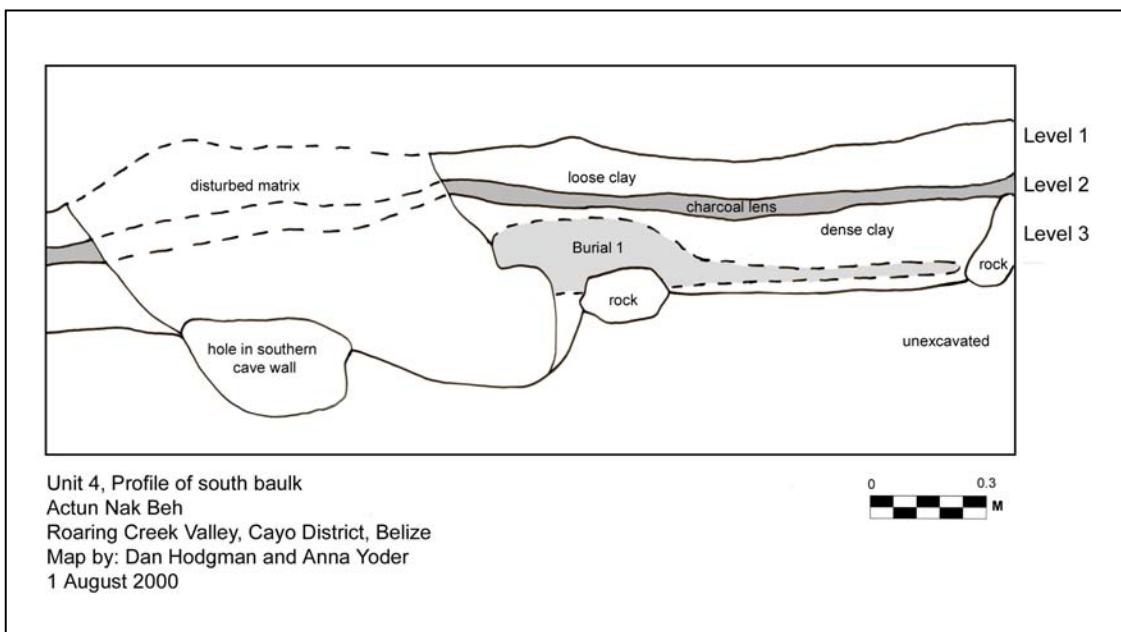


Figure 6: Unit 4, Profile.

Level 2 was comprised of a thick 5 cm lens of charcoal distributed in patches primarily throughout the northern part of the unit. This level yielded fourteen obsidian blade fragments and Early Classic ceramics. Some of the sherds were charred on all sides including the interior, exterior, and cross-section. Human remains were found in the southeastern part of the unit along the cave wall. This area did not contain an ash lens, and appeared to have been disturbed.

Level 3 was comprised of a dense, orange clay matrix. A concentration of human remains was uncovered in the southern part of the unit. Unlike Levels 1 and 2, these bones appeared to have been deliberately placed in the matrix. The human remains were designated as Burial 1. Adjacent to the bones along the wall was a 25 x 50 cm hole that may have been created by either a rodent or human. Such burrowing may have caused displacement of human bones into the first two levels. There was no articulation or orientation of the body, perhaps due to the burrowing activity or to a "seated" placement of the individual. Preliminary analysis of the bone indicates an MNI of one adult individual.

Three modified cave formations were found among the bones. A small 2 cm diameter jade bead, an animal claw, a modified piece of bone, and a fragment of an obsidian blade point were found less than 40 cm north of the bone concentration. Approximately 12 cm below the depth of the artifacts were more human remains, while the remaining clay matrix was void of any artifacts. The soil underneath the burial was also sterile, and excavations halted at about 50 cm below the depth of the modern ground surface.

Unit 6

Unit 6 was placed nearby Unit 4 as a 2 x 0.5 m test pit over a large number of limestone and river cobbles. This unit also served as a means of investigating the nature of the rock clusters and associated artifacts found on the surface: two ceramic sherds (Early Classic) and a human phalange. The matrix of Level 1 was a dark brown soil intermixed with fine bits of carbon and soft limestone inclusions (1 to 5 mm). A large concentration of charcoal (136 cm long) was located in the center of the unit. The eastern baulk of the unit revealed three thin layers (approximately 1 cm each) of ash interspersed with orange clay. This level also contained Early Classic sherds, three obsidian blade fragments, and faunal remains that were identified as a retractable claw probably from a large cat and two (faunal) teeth. Both Units 4 and 6 contained similar ceramics: Dos Arroyos polychrome dishes, which have been broken into several sherds. Some of these sherds were charred on all sides, indicating that burning activity occurred in Chamber 1 after their deposition. Level 2 began below the ash lens and contained dense, orange clay, which was similar to Level 3 from Unit 4. Two ceramic sherds were recovered from this level. No cultural remains were encountered 30 cm below these sherds, thus the unit was closed.

Unit 7

Unit 7 was a 0.5 x 2 meter unit that covered the majority of the surface area of Chamber 5, a tiny chamber that lies within the first few meters of the dark zone of Entrance 2. It was apparent during initial investigations of the cave interior that the floor of Chamber 5 was littered with ceramic sherds and jute shells. An excavation unit within the chamber served as a means of exploring why and to what extent this small, constricted area was used. The unit extended down seven levels, which were divided by natural layers. Changes in matrix may have been created through erosion of soil and water from Chamber 5A, a small (2.2 x 0.5 m) area southeast of the Chamber 5 that possessed cave formations.

Jute shells, both modified and unmodified at the distal end, were recovered from all levels with the greatest frequency within Level 3. They did not appear to cluster in any particular area. Similar to the other interior units, diagnostic ceramics were mostly dated to the Early Classic period. Although all seven levels yielded ceramics, only the first four levels contained sherds large enough to be identified. Charcoal was found in all levels of the unit, with greatest concentrations on the surface and within Levels 1, 3, and 6. Many of the sherds were charred. Large pieces (> 30 cm) of slate extending in from the eastern and western baulk were uncovered in Level 7. They were clearly imported into the chamber, though interpretations of their function are not entirely clear. Because air circulation and breathing conditions within the chamber were poor, excavations of Unit 7 were closed at Level 8, approximately 1.19 m below the modern ground surface.

Causeway

Three units were also placed on the *sacbe* in order to ascertain the date of construction, type of construction, and extent of *sacbe* utilization (Figure 8). The first unit,

Unit 5, was located in the middle of the *sacbe*, just southeast of a large looter pit. The second unit, Unit 8, was placed at the end of the *sacbe* by the entrance of Actun Nak Beh, and the third unit, Unit 10, was placed at the beginning of the *sacbe*, just a few meters south of Cahal Uitz Na's Structure 1.

Unit 5

Unit 5 was an 11.7 x 1 meter transverse unit (Figure 7). While the majority of the unit was excavated to the top of level three, two subunits, a central subunit and eastern subunit, were brought down to sterile. A layer of ballast, ranging from 20 to 40 cm in depth, was encountered in Level 2. The limestone rocks in the ballast ranged from 5 to 10 cm and were interspersed with an orange-brown matrix. Just above the ballast were three 6 to 12 cm pieces of plaster approximately 2.5 cm thick, indicating that the *sacbe* had once been plastered. The lack of multiple plaster phases and the appearance of one ballast layer suggest that the causeway was constructed once without subsequent construction phases.

Below the ballast in Level 3, was the construction core. Similar to the construction fill of structures within Cahal Uitz Na's site core, the core of the *sacbe* was composed of large (12 to 34 cm) limestone rocks, river cobbles, and slate. Underneath the core was a layer of sterile red-brown clay, and sterile silt-clay. The causeway construction core and ballast were supported on both sides by cut limestone facings. Cut limestone rocks are also apparent along some of the unexcavated sides of the *sacbe*.

Few artifacts were found within this unit. Within Level 1, the humus layer, were a cream-colored biface, two granite mano fragments without wear, and seven ceramic sherds. The ballast layer, Level 2, contained an obsidian blade fragment, an 8.5 cm diameter round limestone ball with 1/5 of it broken off, and thirty-five ceramic sherds. Only one vessel could be identified, which dated to the Early Classic period.

Unit 8

Unit 8 is a 1 x 2 meter unit that was placed at the *sacbe* terminus in order to retrieve ceramics for dating purposes, and determine if the *sacbe* ended abruptly or lowered to a platform. As in Unit 5, Unit 8 exposed a ballast (Level 2) and core (Level 3) of the causeway. Two (7 to 15 cm) pieces of plaster were found within the ballast. Similar to Unit 5, the core was composed of limestone rocks and river cobble (10 to 20 cm), and was retained by a facing of large 30 cm cut limestone that runs east-west on the *sacbe* terminus. No platform or floor was uncovered south of the cut limestone alignment. Below the core and a layer of clay, was a sterile 30 cm layer of small river cobbles (< 5 cm) and gravel, which may have been part of an old arroyo. Underneath this matrix was a red-brown clay. An obsidian blade fragment and small (< 3 cm) ceramic sherds, were recovered from the ballast. Small ceramic sherds were also found in the remaining levels of the unit with only one identifiable sherd from Level 3, belonging to the early phase of the Late Classic.

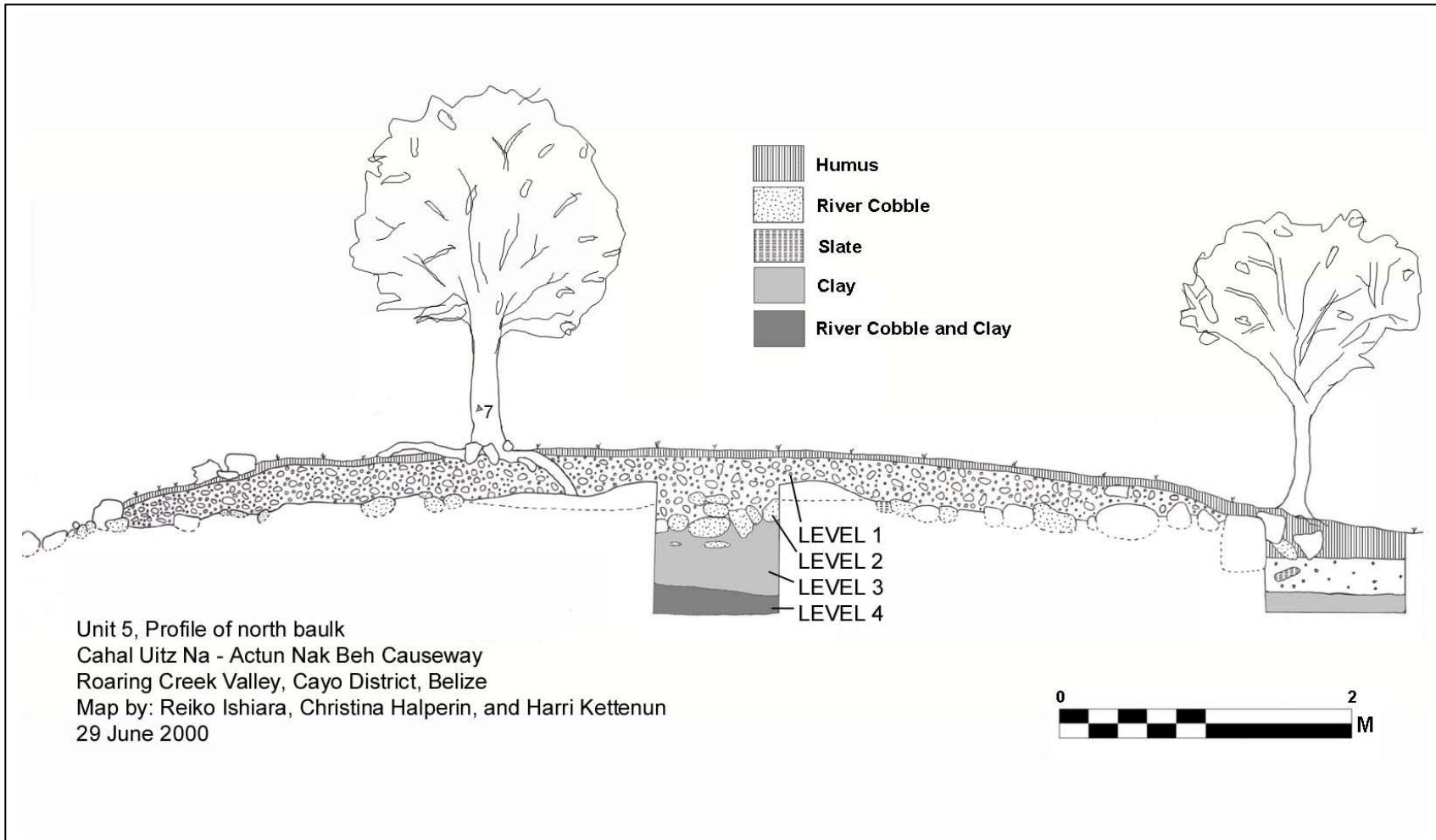


Figure 7: Unit 5, Profile.

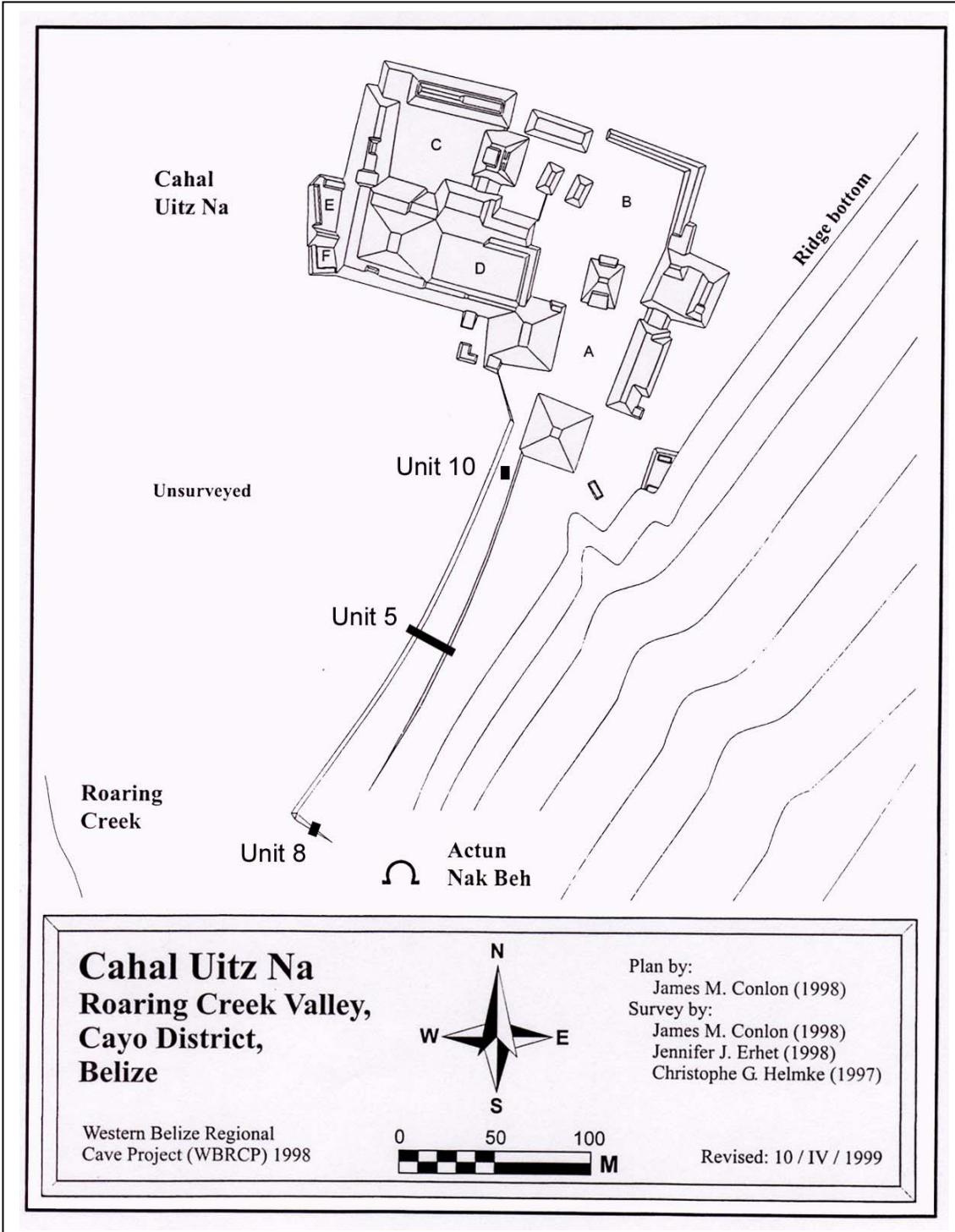


Figure 8: Plan of Cahal Uitz Na,
showing the locations of Units 5, 8, and 10 on the *sacbe* leading to Actun Nak Beh.

Unit 10

Due to the lack of ceramics from Units 5 and 8, Unit 10, a 1 x 2 meter unit, was placed at the beginning of the causeway in order to accumulate more chronological data. Similar to the middle and end of the *sacbe*, this area contained a layer of ballast and core. Unlike the other two units however, the amount of limestone and river cobble core in Level 3 was not as dense as that found in the other units. Ceramics, the only type of artifacts recovered from this unit, were found in the ballast, core, and red-brown clay below the core. The majority of the ceramics were highly eroded, making type identification close to impossible. Two sherds contained sand temper, which is unusual in the Belize Valley. Gifford (1976:125, 167, 183-4) has found sand tempered ceramics during the Early and Late Classic periods. Two other sherds from the ballast and core have been dated to the Early Classic period.

CONCLUSIONS

Actun Nak Beh was utilized throughout the Classic period (A.D. 250 - 900). Although there is a low frequency of datable ceramics from the *sacbe*, a preliminary assessment suggests that construction terminated during the early phase of the Late Classic period (Tiger Run phase). This chronological data as well as the mere presence of the *sacbe* indicate that the cave was utilized by the inhabitants and/or visitors of Cahal Uitz Na, which was occupied throughout the Classic period (Awe and Helmke 1998; Ehert and Conlon 1999; Ferguson 1999). Ceramic analysis also indicates that the interior of the cave was used predominately during the Early Classic period while the exterior was exploited primarily during the Late Classic period. This temporal-spatial relationship is unusual for caves investigated by the WBRCP in the Roaring Creek Valley (Griffith 1998; Moyes and Awe 1998; Mirro and Halperin 2000). Similar cultural remains were found in the exterior and interior of the cave, indicating that similar activities occurred diachronically at the site. For example, both interior and exterior units contained disarticulated burials. Associated with these burials were ceramics, obsidian blades, burning activity, and unusual grave goods such as quartz crystal (Burial 3) and speleothems (Burial 1). The presence of burials and symbolically charged artifacts such as quartz crystal (Brady and Prufer 1999) and modified speleothems (Brady 1989), and the paucity of domestic refuse such as lithicdebitage and identifiable middens suggest that Actun Nak Beh was an important ritual locus within the Roaring Creek Valley. Similar to Actun Uayazba Kab, which also contained evidence of human interments under a plaster floor(s) (Ferguson and Gibbs 1999; Gibbs 1998), activities at Actun Nak Beh may have been linked to ancestral veneration and/or communication. As an extension of Cahal Uitz Na, it is likely that such activities were sponsored or controlled by the rulers or administrators of the center.

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APPENDIX: THE GEOLOGICAL SETTING OF ACTUN NAK BEH, CAYO DISTRICT, BELIZE

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INTRODUCTION

The purpose of this report is to provide a geological context to the archaeological investigations conducted at Actun Nak Beh during the 2000 field season of the Western Belize Regional Cave Project (WBRCP). The site is a small dry cave located just north of the contact between the Maya Mountain metasediments and the limestone lowlands in the Roaring Creek Valley. A presentation of the geologic characteristics of Actun Nak Beh begins with a brief geologic history of the Roaring Creek Valley, and is followed by a description of fluvial and geomorphic observations conducted during June and July 2000.

CONDENSED GEOLOGIC HISTORY

The terrain observed in the Belize Valley today is the result of millions of years of fluvial interaction between Roaring Creek and the underlying bedrock geology. The Maya Mountain uplands consist of a block of undifferentiated sedimentary rocks that were uplifted and metamorphosed during the Paleozoic era of geologic history (~545 – 245 Mya). During the Triassic period of the late Mesozoic era (~245 – 208 Mya) (Hall and Bateson 1972), granites intruded into the Maya block through east-west striking faults along the northern extent of the uplands. Elevated sea levels during the Cretaceous period (145 – 65 Mya) covered all but the highest points of the Yucatan Peninsula and deposited a thick blanket of limestone throughout the Maya area. The combined effects of declining sea level and continued uplift of the Maya Mountain block left the carbonate rocks exposed to the atmosphere. Erosion and chemical weathering together with the crumbling effects of tectonic uplift fragmented the limestone while minerals dissolved in surface waters and began to locally re-cement the pieces together (Miller 1996). As a result, most of the bedrock into which caves were sculpted, consists of a breccia that is widespread in the Belize Valley today.

The chemical properties of the upland rocks and soils caused and still cause surface water to become acidic before flowing over the limestone lowlands. Precipitation in the uplands reacts with acid intrusive granitic rocks, resulting in a further lowering of the pH of the surface waters before flowing over the carbonate lowlands. Carbonate rocks are extremely vulnerable to acidic waters, which accelerates fluvial erosion processes. Precipitation and other surface waters that infiltrate into vegetated soils become enriched in carbonic acid (HCO_3^-) from plant root respiration (White 1988). This groundwater is even more acidic than the surface water, and therefore has much greater erosion and weathering potential. Limestone bedrock below the water table is attacked by the circulating

groundwater and begins to dissolve along fractures, bedding planes, and openings that enlarge to form subterranean sinkholes, conduits, and caves.

Physical processes such as tectonic uplift and fluvial erosion further contribute to the continued development of Roaring Creek Valley. As the Maya Mountain block continues to uplift, stream base level declines and the stream continually seeks a lower elevation. The combination of these two driving forces causes further incision into the limestone riverbed and eventually leaves the once inundated surfaces exposed to the atmosphere. In the upper reaches of the stream where slopes are relatively steep, rapid downcutting into the bedrock occurs. Further downstream where slopes are not as extreme the stream channel will meander causing floodplain development (Dunne 1990; Palmer 1990; White 1990). This valley geometry allows for the deposition of floodplains at successively lower elevations as these processes continue. It is at this point in geologic time that evidence of human occupation would be preserved, and with the exception of the occasional high flood where the river would reach the highest floodplain elevation, geomorphic processes come to an apparent standstill.

Actun Nak Beh is situated upon the highest of three floodplain levels that were deposited by the Roaring Creek River. Today the river is approximately 150 meters from the cave site and several meters below the entrance to the cavern. The cave has been carved into a steep valley wall in the brecciated Campur limestone formation sometime since the late Cretaceous (~90 – 65 Mya). It is surrounded by numerous cave sites including Actun Tunichil Muknal, which is approximately 700 meters 315° northwest of Actun Nak Beh, and Actun Uayazaba Kab, which is 450 meters due west.

EXTERIOR CAVE COMPONENT

The exterior or rock shelter portion of Actun Nak Beh is approximately 20 - 25 m wide, 2 - 10 m deep (measured from dripline to wall) and 4 m high at the base of a north-south oriented cliff that stands over 12 meters high. Probably the most prominent feature is a large sinkhole/collapse tunnel in the northern part of the shelter that rises approximately 10 meters to a small (less than .60m) opening atop the cliff. Most of the slope is composed of meter-sized pieces of breakdown but includes a poorly sorted mix of rocks of all sizes. The matrix beneath the breakdown is mostly clay and some organic material that has washed in from the access hole at the top. A large fracture in the limestone above the collapse allows water to flow after heavy rains, as observed during June and July of 2000. There is some evidence of past flowstone formation on the ceiling and in the southern side of the tunnel that was also active during the season. The lower most part of the collapse tunnel slope is clay mixed with alluvial materials. The shelter floor itself is nearly one meter below the jungle floor, probably because there are no plants to decay and accumulate over time.

Just to the south of the slope is Entrance 1, a 1 x 2 meter opening situated approximately 1.5 meters above the shelter floor. It is characterized by a smooth rock face, which extends approximately eight meters south of the entrance opening. This area has the largest overhang of the rock shelter portion of the cave. The next 5 to 8 meters south along the overhang resembles a cave entrance but only extends two or three meters from the

surface of the cliff. Above this section is a ledge from which water pours down after a heavy rain. The final five meters of the exterior cave component is simply a cliff face that extends to the south and leads to the east where the second cave entrance, Entrance 2, lies approximately eight meters above the main shelter floor.

Fluvial activity appeared to be a significant agent of site alteration. Evidence of small channels, delivering sediment to the rock shelter portion of the cave was apparent during rainstorms. Water dripping down the surface of the outer wall had also removed some of the material from the shelter floor, and washed sediment into a small crawl space, which is less than 1 meter high. Oil containers, batteries, and other recent evidence of human occupation were found washed in further than one could crawl, and were also partially buried. During the 2000 field season a large storm produced enough rain to seep through the fracture in the breakdown area and wash out Unit 1, depositing almost 50 centimeters of mud and water in the bottom of the unit. The upper one meter of Unit 9 was also composed almost entirely of alluvial material. From these observations it can be deduced that fluvial activity near and around the rock shelter has contributed significantly to the geomorphology of the site during the last 1000 years.

INTERIOR CAVE COMPONENT

The interior of the cave shows less evidence of recent geomorphic change, yet displays signs of alteration since cave formation. The entire cave resembles a horseshoe where both entrances emerge from the same cliff face. Passages are mostly vertical walled with a rounded ceiling that is characteristic of phreatic dissolution. Most of the cave floor is composed of compacted orange-red clay that forms a flat walking surface. There are no areas within the cave that give any indication as to how thick the clay deposit is. Near both entrances are cobble-sized river stones of slate, various metamorphosed sedimentary rocks, granite, as well as a few limestone pieces. Most of the cave is inactive in terms of speleothem growth. A few locations contain flowstone and small soda-straw stalactites. Outlined below is a description of flowstone activity and cave morphology by cave area.

Entrance 1 Corridor

This is a narrow passage with no active speleothems. The walls frequently have condensation indicating high humidity. There were some palm nuts and river cobbles in small piles at the base of the walls.

Chamber 1

Chamber 1 contained active speleothem formations in the northern portion of the chamber. The ceiling in this area extended more than six meters high in the southern part. More river cobbles (some as heavy as 15 lbs.) and limestone rocks were encountered on the floor of the southern end of the chamber.

Chamber2

No active speleothems were observed in Chamber 2. Some river cobbles (10-30 cm) and limestone rocks were lying on the cave floor.

Chamber 3

Chamber 3 contained numerous actively growing speleothems including stalactites, stalagmites, and bacon strips. No allochthonous geologic materials were present.

Chamber 4

Chamber 4 was a very high shaft-like room reaching over eight meters high. Stalactites were growing from the ceiling toward the clay floor.

Chamber 5

Chamber 5 showed no sign of speleothem formation at all. The clay floor was very thick (>1.5 m), and its stratified nature suggests an alluvial origin. A side chamber (Chamber 5A) contained a flowstone formation on the eastern wall.

Entrance 2 Corridor

This entrance is situated atop a steep slope along the southern cliff wall. A large limestone piece on the entrance floor somewhat blocked access, but the piece did not appear to have come from the ceiling directly above where it sits. There is a significant accumulation of clay on the northern wall with obvious stratigraphy. Various insects and reptiles now inhabit the clay and have burrowed many cavities in the clay. At the base of the corridor near the entrance to Chamber 5, slate pieces (~7 cm x 30 cm) and limestone rocks (~10 cm) were found on the floor.

CONCLUSION

Actun Nak Beh is a small dry cave previously dissolved out of the brecciated limestone of the Campur Formation sometime since 50 Mya. Millions of years of erosion, chemical weathering, tectonic uplift, and fluvial activity have molded the site into its present state. The exterior of the cave site is situated on the uppermost portion of three a floodplain levels. Seasonal rains and possibly heavy flooding from the Roaring Creek River has produced a heavy accumulation of alluvium in the rock shelter portion of the cave. Humans most likely contributed to the appearance of meta-sedimentary rocks with water worn surfaces (river cobbles) in the cave interior. Because these type of rocks were as much as 15 lbs and do not form naturally within dry caves, it seems unlikely that their presence was due to geologic or processes or mammalian activity. Similar to many dry caves, a paucity of speleothems and water flow was characteristic of Actun Nak Beh. In general, however, the geomorphology of the cave shows little evidence of dramatic alterations in the past 2000 years.

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**PRELIMINARY REPORT ON THE ANALYSIS OF ANIMAL REMAINS
FROM ACTUN NAK BEH, ROARING CREEK VALLEY,
CAYO DISTRICT, BELIZE**

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INTRODUCTION

The Actun Nak Beh faunal assemblage comes from six excavation units, three from the exterior of the cave (Units 1, 2 and 3) and three from the dark interior (Units 4, 6 and 7). One exterior unit, Unit 9, contained no faunal material. A total of 1,459 individual specimens were recovered, of which 1,432 could be identified with confidence. All told, 13 species were identified with another four to seven species (numerically poorly represented) as yet to be identified (Tables 1 and 2). The bulk of the faunal assemblage is molluscan remains (94.3 %) and are comprised of at least four species, i.e., *Pachychilus indorum* (97.7 % of the molluscan sample), *Pachychilus glaphyrus* (1.5 %), *Pomacea sp.* probably *flagellata* (0.5 %) and most likely *Nephronias sp.* (0.3 %). The remainder of the specimens (except for two bird bones) are mammalian/marsupialan (5.7 % of total faunal assemblage) and are represented by nine different species (Table 1). What follows is a brief discussion of what this assemblage and its distribution at the site might mean in terms of how this cave was utilized by the ancient Maya.

OBSERVATIONS

The first and most significant observation is that the distribution of the faunal remains is very telling. The faunal material from the exterior in the naturally illuminated units is more than two thirds larger than the remains from the dark interior units, i.e. 68.5 % to 31.5 %. This alone would suggest that very little in the way of faunal material was brought into the interior of the cave by humans. The validity of this observation is strengthened by the fact that of the 462 specimens recovered from the interior units all but six came from Unit 7, which is located in Chamber 5 off of a straight corridor (Entrance 2) some fifteen meters from Entrance 2. The other two interior units, on the other hand, are somewhat further into the cave complex in Chamber 1, which is reached via a more sinuous route from Entrance 1 (Tables 3 and 4). Significantly, of the seven species identified in the sample from Unit 7, five are represented by only one specimen. The remainder consist of jute ($n = 430$) and the remains of a single partial opossum skeleton ($n = 21$) found in Level 8.

The second observation has to do with the number of species present in the assemblage and the number of identified specimens of each. As noted above, the molluscan remains, represented by at least four species, constitutes 94.3 % of the total assemblage. Clearly this class of animals, particularly the common jute (*Pachychilus indorum*), was the most important food animals brought to the cave, with only a third ending up in the interior.

Likewise of the five edible mammalian/marsupialan species uncovered at the cave, only the opossum, comes from the interior of the site. The location and context of the opossum remains, however, do not necessarily represent some sort of ritual/cultural behavior; it could very well have been a product of natural processes such as natural death. The three medium-sized mammals (Peccary, Red Brocket and White-tailed Deer) along with the smaller-sized armadillo were found in the exterior units. This would suggest that these food animals (if the armadillo was regularly eaten) were consumed near Entrance 1 of the cave and were not part of any activities that were conducted inside.

SUMMARY

The Actun Nak Beh faunal assemblage does not suggest any significant involvement of animal species in the use of the cave. The only clear case from the faunal material for human activity in the cave's interior is the large number of jute (*Pachychilus indiorum*) found in Chamber 5. The majority of these snails, which would not naturally occur inside the cave in any large numbers, have their apexes deliberately broken to facilitate access to its edible portion. In this context it may be significant that the jute were present in all eight levels of Unit 7. Until we have a larger number of cave sites of different types, in different environmental settings and associated with different cultural features (ceramics, constructions, art, etc.), it is premature to take our interpretation any further.

I Mollusca (Invertebrates)

Pachychilus indorum: Common Jute (Smooth, Coiled variety) (NISp = 1319; 92.1 %)

Pachychilus glaphyrus: "Jute" (Sculptured, Coiled variety) (NISp = 20; 1.4 %)

Pomacea sp. probably flagellata: Apple Snail (NISp = 7; 0.5 %)

? Nephronias species: River Clam (NISp = 4; 0.3 %)

II. Mammalia

Very Small Species (less than .99 kg)

Oryzomys species, very likely cousei: Rice Rat (NISp = 3; 0.2 %)

Small Species (1.0 – 24.9 kg)

Dasyurus novemcinctus: Nine-banded Long-nosed Armadillo (NISp = 45; 3.1 %)

Medium Species (25.0 – 49.9 kg)

Tayassu pecari: White-lipped Peccary (NISp = 3; 0.2 %)

Mazama americana: Red Brocket Deer (NISp = 8; 0.6 %)

Odocoileus virginianus: White-tailed Deer (NISp = 2; 0.1 %)

III. Marsupialia

Small Species (1.0 – 24.9 kg.)

Didelphis marsupialis: Common Opossum (NISp = 21; 1.5 %)

In addition several as yet unidentified species were recovered. These are as follows:

Mollusks – possibly up to 4;

Invertebrates – at least 1;

Mammals – 1 very small, 1 or 2 small;

Avifauna – at least 1

Table 1: Animal species positively identified in the faunal assemblage (n = 1432) from Actun Nak Beh and the number of identified specimens of each (NISp).

Table 2: Breakdown of the Actun Nak Beh faunal sample by unit, level, animal class and specimen.

Unit	Level	Class	Size	Bone/Shell	Species	NISP ¹
1	8	Mml	V Sml	Tibia: cmplt, px & dt fsd	Prov. identif. <i>Oryzomys</i> species	1
Unit	Level	Class	Size	Bone/Shell	Species	NISP ¹
2	1	Mlsc		Shell; 25 cmplt, 34 w/o apexes, 18 frgs (Note: 13 of frgs w/o apexes)	<i>Pachychilus indorum</i>	77
				Shell frgs (Code # 8060)	? <i>Nephronias</i> species	1
				Shell species	Unidentifiable?	1
				Snail species (Code #8090)	To be identified	4
		Mml	Md	Canine: cmplt	<i>Tayassu pecari</i>	1
2	2	Mlsc		Shell: 58 cmplt, 159 w/o apexes, 62 frgs (Note: 42 of frgs w/o apexes)	<i>Pachychilus indorum</i>	279
				Shell: 3 cmplt, 13 w/o apexes	<i>Pachychilus glaphyrus</i>	16
				Shell frgs (Code #8060)	? <i>Nephronias</i> species	3
				Snail species (Code #8090)	To be identified	4
		Mml	V Sml	Incisor (I ₁) frg	Rodent (? <i>Oryzomys</i> species)	1
2	3	Mlsc		Shell: 1 cmplt, 6 w/o apexes, 3 frgs	<i>Pachychilus indorum</i>	10
2	4	Mlsc		Shell: 2 frgs	<i>Pachychilus indorum</i>	2
		Mml	Sml	Snail species (Code #8090)	To be identified	1
				Canine frg	To be identified	1
2	2-5dug	Mlsc		Shell: 8 cmplt, 144 w/o apexes, 46 frgs	<i>Pachychilus indorum</i>	198
				Shell frg	<i>Pomacea</i> species	1
				Shell frg	To be identified	1
Unit #	Level	Class	Size	Bone/Shell	Species	NISP ¹
3	1	Mlsc		Shell: 1 cmplt, 6 w/o apexes, 3 frgs	<i>Pachychilus indorum</i>	10
		Mml	Sml	Shell: 1 cmplt	<i>Pachychilus glaphyrus</i>	1
				Scutes	<i>Dasypus novencinctus</i>	8
				Radius: px, fsd; unidentif. frgs	To be identified	3
3	2	Mlsc		Shell: 1 cmplt, 4 w/o apexes	<i>Pachychilus indorum</i>	5
3	3	Mlsc		Shell: 1 w/o apex	<i>Pachychilus indorum</i>	1
Unit #	Level	Class	Size	Bone/Shell	Species	NISP ¹
4	1	Mlsc		Shell: 4 w/o apexes	<i>Pachychilus indorum</i>	4
Unit #	Level	Class	Size	Bone/Shell	Species	NISP ¹
6	1	Mml	Sml	Tooth frgs	To be identified	2
Unit #	Level	Class	Size	Bone/Shell	Species	NISP ¹
7	1	Mlsc		Shell: 9 w/o apexes, 1 frg	<i>Pachychilus indorum</i>	10
				Shell frg	Unidentified	1

Table 2 (continued): Breakdown of the Actun Nak Beh faunal sample by unit, level, animal class and specimen.

7	2	Mlsc	Shell: 13 w/o apexes Snail species (Code #8090) Snail species	Pachychilus indiorum To be identified Unidentified	13 1 1
7	3	Mlsc	Shell: 6 cmplt, 101 w/o apexes, 18 frgs Shell frg	Pachychilus indiorum To be identified	125 1
		Avs	Vertebral frg	To be identified	1
7	4	Mlsc	Shell: 4 cmplt, 50 w/o apexes, 5 frgs	Pachychilus indiorum	59
7	5	Mlsc	Shell: 6 cmplt, 57 w/o apexes, 26 frgs (Note: 3 frgs w/o apexes)	Pachychilus indiorum	89
7	2-5	Mlsc (dug together)	Shell: 1 cmplt, 6 w/o apexes, 30 frgs (Note: 6 frgs w/o apexes) Shell frg	Pachychilus indiorum Pomacea species	37 1
7	6	Mlsc	Shell: 13 w/o apexes	Pachychilus indiorum	13
7	7	Mlsc	Shell: 56 w/o apexes, 9 frgs	Pachychilus indiorum	65
7	8	Mlsc	Shell: 19 w/o apexes Snail species (code #8200)	Pachychilus indiorum To be identified	19 1
		Mml V Sml	Mandibular frg	Rodent species	1
Mar	Sml	Skull: cmplt w/ jaws (2) Cervical vertebra (6) Thoracic vertebra (1) Ulna and Radius (2) Metacarpals (3) Phalanges (3) Carpal bones (3) Scapula frg	Didelphis marsupialis “ “ “ “ “ “ “ “ “ “ “ “ Prov. identif. Didelphis species	(MNI = 1)	20 1

Table 2 (continued): Breakdown of the Actun Nak Beh faunal sample by unit, level, animal class and specimen.

Cave	Unit ¹	Lev-	NPIS ² (%) ³	Mlsc (%)	NISp ⁴	Aves (%)	NISp	Mml ⁵ (%)	NISp	Totals (%)
Locus	el		NPIS		NPIS		NPIS		NPIS	
Ent-	1	1	4	30.8	3	75.0	11	--	1	25.0 1
rance	1	2	6	46.2	3	50.0	36	1	16.7 1	2 33.3 34
		3	4	30.8	3	75.0	9	--	1	25.0 3
		4	4	30.8	2	50.0	22	--	2	50.0 8
		5	3	23.1	1	33.3	138	--	2	66.6 3
	2-5(dug	3	23.1		3	100.0	57	--		--
	together)	6	3	23.1	3	100.0	51	--	--	(1)
		7	--				--	--		
		8	1	7.7	--		--	1	100.0	1
	Total				324		1		50 +(1)	375 25.7
Ent-	2	1	4	30.8	3	75.0	82	--	1	25.0 1
rance	1	2	5	38.5	4	80.0	302	--	1	20.0 1
		3	1	7.7	1	100.0	10	--		--
		4	2	15.4	2	100.0	3	--	--	(1)
	2-5(dug	2	15.4		2	100.0	199	--		--
	together									
	Total				597				2 +(1)	599 41.1
Over-	3	1	3	23.1	2	66.6	11	--	1	33.3
hang	1	2	1	7.7	1	100.0	5	--		8 +(3)
		3	1	7.7	1	100.0	1	--		--
	Total				17				8 +(3)	25 1.7
Ent-	4	1	1	7.7	1	100.0	4	--		--
rance	1									
	Total				4				4	0.3
Cham-	6	--		--		--		--		--
ber	1									
Cham-	7	1	1	7.7	1	100.0	10	--		--
ber	5	2	2	15.4	2	100.0	14	--		--
		3	2	15.4	1	50.0	125	1	50.0 1	--
		4	1	7.7	1	100.0	59	--		--
		5	1	7.7	1	100.0	89	--		--
	2-5(dug	2	15.4		2	100.0	38	--		--
	together)	6	1	7.7	1	100.0	13	--		--
		7	1	7.7	1	100.0	65	--		--
		8	4	30.8	2	50.0	20	--	2	50.0 22 ⁶
	Total				433		1		22	456 31.7 31.7
	Totals				1375	94.2%	2	0.1%	82 ⁵	5.6% 1459 +(5) 100.1%

Notes:

- Material recovered in each Unit includes any material from excavated extensions to these Units.
- The total number of provisionally identified species is 13
- Percent formula is: X / 13 (the number of provisionally identified species)
- Includes all specimens identified to this class
- Includes the one marsupialan species.
- Twenty one specimens are from a single partial opossum skeleton

Table 3: Breakdown of the Actun Nak Beh faunal assemblage by the number of individual specimens (NISp) in each animal class and number of provisionally identified species (NPIS) in each class.

Cave Locus	Unit	Lev- el	Mlsc	%	Aves	%	Mml ²	%	Total	%	Unidentifi- able ?
NISp											
Ent- rance 1	1	1	11	--			1	--	12	--	
	2	36		1			34	--	71	--	
	3	9		--			3	--	12	--	
	4	22		--			8	--	30	--	
	5	138		--			3	--	141	--	
	2-5(dug together)	57		--			--	--	57	--	
	6	51		--			--	--	51	1	
	7	--		--			--	--	--	1	
	8	--		--			1	--	1		

Totals: Unit 1 (%) ¹		324	86.4	1	0.3		50	13.3	375	100.0	2
		(23.6)		(50.0)			(61.0)		(26.0)		
Ent- rance 1	2	1	82	--			1	--	83	1	
	2	302		--			1	--	303	--	
	3	10		--			--	--	10	--	
	4	3		--			--	--	3	1	
	2-5(dug together)	199		--			--	--	199	1	

Totals: Unit 2 (%) ¹		596	99.7	--			2	0.3	598	100.0	3
		(43.4)		--			(2.4)		(41.0)		
Over- hang 1	3	1	11	--			8	--	19	3	
	2	5		--			--	--	5	--	
	3	1		--			--	--	1	--	

Totals: Unit 3 (%) ¹		17	68.0	--			8	32.0	25	100.0	3
		(1.2)		--			(10.0)		(1.7)		
Ent- rance 1	4	1	4	--			--	--	4	--	

Totals: Unit 4 (%) ¹		4	100.0	--			--	--	4	100.0	--
		(0.3)		--			--	--	(0.3)		
Cham- ber 1	6	--	--	--			--	--	--	2	
Cham- ber 5	7	1	10	--			--	--	10	1	
	2	14		--			--	--	14	1	
	3	125		1			--	--	126	1	
	4	59		--			--	--	59	--	
	5	89		--			--	--	89	--	
	2-5(dug together)	38		--			--	--	38	--	
	6	13		--			--	--	13	--	
	7	65		--			--	--	65	--	
	8	20		--			22 ³	--	43	--	

Totals: Unit 7 (%) ¹		433	95.0%	1	0.2%		22	4.8%	456	100.0%	3
		(31.5)		(50.0)			(61.0)		(31.3)		

Totals (%) ¹		1375	94.2%	2	0.1%		82	5.6%	1459	99.9 %	13
		(100.1)		(100.0)			(100.2)		(100.3)		
Notes:	1. Percentage of all units taken together. 2. Includes one marsupialan species 3. Twenty one specimens are from a single partial opossum skeleton.										

Table 4: Number of identified specimens (NISp) by class in the Actun Nak Beh faunal assemblage.

Abbreviations

avs – Aves	mar -- Marsupialia	sml – small
bn – bone	md – medium	sp – species (sps- plural)
cmplt – complete ("immature")	mlsc – Mollusca	unfsd – unfused
dt – distal	mml – Mammalia	v sml – very small
frg – fragment/fragmentary	MNI -- Minimum Number of Individuals	
fsd – fused ("mature")		
Inv -- Invertebrate	mol -- molar	
lg – large	NISp – Number of Identified Specimens	
lng bn – long bone	prm - premolar	
	px – proximal	

Table 4 (continued): Number of identified specimens (NISp) by class in the Actun Nak Beh faunal assemblage.

A TERMINAL CLASSIC MOLDED-CARVED VASE FROM ACTUN NAK BEH, ROARING CREEK VALLEY, CAYO DISTRICT, BELIZE

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INTRODUCTION

Previous research on Belize Molded-carved vases (Helmke 1999b, 2000a; Helmke et al 1998) has provided detailed data on the distribution, symbolism, and function of these transitional Terminal Classic to Early Postclassic vessels (ca. AD 830-1000). In particular, these vases appeared to have been utilized predominately by a select group of non-ruling elites (Helmke 1999b). The recent recovery of a Belize Molded-carved vessel during the 2000 field season of the Western Belize Regional Cave Project (WBRCP) at Actun Nak Beh in the Roaring Creek Valley provides new insight into the contextual distribution and function of these vases. Although most commonly found in association with domestic assemblages of residential structures, the Actun Nak Beh specimen was found in a ritual context, which is supported by its association with a human interment in a cave context. An overview of these contexts as well as possible socio-political associations are explored, in order to complement previous studies on Belize Molded-carved vessels, and provide clues to social interactions operative in the Roaring Creek Valley, during the Terminal Classic period (ca. AD 830-950).

SETTING AND BACKGROUND

Actun Nak Beh is a small dry cave located in the upper Roaring Creek Valley in the Cayo District of Belize (Figure 1). In relation to modern landmarks the cave is situated 13 km south of Teakettle Village, and 18 km S 30° W of Belmopan. The site was first located by archaeologists in 1996 and was subsequently explored in 1997 and 1998 (cf. Awe and Helmke 1998; Halperin et al., this volume; Mirro et al. 2000). Intensive archaeological investigations were initiated during the 2000 season in the form of exhaustive survey operations and test-pit excavations, which are reported on by Christina Halperin *et alii* in this volume.

Actun Nak Beh is connected to the medium-sized major center of Cahal Uitz Na by a 240 m long *sacbe* (Awe 1999; Awe and Helmke 1998; Conlon and Ehret 1999; Ehret and Conlon 1999; Halperin et al., this volume; Mirro et al. 2000) (Figure 2). It has been suggested that the construction of the *sacbe* between these two sites is a contemporaneous construction effort and an integral part of the site layout and configuration (Awe 1999). This

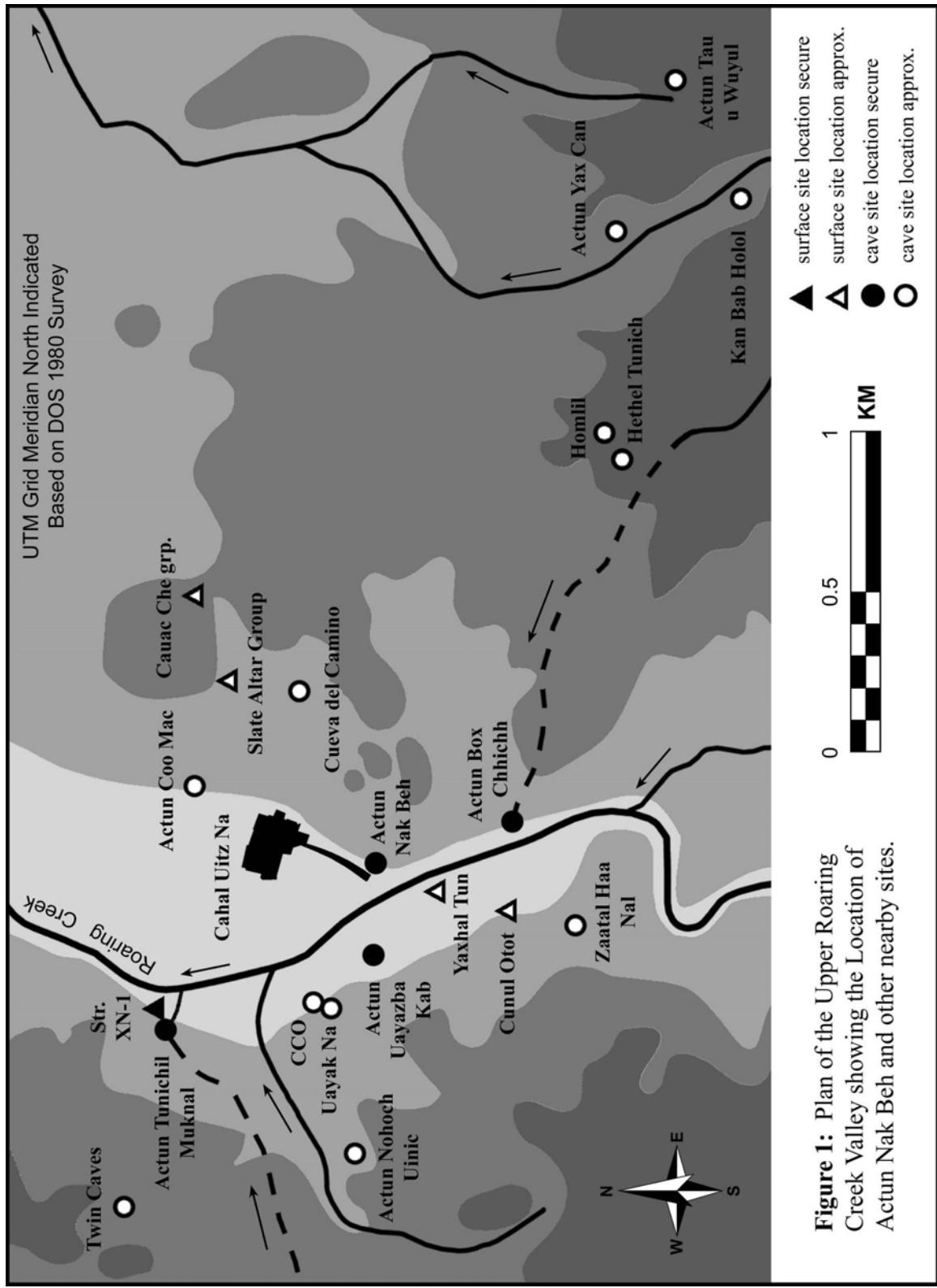


Figure 1: Plan of the Upper Roaring Creek Valley showing the Location of Actun Nak Beh and other nearby sites.

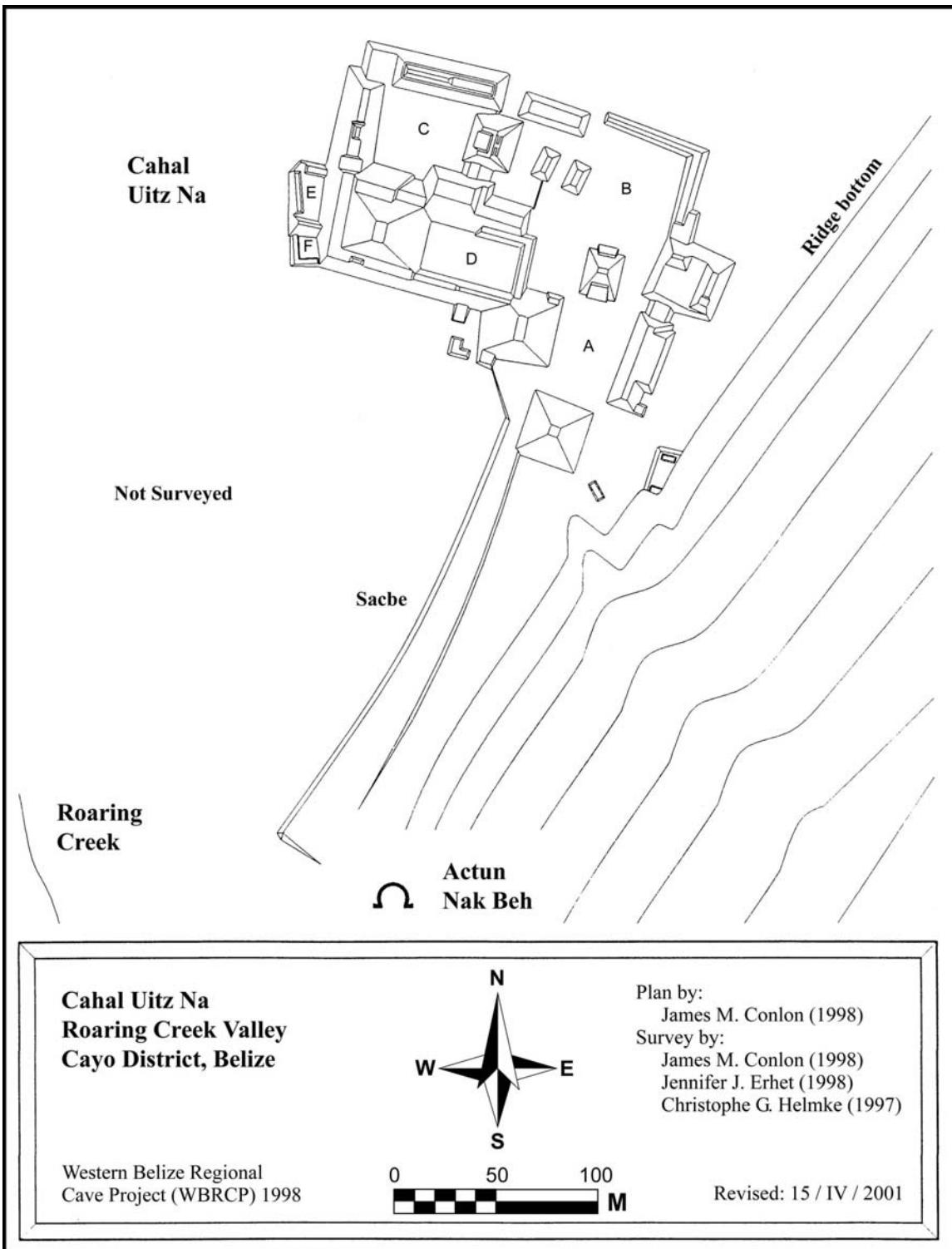


Figure 2: Plan of Cahal Uitz Na, the causeway, and Actun Nak Beh.

argument is now supported on the basis of contemporaneous ceramic units from Cahal Uitz Na, its causeway and Actun Nak Beh, that span the length of the Classic period (ca. A.D. 300-900) (Awe and Helmke 1998; Ehert and Conlon 1999; Ferguson 1999; Halperin et al., this volume). The presence of a *sacbe* between these two sites indicates that the cave functioned prominently in the ancient socio-political sphere of Cahal Uitz Na. The labor expenditure required to build a *sacbe*, as with monumental architecture in general, serves as a noticeable example of the conspicuous consumption of commoner labor by local elites (DeMarrais et al. 1996:18-19; Schwake 2000; Trigger 1990). The process of labor consumption in fact reiterates and therefore maintains the social inequality nurtured by the elite (Pauketat 2000; Trigger 1990).

The current paradigm of Maya cave usage is based on archaeological, ethnographic, ethnohistoric, iconographic and epigraphic data. This paradigm stipulates that caves serve and served as sacred points in the landscape functioning as the loci of extensive rituals and ceremonies (Awe 1998; Bassie-Sweet 1991, 1996; Brady 1989, 1997, n.d.; Brady and Ashmore 1999; Brady and Stone 1986; Pohl and Pohl 1983; Redfield and Villa Rojas 1962; Reents-Budet and MacLeod 1997; Stone 1995; Thompson 1975; Vogt 1976, 1981, 1992). Consequently, artifacts found within caves in the Maya area are interpreted as the material precipitates of ancient ritual activities. The deposition and smashing of pottery in caves, for example, are often associated with period ending or termination rituals and the votive caching of offerings (Awe 1998; Pendergast 1971:112; Thompson 1975).

The discovery of three human burials at the site of Actun Nak Beh (Halperin et al., this volume) suggests that the site served, at least in part, votive purposes. The Belize Molded-carved vessel and its association with one of these human interments may therefore be used to gauge the dynamic social processes operating at this site, albeit in a synchronic fashion. The activities conducted at Actun Nak Beh are of great interest if considered in light of how these may have served to mediate social inequality through the faceted expression of ritual and symbolic behavior. Identifying the status, age and sex of the burial's occupant as well as the latent symbolism of the accompanying votive offerings are thus pivotal to a proper assessment of the interment within its broader societal system. However, these issues are eschewed in the present report, as these interpretations would require a detailed study of each specific context. An additional impediment is the poor preservation of the human remains from the burials at Actun Nak Beh.

INTERSITE DISTRIBUTION

Unlike the majority of Belize Molded-carved vessels, the Actun Nak Beh specimen is only the sixth to date, recovered from a sub-surface site (cf. Helmke 2000a, b). Other caves in Belize that have yielded molded-carved vessels include Actun Tunichil Muknal (Helmke et al. 1998), Chanona Cave (Graham et al. 1980), Actun Chek (a.k.a. Footprint Cave) (Graham et al. 1980), Actun Lubul Ha (a.k.a. Waterfall Cave) (Graham et al. 1980; Helmke 1999a), and Actun Balam (Pendergast 1969). These caves are all located in the Cayo District: in the Roaring Creek Valley, Caves Branch Valley and the Chiquibul, respectively. In addition, a fragmentary Pabellon Molded-carved vase has been recovered from Seamay Cave in southeastern Peten, in the western foothills of the Maya Mountains (Smith 1955:Fig.

66b4). The possibility remains that additional Belize Molded-carved specimens have been discovered in caves located in the foothills of the western Maya Mountains (in the Peten), although these have not yet been the subject of publications (although cf. Laporte et al. 1993). In contrast, a survey of published sources indicates that Belize Molded-carved vessels have been recovered from at least 22 surface sites located throughout central Belize and eastern Peten (Helmke 2000a, b; Helmke and Aimers n.d.).

INTRASITE CONTEXT

Forty-five sherds of at least one Belize Molded-carved vase were uncovered in Levels 6 and 7 of Unit 1 and its extension. These excavation efforts were focused at the northwestern end of Actun Nak Beh's main entrance, and extended halfway below an overhang of the cave wall at the foot of a breakdown slope (Figure 3).

Only the broad strokes of this excavation are presented here, in this volume, as Halperin *et al* provide a detailed description of Unit 1 and its extension. The excavation unit was initiated in order to test the validity of a spatial patterning identified at other cave sites in the Roaring Creek Valley. The pattern in question was first revealed at Actun Uayazba Kab, wherein the preferential deposition of human interments along cave walls was noted (cf. Ferguson 1999b; Gibbs 2000). Unit 1, having been positioned along one of the walls of Actun Nak Beh, allowed confirmation of this bias, with the discovery of two interments (Burials 2 and 3). Exposure of these deposits prompted the initiation of an extension to the original configuration of Unit 1.

Excavation of Unit 1 revealed four principal contexts:

- The earliest context encountered is Burial 3 (at a depth of 1.05 m below modern ground surface), associated with the Tepeu 2 phase (ca. AD 700-800) (i.e. Level 9).
- Following the deposition of this interment is the construction of Floor 2, which entailed the deposition of a ca. 0.30 m thick layer of core and a 0.10 m thick layer of ballast. Ceramics contained in the core of Floor 2 are predominantly associated with the Tepeu 3 phase (ca. AD 800-900) (i.e. Levels 7 and 8).
- Subsequently, the 0.15 m thick core and 0.10 m thick ballast of Floor 1 was laid down. This second construction effort sealed Burial 2, which was partly cut into the core of Floor 2. The late facet Tepeu 3 dating of Burial 2 (ca. AD 830-950) can thus also be applied to the construction of Floor 1 (i.e. Level 6 and part of Level 5). It should also be noted, that independent dating of the same floor in Unit 2 (i.e. Level 4) yields a contemporaneous date.
- The fourth and final context includes the accumulation of 0.40 m of alluvial matrices since the construction of Floor 1 (ca. AD 900 to the present). This stratum has been affected by bioturbation and may also have been moderately disturbed by looting probes (i.e. Levels 1 through 4).

Floor 1

What is interpreted as the ballast of the highly deteriorated Floor 1 was discovered in Level 5, at an approximate depth of 0.40 m below the modern ground surface (a.k.a. MGS). This 10 cm thick layer of ballast was also discovered in Unit 2, where it was found in association with small plaster nodules. The lower part of Level 5 as well as the entirety of Level 6 is thought to represent the ballast and core of Floor 1, respectively. The core of Floor 1 can be described as a dark mixture of clayey matrix and alluvium, with carbon and small dolostone inclusions. This layer contained a mixture of Early and Late Classic ceramic sherds, a fragmentary granite *mano*, and a quartz crystal. Although highly deteriorated, the presence of a floor in the entrance of Actun Nak Beh, finds direct parallels in the discovery of such features at Actun Uayazba Kab and Actun Tunichil Muknal (Griffith 1998) as well as at the Uayak Na rockshelter (Awe et al. 1998). Based on this evidence, the practice of plastering the floors of cave entrances in the Roaring Creek Valley seems well attested.

Floor 2

Floor 2 is represented by a second layer of ballast, which in turn marks the boundary between Levels 6 and 7 (at an approximate depth of 0.65 m below MGS). The core of Floor 2 apparently includes both Levels 7 and 8, although the lower limit is difficult to ascertain. The presence of a second, earlier floor is also attested from the excavation of Unit 2. The core contained limestone rocks throughout Level 7. Deeper, in Level 8, the core consisted of limestone rocks and river pebbles. The soil constituent of the core is similar to that of Floor 1, again consisting of dark clayey matrix with small limestone and carbon inclusions. Ceramics were found throughout the core.

Capping Stones of Burial 2

The Belize Molded-carved sherds were scattered on top of and within a layer of limestone rocks, small slate fragments, and charcoal between 0.62 and 0.94 m below MGS in the southeastern portion of Unit 1 and its extension. The feature composed of these rocks, which range in size from small rocks (about 5-15 cm in diameter) to a large 0.60 m boulder, served to cap Burial 2.

Since the excavations proceeded in levels, prior to the identification of the capping stones as a partly intrusive feature into Floor 2, the molded-carved sherds were recovered as part of two separate levels. In Level 6 the concentration of limestone rocks found in the southeastern portion of the unit (below the surface of Floor 1), included a fragment of a prismatic obsidian blade, 5 jute shells (*Pachychilus* sp.), 7 Belize Molded-carved sherds, and the strap handle of an Augustine Red olla (Gifford 1976:291-293; see Graham 1987:Figs. 4j, 6a, for similar specimens). The cap of the burial continues below the surface of Floor 2, suggesting that the floor was cut to allow the deposition of Burial 2. Consequently, some of the material from the southern portion of the unit is later than that included as part of the core of Floor 2. Thirty-eight Belize Molded-carved sherds were found among the capping stones overlying the burial, as part of Level 7. At the juncture between Levels 7 and 8 was an ash lens, apparently overlying Burial 2.

Actun Nak Beh
Roaring Creek Valley
Cayo District, Belize
WBRCP 2000

Plan by: C. Helmke (2002)

C. Halperin (2000)

Survey by: D. Hodgman (2000)

C. Halperin (2000)

C. Helmke (2000)

B. Russel (1999)

unsurveyed
cliff face

Unit 4

Unit 6

Unit 3

Unit 7

Entrance 1

Unit 2

unsurveyed cliff face

Entrance 2

0 10 M

Scale 1:300

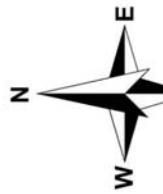


Figure 3: Plan of Actun Nak Beh.

Burial 2

The human bone fragments constituting Burial 2 were encountered at a depth of ca. 0.95 m below MGS, which represent the partial remains of one adult individual. These bones were poorly preserved, and included a thoracic vertebra and rib bones. Associated with the burial were a slate pendant and three fragmented prismatic obsidian blades (Figure 4).

Burial 3

Burial 3, which contained the disarticulated remains of two adult individuals and one juvenile, was uncovered in Level 9 at 1.05 m below MGS. Among the bones were two chert flakes, a fragment of a quartz crystal, and 7 sherds of a Benque Viejo Polychrome vase (Gifford 1976:269-272); charcoal flecks were scattered throughout. Similarly to Burial 2, the bones were poorly preserved and too brittle to recover. Due to time constraints, excavation of the unit was halted at approximately 1.25 m below MGS.

ANB00-E1-148	Unit 1, Level 6	2 sherds
ANB00-E1-245	Unit 1-ext, Level 6	2 sherds
ANB00-E1-250	Unit 1-ext, Level 6	3 sherds
ANB00-E1-125	Unit 1, Level 7	3 sherds
ANB00-E1-244	Unit 1-ext, Level 7	20 sherds
ANB00-E1-247	Unit 1-ext, Level 7	13 sherds
ANB00-E1-251	Unit 1-ext, Level 7	1 sherd
ANB00-E1-281	Unit 1-ext, Level 7	1 sherd

Table 1. Specific distribution of Belize Molded-carved sherds.

CERAMIC ASSOCIATIONS

Recognition of the four principal contexts (synthesized above), allows for a clear segregation between ceramic units. All identified diagnostic sherds are represented in Table 2, according to context. The data contained in Table 2, serves as the basis of the typological analysis presented below.

	Above Floor 1	Floor 1, Level 6, Core	Bu. 2 Cap, Level 6	Bu. 2 Cap, Level 7	Floor 2, Level 7, Core	Floor 2, Level 8, Core	Burial 3, Level 9	Baulk, Level 9?
Caban / New Town (EF)			1					
Augustine Red: Augustine Var.								
Tepeu 3 / Spanish Lookout (LF)								
Belize Molded-carved: Unsp. Var.	7	38						
Daylight Orange: Darknight Var.		1						
Roaring Creek Red: Roaring Var.	1			3				
Tinaja Red: Unsp. Var.			1					
Vaca Falls Red: Vaca Var.			1	7				
Tepeu 2 / Spanish Lookout (EF)			2					
Belize Red: Belize Var.								
Benque Viejo Polychrome: Unsp. Var.							4	3
Cayo Unslipped: Cayo Var.					2	1		
Garbutt Creek Red: Garbutt Var.	1		5	1	1			
Garbutt Creek Red: Paslow Var.	1		1	4	1			
Rubber Camp Brown: Rubber Var.			2	6	1			
Meditation Black: Meditation Var.			1	1				
Tepeu 1 / Tiger Run								
Garbutt Creek Red: Garbutt Var.				2				
Garbutt Creek Red: Paslow Var.				1				
Orange-walk Incised: O-w. Var			2	1				
Rubber Camp Brown: Rubber Var.				1				
Sotero Red-Brown: Sotero Var.				1				
Tzakol / Hermitage			1					
Pucte Brown: Unsp. Var.								

Table 2: Absolute frequency distribution of diagnostic ceramic specimens according to chronologically significant contexts.

**Actun Nak Beh, Belize
Entrance 1, Unit 1 & Ext.
Levels 6-7, Bu. 2 & Feat. 2
WBRCP 2000**

Plan: C. Helmke & C. Halperin
Survey: S. Gibbs

Unit 1-Ext.

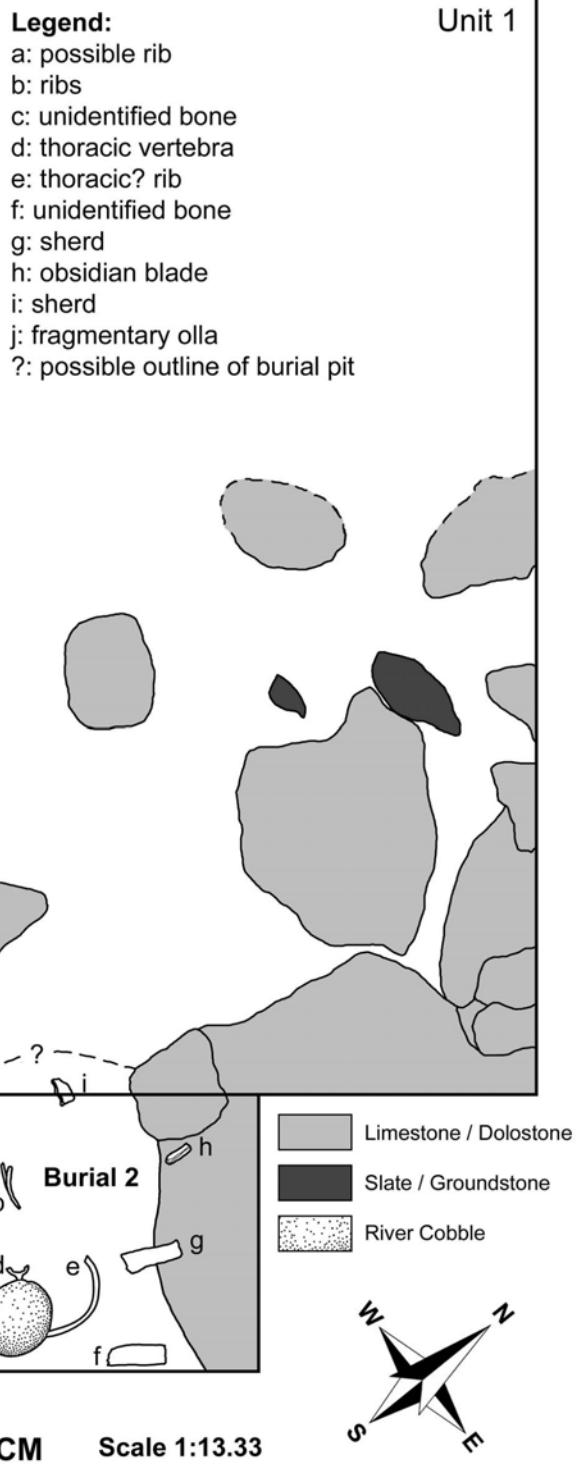


Figure 4: Plan of excavation Unit 1 and Unit 1-Ext., showing the location of Burial 2.

The dearth of diagnostic ceramics and ceramics generally, in the levels above Floor 1, is a notable and important characteristic. One might wonder if the accumulation of matrices subsequent to the construction of Floor 1 was brought about by the deposition of alluvial strata, the result of the periodic flooding of the Roaring Creek River over the course of a millennium. This observation is in keeping with observations made by James Conlon and Jennifer Erhet (1999) who point out that Cahal Uitz Na is only elevated a few meters above the Roaring Creek, and therefore might have been subject to periodic flooding. If natural taphonomic processes can be invoked for the deposition of the upper 0.40 m of matrix, this might explain the near cultural sterility of Levels 3 and 4 of Unit 1, as well as the paucity of artifacts exposed on the surface. Periodic flooding can also be invoked to account for the complete deterioration of the plaster coating of Floors 1 and 2, by means of leaching. The presence of just one Roaring Creek Red: Roaring Creek Variety sherd (Gifford 1976: 240-243) in the matrix above Floor 1, does not contribute to our understanding of the chronology of that context, particularly if one considers the bioturbation and/or looting that accounts for the presence of tin foil as far down as Levels 3 and 4.

The stratigraphy only begins to mesh with ceramics of chronological significance in Level 6. As has been summarized above, this level represents not only the core of Floor 1, but also the uppermost part of the feature capping Burial 2. Based on contextual segregation, probable 1 Augustine Red: Augustine Variety (Gifford 1976:291-293) and 7 Belize Molded-carved sherds were found in the southern part of the unit in association with the stones capping Burial 2. Based on these specimens the deposition of Burial 2 can thus be associated with the Tepeu 3 (ca. AD 830-950) phase and perhaps even the subsequent Caban phase (ca. AD 950-1200?). The construction of Floor 1 is thought to be contemporaneous as there is no evidence to suggest that it was cut through to allow for the deposition of Burial 2. All remaining sherds from this level that are not directly associated with the cap were recovered within the core of Floor 1. In this instance only three additional sherds can be associated with the core, namely two Garbutt Creek Red sherds (Gifford 1976:230-233) and an Early Classic Pucte Brown (Gifford 1976:167-168). Based on these data it seems apparent that the core of Floor 1 incorporates sherds from much earlier deposits, which might have been mined for core material. In addition, ceramic remains from Level 4 of Unit 2, which corresponds to the core of Floor 1, can also be assigned to the Tepeu 3 phase. Thus although the deposition of Burial 2 is particularly late (due to its association with New Town / Caban pottery), Floor 1 can nonetheless be anchored to the Tepeu 3 phase (ca. AD 800-900).

The ceramics recovered as part of Levels 7 and 8 represent the same situation as in the case of Level 6. This is due to the fact that the pit of Burial 2 was partially cut into the core of Floor 2. Ceramic materials associated with the capping stones, thus have a tendency to be slightly later than those, which were originally incorporated into the core of Floor 2. That Floor 2 was constructed during the Tepeu 3 phase is attested by the inclusion of 1 Tinaja Red (Level 7) (cf. Adams 1971:23; Ball 1977: 23; Gifford 1976:282-283; Sabloff 1975:158-160; Smith and Gifford 1966:163), 8 Vaca Falls Red (Gifford 1976:235-237) (Levels 7 and 8), and 3 Roaring Creek Red sherds (Level 8) (Gifford 1976:240-243) into the core of Floor 2. The core otherwise contains a wide-sweeping spread of ceramics spanning Tepeu 1 to Tepeu 3 phases (ca. AD 600-900). Again this wide chronological spectrum might

suggest that mining of earlier deposits was undertaken, so as to generate core material. The intrusive feature otherwise contains 38 Belize Molded-carved sherds and 1 Daylight Orange: Darknight Variety sherd (Gifford 1976:301-302), a type, which has been variously assigned to the Terminal Classic and/or Early Postclassic (Jim Aimers pers. comm. 1998; LeCount 2000). The trend of the ceramics associated with the Burial 2 cap to include Early Postclassic specimens is suggestive, and might indicate that Belize Molded-carved vases continued to be used into the Postclassic (Helmke 2000a, b). Conversely, one might stipulate that types thought to be restricted to the Postclassic, in fact have antecedents in the Terminal Classic. In either case, the overlap between both ceramic complexes is in evidence, and suggests that a more fluid definition of the Terminal Classic to Early Postclassic transition must be sought.

Underlying and preceding the construction of Floor 2, is Burial 3. Associated with this burial are 7 Benque Viejo Polychrome sherds, all of which apparently derive from the same vase (Gifford 1976:269-272). This feature alone indicates that Burial 3 was deposited during the Tepeu 2 phase (ca. AD 700-800), since polychrome surface treatment declines notably during the subsequent Tepeu 3 (cf. Gifford 1965, 1976; LeCount 1992, 1996, 2000). In addition, all other diagnostic ceramics contained in Level 9 are also restricted to the Tepeu 2 phase. This dating thus allows assignation of the lower ceiling for the construction of Floor 2 to ca. AD 800.

In passing it should be noted that Belize Molded-carved vessels are frequently found in association with Roaring Creek Red dishes (Helmke 2000a, b). Although no Roaring Creek Red dishes were recovered in direct association with the Burial 2 capping stones, a Daylight Orange: Darknight Variety dish sherd was recovered. The latter type is identical to the Roaring Creek Red dishes in form. They differ predominantly in their surface treatment: the Roaring Creek Red dishes are usually slipped red or orange while the Daylight Orange: Darknight Variety dishes possess an orange slip with decorative fireclouding. It is possible that they could replace the Roaring Creek types if form is indicative of function, and if the latter was the primary reason for their contextual associations.

An interesting trend noted by Halperin *et al.* is the reversal of a spatio-temporal pattern usually observed in the Roaring Creek Valley at Actun Nak Beh. In this case, the caves' interior was used predominantly during the Early Classic, and the exterior predominantly during the Late Classic, an almost direct reversal of the pattern observed at other sites (cf. Awe 1998). One might wonder if Early Classic deposits in the entrance are located deep below the Late Classic ones excavated during the 2000 season. If such putative Early Classic deposits were discovered in the entrance to Actun Nak Beh, then the spatio-temporal pattern might only represent a difference in emphasis rather than complete reversal. In addition, detection of such deposits would allow for the reconstruction of a longer sub-regional seriation, although admittedly shorter than that represented at Actun Yaxteel Ahau, which spans from the Middle Preclassic to the Middle Postclassic (ca. 300 BC-AD 1200) (cf. Awe and Helmke 2000; Mirro 2000; Mirro and Halperin 2000).

MORTUARY CONTEXT

In this section emphasis is placed on the mortuary context of molded-carved vessels. As has been noted elsewhere (Helmke 1999b) mortuary associations of the molded-carved vases are few in comparison to the other types of contexts which yield this type of pottery. In addition, it has also been suggested (Helmke 1999b) that Belize Molded-carved specimens occur far more infrequently in grave contexts than do the vessels of the analogous Pabellon Molded-carved type. The discovery of Belize Molded-carved vases at Actun Nak Beh and Pook's Hill, during the 2000 season of investigations (cf. Halperin et al., this volume; Helmke et al., this volume) are slowly changing this interpretation. Based on these recent data it can be suggested that molded-carved vases regardless of specific type, occur in burial contexts with roughly equal frequency. Nonetheless, it should be emphasized that funerary molded-carved vases generally represent a small and specific contextual sub-set.

Apart from the Actun Nak Beh specimen, Belize Molded-carved vases have also been found in funerary contexts in Structure 4A at the Pook's Hill plazuela (Burial 3) (Helmke et al., this volume), in Str. NW 42 at Pacbitun (Bu. 1 & 2) (Cambell-Trithart 1990: 215-217, 303, 376; Helmke 2000c:9-10, Figs. 6-9) and in Str. A8 at San José (Bu. A9) (Thompson 1939:145-146, 197, Fig. 83a). In addition, Pabellon Molded-carved vases have also been found in Str. A-41 (Bu. 1) and Str. C-24 (Bu. 31) at Seibal (Sabloff 1973:198; Tourtellot 1990:87-88, 100), in Str. 5D-22 at Tikal (Bu. 201) (Culbert 1993:Fig. c1; Coe 1990: 399-400, 405-406, Figs. 114, 115d), in Str. IV at Becan (Bu. 69-1) (Ball 1977:149) and in Str. AV at Uaxactun (Bu. A41) (A. Smith 1950:98, Figs. 69:3, 131c; R. Smith 1955:95, Tab. 7, Figs. 10s-t). Although this short inventory is far from exhaustive it provides the basis for comparison of similarities and differences in mortuary differentiation.

Due to the small size of the sample listed above, it is not possible at present to offer interpretations based on statistical correlations. Nonetheless, general qualitative attributes have been identified, which may serve as the basis for models to be tested by a larger sample population. A larger sample may be generated by a thorough and exhaustive review of the literature as well as through continued excavation. Amongst the general trends noted are the following:

- Typically each mortuary context only contains one molded-carved vase.
- There is a tendency for domestic context burials to be those of multiple individuals (i.e. between 2 and 3), typically including one male and one female individual, both of whom are adults or old adults.
- Conversely, the more public setting burials tend to be those of young females (or individuals of unidentified sex). These burials are typically located on the primary axis of large temple or administrative structures. These structures apparently had undergone partial deterioration prior to the deposition of such interments. The deposition entailed cutting into the terminal phase of these structures at the summit
- The public context burials tend to contain higher numbers of ceramic vessels.

DISCUSSION OF CONTEXT AND SETTING

Cave Context of Molded-carved Vases

Although the relative frequency of troglophilic molded-carved vessels is low in relation to the overall sample population (ca. 13 %), their repeated discovery in cave sites may suggest that these represent a discrete and specialized type of deposit. Thus in light of the predominance of domestic contexts wherein molded-carved vessels are recovered at surface sites, an attributed secondary function must be invoked to justify their introduction into the societal system ultimately responsible for their deposition. One might thus draw from this inference that these specimens are the precipitates of specific ritual activities, conducted in cave settings.

Conversely, it should be cautioned that the specific cave contexts of these vessels are considerably heterogeneous (as compared to surface contexts). The Tunichil and Chek vases were found on ledges and associated with monuments (Graham et al. 1980; Helmke et al. 1998), the Chanona vase was discovered amidst breakdown (Graham et al. 1980), the Lubul Ha vase was recovered from a surface scatter at the cave's entrance (Ian Anderson pers. comm. 1998), the Balam vase was uncovered in a large midden-like deposit (Pendergast 1969), and finally the Nak Beh vase was excavated from a human interment. The specific cave contexts may therefore be more revealing as to the specific activities accounting for the deposition of molded-carved vases rather than presence of such specimens alone. This heterogeneity could thus be used to go as far as to suggest that the presence of molded-carved vases at cave sites is nothing more than the product of cave usage in the Terminal Classic and the Early Postclassic transition.

Socio-political Context of the Actun Nak Beh Molded-carved Vase

The Actun Nak Beh molded-carved vase appears to have been deposited within a relatively public, ceremonial context. Central to this argument is the presence of a 240 m *sacbe* leading to the cave site, and the deposition of the vase in a partly open, public area of the cave. *Sacbeob* have been recognized as architectural features funneling, directing, leading and guiding the movement of peoples through space (Ashmore 1981, 1989, 1991, 1992; Schwake 2000). The construction of the *sacbe* may therefore be understood as a deliberate effort to direct the procession of peoples between two points. In this case, the *sacbe* connects the largest plaza of Cahal Uitz Na to the cave of Nak Beh. Plazas in general are understood as the setting for public gatherings during multiple events and commemorations. The presence of the *sacbe* thus suggests that its construction was designed to guide such large congregations to the cave.

Ceramic dating indicates that the *sacbe* was most likely constructed during the 7th century or later. Due to the low number of ceramics and even fewer diagnostic ceramics recovered from the causeway excavations, this assessment is preliminary in nature. Only four ceramic specimens have been identified to date: an Actuncan Orange Polychrome: Actuncan Variety (Gifford 1976:170-173), a possible Dos Arroyos (Gifford 1976:173-179), a

flanged dish diagnostic of the Tzakol phase, and a Mountain Pine Red: Old Jim Variety dish (Gifford 1976:193-195). Thus, the latest sherd identified is a Tepeu 1 phase sherd (ca. AD 600-700), indicating that initial construction took place sometime after AD 600.

Based upon the chronological data recovered from the *sacbe* and cave site excavations, it appears that the major use of the cave exterior, which includes the deposition of two burials and architectural refurbishment, ensued the construction of the *sacbe*. One may thus be tempted to conclude that the cave entrance was the focus of usage once the cave had been drawn into the direct architectural sphere of Cahal Uitz Na. This suggests an emphasis on the more visible and putative public aspect of cave-related activities. In stark contrast, the interior of the cave appears to have been used most intensively during the period preceding the construction of the *sacbe*. Thus private activities may have been favored prior to the incorporation of the cave into the Cahal Uitz Na sphere.

Public activities conducted at Actun Nak Beh's main entrance during the Late Classic period denote participation by both commoner and elite social segments. As noted earlier, the construction of the *sacbe* signifies extensive group-based labor, most likely involving commoner participation with local elite sponsorship or organization. In addition, the *sacbe*'s presence serves to legitimize elite authority and demonstrates a direct connection with, if not control over, the cave site by elites. Participation by commoners may have included witnessing and veneration of the interments. Material correlates of public ceremonies would have possessed symbolic meaning that was legible by commoner and elite alike. The molded-carved vase, in particular, as an object generally associated with the non-ruling elite, was quite possibly a medium through which specific group exclusion or cohesion was communicated (cf. Helmke 1999b).

CONCLUSION

Deposition of Belize molded-carved sherds at Actun Nak Beh and in other cave and mortuary contexts in Central Belize attest to their secondary, ritual function. Most Belize molded-carved vessels are associated with domestic assemblages, related to residential structures. The Actun Nak Beh specimens, in conjunction with a growing body of data, indicate that they fulfilled significant ritual purposes as well. Found in the form of small sherds scattered among the capstones of a burial, this vase most likely functioned as a votive offering related to the interment. The analysis of molded-carved vases from mortuary contexts have the potential to reveal detailed information concerning horizontal social relations by looking at the vessel's PSS titles or names. Due to the poor preservation of the osteological material as well as the recovery of only parts of the vessel, however, such information could not be recovered.

It is apparent from contextual evidence that Belize Molded-carved vases were utilized by a specific social segment of society. The discovery of a molded-carved vase at Actun Nak Beh supports the notion that these vessels were used by high-ranking individuals through its association with a cave site that had direct connections with the ceremonial and administrative core of Cahal Uitz Na. In turn, the vase's association with a non-ruling elite group alludes to social and political power struggles within the Cahal Uitz Na polity during

the Terminal Classic period (ca. AD 830-950). The cave entrance, as an arena for public ceremonial activity, would have been a prime location for the negotiation and demonstration of social and political authority. The control of ritual or ritual space reinforces social inequalities and the access to power within the community. A non-ruling elite interment at the site, as the presence of the Actun Nak Beh molded-carved vase suggests, attests to the manipulation of public ritual and the increasing status of this segment of society during the Terminal Classic period.

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APPENDIX: TYPE DESCRIPTION OF THE ACTUN NAK BEH SPECIMEN

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Provenience: Actun Nak Beh, Entrance 1, Unit 1 and Unit 1-ext., Levels 6 and 7.

Reference: Halperin et al., this volume.

Type: Belize Molded-carved. (Type not formally established, but refer to Awe 1985; Chase 1994; Graham 1987; Graham et al. 1980; Helmke and Aimers n.d.; Helmke et al. 1998; Helmke 1999a, b; 2000a, b)

Variety: Not Identified.

Group: Unspecified.

Ware: Pine Ridge Carbonate.

Complex: Spanish Lookout (late facet).

Sphere: Tepeu 3-Eznab.

Dating: Terminal Classic (ca. AD 830-950) or slightly later.

Specimens: 45 sherds, apparently derived from one vase.

Illustration: Figures 5 and 6.

Form: Too fragmentary to comment. Apparently cylindrical or barrel-shaped vase. Absence of basal fragments disables identification of pedestal base or tripod oven supports.

Size: Reconstructed height of PSS glyph band is ca. 2.50 cm. Mean height of medial molding is 0.31 cm (n=5). Note that in this instance the medial molding is only represented by a central ridge. Mean height of the central ridge of miscellaneous other moldings is 0.48 cm (n=6) (this includes both superior and inferior moldings). Mean thickness is 0.58 cm (n=27) with a range between 0.40 and 0.80 cm. Relief ranges between 0.10 and 0.20 cm. No additional measurements were obtainable.

Surface:

Exterior: Details of gouging and incising range from pristine to moderately weathered. All foreground exterior surfaces are still covered in slip. The slip is soft, easily scratched with a fingernail and feels almost waxy to the touch. Execution of the incised details of the iconographic program and PSS is next to identical to that of the Tunichil Muknal vase and that of the Lubul Ha vase (cf. Helmke et al. 1998; Helmke 1999a). These attributes may suggest local production.

Interior: No apparent erosive damage to the unslipped interior. Very faint horizontal drag marks are present, possibly brought about during the smoothing of the interior. The interior is hard and difficult to scratch with fingernail.

Paste: Hard and oxidized throughout. A thin tan band along the interior wall suggests lesser oxidation (might the vase have been fired upside-down?). Clay matrix is very fine textured and color is otherwise homogeneous.

Temper: Sole tempering agent identified consists of minute calcite dust, which appears as flecks in cross-sections.

Color: Slip of exterior is dark orange; paste core is red-orange, unslipped interior is tan. Presence of orange rather than deep red slip might be an attribute with chronological significance (Graham 1987).

Decoration:

Iconography: The iconographic program represented is difficult to ascertain on the basis of the fragmentary state of the vases' decorative panels. The largest preserved sherds represent part of headdress and part of the chest and necklace of a main figure, neither finding direct parallels to the programs represented on the so-called 'Caves Branch' Iconographic Scenes (cf. Graham et al. 1980; Pendergast 1982, 1990; Helmke 1999b, 2000a, b). Very similar headdresses are, however, represented on the nearly complete Molded-carved vase recovered in association with Structure 2A at Pook's Hill (Helmke et al., this volume). The iconographic program represented on that vase shares broad similarities with the scenes typically represented on Sahcaba Molded-carved vases (cf. Thompson 1939; Smith 1995: Fig. 44 m; Fig. 86i, m, o; Kerr 1991: K5009, Kerr 2000: K6560).

All additional sherds represent either portions of the moldings, or parts of the feathers of headdresses. These features are too commonplace and are thus not diagnostic of specific iconographic programs.

Epigraphy: In all, portions of at least 7 as many as 11 collocations are represented on 6 sherds. The viability of the collocations is low, verging on pseudoglyphic renditions. Nonetheless, based on comparisons to viable parallel clauses of molded-carved PSSes, identifications of the graphemes or collocations can be suggested. Proceeding along the reconstructed reading order, glyph blocks pB1, pC1, pD1, pN1 and pO1 have been reconstructed on the basis of comparisons to the Actun Tunichil Muknal PSS (cf. Helmke et al. 1998).

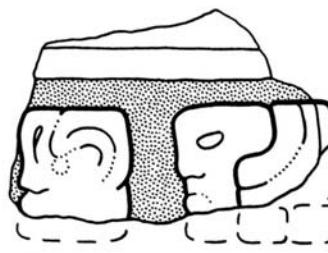
The most readily identifiable glyptic grapheme is a T18 subfix (Thompson 1962:445). Form and placement suggest that this grapheme is likely part of the collocation with 'Cimi' or T736c (Thompson 1962:455) as its main sign, which represents an allograph of the Step/God N segment of painted PSSes (cf. MacLeod & Reents-Budet 1994). The T736c allograph is a common feature of the molded-carved PSS and occurs as part of the Ucanal, Tunichil and Lamanai type PSSes. The typical allograph on the Belize Molded-carved vases is composed of the 'Cimi' main sign, with otherwise identical affixes (written as T15.736c:18). Although the 'Step' collocation has now been read on the basis of phonetic renditions in parallel clauses as *t'ab'-[aa]ly* (i.e. "ascend / lift" or more broadly "begin") (Stuart 1998: 409-417 *passim*; Houston et al. 2000:333, Fig. 5c; cf. Grube and Wagner 1996, cited in Schele 2000:51), it is still unclear if the 'God N' and 'Cimi' allographs also represent direct phonetic equivalence. Outside of the PSS the T736c sign has been assigned the logographic value of *kimi* (i.e. "death") (Grube & Nahm 1991, cited in Schele 2000:41). More recently, a full phonetic reading of the T15.736c:18 allograph in PSS contexts has been offered, yielding *chamiy(i)* (i.e. "was dappled") (Zender 1998). These collocations occur in the introductory section at the second position in the PSS, thereby allowing a reconstruction of the position as glyph block pB1.

The two most weathered collocations appear to represent the otherwise rare glyptic pair, *yuxul najal* (i.e. “the carving is finished”). In this instance only the head of the bat (T756; Thompson 1962:455) and the female head (T1000; Thompson 1962:457) are discernable, with the **ja** (T181; Thompson 1962: 448) grapheme being only faintly visible.

Based on these identifications the PSS may be of the Tunichil or Ucanal type, although distinct nominal collocations would be necessary to decisively identify the PSS type. Nonetheless, the principal surviving nominal collocation may also be represented on a molded-carved specimen recovered from the site of Tzimin Kaax (a.k.a. Mountain Cow), by excavations conducted by Dr. Healy in the late 1970ies (Christophe Helmke notes). This suggests the existence of yet another variant of the Belize Molded-carved PSS.

Comments: Most sherds are quite small. The vase is highly fragmentary.

Actun Nak Beh, Belize
Ent. 1, Unit 1, Bu. 2, Lvl 6-7
Belize Molded-carved sherds
WBRCP 2000
Drawing: C. Helmke



ANB-148
t: 0.5 cm
r: 0.2 cm



ANB 148
t: 0.6 cm
r: 0.2 cm



ANB-244
t: 0.6 cm
r: 0.2 cm



ANB-244
t: 0.6 cm
r: 0.1 cm



ANB-244
t: 0.6 cm
r: 0.1 cm



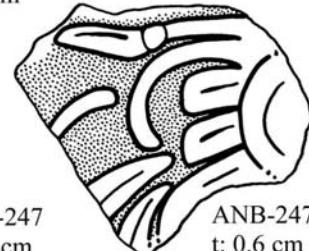
ANB-244
t: 0.5 cm
r: 0.2 cm



ANB-244
t: 0.6 cm
r: 0.1 cm



ANB-247
t: 0.6 cm
r: 0.1 cm



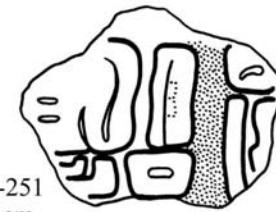
ANB-247
t: 0.6 cm
r: 0.1 cm



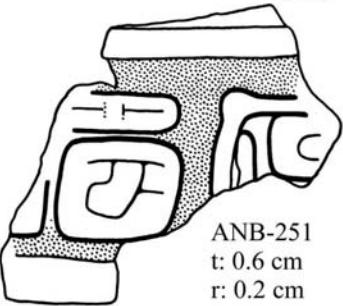
ANB-247
t: 0.5 cm
r: 0.1 cm



ANB-250
t: 0.4 cm
r: 0.1 cm



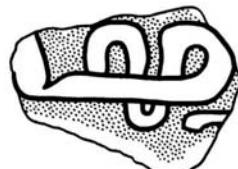
ANB-251
t: 0.5 cm
r: 0.2 cm



ANB-251
t: 0.6 cm
r: 0.2 cm



ANB-281
t: 0.7 cm
r: 0.1 cm



ANB-281
t: 0.6 cm
r: 0.2 cm



Figure 5: Drawings of all sherds bearing iconographic or epigraphic attributes.

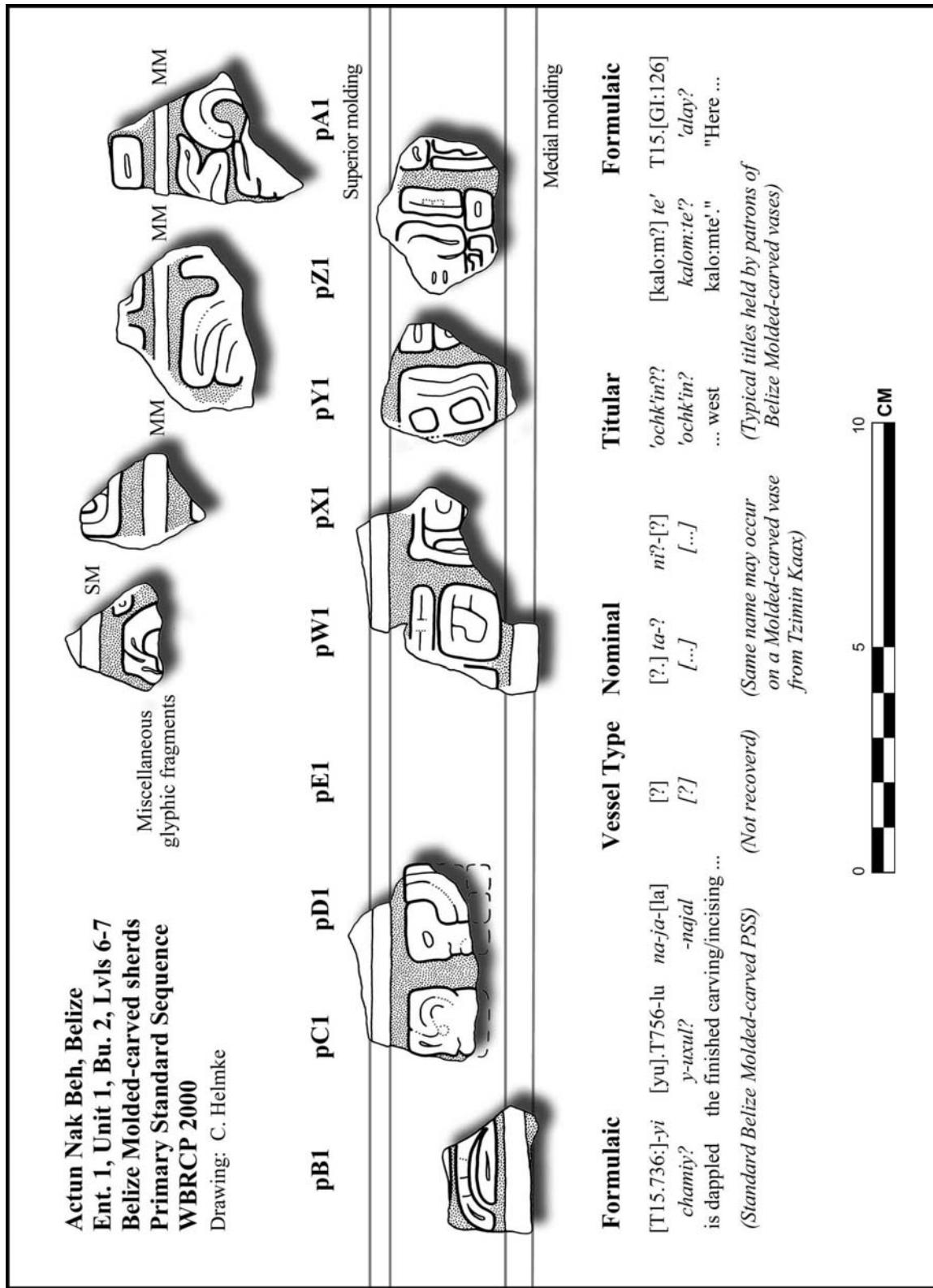


Figure 6: Reconstructed Primary Standard Sequence of the Actun Nak Beh vase.

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ASSESSMENT OF THE ARCHAEOLOGICAL POTENTIAL OF TUNICHIL CREEK, ROARING CREEK VALLEY, CAYO DISTRICT, BELIZE

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INTRODUCTION

During the month of June 2000, the Western Belize Regional Cave Project conducted an assessment of the archaeological potential of the creek that flows through Actun Tunichil Muknal. The focus of the investigation was to determine, through the use of SCUBA, whether artifacts that may have at one point been at the entrance to the cave, have, in fact, washed down into the pools that flow from the cave. Investigations were also carried out in the Stelae Chamber of Actun Tunichil Muknal, an area where high concentrations of artifacts have been discovered in previous years (Awe et al. 1997a, b; Helmke et al. 1998; Moyes and Awe 1998). Underwater investigations were conducted in this area to determine whether artifacts would also be present in the pool below the ledge. Surface collections were carried out in all pools that were investigated, and a total of three units were placed in areas of the cave and creek that were believed to be areas where concentrations of artifacts would be found. The following paper is a report of these investigations.

LOCATION AND DESCRIPTION OF THE CREEK

Tunichil Creek is a small tributary of the Roaring Creek River in the Cayo District. The Roaring Creek flows northward from its point of origin at the Thousand Foot Falls (also known as Hidden Valley Falls) and is itself a tributary of the Belize River. Both rivers converge near the modern settlement of Roaring Creek, which lies 2 km northwest of Belmopan. Many small tributaries that develop from the runoff of the Mountain Pine Ridge to the south feed the Roaring Creek River. Most of these tributaries are resurgences of streams that flow through and form caves in the karstic terrain (cf. Marochov and Williams 1989, 1991; Miller 1989, 1990). Tunichil Creek is the stream that flows from west to east through the 4 km long cave system known as Actun Tunichil Muknal (i.e. Stone Sepulcher Cave). Once it exits the cave, the creek continues to flow in a northeasterly direction until it meets the Roaring Creek River, 132 m from the downstream entrance to the cave (Figure 1).

Actun Tunichil Muknal (Figure 1) was extensively used as a focus of ritual activities by the ancient Maya during the Classic Period (ca. A.D. 250-950). Evidence of these ancient rituals is represented by hundreds of ceramic vessels, 14 skeletons, and slate monuments discovered within the cave (Awe 1998; Awe et al. 1997a, b; Gibbs 1997, 1998; Griffith 1998; Helmke 2000; Moyes and Awe 1998). Initially, the cave was explored by cavers of the Belize Speleological

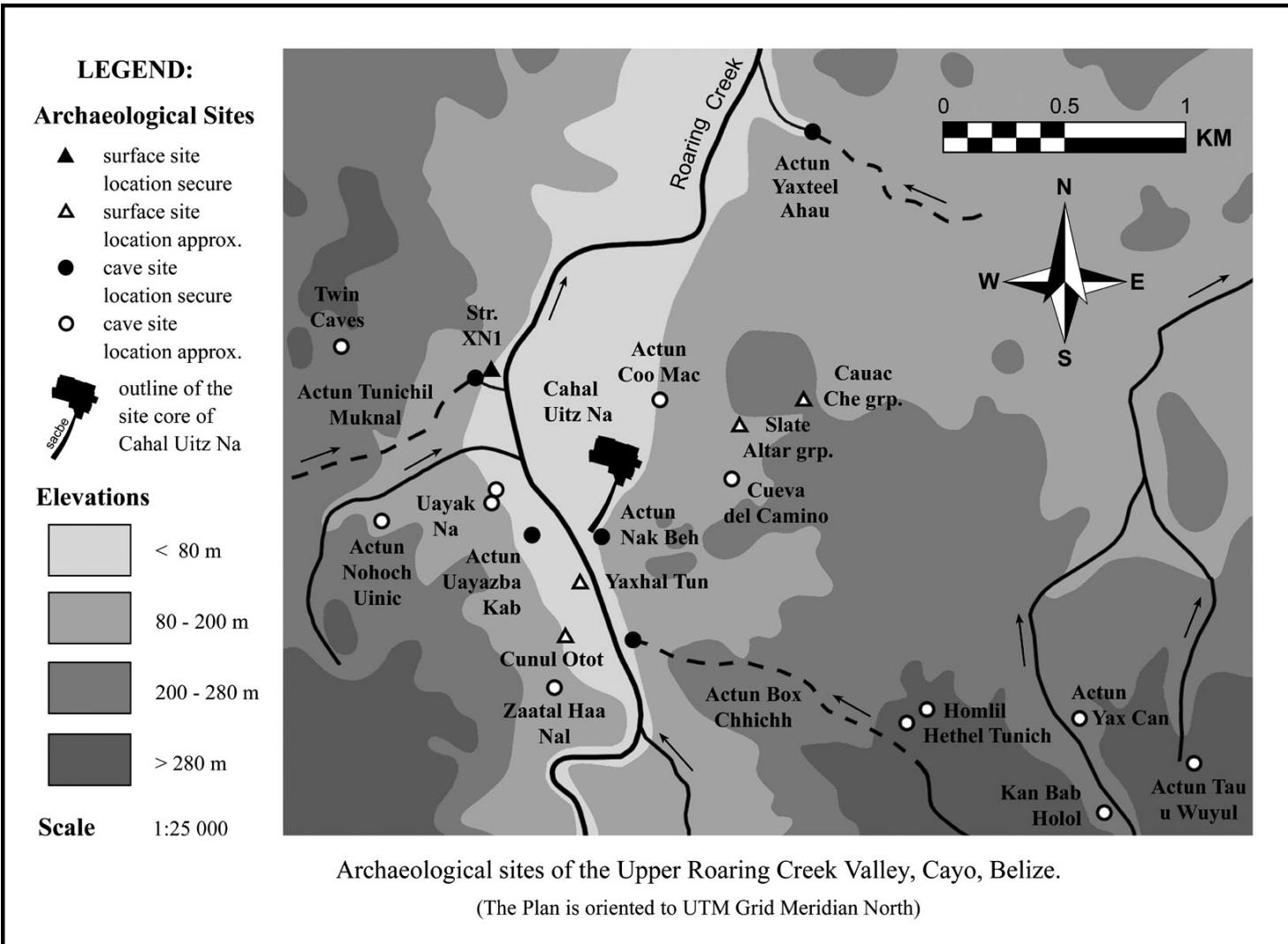


Figure 1: Map of the Upper Roaring Creek Valley showing the location of Actun Tunichil Muknal.

Expedition from Queen Mary College, London (Marochov and Williams 1989, 1991) and by geomorphologist Dr. Thomas Miller (1989, 1990). In 1993, archaeologist Dr. Jaime Awe brought the cave to the attention of the National Geographic Society. Subsequently, this cave was featured in a documentary filmed by National Geographic Explorer on caves in Belize entitled “Journey Through the Underworld” (Awe 1998a; Awe et al. 1997a, b). Since 1996, the cave has been the site of intensive archaeological excavations carried out by the Western Belize Regional Cave Project (hereafter WBRCP) under the direction of Dr. Jaime Awe, of the Belize Department of Archaeology.

Located approximately 400 meters from the entrance of the cave is a ledge on the northern side of the Tunichil stream that rises approximately 10 meters above the level of a large pool. Known as the Stelae Chamber (Figure 2), the ledge contained two slate monuments, several ceramic vessels, two obsidian blades and a small incised slate tablet (Awe et al. 1997a, b). Given the presence of the cultural remains on the ledge, it was believed that additional artifacts could be present in the stream immediately below the ledge. Consequently, the pool at the foot of the ledge is an area that was excavated in hopes of retrieving cultural remains.

Another large pool (Pool 1) is located at the eastern entrance of Actun Tunichil Muknal (Figure 3). Because the areas immediately inside and outside the cave flood annually, no artifacts are immediately visible. However, based on the presence of artifacts in the entrances to many other caves in the Roaring Creek Valley, it was believed that there could also be artifacts in the water at the entrance of Tunichil Muknal.

As the creek exits the cave, it runs over a bedrock outcrop forming a short waterfall that feeds a shallow pool (Pool 2; Figures 3 and 4). This pool and the remainder of the course of the creek outside the cave are lined with sandy alluvium. Beyond this pool is another deeper pool (Pool 3; Figures 3 and 4). Within Pool 3, a large sandbank has accumulated on the southern side. The bottoms of both of these pools are coated with forest debris and foliage.

Pools 2 and 3 are used for laundry and bathing by the WBRCP. As a result of this intensive presence, a fragmentary ceramic *olla* (jar) rim was found in the bottom of Pool 3 in 1997, a specimen tentatively identified as Zibal Unslipped (Gifford 1976:222-225; Christophe Helmke, personal communication 1999). Hydrological studies state that fluvial activity causes the deposition of large materials near the source, while the smallest clay-sized particles occur farthest from the source. Consequently, it can be suggested that this artifact represents part of an *olla* that was deposited near the entrance of the cave, due to the relatively large sherd which had only been moderately affected by the abrasion of waterborne materials (cf. Schiffer 1987:275, 277). Unfortunately, the specific activity responsible for the deposition of the Zibal specimen cannot be identified. Two salient yet disparate possibilities exist to account for the Zibal *olla*: usage of the creek as a source of potable water (thus accidental deposition of the *olla*) or usage of the creek as a place of worship (thus deliberate votive deposition of the *olla* and perishable contents).

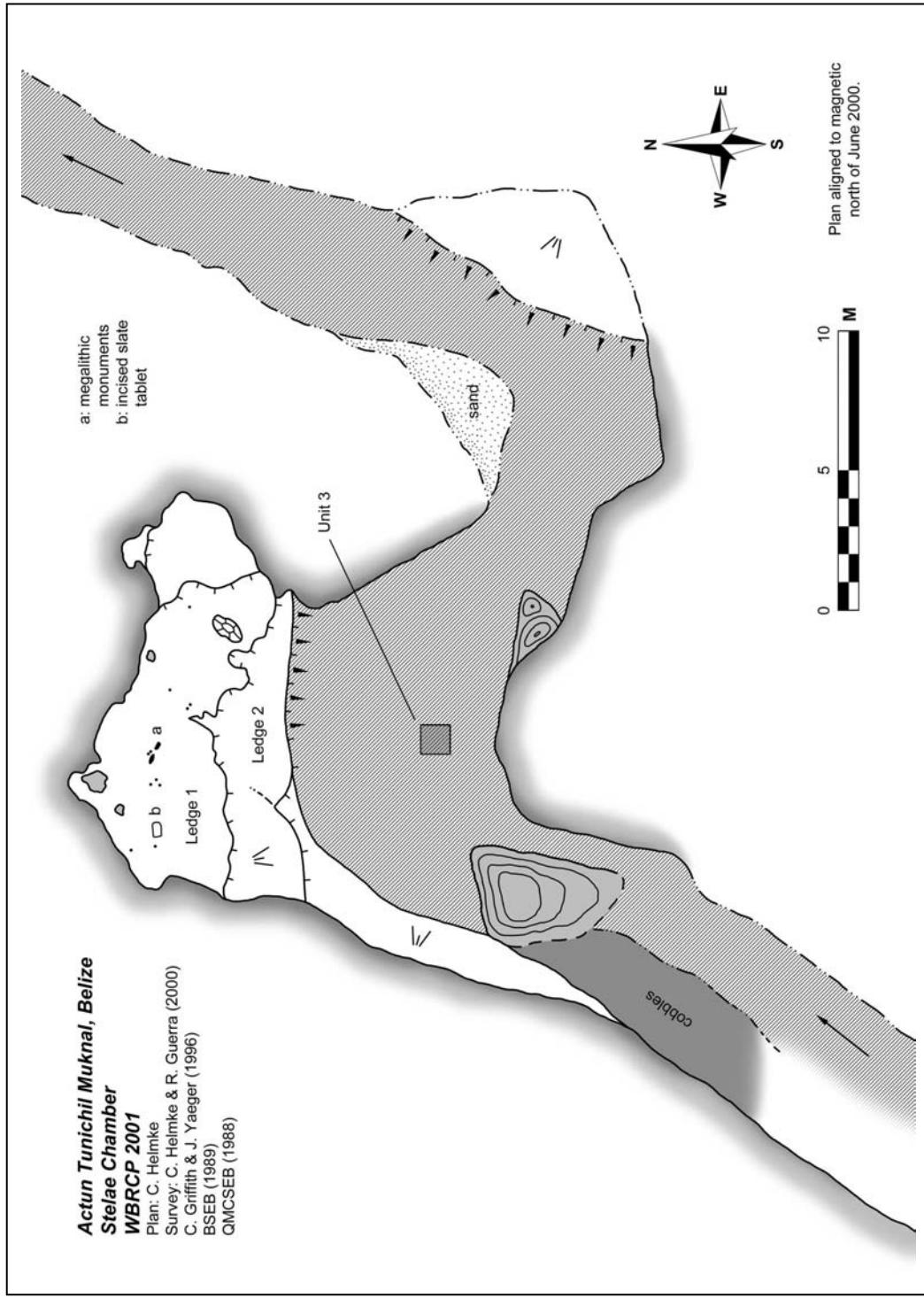


Figure 2: Map of the Stelae Chamber of Actun Tunichil Muknal showing the placement of the SCUBA excavation unit.

Tunichil Creek, Belize
WBRCP 2001
 Plan: C. Helmke & M. Bassendale
 Survey: C. Helmke & R. Guerra (2000)
 J. Conlon & J. Erhart (1998-1999)

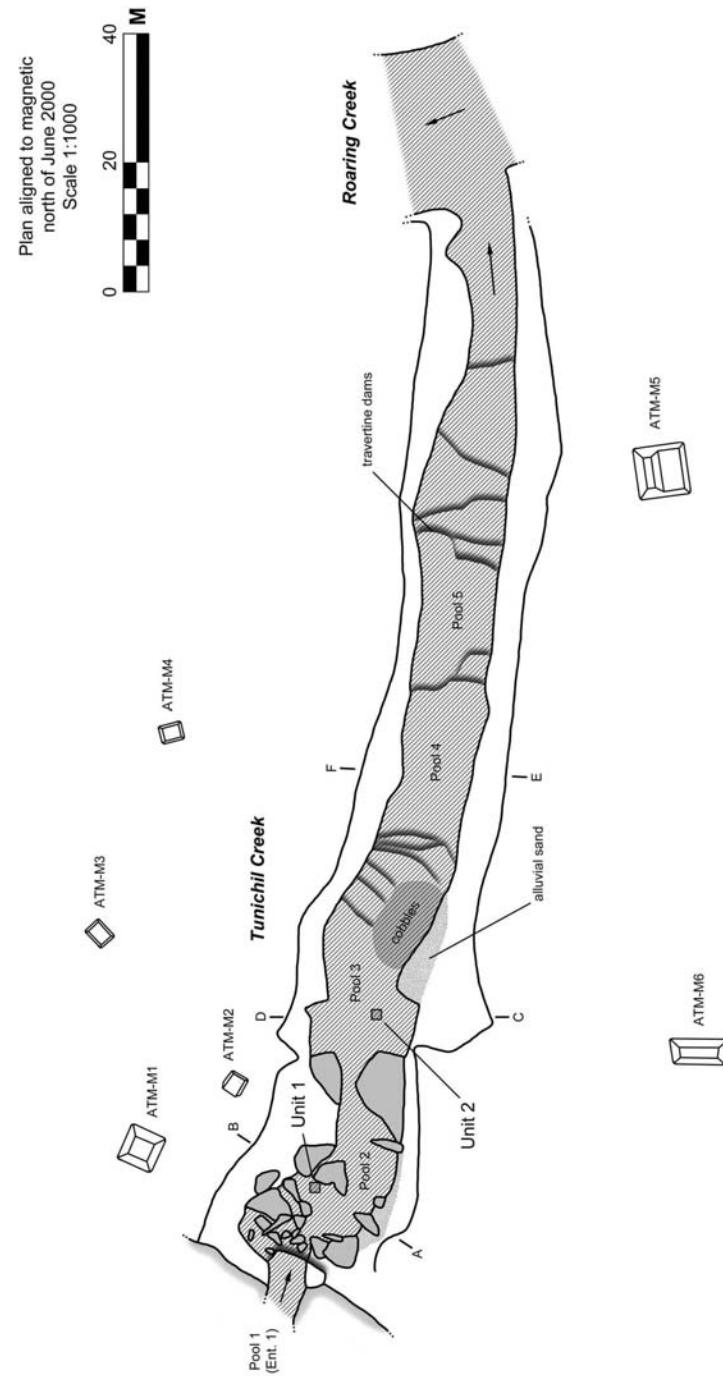


Figure 3: Map of Tunichil Creek showing the placement of the SCUBA excavation units. Note the principal entrance to Actun Tunichil Muknal to the left (marked as Ent. 1 and Pool 1).

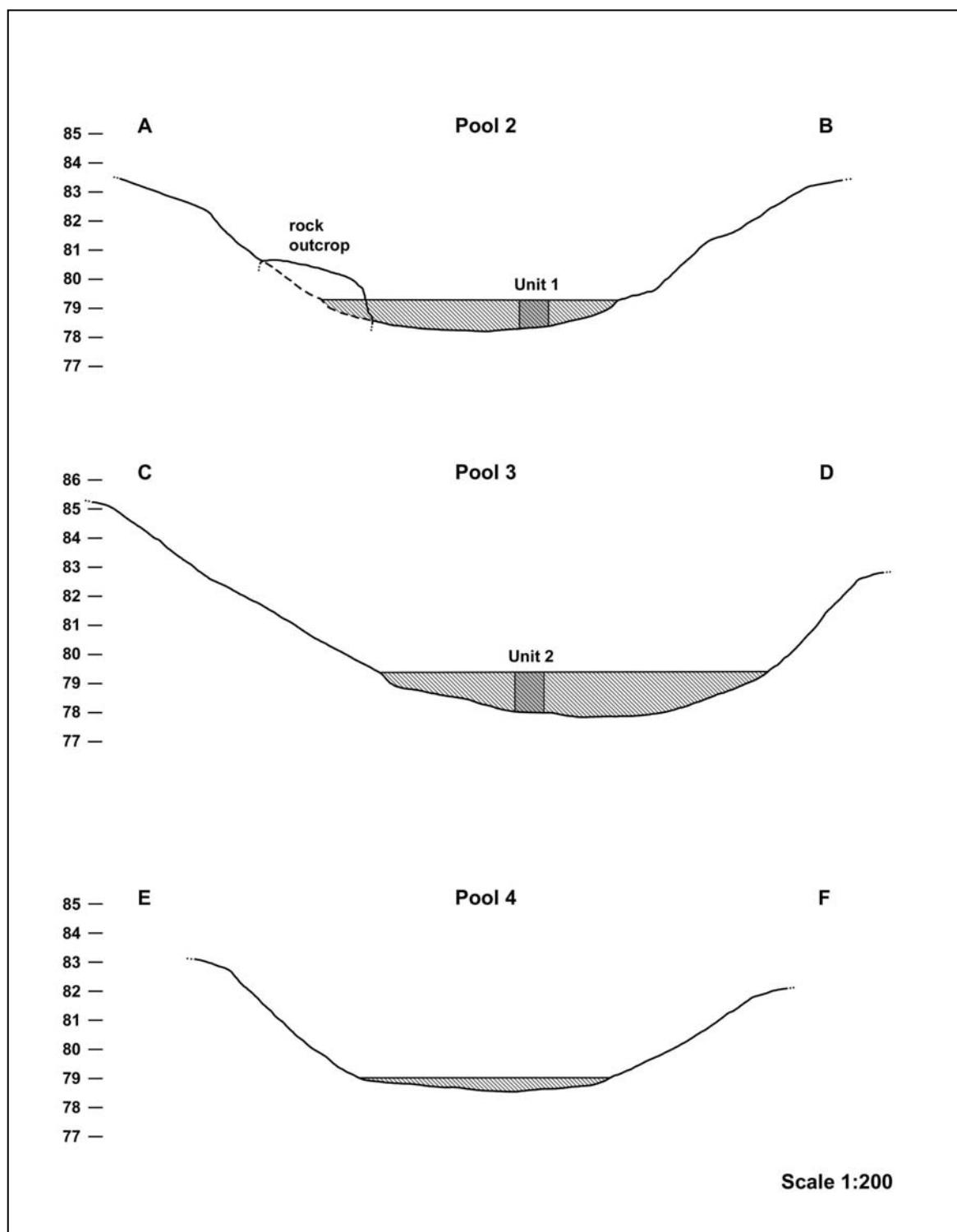


Figure 4: Transversal cross-sections of Tunichil Creek showing areas investigated by SCUBA excavations (Pools 2 and 3). Elevations are in meters in relation to datum TCK1 (80 m AMSL – assumed).

BACKGROUND

Investigations at numerous cave sites in the Roaring Creek Valley and other areas within Belize have revealed that some of the largest quantities of archaeological material occur at the entrances of caves (e.g. Awe 1998a; Griffith 1998). Furthermore, ethnographic research in the Maya area has documented that descendants of the ancient Maya still use caves as important pilgrimage sites (Brady 1989; Schuster 1997). Models have consequently been formulated based on ethnographic analogy to account for the distribution of artifacts within caves (e.g. Stone 1997). These suggest that artifacts cluster at important stops in the ritual processions. These stops are dictated by important geomorphic features of caves and include the entrance to caves, the forks of main passages and the rear of chambers (Stone 1997). It is logical that high frequencies of artifacts are encountered at entrances since each procession begins at the entrance of caves (it should be noted that not all processions end at the entrances of caves).

In addition, it has been argued that important temporal differences in cave rituals may account for differences in the patterns of artifact deposition (Awe 1998a). It has been archaeologically documented that earlier rituals (prior to ca. A.D. 500) occur near the cave entrance in penumbral areas, while later rituals (after ca. A.D. 500) penetrated deeper into caves as far as several kilometers from the entrance to the cave (Awe 1998a, 1998b). The exact reasons for such temporal differences have not yet been properly established. Nevertheless, the abundance of archaeological material amassed in entrances can be accounted for since the entrances of caves generally witnessed the longest usage.

METHODOLOGY

In all, four submerged areas of the cave were sampled for the presence of cultural material by the use of SCUBA. Surface collections were conducted in all of these locations and excavations were conducted in all areas with the exception of the entrance to the cave (Pool 1). As it seems that very little sediment has been deposited in this area (Pool 1), it was assumed that a surface collection would allow for full retrieval of any artifacts present in this location.

Since the fluvial currents responsible for the accretion of alluvial deposits indiscriminately affect artifactual material, areas of large alluvial deposits were targeted as likely to yield higher artifact frequencies. Consequently, excavation units were placed in areas of the creek, which exhibited significant accumulations of alluvial deposits (Figure 4). For example, Unit 1 (Pool 2) was placed on the western side of a large rock located in the center of the pool because it was observed that most alluvium accumulated along rocks and other protuberances, rather than continuing down the creek. This train of thought was also used when deciding the placement of Units 2 and 3. Unit 2 (Pool 3) was set up in an area of substantial alluvial sediment build up, while the proximity of the stelae monuments, as well as sediment deposition, influenced the placement of Unit 3 (Figure 2).

Initially, it was hoped that a dredge system could be used to excavate the material in the creek. Using such a system, the matrix of the creek could have been removed while

leaving the artifacts *in situ*. A dredge would have also made the removal of the matrix more expedient and far more efficient as the cumbersome task of filling, lifting, and passing buckets. However, due to logistical problems and financial limitations, the use of a dredge was not possible.

Therefore, sediment was removed through a “scooping” action by the use of plastic washing basins, approximately 35 cm in diameter. The excavator would then pass these buckets up to the screeners, who proceeded to sift all the material through $\frac{1}{4}$ inch screens in the water. This allowed for the easy removal of wet sand but left most other materials such as rocks and artifacts. Initially a $\frac{1}{8}$ inch screen was used, it was quickly abandoned, however, as most of the sandy material would not pass through this. All possible artifacts were collected, as some of the water-worn rocks were deceptively similar to ceramic sherds. These were then dried and at the end of the day, sorted into piles of actual artifacts and “pseudo-artifacts” (which were later discarded).

We had planned to use 1 x 1 m Plexiglas excavation units that were to be driven into the ground. Unfortunately, we were unable to obtain adequate materials once in Belize to make this a feasible option. Alternatively, Pools 2 and 3, as well as the Stelae Chamber were investigated by laying down pre-made 1 x 1 meter baulks made of wooden planks. All units were oriented north-south, and in all units an attempt was made to fully uncover bedrock. The matrix of the units was removed through a “scooping” technique, and this material was subsequently wet-sieved through a $\frac{1}{4}$ inch screen. Barring excavation of natural stratigraphy it was decided that the matrix would be excavated in 10 cm arbitrary levels; however, in the field, this proved to be very difficult, and consequently, material was excavated in arbitrary levels.

RESULTS

Due to the characteristics of the underwater environment, the preservation of artifacts tends to be better because the material is less exposed to environmental stress (Osterholtz 1999). In addition, the freshwater environment is much more likely to preserve artifacts than the saltwater environment (Marx 1975:66). This is because there are fewer chlorides in freshwater and consequently, damage from salt contamination such as corrosion and crystallization on the surface of artifacts is much less (Singley 1998:8, cited in Osterholtz 1999:22). Ceramics preserve the best in underwater environments (Osterholtz 1999), however, it was also stipulated that lithics, wooden artifacts and possibly bone would be found in the creek. As will be discussed in the following sections, ceramic material was the only class of artifacts found.

Pool 1, Surface Collection

The surface collection that was conducted in the principal entrance to the cave (Entrance 1) produced no cultural remains. SCUBA and lighting equipment was used so that a close examination of the sediment could be conducted. However, it seems that either material has not been deposited in this area, has been washed out, or has been completely dissolved.

Unit 1 (Pool 2)

Unit 1 was located in Pool 2 directly outside and below the small waterfall at the mouth of the cave. The unit was placed between 0.90 m and 1.20 m below the surface of water on the western side of a large boulder that is located in the middle of the pool (Figures 3 and 4). Both surface collection and excavation were carried out in Pool 2.

Stratigraphically, Level 1 of Unit 1 consisted of boulders, water-worn rocks, and pebbles (Figure 5). Throughout the entire unit, there was a large quantity of forest mulch that was constantly floating in the creek and therefore inevitably made its way into our excavation areas. As previously mentioned, it was difficult to excavate in 10 cm levels because of the characteristics of sand and the way it slumps when settling. Because of this, it was difficult to maintain horizontal control on the outer edges of the baulks of the unit, however, the center of the unit was less prone to the horizontal effects of sand surges. Therefore, the unit was excavated in arbitrary levels. The matrix of Unit 1 was the same (water-worn rocks and pebbles) all the way down to bedrock, hence this unit was excavated as one level. The only exception to the uniformity of the matrix was a clay concentration in the northern end of the unit. Probing into the concentration of clay indicated that it is culturally sterile. Consequently, this clay deposit was not excavated.

During the excavations of Unit 1, it was hoped that artifacts that had either been washed out of the cave or those artifacts that had been placed at the entrance to the cave and then subsequently washed down the creek would be found. Unfortunately, no artifacts were recovered during the surface collection of Pool 2. The unit was begun after the completion of the surface collection and although snorkeling equipment was used initially, the use of SCUBA quickly became necessary as the unit became deeper. Visibility was very poor because of the forest debris and the clay that was encountered in the northern end of the unit. The unit was excavated to a maximum depth of 10 cm, at which point bedrock was encountered.

Approximately 10 very small and highly eroded ceramic sherds (approximately 2 to 4 cm in diameter) were recovered from Unit 1. Based on the formal attributes of these sherds (i.e. highly fragmentary, eroded with tempering agents exposed, and considerable wear on all surfaces) and their low absolute frequency, it can be assumed that these specimens have been adversely affected by unremitting long-distance fluvial transport (cf. Schiffer 1987:275).

Unit 2 (Pool 3)

Unit 2 was located in Pool 3, east of the entrance to Tunichil Muknal (Figures 3 and 4). Again, this unit was placed in an area where sediment seemed to accumulate and where it would seem probable that artifacts might be located. The matrix of this unit consisted of water-worn rocks, cobbles, pebbles, sand as well as a large amount of forest debris (Figure 5). Whereas in Unit 1 the rocks were concentrated throughout the entire unit, Unit 2 was predominantly sand with small rocks (approximately 6 to 8 cm in length and 2 to 4 cm in width) with a few large boulders interspersed throughout. As with Unit 1, there were similar

problems maintaining horizontal control of the outer baulks of the unit, and therefore, excavations proceeded as a single level. An attempt was made to steady the unit into the matrix in an effort to prevent the slumping of the sand, however, this was not possible as the large rocks dispersed throughout the matrix blocked the walls of the wooden frame in various places.

A surface collection of Pool 3 was conducted, during which one diagnostic ceramic fragment was recovered. The comparatively large size of the sherd and relatively low degree of erosion, suggests that the sherd had not been affected by long-distance fluvial transport. Consequently, it is thought that the vessel from which the sherd derives was actually deposited near the entrance to the cave. Nonetheless, due to the effects of erosion, it could not be positively determined whether the specimen represents a fragment of a Minanha Red (Gifford 1976:156-159) or a Mountain Pine Red (Gifford 1976: 193-195) dish. Regardless, this specimen indicates that the mouth of the cave was a locus of activity as early as the 3rd or as late as the 8th century A.D. (cf. Gifford 1976). Positive identification of the sherd's type would allow considerable reduction to this temporal breadth.

The excavations of the unit followed the same methods as Unit 1, using the buckets for scooping and screening the matrix in the water. The entirety of this unit required SCUBA gear as it was located below 2.3 meters of water at the shallowest point. Excavations of Unit 2 yielded approximately 20 small (2.2 cm in diameter) ceramic sherds. The artifacts recovered from this unit were, like those from Unit 1, in extremely eroded condition, leaving the tempering agents exposed. Again, the state of these ceramics is likely due to the erosive action of the water over the course of long-distance fluvial transport. The fact that more artifacts came out of Unit 2 than Unit 1 may be indicative of the force of the water displacement in the two areas. Apparently, less material was recovered from Unit 1 due to the relative variability of the force of hydraulic displacement, if compared to the Unit 2 context, which is further down the stream in an area that is not as restricted and where the water may not have been as forceful.

One of the major problems with Unit 2 was keeping it weighted down. This unit was in deeper water (approximately 2.3 m) than Unit 1 and as the excavations proceeded, the unit became less and less stable due the slumping of sand. Ultimately, large weights had to be placed on the four corners of the frame, requiring constant monitoring so as to avoid displacement of the unit. In addition, the murkiness of the water caused by the large amount of decaying forest debris remained an obstacle. This made the visibility of the unit about 0.5 m (worse than in Unit 1) and periodically excavations were suspended in order to let the water clear. Again, there were problems maintaining horizontal control of the baulks of the unit thus making it very difficult to move a substantial amount of material from the excavation area. Nonetheless, this unit was excavated to a maximum depth of 34 cm, until large rocks were uncovered making it impossible to excavate any further.

Unit 3 (Stelae Chamber)

Unit 3 was placed in the Stelae Chamber and was the third and final area to be sampled (Figure 2). It was hoped that Unit 3 would yield artifacts (ceramics, lithics or

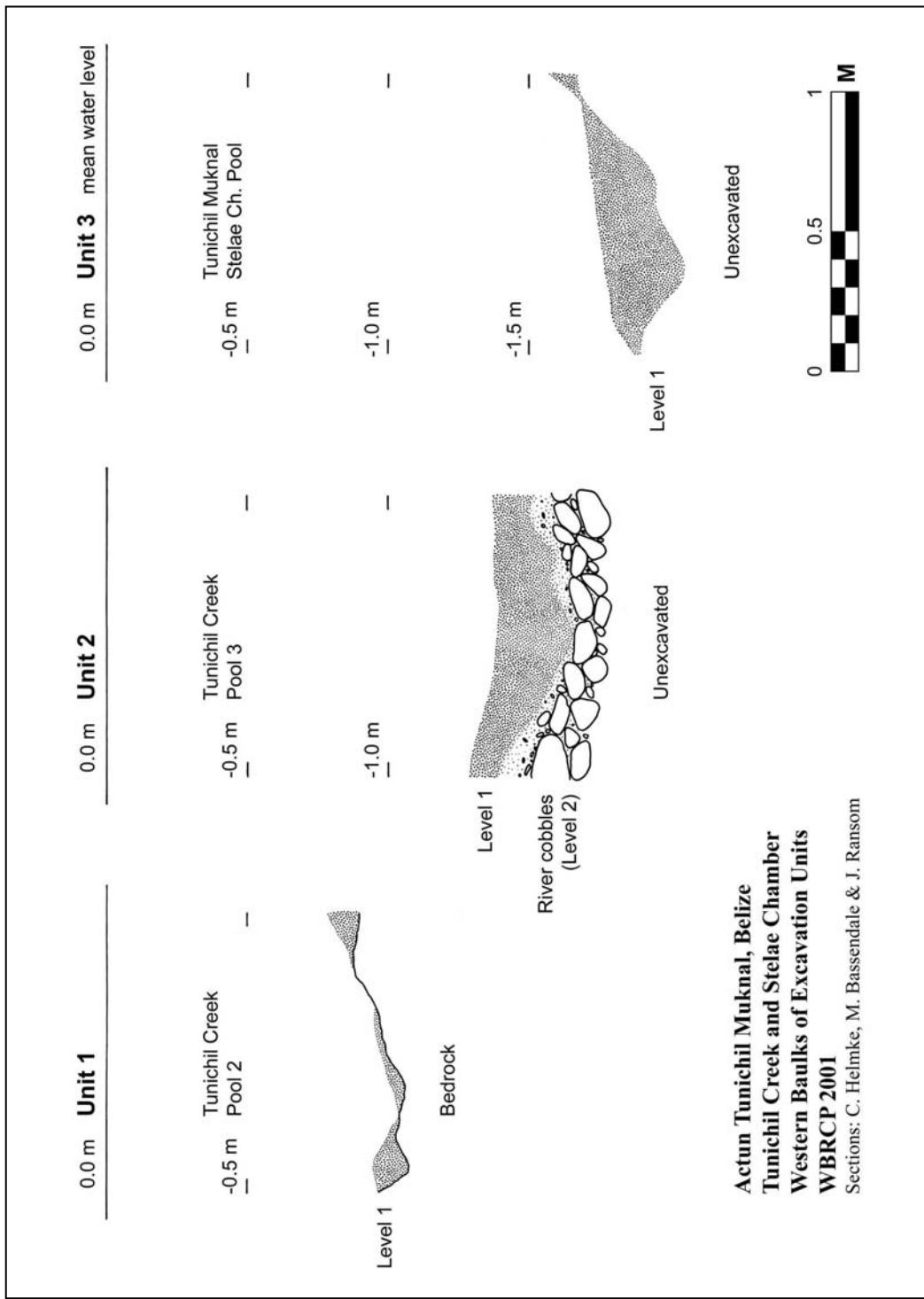


Figure 5: Stratigraphic cross-sections exposed as part of the excavations. All show the western baulk of the excavation units. In these sections north is to the right and south to the left. Elevations are relative to the mean water level.

wooden) that had either been thrown or fallen into the water or inadvertently ended up in the water from the cultural activities that were occurring in this area. As previously mentioned, this chamber has monuments located on one of the ledges (Awe et al 1997a; Helmke et al 1998), and it was hypothesized that there may be evidence of ritual activity in the pool below the ledge (Figure 2). The matrix of this area consisted of mainly small, water-worn pebbles and sand (Figure 5). There were similar difficulties to those encountered during the excavations of Units 1 and 2, (i.e. murkiness of water, slumping baulks), present in the case of Unit 3, and these impediments were compounded by the complete absence of light.

After lowering the SCUBA equipment through the alternate sinkhole entrance to the cave and carrying it to the Stelae Chamber, the unit was established in an area below the slate monuments on a north-south axis. Logistically, this area was much more difficult to excavate for a number of reasons. The water was a deeper (Figure 5) making it difficult to transport the excavated material, and it was difficult to keep our lights in place over the unit because there was nothing available on which to attach them. Maintaining horizontal control of the unit was also problematic.

Upon reaching a depth of 58 cm, it became logically impossible to continue excavating Unit 3. In addition, the excavations reached a depth where, although excavations continued, the walls would constantly slump. Although Unit 3 was not excavated to bedrock, it was closed the same day it was opened due to the logistical problems mentioned. Surprisingly, no artifacts were recovered from this area.

GENERAL SUMMARY: METHODOLOGICAL DIFFICULTY

The underwater investigations conducted during the 2000 field season did provide useful information with regards to the archaeological potential of Tunichil Creek and ancient Maya cave use. There were, however, a number of problems faced by the excavators. The remote location of the excavations made the acquisition of supplies (i.e. compressed air) very difficult and expensive, as they had to be transported in from Belize City on a weekly basis. Furthermore, because dredge equipment was inaccessible, the actual removal of the matrix was difficult. In addition, the loose leaves and mulch that were floating in the water reduced underwater visibility to near zero very quickly when they were stirred up. This would require the excavations to be suspended for up to 25 minutes while the water cleared. Thus, progress was considerably slower than anticipated. Further complications included the cold temperature of the water. Throughout the duration of the excavations, it was determined that full wet suits of at least $\frac{1}{4}$ inch thickness were necessary. Anything less than this was simply not warm enough for the prolonged exposure to the creek water.

Based on the problems that were encountered during the 2000 season excavations, suggestions can be made for future cave underwater excavations or other karstic bodies of water. Most notably is the importance of a dredge. Use of this equipment would have contributed to the expediency of the excavations, while maintaining horizontal control for all specimens uncovered. A dredge would have allowed for greater control over the removal of the matrix and the sediment would not have been stirred up to the degree that it was by the “scooping” action of the buckets, thus allowing for better visibility. Additional equipment

that would make progress quicker and more efficient includes a weighted excavation unit or grid that would also help maintain the integrity of the baulk walls. Inside of the cave, items such as light holders that would keep the lights steady and constant would have been very helpful. It is also recommended that at least three large dive lights per person be available.

CONCLUSION

The purpose of the 2000 season underwater excavations was to assess the archaeological potential of Tunichil Creek. Because the only cultural remains recovered from the underwater context were few, poorly preserved, very fragmented and highly eroded sherds, it would seem that the potential of recovering artifacts from within the creek area is very low. It would also seem that the artifact recovery potential of the Stelae Chamber pool is equally low. However, to make any solid conclusions dredge excavations would be necessary and are recommended.

In total, 31 ceramic sherds were recovered from the underwater excavations. This number includes only those materials found in the water during the 2000 field season. It takes into account the one sherd that was recovered from the surface collection of Pool 3, as well as those artifacts recovered from the excavations of both Units 1 (Pool 2) and 2 (Pool 3). The total area of the creek (ca. 1228 m^2) in relation to the surface area of the excavation units (3 m^2) is very small totaling only approximately 0.2 %. However, these units were set in areas of high alluvial deposition. As these deposits are understood as the loci of lower hydraulic displacement thus increasing the possibility of quantitatively greater artifact deposition, it is thought that the excavations may constitute a qualitatively representative sample of the archaeological potential of the creek. The low frequency or absence of said artifacts is very interesting and suggests a number of additional questions. Such inquiries might, for example, strive to ascertain whether low artifact frequency is a function of the solubility of the calcitic composition of sherds, in an aqueous context rich in carbonic acid.

Based on the taphonomic processes examined by Schiffer (1987) and their effects on material culture, a number of data can be inferred from the attributes exhibited by the ceramic specimens recovered in the creek. Of all the ceramic material that was recovered, only the two larger sherds (i.e. a Zibal Unslipped olla rim and the flange/ridge dish sherd from Unit 2) would originally have been placed at the entrance to the cave. These two sherds are significantly larger and less eroded than the smaller sherds that were excavated from Units 1 and 2.

Since it is the cave context that imbues ceramic materials with a ritual function, the dichotomy maintained between domestic versus votive contexts is difficult to recognize for the creek material. Consequently, great difficulty arises in determining whether these vessels are of domestic or ritual origin, because the context of the creek is not determined with regards to its ritual or non-ritual function. This latter attribute was actually one of the focal points of the investigations, but due to the paucity of material is difficult to address at present.

It is important to note that aside from the two specimens discussed above, none of the material recovered from the excavations were derived from primary contexts. It has however,

been possible to distinguish between materials that were deposited at the entrance of the cave from those that were washed out. Thus, a distinction can be drawn between those materials that were less affected by hydroturbation (closer to primary contexts) than those that were more affected by water displacement (secondary contexts). Based on the formal attributes of ceramic specimens recovered as part of the excavations in the creek (i.e. high fragmentation, small size, extensive erosive striations of random orientation on all surfaces, tempering agents exposed on all surfaces) it is clear that these sherds have been adversely affected by long-distance fluvial transport (cf. Schiffer 1987:275, 277). Consequently, it is stipulated that these are derived from archaeological features once deposited within the cave. Thus, it is assumed that fluvial activity has adversely affected the integrity of certain assemblages inside the cave. A direct consequence of this interpretation is that all assemblages inside the cave that are subject to contact with floodwater cannot be thought of as representative of the statistical population once present (cf. Helmke 2000 for similar suggestions).

The low quantity of artifacts recovered from the underwater context is likely a result of a number of factors. The continual flooding and wash action of the cave has likely had a detrimental effect on any artifacts that may have been in the water at one point. Furthermore, the increase in pedestrian traffic through the cave may have also affected the artifacts in the underwater environment of the cave. In addition, the cultural material may simply be buried too far beneath the sediment to be reached when using the “scooping” technique, and thus may have only been accessible through use of a dredge. Consequently, it is the opinion of the authors that Tunichil Creek does have archaeological potential, although it does not manifest itself in the form of artifact recovery, but rather from detailed analyses of the taphonomic processes operating upon the materials once contained in the Creek. In addition, should any further excavations be undertaken in this area, the use of a dredge would be essential.

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**A STALAGMITE-BASED RECORD OF PALEOCLIMATE
FOR WESTERN BELIZE: EVIDENCE FROM ACTUN TUNICHIL MUKNAL
AND ACTUN YAXTEEL AHAU**

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INTRODUCTION

Many recent paleoclimate investigations have focused on speleothem-based records, and have been yielding highly resolved paleoclimate data for many regions of the world. Comparing terrestrial climate records to global-scale records like ice cores is useful for determining whether climate shifts such as glaciation are reflected in more local settings. Few of these studies, however, have considered the cultural significance of climate change. This research explores the relationship between climate change and Maya history in western Belize throughout the last 3000 years. The purpose of this study is to integrate a time series stalagmite-based paleoclimate record with the plethora of archaeological evidence that points toward a massive Maya population decline in western Belize near 900 A.D.

At present, there exists extensive archaeological evidence for changing cultural and agricultural practice during the end of the 10th century in the Maya regions of western Belize. There is also a marked increase in cave use near the time of Maya population decline. The Maya believed caves embodied the spirits of agricultural fertility and productivity leading to extensive religious practice within caves. Provided the Maya were dependent upon agricultural productivity for survival, it is hypothesized that environmental stresses prompted this increase in religious practice in hopes that the gods would provide more adequate growing conditions.

Little geologic information has been collected from the Cayo District of Belize regarding changing environmental conditions that may have affected civilizations of the recent past. An even smaller fraction of this geologic information has been integrated with archaeological findings. Previous speleothem dating in other caves in Belize aimed only to identify when cave genesis began. In addition, of the many recent speleothem-based studies, few discuss the cultural implications of climate change. It is the aim of this investigation to contribute geological information that may provide insight into the relationships between climate and culture.

Two stalagmites from caves in the Roaring Creek Valley of Western Belize are being analyzed for physical stratigraphy, growth characteristics, and stable isotope data. A number of questions regarding speleothem growth are being addressed. How has the nature of growth of these deposits changed through time? What does the growth character of the deposits indicate about the conditions in which they grew, and what do these features indicate about climate? What was the character of regional temperature and precipitation

during the last three millennia? Are vegetation changes on the surface recorded in speleothem and detected using stable isotope analyses? Were there environmental factors that interfered with the necessary agricultural production in 900 A.D. that would have forced people to flee the area? Were internal conflicts between city-states a result of some external force that stressed these people? Finally, do these changes in the geologic record correlate in time with cultural discontinuities of the Maya empire?

THE SPELEOTHEM

Speleothem is a collective term used to describe all secondary calcium carbonate (CaCO_3) mineral formations occurring in limestone caves including, but not limited to, stalactites, stalagmites, flowstone, and travertine (Bradley 1999; White 1988). They form by the loss of carbon dioxide from groundwater by degassing and/or evaporation followed by precipitation of CaCO_3 (Bradley 1999; Gascoyne 1992; White 1988). The primary source of CO_2 is the soil horizons and the calcite source is the dissolved limestone at the soil-bedrock interface (White 1988). Water that has percolated through soils in contact with organic matter accumulates a partial pressure of CO_2 that is higher than that in the cave atmosphere. When the water enters the cave, CO_2 degassing leaves the water supersaturated with calcite, which subsequently precipitates (Bradley 1999). This depositional process is dependent upon the geological, hydrological, chemical, and climatic setting of the cave environment. A change in any one of these variables can invariably alter or even terminate the deposition of calcite.

Pure and unaltered calcite is typically clear, white, or milky white and reflects light with spectacular reflections from the numerous crystal faces. Speleothems are more commonly stained red, orange, tan, or brown and infrequently green, yellow, or blue. Red, orange, and tan discoloration can be from organic compounds leached in from overlying soils. Dark brown and black is a result of oxides and hydroxides of iron and manganese, while the rare yellow, blue, and green stains are due to copper and nickel substitution in the calcite structure (White 1988). Few of the samples observed in Belize were pure white; the most common color was a light orange to red. Staining and discoloration seen in longitudinal sections of stalagmites can be a relative indicator of soil moisture and soil microbial activity. Discolored stratigraphic bands resulting from erosion, resolution, or periods of non-deposition usually signify growth hiatuses. These features are of great interest and provide points of reference during stratigraphic analyses.

The internal structure of cave deposits is similar to that of a tree where there are distinct laminations representing discreet intervals of time. Viewed in cross section, concentric rings appear similarly to a tree or an icicle. When sliced longitudinally, many stalagmites display finely laminated horizontal bands that accumulate upward as the dripping water from a stalactite lands on the growing tip of a stalagmite. Like any depositional process, natural forces influence the rate and character of deposition so the laminated structure should reflect changes in the variables affecting speleothem growth. We will see shortly that many investigations have shown the laminations to be annual and that radiometric dating then places the stratigraphy in a temporal context.

Of the many speleothem growth forms, stalagmites and flowstone typically show the most well developed stratigraphy and lack resolution holes caused by secondary dissolution from percolating water. The stalactites which deliver water to the active stalagmite tips are less suitable for analysis because of re-solutioning inside a central canal through which water flows, the layers are very thin, and layers are difficult to differentiate in longitudinal section (Gascoyne 1992). Stalagmites typically record environmental conditions more than stalactites, and are easier to decipher with greater precision. In addition, active formations provide an automatic age control in the relative sense, reducing the need for extensive radiometric dating. Tropical caves typically contain enormous masses of speleothems compared to caves at higher latitudes possibly due to the increased soil activity, longer growing seasons, increased precipitation, and higher temperatures (White 1988). Calcite deposits accumulate over long periods on cave ceilings, walls, and floors locking in environmental clues that are generally limited to the Quaternary period of geologic history.

THERMAL IONIZATION MASS SPECTROMETRIC (TIMS) URANIUM-SERIES DATING

The most commonly used radiometric method to date speleothems today is by $^{230}\text{Th}/^{234}\text{U}$ decay using thermal ionization mass spectrometry. Initial radiometric dating was attempted by $^{230}\text{Th}/^{234}\text{U}$ decay using alpha-spectrometry and low uranium yields resulted in an inability to obtain dates with that method. Alpha-spectrometry typically has a 50 % particle emission counting efficiency leaving weakly concentrated samples to take an impractical amount of time to date. In contrast, thermal ionization mass spectrometry (TIMS) dating has a near 100 % counting efficiency due to the ionization process and therefore allows for more uranium detection from a smaller sample during the same counting time period (Chen et al. 1992). Since the focus of the project is concerned with the last 3000 years, mass-spectrometry will provide the most precise results and will provide a temporal framework for the existing stable isotope record.

STABLE CARBON AND OXYGEN ISOTOPES

Stable carbon and oxygen isotope analyses of speleothems are becoming increasingly popular and have led to large amounts of paleoclimate data in carbonate terrains throughout the world. Stable carbon and oxygen isotope analyses have the potential to track temperature, precipitation, and vegetation shifts in terrestrial settings through time that can then be compared to the archaeological record. With improved analytical techniques, researchers have been able to reconstruct paleoclimate at decadal or better resolution during the Pleistocene in Botswana, New Zealand, Oman, and Norway, and through the Holocene in Iowa and South Africa. The integration of stable isotope analyses and absolute dating methods has become the accepted standard procedure for speleothem-based paleoclimate investigations over the last decade.

The metabolic pathway employed by the vegetation overlying the cave is probably the most significant variable determining of the $\delta^{13}\text{C}_{(\text{calcite})}$ value in speleothem. The C3 metabolic pathway is characteristic of most woody plants and cool season grasses, while summer grasses, sedges, and maize use the C4 pathway. CAM is a less common metabolic

process used mainly by cactuses and succulents (Latorre et al. 1997). The relative proportion of C3 to C4 plant cover determines the $\delta^{13}\text{C}_{(\text{calcite})}$ value at any given time (Latorre et al. 1997). $\delta^{13}\text{C}_{(\text{calcite})}$ values of $-14\text{\textperthousand}$ to $-8.0\text{\textperthousand}$ are indicative of a dominance of C3 plants while C4 is indicated by values ranging from $-2\text{\textperthousand}$ to $-8.0\text{\textperthousand}$. CAM plants show $\delta^{13}\text{C}$ values between C3 and C4 (Latorre et al. 1997). A decrease in $\delta^{13}\text{C}$ values in Belize speleothems may reflect a change from a maize dominated plant community (C4) to a forested cover (C3) as populations and agriculture declined in the area.

In the tropics, $\delta^{18}\text{O}_{(\text{Calcite})}$ variations typically indicate the amount of precipitation that occurred at the time of deposition as opposed to the mean annual air temperature. Studies in monsoon regions indicate that precipitation falling during the monsoon months has a $\delta^{18}\text{O}_{(\text{H}_2\text{O})}$ value of $\sim 6\text{\textperthousand}$ lower than during the non-monsoon periods (Burns et al. 1998). In Belize (17°N latitude) this principle may hold true and indicate changes in precipitation magnitudes through time. Changes in the $\delta^{18}\text{O}$ values may suggest changing precipitation characteristics through time.

Stable isotope variations in a sediment core from Lake Chichancanab in Yucatan, Mexico suggest a 200-year period of drought between 800 A.D. and 1000 A.D. (Hodell et al. 1995). These findings are reinforced by the increased occurrence of low lake stands in central Mexico, and numerous fires in Costa Rica during the same time period. Contributing a stable isotope record from Belize to the Mexico record would be a significant addition of evidence toward the Late Classic Maya decline of ca. 900 A.D.

BACKGROUND ON SPELEOTHEM-BASED PALEOCLIMATE STUDIES

Much paleoclimate research is now focused on terrestrial data sources and speleothems are yielding highly resolved paleoclimate data for many regions of the world (Atkinson et al. 1978; Baker et al. 1995; Baker et al. 1993; Broecker 1960; Burns et al. 1998; Denniston et al. 1999a,b; Gascoyne 1992; Genty and Quinif 1996; Hellstrom et al. 1998; Hennig et al., 1983; Holmgren et al. 1999; Lauritzen 1995; Repinski et al. 1999; Shopov et al. 1994). Three main areas of study have been the most common and these include: 1) physical stratigraphic studies; 2) growth rate and timing studies using radiometric dates for age constraints; and 3) integrated studies using radiometric dating and stable isotope analyses in order to reconstruct paleoclimate at high temporal resolution. In most cases, one method of absolute dating was employed in order to confirm temporal periodicities measured in the calcite growth. An abbreviated summary of the leading reports of these three areas is presented here and the reader is encouraged to consult references.

Physical Stratigraphy

Studies beginning in the 1960's focused mainly on physical stratigraphy and/or radiometric dating of cave calcite in order to establish temporal growth patterns. One of the more straightforward studies investigated the lamination of cave travertine around a human

femur (Broecker 1960). Radiocarbon dating of the bone gave an age of $1,400 \pm 250$ years old, while counting 1,406 laminations confirmed the hypothesis that the travertine represented $\sim 1,400$ years of annual banded growth. A simple conclusion of annual growth banding was made.

High stratigraphic resolution began to emerge with the advent of a technique called spectral luminescence that permitted the measurement of annual microbands in cave calcite (Baker et al. 1993; Shopov et al. 1994). This procedure involves the transmission of a portion of ultraviolet light produced by a super-pressure mercury lamp that generates a strong luminescence from organic matter. Highly magnified speleothem sections displayed annual bands on the order of 0.05 mm thick after cross-referencing TIMS ^{230}Th dates along the growth axes (Baker et al. 1993). Although many of the samples did not display this luminescence, the ones that did showed periodicities on the order of years, and in some cases, 11-year cycles corresponding to changes in the abundance of sunspots (Baker et al. 1993).

Radiometric Growth Rate Studies

In many cases, absolute dating of speleothems at intervals along the growth axis is sufficient to establish a temporal pattern of growth through time (Atkinson et al. 1978; Baker et al. 1995; Hennig et al. 1983). Periods of growth and non-deposition can be paralleled to periods of well-known climatic fluctuations such as glacier advances and retreats. Statistical frequency analyses including hundreds of radiometric dates have proved useful for making such correlations. A common conclusion of these studies is that during times of favorable climatic conditions speleothem growth was most frequent and during less favorable times, such as glacial maxima, speleothem growth was less common or non-existent.

By 1983, countless ^{14}C and $^{230}\text{Th}/^{234}\text{U}$ dates were established from speleothems from virtually everywhere in the world, and the limitations of U-series dating had been recognized (Atkinson et al. 1978; Hennig et al. 1983). The fact that ^{230}Th has a shorter half-life than ^{234}U constrained the possible dating range to within 400,000 years (Atkinson et al. 1978). Furthermore, a minimum sample size of approximately 20 grams was necessary for the alpha-spectrometric method, which would usually incorporate many years of growth. In spite of these sources of error though, it was possible to reach general conclusions regarding the timing and length of time of speleothem growth. During times of glaciation and lowered soil water speleothems grew either more slowly or not at all. This simple observation was a precursor to further investigations into this phenomenon.

Hennig et al. (1983) conducted a frequency analysis on U-series dates from 660 speleothems and 141 travertine samples. These samples were sub-divided into northern glaciated regions, and non-glaciated tropical regions. The frequency distribution was used to determine the times that were the most prone to speleothem growth. Times of maximum growth were determined to be during the last 10,000 - 20,000 years, between 55,000 and 40,000 ybp, and between 130,000 and 90,000 ybp with maximums occurring at 125,000, 115,000, and 105,000 ybp. Conversely, growth minima and hiatuses occurred between the above-mentioned dates. The data were also compared to reliable paleotemperature data from

ice cores to further the correlation. The periodicity of most active growth correlates very well with the last two interglacial periods and it was concluded that the periods of growth and non-growth was a significant indicator of climatic change.

Speleothems from Britain have shown to reflect solar cycles such as insolation maxima and minima (Baker et al. 1995). TIMS U-series dating was performed at intervals along the growth axis of a 33-cm flowstone before and after visible growth hiatuses. The periods of rapid growth were then compared to the solar insolation record of Berger and Loutre (1991). Seven measured episodic growth periods between 140-30 ka, with one exception, correlated exactly with insolation maxima. The explanation for this was that during times of high solar insolation, there was an increase in temperature and plant activity, a prerequisite for speleothem production.

Similarly to Hennig (1983), Gascoyne (1992) described age frequency distributions using more case-specific examples rather than lumping the data into two major climatic regimes. The report also summarized the previous 20 years of speleothem-based research that focused mainly on speleothem abundance and temporal growth patterns. The report also discussed radiometric dating, stable isotope measurement, trace constituent content, and paleoclimate determination from cave speleothems.

Integrated Radiometric Dating and Stable Isotope Paleoclimate Studies

By far, the most highly resolved paleoclimate information has come from the integration of U-series dating and stable carbon and oxygen isotope measurements. This combination of methods has several advantages. When using TIMS dating, it is possible to measure a wide range of time (~400,000 years to present) using a small sample size of < 2 grams. Stable isotope analyses can yield paleoclimatic information such as temperature, precipitation, and vegetation shifts in terrestrial settings, with a sample size on the order of < 1 mg. With these improved analytical techniques, it has been possible to reconstruct paleoecosystems at decadal or better resolution during the Pleistocene in Botswana (Holmgren et al. 1995), New Zealand (Hellstrom et al. 1998), Oman (Burns et al. 1998), and Norway (Lauritzen 1995). Studies of Holocene climate include those in Iowa (Denniston et al. 1999; Dorale et al. 1992) and South Africa (Holmgren et al. 1999).

Common to all studies in this category are the processes by which high-resolution data was obtained. Samples are longitudinally sawed into two or three sections and each section is then used separately for U-series dating, stable isotope measurements, or thin section analysis. Using separate sections helps prevent contamination between sampling methods. Between four (Holmgren et al. 1995) and 21 (Holmgren et al. 1999) U-series dates were drilled from the growth that are before and/or after visible growth hiatuses. A minimum of 30 stable carbon and oxygen isotope measurements were taken at nearly regular intervals along the growth. In many instances the Hendy (1971) test was performed to ensure the calcite was deposited in isotopic equilibrium with the seepage waters. This test involves sampling stable isotopes multiple times along a single growth layer and checking for significant variability. If there is no significant variability, the results are then suitable

to be used for inferences about paleoclimatic conditions. This combination of methodologies has set the benchmark for speleothem-based paleoclimate investigations over the last decade.

Data from the Botswana speleothem (Holmgren et al. 1995) show a warm and wet growth period from 51,000 to 43,000 ybp (phase I), and a second cool and dry period from 27,000 to 21,000 ybp (phase II). The period between those times is represented by a growth hiatus with some recrystallization that was concluded to be a very dry climatic period. Mean values for $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ increased only 0.10 ‰ and 0.20 ‰ from phase I to phase II, respectively. The interpretation of these data are that there was a ~2°C temperature decrease from phase I to phase II accompanied by a gradual increase in C4 vegetation during the entire record.

GEOLOGIC HISTORY, REGIONAL GEOLOGY OF BELIZE, AND SITE DESCRIPTION

Belize is settled on the Caribbean Plate in the southeastern portion of the Yucatan Peninsula, bordered by Guatemala to the west and south, Mexico to the north, and the Caribbean Sea to the east. Considerably further to the south are the Cayman Trench and the Motagua Fault Zone complex, which compose the transform fault boundary between the North American and Caribbean plates. Most of the area is dominated by carbonate terrains of Cretaceous age, with an exception for the Maya Mountain block that boasts a longer and more controversial history. Much of the geologic discrepancy in published reports on the Maya Mountains is due in part to the lack of funded extensive study, a limited number of investigations, and the difficulty of detailed mapping because of dense sub-tropical jungle flora. Over time, and after numerous revisions of pioneer work in the mountains, a respectable geologic interpretation has been established and is widely accepted today.

Karl Sapper (1899) made the earliest publicly documented geologic investigations who traversed numerous river valleys to observe granites, metamorphic and fossiliferous Paleozoic sediments, and a quartz porphyry (Hall and Bateson 1972). Only Henry Fowler in 1879 and G. H. Wilson in 1885 who had passed on reports of their observations preceded Sapper's work. L. H. Ower (1928) then recognized all of the major geologic divisions of the area and produced the first geologic map of British Honduras (Bateson 1972). Included in this map were new observations concerning the porphyry, now regarded as intrusive lava flows that were inferred to be coincident with the metasediments. In addition, the metasediments were now the metamorphic equivalent of the fossiliferous, less metamorphosed Paleozoic rocks.

No significant advancements were made until Dixon (1956) reinterpreted the sedimentary history of the metamorphic and fossiliferous sediments to consist of the older Maya series and a younger Macal series of Pennsylvanian to Middle Permian age separated by a regional unconformity which postdated the granite intrusion (Bateson 1972). Dixon also noted the occurrence of economic minerals, particularly tin and gold in the upland areas. Bateson (1972) and a number of others established that the earlier subdivision of the Maya uplands was inaccurate, and the metasediments and Bladen Volcanic Member were combined into a single unit that was time equivalent to the late Paleozoic Santa Rosa Group

of Guatemala. Today, four geologic units comprise Belize: the Santa-Rosa Group including the Bladen Volcanic Member, intrusive granites, Post-Cretaceous and coastal sediments, and Cretaceous limestone in which extensive karst has developed.

The geologic structure of Belize is then dominated by the Santa-Rosa Group bounded to the north and south by east-west striking faults, surrounded by Mesozoic, Tertiary, and Holocene sedimentary rocks to form a regionally isolated outcrop (Hall and Bateson 1972). The Santa Rosa Group comprises the majority of the Maya uplands whereas the Bladen Volcanics are restricted to the southern portion of the range. Three individually isolated granite intrusions are recognized in the Santa Rosa (Kesler and others, 1974): the Mountain Pine Ridge, the Hummingbird Batholith, and the Cockscomb Batholith. Much of the lowlands surrounding the Maya area is composed of a 3,200 m thick deposit of northward-dipping Cretaceous limestone that has been heavily karsted, containing large underground conduits and caves. Continuous recent uplift of the Mayas has played an integral role in the recent geomorphology of the carbonate lowlands, and becomes a key element in the formation of multi-leveled cave passages that are extensive in Belize. Caves in the Boundary Fault Region were formed by the action of northward flowing, well-integrated rivers discharging large volumes of chemically aggressive water onto the limestone (Miller, 1996). Most caves are presently active with modest volumes of streamflow present during most of the year (Jaime Awe, personal communication, 1998).

Caves in the Upper Roaring Creek Valley are predominantly oriented east-west, paralleling the strike of the Northern Boundary Fault. As such it seems evident that the faulting in the Cretaceous limestone has incited the formation of caves by carbonate dissolution. The course of Roaring Creek itself and its numerous smaller tributaries (some are ravines where excess precipitation flows only in the Rainy Season) have differentially eroded the granites and the limestone over which it flows. Roaring Creek is a northward flowing stream that flows down from the Mountain Pine Ridge (Maya Mountains) to the carbonate lowlands. "Since the Cretaceous period, erosion has eliminated much of the easily weathered foramineral limestone mantle from the summit of [the Mountain Pine Ridge]" (Rice 1974: 10). This fluvial system has incised through the limestone to expose cherts, quartzites, shales, slates, schists, and igneous elements such as granite and pumice. As a result many of these types of rocks are found as water-worn cobbles and pebbles in the bed and banks of Roaring Creek and in many cave streams and possibly used by the Maya.

Belize is divided in climate by the tropical savanna in the northern part of the country and the tropical rainforest to the south (Miller, 1996). Annual rainfall increases near the topographic highs of the Maya Mountains at more southerly latitudes, with an average value greater than 100 cm. The majority of this rain falls between June and December. Hurricanes are rare in Belize, although the most recent was in 1995 (Miller, 1996). Annual mean temperatures are in excess of 20°C and freezing temperatures have never been recorded in Belize.

METHODS

Sample locations were mapped in accordance with BVAR archaeological standards. The sampling area was limited due to personnel and logistical limitations that prevent entering caves with fewer than three people. Active research is focused on upper, fossil levels of cave passages in Actun Tunichil Muknal and Actun Yaxteel Ahau. Site selections were based upon size, promise of visible laminated growth, and minimal aesthetic damage to the cave. Samples were gently tapped with a rock hammer and floor chisel that fractured them along planes of weakness created by growth hiatuses or impurities in the calcite (Harmon et al. 1977). Sample locations were mapped and cataloged along with the artifacts studied *in situ*.

Six speleothems were removed from caves and cataloged during the 1999 field season. A stalagmite/stalactite pair was removed from an unmapped and culturally sterile passage of Actun Tunichil Muknal. In Actun Yaxteel Ahau, one stalagmite was removed from each of Ledges 2, 3, and 4, while drapery was excavated from Ledge 6. These samples showed signs of active growth, as there were water beads on the tips of the feeding stalactites. Water was not flowing rapidly at the time, however, due to the relatively dry 1999 season. All samples were removed from Belize with export permits provided by the Department of Archaeology and brought to the University of New Hampshire for analysis.

The information contained within this progress report will focus only on stalagmites from Actun Tunichil Muknal (catalogue # WBRCP99-SP-002) and from Ledge 2 of Actun Yaxteel Ahau (catalogue # WBRCP99-SP-014). These two samples displayed the most remarkable laminations and growth hiatuses, which eased layer counting and stratigraphic analysis. Most of the other samples did not show this intricate layering, rendering them relatively useless in stratigraphic correlations.

Sample Preparation

Intact samples were weighed, measured, photographed, and physically described before proceeding to any destructive analyses. Each stalagmite was then sawed into two longitudinal sections using a circular diamond blade rock saw. One half was designated for physical stratigraphic description, preliminary stable isotope work, and archival purposes. The other half was sectioned into thick section blanks for detailed stable isotope sampling, U-series dating, and thin section analysis. Maps of the dicing procedure were produced for both samples and used for imaging procedures.

Thick sections were prepared on 3" petrographic microscope slides for detailed stable isotope analyses and later petrographic analyses. Sampling was done at the stable isotope lab at Syracuse University under the supervision of Dr. William Patterson. Sections were cut in a staggered pattern in order to incorporate the entire longitudinal section without cutting normal to the growth axis. The samples were then impregnated multiple times with epoxy and polished using aluminum carbide powder and mounted to glass slides with epoxy. After the stable isotope analyses were completed, the thick-sections were made thin for the petrographic and stratigraphic analyses.

Two milled samples of ~8 grams each were taken from the bottoms of the two stalagmites and sent to the uranium-thorium lab at Florida State University for absolute age determination by $^{230}\text{Th}/^{234}\text{U}$ using alpha spectrometry. Low uranium yields resulted in an inability to obtain dates using that method. TIMS $^{230}\text{Th}/^{234}\text{U}$ dating is being performed at the University of California at Santa Cruz for the remainder of the analyses; results are awaited at this point.

Stable Isotope Sampling and Analysis

95 preliminary samples were drilled from the intact halves using a diamond tipped dental drill bit and a Dremel drill tool. A 3 mm sampling interval was used as a preliminary assessment of stable isotope variability on the Tunichil Muknal sample (40 samples), while a 5 mm interval was used for the lower 21 cm of Yaxteel Ahau, and a 3 mm interval completed the upper 5 cm totaling 55 samples. The results of the coarse sampling were used to focus detailed micromilling on areas of interesting isotope signal and to eliminate needless and mind-numbing oversampling. The high degree of variability observed after analyzing ATM and the bottom portion of YAX prompted a 1 mm sampling interval for the entire length of both samples. It is important to note that the samples are not taken from every lamination in the sample, but at regular, 1 mm intervals. An attempt was made to overcome this inadequacy in data collection using methods described below.

Detailed stable isotope sampling was accomplished using the computer controlled, motorized micromilling equipment at Syracuse University. Distance increments can be made at 1 mm precision. Very small samples (~25 - 50 mg) are drilled from the surface of the thick-section and collected into containers using a small razor blade. The calcite powder is then converted into CO₂ by phosphoric acid at 70°C in an automated Kiel device. A Finnigan 252 mass spectrophotometer then measures each sample for $^{13}\text{C}/^{12}\text{C}$ and $^{18}\text{O}/^{16}\text{O}$ ratios.

Uranium-Thorium Analysis

Seven 2 g samples were sent to the University of California at Santa Cruz on March 29, 2000 for absolute age determination by $^{230}\text{Th}/^{234}\text{U}$ using mass-spectrometry. A detailed explanation of the dating procedure will be included in the 2000 report. As of July 16, 2000, no dates were reported as these analyses take much time. Additional funding in the form of an EOS-ESCI research grant from the University of New Hampshire as of April 14, 2000 will allow for higher resolution dating.

Stratigraphic Analysis

As the stable isotope sampling is now complete, thin sections are being prepared in order to conduct an extremely detailed analysis of growth layers within the stalagmites. Using petrographic microscopes, it is possible to see each individual layer in incredible detail. Photographs will be taken of sections of the stalagmite under the microscope and developed onto computer disk. The files will then be reassembled using software designed to splice JPEG images. After the entire samples are digitally reassembled, a second software program called ImageJ, distributed by the National Institute of Health, will then measure the thickness and luminosity of each layer while counting the number of layers. With these additional data, it will then be possible to count the number of layers between stable isotope measurements and use those data to infer growth variations continuously. Integrating all of the data described above will allow for the creation of a very continuous record for the entire length of both samples.

PRELIMINARY RESULTS

At present, we have a record of 371 stable carbon and oxygen isotope values that is in no temporal context. There is a maximum of 9 ‰ variation in $\delta^{13}\text{C}$ values and a 40 range in $\delta^{18}\text{O}$ values. Interpretation of these records is very difficult without a sound temporal context. Much of the record is cyclic showing repeated increasing and decreasing values. The cyclicity of these records is based only on distance between samples; there is no knowledge of how much absolute time these records represent. The only assumed age is that of the growing stalagmite tip which is within the last five years.

The stratigraphic portion of the analysis shows much potential for use in interpolating between stable isotope measurements and absolute dates. Some fine-tuning of the thin sections will allow for excellent imaging and the software capability will allow for rapid construction of complete images. By the time the dates arrive from the lab, the stratigraphic analysis should be complete and the entire record can finally be placed in a tightly controlled context. Expected completion of the project is estimated at December 2000.

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**A PROGRESS REPORT FOR THE 2000 FIELD SEASON
AT BARTON CREEK CAVE, BARTON CREEK VALLEY, CAYO DISTRICT,
BELIZE**

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INTRODUCTION

During the 2000 field season the Western Belize Regional Cave Project (WBRCP) conducted an extensive archaeological investigation at Barton Creek Cave, Cayo District, Belize, under the direction of Dr. Jaime Awe and the Belize Department of Archaeology. The primary goals were to draft a map of the cave and the ledges containing evidence of cultural activity, analyze the human remains, collect and analyze the artifacts and contextual data, and conduct an excavation of the structures near the entrance in an attempt to link the cave to the surface site. In addition, a number of reconnaissance trips were undertaken for the purpose of examining regional settlement and patterns of cave use.

Barton Creek Cave has been a popular tourist destination in Cayo for a number of years. Due to the cave's importance as a tourist destination and its prominence as an archaeological site, many ledges have been thoroughly explored by tour guides, local residents, tourists, and looters. Looter activity and foot traffic have impacted the archaeological record in various loci of the cave. For example, several artifacts and skeletal remains have been moved from their original contexts to more visible places in order to enhance the tour of the cave. In an effort to prevent the loss of any more data, the Belize Department of Archaeology requested an investigation of archaeological materials in Barton Creek Cave.

Preliminary investigations of the cave in 1999 revealed that the cave was not as disturbed by looters as previously thought. While many ledges displayed evidence of recent human intrusion, a number of artifacts maintained their original primary context. Based on the results of the 1999 survey, the WBRCP decided to conduct a more intensive archaeological analysis of the cave, its artifacts, and associated surface sites.

Over the course of the 2000 field season, approximately three-quarters of the areas in Barton Creek Cave with known archaeological material were investigated. Mapping and artifact analysis was completed for seven of the ten cultural ledges of the cave. Inventories are completed for the skeletal remains discovered thus far, and analyses of the dental and skeletal materials are currently underway. Finally, a preliminary ceramic analysis based on

James Gifford's ceramic sequence (Gifford 1976) was undertaken for all of the diagnostic material collected.

SETTING

The study area for the 2000 field season in the Barton Creek Valley included Barton Creek Cave, a series of structures on the river terrace near the cave entrance, and various architectural features and caves in the surrounding mountains flanking the valley. The valley is oriented roughly northeast and southwest, trending with the creek running on the eastside. In the area around the cave, the stream is dry except during the rainy season. However, on the opposite side of the valley two springs issue forth a large quantity of water and drain into the river flowing from the cave. It is this water that likely would have made the site an attractive area for dwelling in ancient times.

Barton Creek Cave is a large subterranean riverine system, of which some informants have suggested to be as long as 20 km. Despite the suggested length of the cave, cultural material is found only within the first kilometer from the known entrance. Within this area above the river are ten ledges that show evidence of ancient Maya activity. This area of the cave is also rich in speleothems occurring in large clusters suspended from the ceiling and cascading down the walls. The average passage size for the cultural section of the cave is between 20 to 40 m in height, and between 10 and 15 m wide. The base of the cave is entirely submerged in water that ranges in depth between 0.5 and 3 m deep.

Barton Creek, in general, is a north-northeast flowing stream in a relatively narrow valley draining into the Belize River, east of San Ignacio. The headwaters of the creek drain a portion of the Pine Ridge, a granite massif rising several hundred meters above the surrounding limestone. The creek descends from the Pine Ridge down a series of cascades into the Barton Creek Valley. Several smaller resurgences feed the creek draining the surrounding karst hills.

METHODOLOGY

The investigation of the Barton Creek area was conducted on several different levels. This included a GPS survey of a series of structures surrounding the cave, excavation of several of these structures, production of a large scale map of the entire cave, production of maps of archaeologically significant areas within the cave and reconnaissance to various loci in the surrounding mountains. Additionally, each ledge in the cave was divided into "areas" and all archaeological information was recorded in a structured manner.

The methodology of the inventory was relatively simple. In order to determine the extent of cave usage, we systematically searched the cave from the entrance to the point where we determined was the limit of ancient Maya activity. Each ledge we encountered was assigned a number and was further divided into areas that were assigned letters. All of the cultural material in each area was designated either as a feature, pool, artifact cluster, bone cluster, or burial. A ledge is defined as a natural rock shelf above the river, which is a discrete space defined by the extent one can walk or climb; it is impossible to walk from one

ledge to another. An area is defined as a culturally continuous space on a ledge that is separated by either features in the landscape, such as cliffs or extreme changes in elevation, or areas devoid of artifacts. An artifact cluster is a group of one or more artifacts in an area distinctly isolated from other groups. Occasionally this distinction is arbitrary. A pool is defined as a depression in an area, created by drip water or bat droppings, which contains artifacts or arrangements of stones. A feature is a constructed arrangement of stones or cached artifacts in an area. A bone cluster consists of co-mingled human bone in a confined space on a ledge. Using this structure, we generated an inventory of all of the ledges that were discovered in the cave. In order to synthesize and contextualize the data, maps were made of each ledge, area, some artifact clusters, bone clusters, features and pools.

Mapping of Barton Creek Cave was undertaken on three levels. First, a large-scale map of the entire cave is currently being developed with the cooperation of the Windy City Grotto, a group of cavers from Chicago headed by David and Eleanor Larsen. Secondly, detailed maps of the ledges containing archaeological materials were produced by the field school students and staff of the WBRCP. These maps were produced at a scale of 1:100 and are tied together using the survey stations established by the cavers. Additionally, features, burials, and artifact clusters with significant contextual information were mapped on a scale of 1:20.

Skeletal remains in Barton Creek Cave were analyzed to determine the age, sex, and health status of the individuals interred within the cave as well as to provide insight in the mortuary use of caves by the ancient Maya. Bone clusters (BCs) in the cave were recorded, mapped and photographed, and an inventory of all of the skeletal elements for each cluster was recorded. When possible, analysis and measurements were conducted *in situ*; however, in many cases it was necessary to remove the bones for proper cleaning. In addition to the analysis and inventory of the skeletal material, contextual details were carefully recorded along with associated artifact clusters and features.

Artifacts were collected from many of the artifact clusters and features. Collection was based on the uniqueness of the artifact, presence of diagnostic characteristics, and the possibility of being looted. Artifacts were analyzed based on type, material, manufacture, and were classified into taxonomic categories. Ceramics were preliminarily classified referencing Gifford's (1976) ceramic sequence. Wear characteristics of chipped stone artifacts were analyzed using abstracted patterns from Ahler (1971:38-39) and Shafer (1973:87-88) while other characteristics were examined using guidelines taken from Van Buren (1974). Furthermore, all artifacts except ceramic body sherds were illustrated on a scale of 1:1.

In the surrounding series of structures near the cave entrance, mapping and excavations were undertaken for the purpose of examining relationships between the cave and the surface site. A GPS map was produced of the structures located in close proximity from the entrance to about a mile southward up the valley. This was conducted by William Poe using a Trimble GPS system. Furthermore, three units were excavated into three separate structures. The specifics of the methodology employed in these excavations will be discussed below.

Reconnaissance was undertaken on several occasions to examine settlement outside the valley and to look for additional associations between caves and settlement. Excursions were made into the mountains southeast of Barton Creek. Structures and caves in a selected study area were mapped, explored and described. GPS coordinates were taken in the vicinity of one of the structures and a tape and compass map was used to tie in the remaining structures.

LEDGE 1

Ledge 1 is the first ledge in Barton Creek Cave situated immediately adjacent to the entrance on the western side of the cave river. It consists of a series of slopes, levels and alcove chambers formed within several large groupings of formations. The Maya used many of these smaller ledges; however, due to the close proximity of the entrance, there is much evidence of looting. Very little ceramic material remains in the area and no obvious architectural features constructed by the Maya are present, thus we considered this area of lowest priority for archaeological investigations. In 1999, we conducted an artifact inventory.

This season, several observations were made regarding the condition of Ledge 1 based on the inventory conducted in 1999. It was noted that several small clusters of sherds that were present last year are now missing. Significant impact to the surface of the ledge was also observed in several of the small chambers, and can be attributed to a series of digging events. Based on these observations, one can assume that looting and amateur exploration continues to this day, and measures need to be taken to insure the preservation of the cultural resources from this ledge.

LEDGE 2

Ledge 2 is the largest and most complicated ledge investigated within Barton Creek. As defined by our survey, the ledge consists of six areas, which we treated as separate entities. The main portion of the ledge consists of Areas A through D, which are located along the western wall of the cave forming a continuous path on two levels. Two additional areas (Areas H and E) are on the opposite wall of the cave, and consist of small ledges that can be accessed by climbing formations that span the river.

The artifact assemblage observed on Ledge 2 is very diverse dating between the Early Classic and Late or Terminal Classic. This was determined through an examination of the high density of ceramic material recovered from the ledge. Lithic artifacts comprise the second largest artifact class analyzed from Ledge 2. Other artifacts, such as beads and wood, are also found on the ledge.

A total of three individuals were discovered on Ledge 2, all of which are primary interments. Due to human intrusion and heavy taphonomic pressures, the remains of these individuals are fairly disturbed. Two of the individuals were placed in pools or depressions in the floor and exhibit burning episodes on the floors upon which the individuals were

placed. In addition to these two individuals, a cluster of bones (BC 22) was discovered amongst a large concentration of ceramic sherds and jute.

Ledge 2 is a biologically active part of the cave. Bats are present in a fairly high concentration as indicated by the thick blanket of guano over the surface of the ledge. Seeds carried into the cave by fruit bats can be observed sprouting below their roosts. Insects and spiders are also common and have been observed living within the guano on the floor. Indirect sunlight reaches the eastern half of the ledge providing energy for lichens on the walls. This active ecosystem has acted in both preserving and destroying artifacts and context.

Area A is a small chamber located higher than other areas of Ledge 2. It is comprised of immense rimstone dams and formations within a depression in the wall. Furthermore, additional formations and accumulations of clay have formed a fairly level surface that presumably would have served as a functional space for the Maya. A large number of bats use this area to roost, resulting in thick accumulations of guano covering the floors and surfaces concealing artifacts and features beneath. This has protected many of the artifacts from removal by looters and tourists who have ventured into the area. The guano also made it challenging to survey the area because of the difficulty in removing the overlying guano to expose the artifacts. A grid was established over a portion of Area A to provide a more detailed spatial analysis of the surface artifacts and possible buried features.

A flowstone terrace is located against the west wall of the area forming a terrace 0.5 m above the rest of the chamber. The ceiling above this terrace is only 1.5 m high near the eastern side, and tapers down until it meets with the floor in the rear. At the back of this natural feature is a small hole extending 60 cm into the wall, in front of which is a structure of backdirt from a looter excavation. The surface of this area was blanketed with ceramic artifacts.

Ceramics are distributed throughout the remainder of the chamber in several concentrations and will be discussed in more detail in the “Summary and Results” section. Most of these ceramics have been moved from their primary context and artificially placed in piles on rimstone dams and rocks within the chamber. In one of these concentrations a shovel was discovered, and was probably used to excavate the hole in a nearby alcove. Several features are also present in the chamber. These consist of stone alignments placed against the walls of the chamber, or as small dams in circular depressions.

Area B is characterized as a long and narrow terrace below Area A. The surface of the area consists of numerous rimstone dams that are filled with clay and guano forming a level surface between Area A and Area C. The Maya used these pools as ritual spaces as evidenced by the presence of numerous rocks and ceramics. Rocks, typically consisting of granite and limestone, were placed in numerous niches and circular depressions. Additionally, a stone alignment of three stones in the form of a triangle is located at the north end of the ledge. A unit was excavated in Area B to examine the possibility of the construction of a floor and to examine the area for potential stratified deposits.

The artifacts found in this region of the cave are the most diverse relative to the rest of the cave. Artifact types include jade, obsidian, ground stone, ceramics, wood, and lithics. Nearby, an incised spindle whorl and obsidian blade was discovered in a small niche in the wall of the cave. An abundance of ceramics was located in this area including slipped bowls and numerous jars of varying sizes.

At the south end of Area B there is an area of dense formations, which also serves as the entry point to Area C. This area contains one of the higher densities of artifacts within the cave. The area itself consists of a chamber, which is separated from the river by the formations, and opens up to a narrow terrace on the south side. A portion of the wall has fractured off, forming a narrow ledge above the chamber and a small narrow passage behind.

Adjacent to the remains in the central part of the chamber, there is a depression within the formations forming a receptacle for a large number of sherds, shells, and human bone. This one-meter-deep pit contains several hundred sherds comprising 20 or more vessels, the miscellaneous skeletal remains of a single individual, and an abundance of jute. In the center of the depression, a column rises like a tree connecting with the formations above like a canopy.

The south side of the room houses one of the most interesting features within the cave. This feature consists of a shallow rimstone pool covered with boulders. Beneath and between these rocks are the remains of numerous carbonized corn plants. Associated with the features is a rough biface with clay adhering to its surface, a fragment of a laurel leaf biface showing evidence of heat alteration, fragments of a dish, and fragments of two jars.

Near the outer margins of the chamber a series of small concentrations of ash were noted. Due to their deposition near the edge of the chamber, the ash may be remnants of torches that would have provided some of the light necessary to conduct rituals in the area. Some ceramics are associated with these features, however, it seems evident that they were swept into the area after the fires because they show little to no evidence of heat alteration or charring.

At the southern terminus of the chamber, a single artifact was found on the floor adjacent to a large flowstone column. It is a second fragment of the laurel leaf biface associated with carbonized corn. In this section of the ledge it is possible to either climb up a flowstone formation to access Area D or cross over the river suspended from stalactites to access Area H.

Area D is a narrow terrace widening at the southern end and terminating in a sheer drop to the river. Apart from the formations used to climb to this area, few formations are found in the northern section of this area; however, the southern end consists of several columns and many smaller flowstone formations. In this area, the remains of two individuals were found and were both situated in depressions below active formations. Additionally, the sparse remains of several vessels were found scattered amidst the formations in the southern end of the ledge.

Area H is one of the few undisturbed areas in the cave. It contains a vessel cache in a small niche above a flowstone formation emerging from the same feature. It is a very small area and difficult to access. Additional areas were observed for Ledge 2, but were not recorded this season. A small ledge on the opposite side of the river to Area C contained a number of sherds, which were probably tossed across the river. Above this ledge and slightly downstream was another ledge with the remains of several punctated jar sherds. Should further investigations continue in the cave, a brief survey will be necessary for these two areas.

Ledge 2 is one of the most significant ledges in the cave. Not only is the majority of the ceramic material located on the ledge, but it also contains the greatest diversity of artifacts, in terms of classes of artifacts and temporal range (Early to Late Classic (possibly Terminal Classic) material), and preserved plant remains. It is also the longest continuous deposit of cultural material in the cave. This diversity and density of artifacts may be explained by its close proximity to the entrance of the cave, as is often the case with many other caves in the region (see Awe ed. 1998, Awe et. al. eds. 1999). Thus far, a total of 1700 sherds have been counted for the ledge; however this does not include two large collections of sherds, which will put the total well over 2000. This number was calculated from the sherd counts of 57 artifact clusters and 34 features scattered over a ledge.

The bulk of the investigations conducted on Ledge 2 were focused on Area A due to the high concentration of ceramic material in the area, the presence of a long use history, the unique nature of certain ceramics, and the presence of intact features. A total of nine artifact clusters and eight features were recorded in the area. Four of the features were recorded as rock alignments, one as a biconically-drilled hole in the flowstone, and two as hearths. The rock alignments typically consisted of several rocks in linear formation, rocks blocking the potential drainage of a depression, or simply a cluster of stones. The hearths were comprised of ash adhering to a clay or stone surface in small concentrations. A total of 561 sherds were observed for this area. This excludes ceramics found within the gridded units, as time did not permit us to count these artifacts.

A number of unique and interesting ceramic artifacts were observed and collected from the ledge. A large red slipped censer was located in the central part of the chamber in sherd piles created by looters. The censer, whose shape is reminiscent to a brandy snifter, exhibits a number of incised and punctated patterns. The remains of a shoe pot were found on the flowstone terrace, along with the base of a censer and a small olla. Sherds found in this chamber were dated between the Protoclassic and Late Classic periods. One possible Protoclassic sherd was typed as Ixcanrio Orange Polychrome: Ixcanrio Variety; however, the ceramic analysis is still preliminary. The majority of the identified ceramics are of the Spanish Lookout phase of the Late Classic (Gifford 1976) consisting mainly of Garbutt Creek style bowls and Cayo Unslipped jars (Table 1).

Several interesting special finds and various lithic artifacts were discovered in the area as well. A large, complete laurel leaf biface was collected from the clay floor beneath

Location	Frequency	Type: Variety
L2,A,AC116	1	Cayo Unslipped: Cayo Variety
L2,A,AC116	1	Dolphin Head Red: Dolphin Head Variety
L2,A,AC116	1	Garbutt Creek Red: Garbutt Creek Variety
L2,A,AC116	1	Garbutt Creek Red: Garbutt Creek Variety
L2,A,AC116	1	Hewlett Bank Unslipped like
L2,A,AC116	1	Ixcanrio Orange Polychrome: Ixcanrio Variety
L2,A,AC116	1	Mangrove Brown-Black
L2,A,AC116	1	Mangrove Brown-Black
L2,A,AC116	1	Pucte Brown
L2,A,AC116	1	Rubber Camp Brown: Rubber Camp Variety
L2,A,AC116	1	Shoepot
L2,A,AC116	1	Unknown type.
L2,A,AC119	1	Censer
L2,A,AC119	1	Dolphin Head Red: Dolphin Head Variety
L2,A,AC119	2	Garbutt Creek Red: Garbutt Creek Variety
L2,A,AC119	3	Rubber Camp Brown: Rubber Camp Variety
L2,A,AC119	1	Rubber Camp Brown: Var. Unsp. w/ bark patterns
L2,A,AC120	1	Garbutt Creek Red: Brown Variety
L2,A,AC122	1	Garbutt Creek Red: Garbutt Creek Variety
L2,A,F42	2	Tu-tu Camp Striated: Tu-tu camp Variety
L2,A,F43	1	Garbutt Creek Red like
L2,A,NWP(10,11)	1	Garbutt Creek Red - Dolphin Head Red
L2,A,NWP(10,12)	1	Cayo Unslipped: Cayo Variety
L2,A,NWP(10,12)	1	Censer
L2,A,NWP(10,12)	1	Garbutt Creek Red: Garbutt Creek Variety
L2,A,NWP(9,11)	1	Garbutt Creek Red: Garbutt Creek Variety
L2,A,NWP(9,11)	1	Lucha Incised: Lucha Variety
L2,A,NWP(9,11)	1	Minanha Red
L2,A,NWP(9,11)	1	Vaca Falls Red: Vaca Falls Variety
L2,A,NWP(9,11)	1	Yaloche Cream Polychrome: Yaloche Variety
L2,A,NWP(9,11)	4	Unknown type.
L2,A,NWP(9,12)	1	Cayo Unslipped: Cayo Variety
L2,A,NWP(9,12)	1	Censer
L2,A,NWP(9,12)	2	Garbutt Creek Red: Garbutt Creek Variety
L2,A,NWP(9,12)	1	Garbutt Creek Red: Variety Unspecified
L2,A,NWP(9,12)	2	Rubber Camp Brown: Rubber Camp Variety
L2,A,NWP(9,13)	1	Garbutt Creek Red: Garbutt Creek Variety

Table 1: Ceramic type:varieties from Area A, Ledge 2.

the guano. Additionally, nine beads consisting of bi-directionally perforated faunal phalanges were discovered in and around the small alcove at the rear of the large alcove at the south side of the chamber. Also a large phalanx perforated laterally at the distal end and carved into a seated figure was discovered in the small alcove.

Area B also exhibits a long history of use and a diversity of artifacts. Based on the ceramics located in this area, it is suggested that this ledge was utilized from the Early Classic to the Terminal Classic. The ceramics collection mainly consisted of jars, though dishes and bowls were also present (Table 2). A total of 21 artifact clusters and nine features were recorded in this area. This amounted to approximately 291 in ceramic sherds, three special finds, and one lithic artifact.

The features discovered in Area B typically consisted of rock alignments or individual rocks that had obviously been placed in such a manner. Associated with one such cluster was a chert core, a partially carbonized piece of wood and a jade bead with a circle incised on a flattened side. Three other features consisted of a single rock or two rocks placed within a circular depression in the floor. Ceramic material was typically associated with each of these features.

The results of an excavation unit from the central portion of the ledge revealed the presence of two additional hearths and a stone placed in a circular depression. The unit was excavated beneath a cluster of formations where a complete ceramic dish was broken. Additionally, the area appeared to have a floor consisting of tamped fill with a thin coating of plaster-like material. It is still puzzling as to what the thin coating of white plaster-like calcitic material may be; however, it does form a thin layer over the compact clay floor in a number of places in Area B. The unit was excavated into this material beneath the formations and dish fragments in the hope of finding buried material associated with this ritual act. The fragmented dish on the surface amounted to a large collection of sherds, which was refitted into a single Roaring Creek Red dish with an impact point on the base. Apart from a large olla fragment, few other artifacts were found in the unit.

Area C was also an intensively investigated section of the ledge that exhibited 16 artifact clusters and ten features. This amounted to a total of 565 sherds, two lithics, two ground stone artifacts, and one special find. The special find consists of a single *olivella* tinkler found below the guano lens in the central portion of the chamber. Almost all of the sherds are Late Classic, consisting of various types of jars, several Garbutt Creek style bowls, a few dishes, and one brandy snifter shaped vessel (Table 3).

The features in the area can be predominantly characterized as hearths, amounting to a total of eight. These consisted of a small concentration of ash and charcoal on the original surface beneath the guano. They were typically in the central region of the room except for one, which contains plant remains and will be discussed later. The other two features consisted of rock alignments of no particular pattern. One feature consists of several rocks located in the central area of the chamber, found in association with a fragmented jar, an inverted jar with a small kill hole in its base, and a metate cemented to the floor with a concentration of ash within.

Location	Frequency	Type: Variety
L2,B,AC60	1	Actuncan/Dos Arroyos
L2,B,AC65	1	Mount Pleasant: Mount Pleasant Variety
L2,B,AC65	4	Rubber Camp Brown: Rubber Camp Variety
L2,B,AC66	1	Garbutt Creek Red: Garbutt Creek Variety
L2,B,AC69	1	Cayo Unslipped: Cayo Variety
L2,B,AC69	1	Censer
L2,B,AC69	1	Garbutt Creek Red: Garbutt Creek Variety
L2,B,AC74	1	Dolphin Head Red: Dolphin Head Variety
L2,B,AC91	1	Roaring Creek Red / Kaway Impressed
L2,B,F27	1	Vaca Falls Red: Vaca Falls Variety
L2,B,F29	1	Garbutt Creek Red: Var. Unsp. w/ bark patterns
L2,B,F30	1	Achote Black
L2,B,F30	1	Cayo Unslipped: Cayo Variety
L2,B,F30	1	Tu-tu Camp Striated: Tu-tu camp Variety

Table 2: Ceramic type:varieties from Area B, Ledge 2.

Located on the ledge above the chamber is a jar encrusted with calcite. It is a nearly complete vessel, missing its base. Because of its placement under dripping water a thick layer of calcite has covered the entire vessel and cemented it to the ground. Below the ledge in the main portion of the chamber additional artifacts are fused to the ground in a similar manner. The sherd broken from the killed vessel could not be located.

In the lower section of the chamber, an artifact cluster located in a pit within a formation cluster contained over 250 sherds, primarily dating to the Late Classic, in a one by one meter area. The majority of the sherds are jar fragments; however, a number of interesting vessel types were also observed, including one with a spout and several incised wares (Table 3, AC78). Additionally, an uncounted number of jute shells were observed in the pit. Human skeletal material (described below) was found as well.

The most significant find in Area C, and possibly the cave in its entirety, was a large hearth located in an alcove abutting the cave wall, containing extremely well preserved carbonized maize remains. The hearth is situated in a large rimstone pool covered with breakdown from the cave wall above. This collapse (which may have been caused by the heat of the fire) aided in the preservation of the plant material. A large number of individual cobs, silks, stems, leaves of the corn plant, and wood, were collected from the feature. In addition to these remains, a rough biface, several fragments of a Late Classic dish, and a small olla, were found in association with the feature.

Excluding the two individuals, Area D probably received the least amount of investigation of any area on the ledge. This was due to a total lack of observed features and the presence of only nine artifact clusters. A total of 144 sherds were located in the area. These consisted of predominantly Late Classic bowls (Table 4). No other artifact types were observed.

Location	Frequency	Type: Variety
L2,C,AC78	1	Belize Red: Belize Variety
L2,C,AC78	1	Cayo Unslipped: Cayo Variety
L2,C,AC78	4	Cayo Unslipped: Cayo Variety
L2,C,AC78	1	Garbutt Creek Red: Garbutt Creek Variety
L2,C,AC78	1	Garbutt Creek Red: Garbutt Creek Variety
L2,C,AC78	1	Garbutt Creek Red: Garbutt Creek Variety
L2,C,AC78	1	Mount Malony Black: Mount Malony Variety
L2,C,AC78	1	Mountain Pine Red: Mountain Pine Variety
L2,C,AC78	1	Roaring Creek Red: Roaring Creek Variety
L2,C,AC78	1	Silver Creek Impressed: Silver Creek Variety
L2,C,AC78	1	Tinaja Red
L2,C,AC78	1	Tu-tu Camp Striated: Tu-tu camp Variety
L2,C,AC78	1	Unknown type.
L2,C,AC80	1	Cayo Unslipped: Cayo Variety
L2,C,AC80	1	Teakettle Black: Teakettle Variety
L2,C,AC92	1	Cayo Unslipped: Variety Unspecified (red)
L2,C,AC92	1	Tunichil Tripod Vessel
L2,C,AC92	1	Tu-tu Camp Striated: Tu-tu Camp Variety
L2,C,F23	1	Cayo Unslipped: Cayo Variety
L2,C,F23	1	Cayo Unslipped: Cayo Variety
L2,C,F23	1	Cayo Unslipped: Cayo Variety
L2,C,F23	1	Roaring Creek Red: Brown Variety & impressed
L2,C,F23	1	Roaring Creek Red: Roaring Creek Variety
L2,C,F23	1	Roaring Creek Red: Roaring Creek Variety
L2,C,F29	1	Garbutt Creek Red: Garbutt Creek Variety
L2,C,F29	1	Roaring Creek Red: Roaring Creek Variety
L2,C,F33	1	Yalbac Smudge Brown: Yalbac Variety

Table 3: Ceramic type:varieties from Area C, Ledge 2.

Location	Frequency	Type: Variety
L2,D,AC101	1	Mountain Pine Red / Roaring Creek Red
L2,D,AC105	4	Rubber Camp Brown: Rubber Camp Variety
L2,D,AC111	1	Dolphin Head Red: Dolphin Head Variety
L2,D,AC112	1	Duck Run Incised: Duck Run Variety
L2,D,AC114	1	Dolphin Head Red: Dolphin Head Variety
L2,D,AC97	1	Dolphin Head Red: Dolphin Head Variety

Table 4: Ceramic type:varieties from Area D, Ledge 2.

Area H contained an extraordinary find, consisting of a vessel cache in a small niche in a flowstone formation, located above a complete jar, which was situated on a narrow ledge. The cache contained two vessels and several sherds placed at the terminal end of a niche. Three stacked jar sherds were adjacent to a killed jar. Beside the jar was a complete Dolphin Head Red dish with three jar sherds and an unidentified dish sherd beneath. No other artifacts were associated with the cache. Below the cache was a complete jar with a large kill hole in the base. The missing sherd was not in the local area.

Investigations of Ledge 2 resulted in the discovery of the skeletal remains of two distinct individuals, and a cluster of bones most likely belonging to a third individual. Bone Cluster 24 (BC24) is located in Area D and includes the disturbed remains of an adult. The partial articulation of a number of foot phalanges suggests that this is most likely a primary interment. The skeletal remains are concentrated in a depressed, pool-like area surrounded by wall formations, and a drop to the river, forming a semi-enclosed or circumscribed space. All of the skeletal material was found on the surface and within the thin layer of guano matrix. Directly below this guano lens is a thin, compact clay layer above an ash and charcoal lens, thus suggesting a burning episode occurred prior to the placement of the deceased. Preservation of the bone is relatively fair; however, much of the damage can be attributed to heavy foot traffic through this area. Active formations both above and around the remains may have caused significant damage due to heavy drip water action or water flow. This may also explain the absence of many of the skeletal elements. A total of 82 bone fragments and teeth were recorded for this individual. No associated artifacts were observed.

Bone Cluster 25 (BC25) is located in Area D of Ledge 2 and includes the partially articulated remains of a child. The individual is situated on the surface of an enclosed pool-like area close to the edge of the ledge. There is a large stalagmite forming the eastern side of the pool and a limestone formation forms the remaining walls of the pool. The area contains many cave formations, including draperies, large stalagmites, stalactites and various other forms. It is a very wet, active area and appears to have been so in the past. It is possible that the dry pool containing the skeletal material was at one time filled with water. This is suggested by a drainage area of the pool that has been artificially blocked by a number of speleothems, placed in such a way as to block the drainage of water. The surface of the pool now exhibits a thin layer of guano overlaying a compact clay layer and ash lens. Preservation of bone, in general, is good due to the thin layer of calcite that coats many of the bones; however, the skeletal material is highly fragmented, probably as a result of heavy drip action causing the erosion, calcification and breakage of much of the bone. Thus, the disturbance of the remains is more likely to be a result of taphonomic pressures rather than human intrusion. Although disturbed, some of the skeletal elements were articulated, indicating that this is a primary interment. Based on the layout of the material in the pool, it could be ascertained that the head was in the southern end of the pool, although burial position could not be determined. A total of 52 bones were observed for BC25. Preliminary analysis suggests that this individual was a child of approximately age 5 to 7 based on patterns of dental eruption outlined by Ubelaker (1978). The presence of unfused epiphyses along with the length and size of the long bones also supports this claim.

Bone Cluster 22 (BC22) is located in Area C. This area resembles a ceramic dump with the occasional bone or jute intermixed with the sherds. Relative to the amount of ceramics, there are very few bones. A total of 13 bones were recovered from the bone cluster, which includes ribs, vertebrae, as well as hands and/or foot bones, all belonging to the same individual. As far as we know these bones do not articulate with those from another cluster. The only possibility would be BC24, but BC22 appears to be a younger individual based on the billowed surface of the vertebral bodies and the lack of epiphyseal fusion for the metacarpals and metatarsals.

LEDGE 3

Ledge 3 is a smaller ledge located at the southern terminus of Ledge 2 on the western side of the river. It consists of three levels, two of which contained artifacts. The upper levels exhibit a bedrock floor that has essentially been walled in by extensive formations creating small chambers and passageways in which the Maya conducted rituals.

The uppermost level, Area B, is a very significant area in the cave as it appears to be of an unlooted, primary context. This area contains the remains of one individual in a rimstone pool. A complete jar is located in a small niche on the side of this same pool. Another interesting feature is a passageway that was created by the Maya by breaking through a drapery formation to access the pool from the climb. Ceramic sherds were found in this area.

The middle level, Area A, also contains the remains of a single individual as well as broken draperies. This individual is placed in a rimstone pool among several large formations. Unfortunately, the bones have been highly disturbed by looting activity. Nearby, placed in a niche in the formations, are several large sherds from a jar. Situated in an adjacent pool is a small stack of granite cobbles, several jar sherds and two speleothems that have been placed against a column. Down this passage, beyond the skeletal material, a nearly complete bowl is found at the base of a small stalagmite.

Given that most of the artifacts are associated with the large formations on the upper levels, it can be postulated that these speleothem features attributed to the importance of the ledge. Both individuals are placed in the context of large formations, as are most of the ceramics. Ceramics that are not in this context appear to have fallen from Area B where they were originally amongst the formations. The ceramics identified on this ledge date to the Spanish Lookout phase of the Late Classic (Gifford 1976). They are consistent with other areas of the cave that exhibit Late Classic material, and consist of bowls of the Rubber Camp and Garbutt Creek types, and jars of Cayo Unslipped and Tu-tu Camp Striated types. A total of 81 sherds were recorded on the ledge, 60 of which were observed in Area B.

Our investigations recorded both features and artifact clusters from Areas A and B. A total of two artifact clusters and three features are located in Area A, and five artifact clusters and four features are located in Area B. The features typically consisted of modified cave formations and rock alignments.

Two modified caved formations were discovered on Ledge 3. In Area A, a series of four draperies that had partially obstructed entry to a chamber were broken to provide entry through the passage. The fragmented pieces of drapery were found cached in small depressions within a stalagmite on the floor of the chamber. In Area B, an actual passage, or doorway was broken through four large draperies, which, prior to their breakage, hindered entry. A hole large enough to walk through was created. This "doorway" provided access to a rimstone pool, which contained the remains of a single individual as well as a complete jar. The evidence of ancient activity in the chamber and the caching of the broken speleothem material in the stalagmite indicate that the speleothem was broken in antiquity.

The two individuals that were discovered on Ledge 3 both appear to be primary interments. Bone Cluster 26 (BC26) is situated in a surface depression of the floor in a restricted area between a cluster of formations and the cave wall. Apart from a partially articulated hand, this individual is completely disturbed due to recent foot traffic in the area. A total of 449 bones and bone fragments, their preservation ranging from extremely fragile to well preserved, were observed on the surface and subsurface of the area. A large concentration of bone was located within a 2 cm thick clay matrix interspersed with charcoal inclusions and decomposing limestone. This layer is situated on a bed of charcoal, ash and clay over bedrock. Artifacts associated with this individual include two jute, a slightly polished bone hairpin, and ceramic sherds. Preliminary analysis suggests that this individual is an adult based on the eruption of the third molars and total fusion of all epiphyses. Sex of the individual is indeterminate at this time as much of the pelvic material is highly fragmented. However, the prominent mental eminence and overall robusticity of the bones suggests that this individual was male.

Bone Cluster 27 (BC27) is a primary interment located on the surface of a seasonally active rimstone pool. The individual is oriented almost exactly north-south with the head to the south and the feet to the north and is placed in a face-down, or prone position with the head on slightly lower ground than the feet. The position of the skeleton is slightly extended, and it appears as if the individual was haphazardly placed in the pool based on the bent nature of the right leg. Preservation is excellent due to calcification of most of the skeletal material; however, it has also concealed and distorted the appearance of the bone. The cranium is only partially calcified in the maxillary and frontal region, hindering observation and analysis of the dental material. Thus, age identification was based on measurements of long bones and epiphyseal fusion. Preliminary analysis suggests that the age of death of this individual was approximately four to six years of age. There appears to be some slight occipital flattening causing slight bulging of the parietals. Cranial modification of the frontal bone, however, is extreme. There are no artifacts that are directly associated with the burial. A small granite cobble, a speleothem fragment and a complete vessel are the only cultural materials within close proximity.

LEDGE 4

Ledge 4 consists of several narrow terraces on the east wall of the river passage, 5 to 20 meters above the water level. The ledge shows a lot of exposed limestone, as few formations have formed in this region of the cave. Additionally, this ledge is the most

difficult and dangerous to access, which may explain the general lack of artifacts in this area. Two concentrations of artifacts were observed during reconnaissance and mapping of the ledge.

A large stalagmite is present near the edge of the terrace on the uppermost portion of the ledge, and a level clay floor is located between it and the wall. The remains of a fractured olla are placed against the base of this formation constituting the only artifact observed on this particular section of the ledge. A few scattered sherds and a small hearth are found on a lower terrace near the first climb. The upper and lower sections of the ledge are separated by a series of very exposed and dangerous climbs. These climbs require the use of two hands and must have posed an interesting challenge to the Maya carrying light into these regions.

Based on the reconnaissance trips to Ledge 4, few conclusions can be made regarding the temporality of the activities in this area. The olla discovered beneath the stalagmite is likely Late Classic in origin, with a filleted appliqué encircling the shoulder of the vessel. The pattern exhibits several side-by-side half circles aligned around the shoulder of the vessel with the open end facing down. The vessel is water-worn from drip water associated with the adjacent stalagmite. The placement of the olla is interesting because it was positioned at the base of the only significant formation on the upper ledge.

A hearth and several body sherds are located on a lower section of the ledge near the initial ascent. Water has significantly eroded most of the hearth leaving several patches of gray ash and charcoal flecks adhering to the bedrock. In close proximity to this feature, several small body sherds from unidentified vessel types are scattered throughout small depressions and cracks. It is highly probable the high water levels have reached this area washing away all loose materials and pushing the observed sherds into their current locations.

LEDGE 5

Ledge 5 is a small ledge formed by several alcoves within a large formation cluster on the western side of the cave passage. The main level of the ledge is approximately 10 m above the average water level of the cave. In general, the area consists of a short segment of the ledge that overlooks the river, attached to a series of large chambers behind a wall of formations. At the entrance to the chambers and within them are a fairly significant number of ceramic artifacts.

Large bowl and olla sherds are possibly the fragmented remains of several vessels that may have been terminated in this space. Some of these sherds are found cemented to the flowstone floor, evidence that these vessels were broken in antiquity. Additionally, smaller sherds are situated in a small depression in the floor of the same chamber. Near the entrance, in a single, guano-filled rimstone pool, lie the fragments of a large olla and several fragments of other ceramic vessels.

Based on the preliminary investigations of Ledge 5, little contextual and spatial data can be offered as a result. However, several general observations regarding this area of the

cave will be presented. The ceramics found on this ledge have been assigned type:varieties dating to the Late Classic period. The ollas are square lipped and show many similarities to Cayo Unslipped: Cayo Variety of the Spanish Lookout phase. Furthermore, a bowl observed in the alcove is very similar in style to Belize Red bowls of the same period with three tau-shaped slab feet.

An interesting observation noted during the exploration of the ledge was the presence of two separate sherds from the same vessel located in two separate locations, and separated by a formation. Access between these two areas is achieved via a small hole that can be reached by climbing up and back down the formation. The practice of placing sherds in separate areas of the cave after termination or breakage of the vessel has been observed in other caves in the Cayo area (Jaime Awe, personal communication, 1999).

LEDGE 6

Ledge 6 is a fairly narrow, short ledge consisting of two levels on the western side of the river. The lower section, Area A, is formed on a small bedrock shelf terminating on the north and south in formations. Area A is relatively flat except for a narrow fissure that crosses the ledge. Additionally, two small chambers are located at either end of this fissure beneath the flowstone. On top of a large flowstone at the north end is Area B, which consists of an alcove confined within several columns.

A light scatter of ceramic artifacts and a few lithic artifacts are present on the surface of the ledge. Most of these are concentrated in a small circular pit associated with an ash lens. The remaining artifacts are dispersed throughout the surface in shallow depressions on the floor across the entire ledge. A single bone cluster was observed within a small alcove at the northern terminus of the fissure. The bones are partially buried in alluvial sediments comprising the floor.

A fairly complete set of artifacts was recovered and analyzed from the surface and subsurface of Ledge 6. A total of six features are present on the ledge, and include five hearths and one rock cluster. Two obsidian blades were associated with two separate hearths and a mano was found in the immediate vicinity of the rock cluster. Additionally, 54 sherds were observed within these features. The hearths are generally located along the walls of the ledge, and are characterized as small patches of ash and charcoal adhering to the rock or buried beneath guano in depressions.

Nineteen artifact clusters were recorded on the ledge, and are typically located within shallow depressions. They are dispersed fairly evenly across the ledge in both Areas A and B. A diversity of artifacts are associated with the clusters, and include: 329 ceramic sherds, 1 stemmed chert biface, 4 jute shells, 1 obsidian blade fragment, a wooden log, 2 slate net sinkers, and 2 slate fragments. These totals do not include an additional artifact cluster that was excavated providing a much higher sherd count than the remainder of the ledge.

This artifact cluster is located in an 85 cm deep circular depression in the bedrock. The bottom 40 cm of the depression, divided into four levels, is filled with guano, sherds, ash,

charcoal and clay. Based on the excavation, it was determined that the base of the pit is a mixture of clay and charcoal beneath a 20 cm thick level of broken ceramic vessels, divided by a 5 to 10 cm level of ash. These sherds are covered by a 5 cm-thick layer of guano. Mixed into these levels are 12 to 15 heat-altered stones, comprised of both granite and limestone. The artifacts recovered from the excavation include 954 ceramics sherds, 5 shell disc beads, 2 speleothem fragments, 6 seeds (probably modern) and 14 egg shell fragments (probably modern).

The disarticulated remains of a single adult individual (BC13) were recorded for Ledge 6. The skeletal material was found deep in an alcove located at the northern terminus of the fissure. Associated artifacts include ceramic sherds, a fire-cracked granite cobble and a speleothem. BC 13 consists of a total of 45 bones and bone fragments. Bone preservation is excellent, in general, which allowed for the preservation of a right pubic symphysis and the auricular surface of the right innominate. Analysis of these two characteristics suggests this individual was an adult female in her 40s. Despite the excellent preservation of the skeletal material, this bone cluster was subject to taphonomic pressures. It appears that periodic flooding of the ledge has disturbed and possibly buried much of the skeletal material within the alluvial sediments or washed the bones deeper into the narrow alcove.

Based on the preliminary analysis of the ceramics, we conclude that the Maya were conducting ritual activity on Ledge 6 during the Late Classic period. The ceramics identified fall within the Spanish Lookout ceramic phase (Gifford 1976) providing us with this date range (Table 5).

Location	Frequency	Type: Variety
L6,A,AC14	1	Cayo Unslipped: Cayo Variety
L6,A,AC14	1	Tinaja Red
L6,A,AC14	1	Tu-tu Camp Striated: Tu-tu Camp Variety
L6,A,AC47	1	Cayo Unslipped: Cayo Variety
L6,A,F4	1	Cayo Unslipped: Cayo Variety/Variety Unspecified
L6,A,U2.1	1	Cayo Unslipped: Cayo Variety
L6,A,U2.1	2	Tinaja Red
L6,A,U2.2	1	Tinaja Red
L6,A,U2.2	1	Tu-tu Camp Striated: Tu-tu Camp Variety
L6,A,U2.2	1	Zibal Unslipped: Zibal Variety/Variet Unspecified

Table 5. Ceramic Type: Varieties, contexts and counts from Ledge 6.

LEDGE 7

Ledge 7 consists of several levels, the bottom three (Area A) of which are accessible via an easy climb. An upper ledge, Area B, is accessible only through a very exposed and dangerous climb. There are two large formation clusters on the ledge, one consisting of five large columns on the upper part of Area A, and the second consisting of a large flowstone formation on the northern end of the ledge separating Ledge 6 and 7 by a substantial drop. The upper ledge, Area B, is a small shelf terminating in a narrow fissure in the wall.

Ledge 7 has been heavily vandalized due to enormous amounts of tourist traffic and looting via the relatively easy access point. As a result, few artifacts remain on the ledge and the presence of several imported artifacts was observed. The few artifacts found on the ledge were concentrated near the column and flowstone formations. They consist of small sherds found in small niches and crevices. The imported artifacts are located on the lower terraces in small groupings seemingly set up for display. Larger and more intact ceramic artifacts are present in Area B. Additionally, several human bones are located in close proximity to the cluster of columns in the upper section of Area A.

The few artifacts that are present on Ledge 7, Area A, are located in close proximity to the columns and on top of the flowstone, in two separate artifact clusters. Additionally, seven hearth features were recorded in this area. One artifact cluster contains a scatter of sherds across the slope, below the upper area of Area A, while the second is associated with the columns. The hearths are characterized by small patches of ash and charcoal, and typically occur beneath the compact guano within small depressions along the walls and drop off the ledge. The one bone cluster (BC14) that has been identified for Ledge 8 consists of small, highly fragmented pieces of bone and a modified upper first incisor. These skeletal materials were found in small niches of a large column or in association with sherd clusters at its base. Given the fragmented nature of the skeletal remains, age and sex could not be determined.

Area B is covered with a light scatter of large ceramic sherds, as it has not been heavily looted. Several fragments of Tinaja Red and Garbutt Creek Red vessels were the only types present. No other artifact types were observed in the area. One feature is present in Area B, which consists of a small pile of rocks, presently disturbed, that blocks access to a small crack in the wall. No artifacts were present beyond the rocks. Based on the typological dating of the ceramics, it appears Area B was utilized in the Late Classic. Moreover, the ceramics found on the remainder of the ledge also date to the Late Classic (Table 6). This collection included unslipped jars and slipped dishes and bowls. Only one sherd was polychrome, which is hidden in a small crevice and was most likely imported and used to show tourists.

Location	Frequency	Type: Variety
L7,A,AC2	1	Roaring Creek Red: Roaring Creek Variety
L7,A,AC2	1	Zibal Unslipped: Zibal Variety
L7,A,F4	1	Cayo Unslipped: Cayo Variety
L7,A,F7	1	Cayo Unslipped: Cayo Variety
L7,A,F7	1	Tinaja Red

Table 6. Ceramic Type: varieties from Ledge 7, Area A.

The results of the excavation revealed a thin cultural layer overlying sterile clay that fills a circular depression in the floor. A unit was placed in a circular depression in Area A adjacent to the columns to ascertain if stratified deposits are present in an attempt to

determine long term usage of the area. Given the consistent nature of the clay, its lack of mottling, and general absence of artifacts, it is likely that it is a natural deposit. The upper strata of the unit are thin, stratified layers of charcoal, clay, ash, and other unidentified materials present to a depth of 1 to 3 cm. This layer appears to be the result of multiple uses of the area whereby material was moved around and deposited by foot traffic and remains of rituals. This process probably occurred both in present and past times.

LEDGE 8

Ledge 8 is characterized as two narrow terraces situated on the opposite side of the river and below the upper portion of Ledge 7. It consists of two terraces and a flowstone bridge spanning the river. Access to the ledge was made possible by rappelling down from Ledge 7 onto the bridge; however, in ancient times, a ladder may have been used from the river level. A large number of artifacts were inventoried for Ledge 8, which represents the second largest concentration of artifacts in the cave. Composed mostly of sherds, several lithic and ground stone artifacts are also present.

Area A is an eroded flowstone bridge spanning the river four meters above the water surface. It is pitted with numerous depressions, many of which contain a mixture of ceramics, which seem to have fallen from above and washed into the depressions during floods. One interesting find in this area was a mano found cached in a small niche. In the center of the bridge, a human skull had been placed near the edge for the purpose of display to the tourists in the canoes below.

The lower terrace, Area B, is a bedrock ledge partially covered with flowstone. The artifact density in this area is much less than that of Area C. The main concentration is located in and around a narrow depression on the north side, which is filled with bones and ceramics. This area has been highly disturbed in recent times and many of the artifacts and skeletal materials have been placed in areas suitable for display. Additional artifacts are located in a series of circular depression on the south side of the area.

The upper of the two terraces, Area C, is composed of giant rimstone dams and can be accessed via a challenging climb up a flowstone surface. Cultural materials include human remains in a number of these rimstone pools. Unfortunately, it has been highly disturbed by recent human activity, and many of the objects have been placed on the dams supposedly to entertain modern visitors. Additionally, numerous footprints were evident in the pools, and have caused a fair amount of damage to the artifacts and bones. The artifacts present in the area consist mainly of jar fragments, bowl fragments, and a metate. Seven bone clusters are also present in and around several of the pools.

Area A is the lowest portion of the ledge and most affected by massive floodwaters. For this reason, it was assumed, that the area contained the least amount of artifacts. The majority of them seem to consist of sherds that have washed from above. A total of three artifact clusters were recorded in the area consisting of 82 sherds and a single complete mano cached in a small niche.

One bone cluster was observed for Area A (BC12), which consisted of a partial cranium (both the mandible and maxilla are absent). The skull is situated on the edge of the bridge and has been placed there in recent years by tour guides, both to "enhance" the tour and discourage foot traffic on the ledges for the purpose of viewing the skeletal remains. Analysis of this specimen suggests the individual is an adult female. The surface characteristics and preservation quality is similar to other bones in Area B, which suggests it may have originated from this region of Ledge 8.

Area B contains a light scatter of sherds collected in a series of circular depression in the south side of the ledge and a dense concentration in the north. Associated with this concentration is also a dense cluster of human bone, which is described below. The area has a total of 10 artifact clusters containing 328 sherds and a core. The type assignations of these sherds date primarily to the Late Classic; however, several Early Classic sherds were found. This occurrence of sherds this deep (320 m) into the cave is not uncommon for caves in western Belize (e.g. Actun Tunichil Muknal).

A total of four bone clusters were inventoried for Area B of Ledge 8. These bone clusters are all highly disturbed and their individual concentrations are the direct result of recent looting activity and tourism. However, local inhabitants of the valley who visited the ledge prior to its disturbance, have suggested that the original context of all the skeletal material was in the crevice near the cave wall. This crevice contained an abundance of human remains and was labeled as Bone Cluster 1. This cluster contained the remains of several adults and children, in addition to high concentrations of ceramic material, granite cobbles, speleothems, and an obsidian blade. Much of this material was used as fill for the purpose of leveling the surface floor of the crevice. Bone Clusters 2 and 3 are located to the west of this crevice and appear to have originated from BC1. Bone Cluster 4 consists of a complete skull and mandible that has been artificially placed in a niche on the edge of the ledge in recent years for purposes relating to tourism. The skull belongs to that of an adult individual based on the eruption of the third molars, however, sex could not be determined with confidence. Preservation of all of the skeletal material from Area B ranged from excellent to poor. Analysis of the bulk of this material is currently underway. A preliminary estimate for the MNI for Areas A and B would be 5 adults and 2 subadults based on postcranial material.

Area C is the most complex part of the ledge consisting of a several features, bone clusters, and artifact clusters. A unit was placed in a circular depression in Area C adjacent to the columns to ascertain if stratified deposits are present. A total of 17 artifact clusters and five features were recorded for this area. Three of the features consisted of hearths, one of which was intense enough to stain the wall with soot. The remaining features consist of triangular stone arrangements associated with the skeletal remains. Each of these arrangements contains one or more granite stones.

Comprising the artifact clusters were 377 sherds, 1 core, 2 flakes and 1 metate. The flakes and core were of a honey to amber colored chert and remarkably refit together. The metate was located on the rim of a flowstone dam in a location that facilitated an easy view for passing tourists in canoes. Because of this fact, it is difficult to determine if the artifact is

actually part of the area assemblage or was imported. Adjacent to the metate is a complete olla with a handle, several large sherds, and the complete rims of two additional vessels.

Preliminary analyses of these ceramics suggest that the majority of the sherds from this area are from the Late Classic period, primarily, the Spanish Lookout phase (Gifford 1976). These consist mostly of jars and a few bowls. It is interesting to note that several large Early Classic sherds were observed in the lower strata of one of the artifacts clusters, buried beneath several centimeters of sherds and guano.

A total of seven bone clusters were identified for Area C. Bone Clusters 5 through 9 are highly disturbed due to heavy foot traffic and are characterized by highly fragmented bone and small skeletal elements belonging to both adults and subadults. The degree of disturbance to Bone Clusters 10 and 11 is less severe, and we were able to determine that the two pools, which defined each cluster, held the remains of a subadult and an adult. A preliminary estimate for the MNI for Area C would be 3 adults and 2 subadults.

Unfortunately, due to the extensive modification of the context of artifacts, possible importation of artifacts, and destruction of cultural and skeletal material, much of the information regarding Maya cave ritual is lost. Despite this unfortunate situation, several interesting facts can be gleaned from this ledge. Most notably is the presence of Early Classic material 350 m into the cave and well within the dark zone. Based on previous studies of the Roaring Creek Valley, a pattern has been observed that indicates Early Classic material near cave entrances, not far beyond the dark zone (Awe 1998). The occurrence of Early Classic material on Ledge 8 suggests that a different pattern may occur in the Barton Creek Valley. A second explanation may be that the Maya were caching Early Classic artifacts or relics, collected near the entrance, on Ledge 8 in the Late Classic period as a form of ancestor worship or reverence for the past.

LEDGE 9

Ledge 9 is the farthest ledge from the cave entrance evidencing ritual use of the cave by the ancient Maya. No other cultural remains were found beyond this point. Ledge 9 consists of two levels that were used by the Maya. The lower level, Area A, is formed by a series of rimstone dams that are essentially forming a bridge, which spans the cave passage above the river. It consists of a large, clay-bottomed pool and several small pools on the north side. Located within several of the pools, as well as the dams, are the remains of several individuals. All have been highly disturbed, as looting activity on the ledge is severe.

In general, the presence of artifacts on Ledge 9 is relatively low, which may be attributable to factors such as taphonomic disturbance and looting activity. Conversely, one might also argue that the low artifact density may reflect a difference in types of activities or frequency of activity that would presumably leave less artifact deposition. However, the density of human remains on this ledge is quite high, despite the high degree of disturbance. No artifact clusters were recorded in the lower area, and a total of two or three non-

diagnostic sherds were present on this level. On the upper level, Area B, fragments of two large jars and a piece of partially carbonized wood constitute the entire collection.

The upper level, Area B, is a long limestone terrace that measures 0.5 x 5.0 m. Artifact density is fairly low, and includes two jar remains, wood fragments and charcoal. Additionally, a stone feature is located in a small alcove. This area also shows signs of disturbance, evidenced by footprints and excavations into some of the circular depressions in the floor.

Two features were observed at the south end of Area B. One consisted of a small platform 10 to 15 cm high constructed in two levels from small locally available stones in front of a shallow alcove. No artifacts were associated with this feature, though the presence of footprints from possible looters may suggest that the absence of artifacts could be attributable to recent human activity. The second feature, further south, consists of a pile of small stones adjacent to a low stalagmite cluster, and is found in association with a broken jar and may have some relation to it.

A total of eight bone clusters were inventoried for Ledge 9, all of which were highly disturbed due to both taphonomic processes and heavy foot traffic. However, preservation for the skeletal material is in excellent condition despite some of the recent damage to the materials. Preliminary analysis yields an estimate of 9 individuals (5 adults, 4 subadults) based on cranial materials. Analyses of these materials are currently in progress. All of the bone that was inventoried over the course of the 1999 and 2000 field seasons were surface finds; however, it was discovered that an abundance of skeletal material is situated approximately 5 cm below the surface level within the clay matrix. Due to time constraints and the general plasticity of the clay, the subsurface skeletal material was left untouched.

LEDGE 10

Ledge 10 is one of the most interesting areas of the cave. Unfortunately, over the course of the 2000 field season, no formal investigations were undertaken, though a reconnaissance was conducted allowing for a brief description. To access this ledge, one must climb up an abrasive flowstone formation. Upon reaching the main level, it may not be readily apparent that any activity, either modern or ancient, occurred in the area, yet upon embarking on a second climb through a large column, there is evidence for ancient Maya activity.

The main area of the ledge consists of two terraces, of which only the top terrace exhibits artifacts. Numerous formations fill the upper area, which consist mainly of tall stalagmites as well as one large white column with a bowl resting at its base. Additionally, a complete mano is cached in a small niche in the rear of the formation cluster. Other artifacts include a rattle foot from a ceramic vessel and a large ceramic sherd from an olla.

One of the most interesting aspects of this ledge is the presence of an Early Classic vessel within the dark zone of the cave. As has been typically the case with other cave sites in the area, Early Classic material is concentrated in the twilight area or just beyond at Barton

Creek Cave (Awe 1999). On this ledge, however, located well within the dark zone, 150 m from the entrance, was a Hermitage phase vessel of the Early Classic, a Balanza Black bowl, placed at the base of a white column. A large triangular piece has been knocked off and is situated nearby.

A small, complete granite mano is situated in a small niche behind the column in the wall of the cave. On the floor, in clay, within the general area is the rattle foot of a ceramic vessel. A brief search of the ledge could not reveal the presence of any associated ceramics suggesting that it may be a transported item cached after the killing or terminal use of the vessel. Finally, an olla sherd rests on a small natural clay terrace near the wall.

SURFACE SITE NEAR BARTON CREEK CAVE

Site Description

Surrounding the cave site is a small series of structures that were constructed on a terrace along Barton Creek. The area is a flat alluvial terrace flanked by steep, limestone slopes on the east and west. Three caves, including Barton Creek, issue forth water forming the head of a small stream, which follows the base of the western mountain and flows north eventually joining Barton Creek. Barton Creek is situated along the base of the eastern slope trending north. At the point it reaches Barton Creek Cave, it is usually dry except during the rainy season. Apparently, it sinks about a mile up the valley and resurges either from one of the spring caves near Barton Creek or elsewhere.

The area surrounding the cave is currently pastureland, used both as a yard and as grazing land for horses associated with a local residence. Several structures are associated with the residence including a two-story house on a concrete pad, several four-post buildings and two cabañas on concrete pads. Bordering the pasture is thick jungle, which hindered surveying, hence only structures within cleared areas are included in this report. This area and several fields within a mile up the valley are included in the survey.

According to one local resident, the land was originally cleared sometime in the 1950s for timber and agriculture. Since then, it has passed through many hands alternating between fallow and cleared stages. In the course of this history, residents have plowed some of the structures, which resulted in the disturbance of terminal layers. Also two structures near Barton Creek Cave were used as foundations for modern residences and recent middens can be observed along with ancient remains. Most recently a number of the structures were bulldozed in an effort to level the land as well as to use it as fill for the construction of the concrete pads. Needless to say, many of the structures are in poor condition, and an overland survey was made difficult.

Methods

Investigations of the structures in the immediate vicinity of the cave involved collecting GIS data on the location of the structures relative to the entrances of the caves. The excavation of two 2 x 1 m and one 1 x 1 m units into the probable slopes of the

structures was also undertaken. The general purpose of these investigations was to determine the relationship between the cave and the surrounding structures by looking at orientation and location of the structures in relation to the cave, site chronology via ceramics, and comparative analysis of artifacts. The GPS data was gathered using a Trimble system operated by William Poe of Sonoma State University, California. Center points were taken on smaller structures while multiple points were taken on those of a large size.

The units were excavated in both stratigraphically and arbitrarily (20cm) controlled levels, down to a depth of 20 cm below sterile. The excavated material was screened using $\frac{1}{4}$ " mesh, and all non-ceramic artifacts and sherds larger than a Belizean quarter were collected.

Results and Summary

At this point, the GIS data near the cave has not yet been analyzed. However, several general observations can be presented. A fairly tight cluster of 13 structures is present on the terrace within approximately 300 m of the cave entrance, while two additional structures are located within a radius of 500 m. The concentration of structures decreases as one moves south through the valley for approximately one mile, at which point the valley widens and an increased number of structures are visible in the cleared pasture. Unfortunately, these structures were located on private land, and were therefore inaccessible. A medium-sized plazuela group is located in the valley about one mile north of the Barton Creek Cave. It is in a narrow section of the valley and is associated with several smaller structures.

Three units were excavated in Structures 1, 11 and 13. Structure 1 is located in the northern end of the community and is situated closer to the cave than any of the other structures. Unfortunately, the structure was bulldozed so orientation and size could not be determined. A 1 x 1 m unit was placed at the northwestern end where we had hoped to encounter a wall. The unit was excavated in five roughly 20 cm levels to a sterile layer beneath the structure. A total of 261 sherds were recovered from the unit, all of which date from the Preclassic to the Late Classic. 100 lithics were encountered in this unit and predominantly consist of flakes as well as a few tools. Additionally, seven obsidian blades and blade fragments were recovered from the unit as well as 16 obsidian flakes.

Contrarily to the objective of the unit excavation, the unit did not yield any wall or other architectural features. The fill generally consisted of large granite river cobbles, ranging between 10 and 50 cm in size and to a lesser extent limestone and slate. Granite is one of the most available resources in the valley, as the stream channel is rich in granite river cobbles. Between the boulders is a matrix of clay interspersed with an occasional charcoal inclusion. In this unit, we encountered an early construction period, as the bulldozer had removed the upper levels. All of the ceramics below the surface level date to the Early Classic period amidst the contemporaneous core fill.

Structure 11 is a small structure, measuring 5 x 4 m in plan and 1 m high, comparable to a house structure, oval in shape, oriented roughly north-south in alignment. This appears to be one of the few structures in the area that has not been altered by a bulldozer. At this

time, analyses and counts of the artifacts have not yet been conducted, though a cursory examination of the ceramics revealed mainly Late Classic style ware. The unit was excavated in three levels defined by the cultural stratigraphy. Level 1 was comprised of smaller stones and fill, highly disturbed by plants and clearing of the land. Level 2 is defined by the presence of a decomposing, poor quality plaster floor and the ballast beneath. Similar to Structure 1, the main ballast consists of large granite river cobbles. Beneath the cobbles is alluvial clay, with a low density of artifacts.

Structure 13 is the largest structure in the study area and the most disturbed. The structure ranges between 1.2 to 1.5 m high, measures between 10 and 12 m long and 5 m wide, and is oriented in a roughly northwest-southeast direction. At the northwest end, a lower structure appears to extend to the southwest for 5 m giving the overall shape of the structure to resemble the letter L. As is apparent by intact portions surrounding trees on top of the structure, 0.50 to 0.70 m of material was removed from the top by bulldozing, as is apparent from the profile of the modern cut. Additionally, a considerable amount of trash is present in the area as well as several posts set into the upper portions of the structure. A long-term resident of the valley explained to us that this structure once served as the location of a modern dwelling in the 1970s.

The unit at Structure 13 was excavated into the southwest side of the structure in the hope of finding a wall revealing its orientation or the existence of stairs. The unit was excavated in three levels to a depth of 2.0 m terminating at a sterile alluvial clay. The upper level was architectural collapse, consisting of small limestone rocks and granite fragments. The second layer consists of large granite cobbles and a few limestone rocks. This layer forms the core fill of the structure and is very compacted. Beneath the granite is an alluvial matrix, banded with stream deposits, with a circular feature penetrating it. The feature appears to be a posthole filled with small stones from an earlier structure. Adjacent to the feature is the remains of an incised olla that may have been part of an offertory cache associated with the construction of the core fill.

Despite the excavation of the unit straddling the edge of the structure, no wall or other architectural feature was discovered. This may be the result of poor preservation and slumping of the granite fill. At this time, no analyses of the artifacts or counts have been conducted; however, a preliminary examination suggests that this structure was constructed near the Early Classic period and was in use during the Late Classic. Additional analyses will continue to develop a better understanding of the function and form of this structure.

RECONNAISSANCE BEYOND BARTON CREEK VALLEY

Objective and Methods

The mountains flanking the Barton Creek Valley consist of steep limestone hills eventually leveling off in what is locally termed the “flats.” The “flats” are gently sloping karst terrain present in the foothills at the base of the Pine Ridge granite massif. Many sinkholes and limestone outcrops are located in these regions. Our purpose of three reconnaissance trips was to investigate the settlement patterns beyond the Barton Creek

Valley floor examining how the settlements extend into these hills, and to look at the distribution of caves in this area and how they related to the settlement patterns.

Three trips were taken into the region southeast of the cave site into the limestone mountains and flats and the study area was defined. GPS coordinates were taken, if and when possible, to determine a basic location of an area. Features, including caves and structures that were not recorded with a GPS, were surveyed with a tape and compass. Maps via tape and compass (or pace and compass) were produced of each structure encountered and detailed sketch maps of each cave were made. No excavations were undertaken at this time; however, an analysis of the cross-section of looter trenches was conducted detailing architecture, if present.

Results and Summary

Our excursions into the mountains resulted in the discovery of 4 new pit caves and 3 architectural groups in and around a shallow depression. This area was located roughly a mile northeast of the Barton Creek Cave, at the base of the north side of a small knoll. The majority of the study area was situated in a shallow depression, which contained a small pond in the center. Group 1, located approximately 30 m from the pond, consists of 2 m high and 0.5 m high rectangular structures, situated perpendicular to one another. A second set of structures, Group 2, lies 50 m east of this group on a flat terrace of the depression. The third set of structures, a small plazuela group, lies approximately 500 m to the north.

The caves in this area are situated between these structures and consist of vertical pits of varying depths. Northeast of Group 2 is the deepest pit, a 25 m shaft with a small chamber at the base. The second cave is located closer to Group 1, situated 50 m northeast. This cave is a 10 m vertical shaft, which terminates at a small chamber at the base. The third cave is in a small sub-depression consisting of an unexplored vertical drop at the end of a tight 5 m long passage. The fourth cave is situated at a sizable distance from this area, 250 m north of the depression and halfway between the depression and plazuela group.

Because our purpose was to find a relationship between caves and surface structures, it was our hope to identify cultural remains within the three caves immediately associated with the two architectural groups present in the depression. However, this was not the case. The three caves situated within the depression, contained absolutely no observable artifacts. Despite the close proximity of the caves and the structures, we believe it was the ponds at the base of the depression that made this site an ideal location for habitation and not the caves as we had suspected. The one cave that did contain artifacts was located 250 m to the north, between this area and the plazuela group.

The one significant cave in the area is a 15 m deep pit with a small chamber at the base and on the side. Artifacts were discovered in both chambers. Unfortunately, looters have disturbed this cave and features have been damaged. The small chamber on the side once consisted of a walled chamber, behind which were ceramic materials. The current condition of the wall consists of one to two courses of small tabular limestone rocks, 15 to 30

cm wide. The ceramics in the chamber included a ceramic disc (10 cm in diameter) and several probable Late Classic jar sherds.

At the base of the pit is a small chamber with a clay floor. This area can be described as alcove-like, with a clay floor. One wall of this chamber consists of a profile of a talus cone at the base of the drop. Examination of this cone profile revealed the presence of several jar sherds. Additionally, in a small niche, near the top of the talus several sherds appeared to be cached, consisting of two jar sherds and a Roaring Creek Red dish sherd of the Spanish Lookout phase of the Late Classic (Gifford 1976).

Farther north is the small plazuela group situated on a saddle of a low ridge. This architectural group consists of four structures on four sides of a roughly square plaza. The plazuela group is situated on a slightly sloped area where the east side of the plaza floor is approximately 1.5 m above the forest floor, while the west side is level. The structures constructed on the plaza consist of two low-lying structures on the north and west sides and two large structures on the south and east sides. The largest structure is located on the southern side of the plaza consisting of a two-tiered building, which measures roughly 2 m in height on the west, and 1.5 m high on the east sides. The eastern structure is approximately 1 m high with a lower tier of 0.50 m high on the northern side. A small section of an intact wall is present at the southwest corner of this building. On the north side is a low, 0.30 to 0.40 m high rectangular structure, with a small portion of intact wall along the southern base. The final structure, on the west, is similar to the north, manifested as a low range-like structure between 0.50 to 0.70 m in height.

CONCLUSION

A large amount of data was collected during the 2000 field season at Barton Creek Cave, which included the investigation of ten ledges within the cave, excavations on three structures in the surrounding area, and a reconnaissance into the surrounding mountains resulting in the exploration of four small caves and three architectural groups. However, the analysis of much of the data is still in progress. Presently, Vanessa Owen is conducting an analysis of the skeletal material as part of her Master's thesis, while Christopher Morehart has collected the organic material for analysis and will be obtaining radiocarbon dates as well. In addition, Michael Mirro is examining the interpretations and analyses of some of the artifact classes as well as digitizing maps for publication.

At this point in the study, a fairly complete sample of the archaeological materials in Barton Creek Cave has been obtained. It might be beneficial to excavate some of the stained soils on Ledge 2, as this could result in the discovery of potential postholes, caches, or interments. Also, probing the clay on Ledge 9 revealed the presence of additional bone and ceramic materials, 5 to 10 cm below the surface. An excavation of this area there may broaden our knowledge of the activities undertaken by the Maya in this section of the cave. At this point, however, we feel that the majority of the research in the cave is complete and that our sampling strategy has provided us with sufficient information to make interpretations regarding both the ancient use and significance of this site. The remainder of research,

therefore, should involve analyses of the data obtained from the 1999 and 2000 investigations, and the publication of our results and interpretations.

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GLOBAL POSITIONING SYSTEM SURVEY, 20 JUNE - 14 JULY 2000

**Wm. Clay Poe
Sonoma State University**

OBJECTIVES

The objectives of the GPS survey project for the field season 2000 included:

1. Determining the Universal Transverse Mercator (UTM) coordinates of a number of survey monuments that would provide the foundation for a network of precisely located control points. The intent is to expand over time a western Belize control point network for archaeological mapping that can be used to reference all archaeological mapping in the Belize Valley in a common internationally accepted coordinate system.
2. Determining the UTM coordinates of certain features at Central Farm for the purpose of defining a proposed boundary for an archaeological reserve to protect the site of Baking Pot.
3. Preliminary mapping of the newly recorded site of Bacna.
4. Mapping the locations of mounds in the vicinity of the Barton Creek Cave.
5. Mapping the locations of mounds in the Roaring Creek Valley.
6. Mapping the terraces exposed in a milpa in the valley of Entrance 1 of Actun Chapat.

EQUIPMENT AND DATA PROCESSING

A Trimble 4000SE GIS Surveyor was used as the GPS base station. A Trimble 12-channel GPS Pathfinder Pro XL receiver with a TDC1 Datalogger was used as the rover. The rover receiver was set to record carrier data at five-second intervals synchronized with the base station.

All of the data were differentially corrected in the program Pathfinder Office™ by Trimble Navigation™, Sunnyvale, California. In addition, all of the data gathered in static occupations were processed by the program GeoGenius™ by Spectra Precision Terrasat GmbH, Hoehenkirchen, Germany. This program is designed to integrate terrestrial and satellite data. The equipment and the software have been provided by Trimble™ and by Spectra Precision™ for the use by the author in archaeological research.

METHODOLOGY

The attached appendix, “Gathering and processing GPS data for archaeological mapping,” describes in detail the various methodologies of gathering and processing GPS data that are mentioned below. Three strategies of GPS data gathering and processing were used depending upon the precision requirements of the objective. Objective 1, determining the UTM coordinates of survey monuments, required the highest order of accuracy and precision. These data were gathered by the Static method described in the appendix below and processed with the GeoGenius™ program. Objective 2, determining the UTM coordinates of certain features for the proposed Baking Pot Archaeological Reserve required a lower order of precision. These data were gathered with the Intermittent Kinematic technique with one-minute occupations of critical points. These data were processed in Pathfinder Office™. All of the other objectives required orders of precision that could be obtained with the Continuous Kinematic technique. These data were also processed in Pathfinder Office™.

Grid data

The maps most commonly used by archaeologists in Belize are the 1:50,000 Universal Transverse Mercator Grid series produced under the direction of the Director General of Military Survey, Ministry of Defense, United Kingdom. These maps use the North American 1927 datum and the vertical datum is Mean Sea Level (MSL). These conventions provide a strong argument for reporting data in these same systems. However, there are also strong reasons for favoring the WGS84 datum and Height Above Ellipsoid (HAE) as the vertical datum. WGS84 is the native system for GPS receivers and the receivers compute the HAE from the WGS84 Cartesian Geocentric Coordinates. GPS receivers and post-processing software translate from WGS84 to NAD27 as well as to other coordinate systems. Experience demonstrates that not all GPS software translates among the datums in exactly the same way. The greatest consistency given a variety of equipment and software is obtained by adhering to the WGS84 datum. Mean Sea Level as a vertical datum requires that the GPS receiver or post-processing software have a MSL database available to it. Not all GPS receivers are equipped to report vertical data in MSL but all are capable of reporting in HAE. The grounds of consistency and equipment capacity are compelling for reporting the data in WGS84 datum with HAE as the vertical datum.

The pair of GPS receivers, one a base station and one a rover, are capable of producing exceptionally precise maps, with likely errors of no more than a few millimeters for baselines up to several hundred meters to errors of no more than a couple of centimeters for baselines up to twenty kilometers or more. However, precision is a relative term. To fix the map in an established coordinate system some point that is occupied by a receiver at some time must have reliably known coordinates.

The numbers and locations of monuments from the trigonometric survey of Belize are marked on the 1:50,000 UTM maps. Some of these monuments have been located and occupied with a GPS receiver. However, the present investigator has not been able to discover in the records the positional information for those monuments.

In the statutory description of the El Pilar Archaeological Reserve for Maya Flora and Fauna one finds the definition of the UTM coordinates of the South Boundary Marker, SBM1, as 1907180 N / 271933 E as determined by the Cayo Survey Department traverse and a solar observation on 24 February 1995.¹ Interviews in the Survey Department in San Ignacio failed to produce information clarifying the survey method used or the basis for the assignment of the UTM coordinates. Accurate estimation of latitude and longitude based upon solar observation requires an extremely precise timepiece and accurate elevation. The coordinates of SBM1 are only available to the closest meter and the elevation of SBM1 is not available. The reliability of the coordinates assigned to this monument are questioned in a report of a survey of the boundary of the El Pilar Archaeological Reserve for Maya Flora and Fauna conducted under the auspices of the Fundación Naturaleza Para la Vida. In May, 1998 NPV completed a survey through a sub-contractor that defined the physical limits of the *Sitio Arqueológico del Pilar* in the field. They placed monuments at the corners and at other locations and cut a two meter wide corridor, *brecha*, along the park boundary. In their report on the survey they note, “En comparición con las estaciones dejados por los trabajos de campo realizados en Belice se colocó nuestra estación a escasos 75 metros de diferencia.”² GPS data recorded both at El Pilar’s EPB1 point and at VBRS LM in the absence of selective availability tended to confirm the suspicion that the coordinates assigned to SBM1 were not reliable.

In the absence of reliable positional information for established monuments in Belize it was necessary to seek a carrier phase resolution of a baseline from points in Belize to an external GPS station at a well-known location. The National Geodetic Survey of the United States coordinates a network of continuously operating reference stations (CORS) that provide Global Positioning System carrier phase and code phase measurements. The CORS station at Key West, Florida is the closest CORS station to Belize. The carrier phase solution is strengthened by the number of epochs of data collected and by the number of satellites recorded. Since the base station locations were intentionally selected to maximize satellite reception and since the base station files are always the longest, those files were the clear candidates.

During the BVAR 2000 field season the GPS base station was located at two locations. The majority of the fieldwork was done with the base station antenna located beside the Cabana named Lamanai at the Cahal Pech Lodge in San Ignacio. For work in the Roaring Creek Valley and at the site at Pook's Hill the base station was located at Pook's Hill. In both cases the placed at locations that were not to be permanently marked and for which the position was not known. They are thus referred to as virtual base reference stations and

¹ *Ancient Monuments and Antiquities (El Pilar Archaeological Reserve for Maya Flora and Fauna) order, 1998, Statutory Instrument No. 54 of 1998.*

² *Informe Final del Proyecto Delimitación Física Sitio Arqueológico del Pilar, Documento Técnico, Fundación Naturealeza Para la Vida –NPV-, Junio 1 1,998, p. 7.*

were designated VBRS LM and VBRS PH. In addition base station files had been recorded at the GPS base station reference position for the El Pilar GPS survey. This point is a monument designated EPB1.

The GeoGenius™ GPS postprocessing software was able to resolve the baselines between the Key West 1 CORS station, kyw1, and the BVAR and El Pilar GPS base stations and adjust the resulting network with the following results.

Kyw1

Point, Info, Code	kyw1		
WGS84 Geocentric position, X, Y, Z ³	842465.0550	-5741930.6240	2637061.7300
Lat, Long, Height	N 24 34 56.16458	W 81 39 10.90497	-12.1647

VBRS LM

Point, Info, Code	VBRS_LM		
WGS84 Geocentric position, X, Y, Z	98346.1058	-6095719.6046	1868596.4333
Lat, Long, Height	N 17 8 54.80905	W 89 4 32.48791	158.4994
UTM Zone 16N, N, E, HAE	1897169.572	279187.457	158.065
Solution Type, Freq, Quality	Double Diff Float	L1	Medium
DeltaX, DeltaY, DeltaZ	-744118.9492	-353788.9806	-768465.2967
Sigmas (N,E,H) [mm]	34.4	84.0	87.8
Sigmas (X,Y,Z) [mm]	84.8	81.4	46.3

VBRS PH

Point, Info, Code	VBRS_PH		
WGS84 Geocentric position, X, Y, Z	122162.6181	-6095025.7454	1869200.3208
Lat, Long, Height	N 17 9 16.10189	W 88 51 6.38737	85.2648
UTM Zone 16N, N, E, HAE	1897583.745	303029.822	82.734
Solution Type, Freq, Quality	Double Diff Float	L1	Medium
DeltaX, DeltaY, DeltaZ	-720302.4369	-353095.1214	-767861.4092
Sigmas (N,E,H) [mm]	39.1	123.0	189.0
Sigmas (X,Y,Z) [mm]	119.6	189.3	47.2

³ The WGS84 coordinate system is an Earth centered, Earth fixed (ECEF) Cartesian coordinate system. The X-axis is the intersection of the plane defined by the prime meridian and the equatorial plane. The Y-axis is the intersection of a plane 90 degrees east of the X-axis and its intersection with the equatorial plane. The Z-axis is the intersection of the plane 90 degrees east of the X-axis and the equatorial plane.

EPB1

Point, Info, Code	EPB1		
WGS84 Geocentric position, X, Y, Z	91058.9019	-6092651.9536	1879157.8104
Lat, Long, Height	N 17 14 53.57522	W 89 8 37.45916	243.0025
UTM Zone 16N, N, E, HAE	1908278.572	272071.183	239.303
Solution Type, Freq, Quality	Double Diff Float	L1	Medium
DeltaX, DeltaY, DeltaZ	-751406.1531	-350721.3296	-757903.9196
Sigmas (N,E,H) [mm]	18.2	58.9	61.3
Sigmas (X,Y,Z) [mm]	59.2	60.7	19.4

Correlation with Independent Surveys

There is a correlation possible between the 2000 BVAR GPS survey, GPS surveys conducted in 1998, 1999 and 2000 by the author at El Pilar, and an integrated transit and GPS survey conducted by Fundación Naturaleza Para la Vida, NPV, at El Pilar.

In May, 1998 NPV completed a survey through a sub-contractor that defined the physical limits of the *Sitio Arqueológico del Pilar* in the field. They placed monuments at the corners and at other locations and cut a two-meter wide corridor, *brecha*, along the park boundary.⁴ Vanessa Bunton, a member of the Belize River Archaeological Settlement Survey (BRASS) project who accompanied the N.P.V. surveyors, reported that they used a transit and a hand held GPS receiver with the files differentially corrected with data from a base station operated by CONAP in Flores.⁵ GPS receivers of this type typically produce differentially corrected positions accurate to +/- 2 to 5 meters.

The coordinates of the corners Northwest and the Southwest corner monuments of Sitio Arqueológico del Pilar in Guatemala determined by NPV are:⁶

UTM Zone 16 N, NAD 27 (Mexico)				
Point	Northing	Easting	Latitude	Longitude
NW	1911056.66	268080.66	17°16'26.21"	-89°10'53.52"
SW	1907228.73	267997.37	17°14'21.70"	-89°10'54.88"

These values can be translated to the WGS84 datum as follows:

UTM Zone 16 N, WGS84		
Point	Northing	Easting
NW	1911258.013	268074.771
SW	1907430.071	267991.479

⁴ *Informe Final del Proyecto Delimitación Física Sitio Arqueológico del Pilar*, Documento Técnico, Fundación Naturealeza Para la Vida –NPV-, Junio 1 1,998

⁵ Personal communication

⁶ *Informe Final del Proyecto Delimitación Física Sitio Arqueológico del Pilar*, p8.

In June 1999 the present investigator occupied these same points with the base station located at EPB1, the El Pilar base station location described below. In the case of the Northwest monument GeoGenius™ was able to resolve the data to a fixed solution, the error being less than one millimeter. The baseline to the Southwest monument was resolved to a float solution, the error being slightly more than two centimeters.

The point El Pilar TN5 described below is the common link between the GPS data gathered at El Pilar and that gathered from the BVAR base reference station at VBRS_LM. This well-defined point was occupied in May of 1999 with the base station located at EPB1, the El Pilar base reference position described below. The point was also occupied in June of 2000 with the base station located at VBRS_LM.

Using the base station reference position assigned to VBRS_LM above the coordinates assigned to the NW and the SW points described above are:

UTM Zone 16 N, WGS84			
Point	Northing	Easting	HAE
NW	1911267.472	268090.226	180.392
SW	1907433.106	268008.538	208.925

Subtracting the NPV values from those reported immediately above provides the differences in the two surveys. NPV did not report elevations.

BVAR – NPV difference		
Point	Northing	Easting
NW	9.459	15.455
SW	3.035	17.059

Given that at this time the basis for the reference position of the CONAP base station is unknown, the length of the NPV baseline from Flores to El Pilar, the nature of the NPV survey and the variables discussed above associated with the assignment of a reference position to VBRS_LM, it is reasonable to conclude that the surveys are in essential agreement. This tends to confirm the reasonableness of the coordinates assigned to VBRS_LM.

Should a more precise correlation between the CONAP base station and the Western Belize Control Point Network then BVAR could request files from the CONAP base station operator that were contemporaneous with files recorded at a BVAR control point. If CONAP is archiving their files then files could be requested contemporaneous with data already recorded.

The monument mentioned above, SBM1, at El Pilar was assigned the following coordinates by the Cayo Survey Department.

UTM Zone 16 N, NAD27 (Central America) ⁷		
Point	Northing	Easting
SBM1	1907180	271933

⁷ Datum assumed based upon common usage. The document does not specify the datum.

These values can be translated to the WGS84 datum as follows:

UTM Zone 16 N, WGS84 (Cayo Survey Department)		
Point	Northing	Easting
SBM1	1907383.493	271939.072

Using the base station reference position assigned to VBRS_LM above the coordinates assigned to SBM1 are:

UTM Zone 16 N, WGS84 (BVAR)		
Point	Northing	Easting
SBM1	1907392.761	272010.406

Subtracting the Cayo Survey Department values from those reported immediately above provides the differences in the two surveys.

BVAR – Cayo Survey Department difference		
Point	Northing	Easting
SBM1	9.268	71.334

It is interesting to note that the Northing is very close and most of the difference is in the Easting. The Cayo Survey Department is reported as having confirmed the location with a solar observation. With a solar observation an error in the estimation of the correct time of only fifteen hundredths of a second can produce this magnitude of error.

CONCLUSION

The base station reference position at VBRS LM can be considered fixed and forms an accurate foundation for the development of a network of control points.

Western Belize Control Point Network for Archaeological Mapping

Control Points

The following Control Points are all concrete monuments expected to remain as permanent markers.

Descriptions

Point Number	Northing	Easting
BSM1	Concrete survey monument	Western part of the El Pilar Archaeological Reserve for Maya Flora and Fauna. These monuments are in the jungle and there are no easily recognizable local landmarks to aid location. ⁸

⁸ A local informant, the former owner of a milpa that is now a part of the reserve, believes that the points here designated BSM1 and BSM2 are border demarcations set by the British. They carry no designation but the positional evidence gathered with GPS tends to confirm the identification. British surveyors would have used the Treaty of 1859 as the basis for the demarcation and the Treaty defines the border in the vicinity of these points as “from Garbutt’s Falls due north until it strikes the Mexican frontier.” If the GPS determined coordinates assigned to these positions are converted to Latitude/Longitude equivalents in the NAD27 datum the positions are BSM1 17°15'30.49103" N 89°09'00.81070" W and BSM2 17°15'14.60051" N 89°09'00.86421" W. Using these geographical coordinates the program Forward/Inverse reports the azimuth of BSM1 from BSM2 to be 0°00'00.00000000". BSM1 is precisely due north of BSM2. The present investigator believes that the intent was to place monuments on the border marking latitudes 17°15'15" N and 17°15'30" N. If that is the case then by reference to the GPS measurements, BSM1 is 15.095 meters south and BSM2 is 12.281 meters south of the intended placements, a total linear error of only 2.814 meters. Guatemala has never recognized this British demarcation.

BSM2	Concrete survey monument	See above, BSM1
CCH1	Concrete survey monument	West side of Che Chem Ha Road. This monument is partially obscured by a palm stump.
CP_A1	Survey nail	Top center of structure A1, Cahal Pech
EP_C1	Concrete survey monument	El Pilar, east side of Plaza Duende
EP_C3	Concrete survey monument	El Pilar, east of structure EP7, south of the tunnel and off of the platform
EP_C5	Concrete survey monument	El Pilar, south center of Plaza Copal
EP_C6	Concrete survey monument	El Pilar, east of structure EP9, north edge of Plaza Copal
EP_EPB1	Concrete survey monument	Platform of the water tower beside the caretaker's hut at El Pilar. This point was the base station reference position for the El Pilar GPS project in the 1999 and 2000 seasons.
EP_F1	Concrete survey monument	El Pilar, center of Plaza Faisan
EP_N1	Concrete survey monument	El Pilar, south of structure EP32 on the south side of Plaza Faisan
EP_N2	Concrete survey monument	West of the parking lot fence, east of Plaza Faisan
EP_NW	Concrete survey monument	El Pilar, Northwest boundary marker of Sitio Arqueológico del Pilar in Guatemala
EP_RP01	Concrete survey monument	El Pilar, east of structure EP7, east of the tunnel
EP_SBM1	Concrete survey monument	Just west of the south boundary Ceiba tree at the El Pilar Archaeological Reserve for Maya Flora and Fauna.
EP_SW	Concrete survey monument	El Pilar, Northwest boundary marker of Sitio Arqueológico del Pilar in Guatemala
EP_TN5	Concrete survey monument	North of Structure 1 in Plaza Tzunu'un of El Pilar, east of EP_TN10
EP_TN10	Concrete survey monument	North of Structure 1 in Plaza Tzunu'un of El Pilar, west of EP_TN5.
EP_VC1	Concrete survey monument	Approximately 95 meters Northwest of EP_EPB1. This point is in an overgrown area and is difficult to locate
IGS_E10	Concrete survey monument with bronze medallion	Shaded parking area at El Pilar. The medallion is marked "Interamerican Geodetic Survey 1962" and is stamped "E10".
Trig_XX	Concrete survey monument	Between kilometer 62 and 63 on the Western Highway, approximately 118 m. west of the intersection of the Western Highway and the road to the ferry crossing to Spanish Lookout. The monument is approximately 12.5 m. north of the north edge of the Western Highway.

Forward/Inverse, Copyright© 1997 Mentor Software, Inc, is a Windows based version of the FORWARD and INVERSE programs created by the National Geodetic Survey (NGS).

WGS84 UTM 16N and Geographical Coordinates

Point Number	Northing	Easting	HAE	Latitude	Longitude
BSM1	1909509.597	271397.438	197.259	N 17°15'33.35059"	W 89°09'00.74796"
BSM2	1909021.040	271390.415	205.790	N 17°15'17.46092"	W 89°09'00.80146"
CCH1	1883491.721	277951.266	291.464	N 17°01'29.58406"	W 89°05'09.48315"
Cahal_Pech_A1	1896851.221	279349.458	185.410	N 17°08'44.52740"	W 89°04'27.02532"
EP_C1	1908861.362	271949.930	232.273	N 17°15'12.47080"	W 89°08'41.80575"
EP_C3	1908747.868	271958.411	229.292	N 17°15'08.78317"	W 89°08'41.47604"
EP_C5	1908733.328	271882.663	236.101	N 17°15'08.28298"	W 89°08'44.03409"
EP_C6	1908831.115	271888.265	236.100	N 17°15'11.46491"	W 89°08'43.88129"
EP_EPB1	1908278.684	272071.339	239.372	N 17°14'53.56671"	W 89°08'37.47802"
EP_F1	1908972.006	271899.210	221.422	N 17°15'16.05045"	W 89°08'43.56387"
EP_N1	1908933.124	271887.843	223.882	N 17°15'14.78194"	W 89°08'43.93393"
EP_N2	1908963.325	271936.381	222.408	N 17°15'15.78160"	W 89°08'42.30261"
EP_NW	1911267.472	268090.226	180.392	N 17°16'29.30616"	W 89°10'53.34789"
EP_RP01	1908762.474	271965.320	229.213	N 17°15'09.26063"	W 89°08'41.24772"
EP_SBM1	1907392.761	272010.406	261.007	N 17°14'24.73569"	W 89°08'39.20733"
EP_SW	1907433.106	268008.538	208.925	N 17°14'24.59088"	W 89°10'54.64585"
EP_TN5	1908668.587	272096.401	231.396	N 17°15'06.25490"	W 89°08'36.77632"
EP_TN10	1908668.908	272081.888	227.915	N 17°15'06.26010"	W 89°08'37.26761"
EP_VC1	1908335.694	271996.177	233.021	N 17°14'55.39349"	W 89°08'40.04306"
IGS_E10	1908535.285	272063.793	230.583	N 17°15'01.90831"	W 89°08'37.82977"
NCF1	1902625.855	288020.672	49.028	N 17°11'55.28196"	W 88°59'35.72226"
NCF2	1902634.250	288007.013	49.020	N 17°11'55.55042"	W 88°59'36.18735"
Trig_XX	1901109.164	286505.905	55.430	N 17°11'05.44786"	W 89°00'26.44422"

Reference Points

The following reference points can be relocated by people familiar with their location. While they are not expected to be moved, they do not have the same degree of permanency as do the control points.

Descriptions

CP_E1	Survey nail	Rubble core of the west wall of structure E1
CP_Ex	Hole left from partially driven survey nail	Approximately centered in the crown of the reconstruction cap of structure Ex, Cahal Pech
PH_Datum_1	Survey nail	Prime datum of the Pook's Hill plazuela group
PH_Datum_6	Survey nail	Center of the plaza group at Pook's Hill
PH_Datum_8	Survey nail	Top of the eastern structure at Pook's Hill
PH_Datum_9	Survey nail	Intermediate traverse point between Datum 1 and Datum 6
RC_Datum_1	Stake	Roaring Creek Valley datums placed in pairs to create a baseline for transit mapping. Points 1 and 2 are in the vicinity of the mouth of Tarantula Cave.
RC_Datum_2	Stake	See above, RC_Datum_1
RC_Datum_3	Stake	Points 3 and 4 mark the ends of a sacbe connecting two groups
RC_Datum_4	Stake	See above, RC_Datum_3
RC_Datum_5	Stake	Top of a structure on the west side of a group
RC_Datum_6	Stake	Reference datum west of RC_Datum_

VBRS_LM	Large survey nail driven into the ground and covered with a small pile of rubble	West side of Cabana Lamanai of Cahal Pech Lodge. This is the Virtual Base Reference Station for all of the GPS Survey Project of BVAR season 2000 with the exception of the survey of the Roaring Creek Valley.
VBRS_PH	Cross scribed on a limestone block	Proximate to the northeast most cabana in the upper tier at Pook's Hill Resort. This is the Virtual Base Reference Station for the GPS Survey Project of BVAR season 2000 of the Roaring Creek Valley

Coordinates

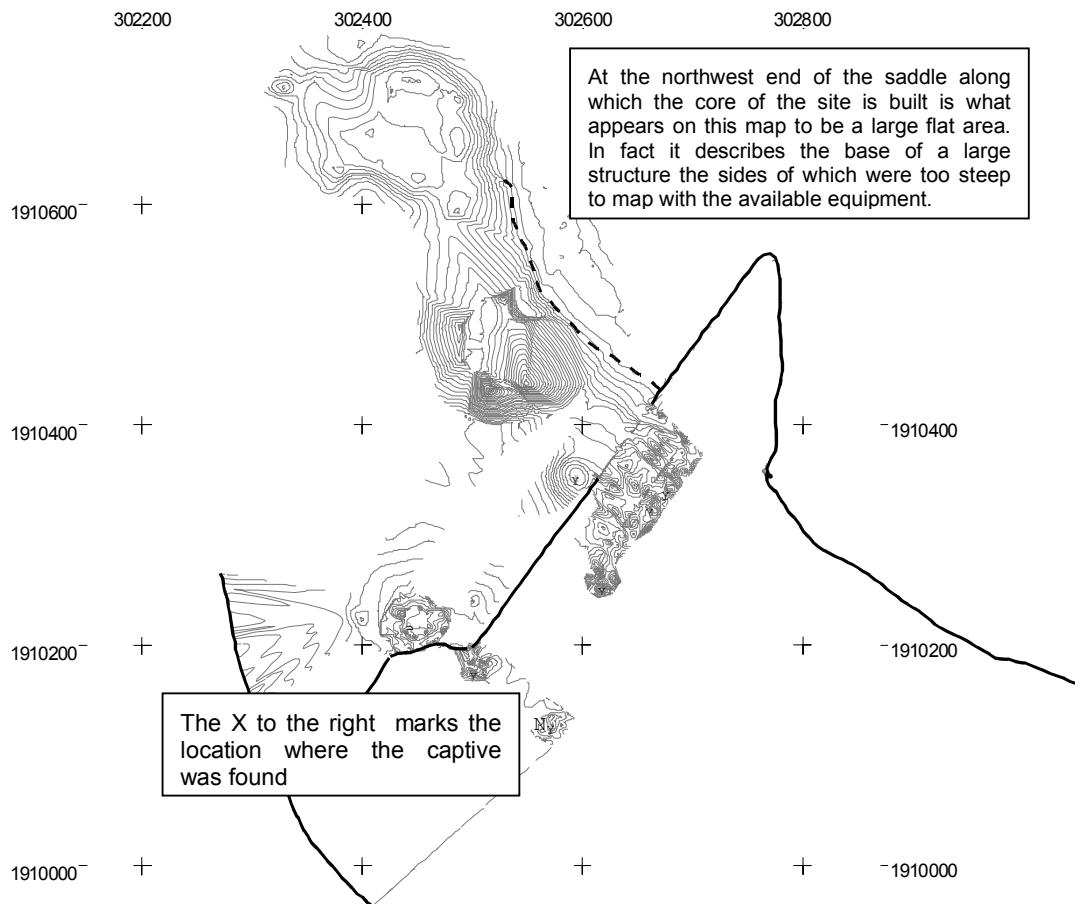
Point Number	Northing	Easting	HAE	Latitude	Longitude
Cahal_Pech_E1	1896837.908	279334.843	177.365	N 17°08'44.08938"	W 89°04'27.51487"
Cahal_Pech_Ex	1896831.754	279348.526	179.182	N 17°08'43.89400"	W 89°04'27.04982"
PH_Datum_1	1897578.941	302991.936	83.612	N 17°09'15.96649"	W 88°51'07.49872"
PH_Datum_6	1897554.369	303014.391	78.596	N 17°09'15.17426"	W 88°51'06.73112"
PH_Datum_8	1897553.340	303031.533	80.851	N 17°09'15.14610"	W 88°51'06.15087"
PH_Datum_9	1897575.463	303013.433	81.982	N 17°09'15.86005"	W 88°51'06.77033"
RC_Datum_1	1895592.761	303558.431	68.789	N 17°08'11.54164"	W 88°50'47.69502"
RC_Datum_2	1895582.997	303571.757	69.336	N 17°08'11.22819"	W 88°50'47.24108"
RC_Datum_3	1896679.602	303663.785	66.998	N 17°08'46.92362"	W 88°50'44.48029"
RC_Datum_4	1896896.874	303608.611	65.749	N 17°08'53.97332"	W 88°50'46.41666"
RC_Datum_5	1898875.005	303930.265	60.196	N 17°09'58.41126"	W 88°50'36.17050"
RC_Datum_6	1898873.553	303895.932	55.272	N 17°09'58.35344"	W 88°50'37.33160"
VBRS_LM	1897169.572	279187.457	158.065	N 17°08'54.82404"	W 89°04'32.62005"
VBRS_PH	1897583.745	303029.822	82.734	N 17°09'16.13448"	W 88°51'06.21857"

Bacna

The newly recorded site of Bacna was mapped using a continuous kinematic technique. Almost 3200 points were recorded for topographic mapping by walking between the rows of corn with the GPS unit mounted on a two-meter range pole. The 95% confidence interval horizontal precision was in the range of 25 to 35 centimeters. This is more than adequate for construction of a reliable 0.5 meter contour map.

Only a few points were gathered in the site core. Part of the core is covered with thick brush and the remainder is covered with high weeds. There is a very large shallow depression to the Northeast of the site core.

Bacna



Belize Valley Archaeological Reconnaissance Project

Plan: W. Poe 302200 2000 302400 302600 302800
Survey W. Poe 2000 S. Hayes 2000

100 0 100 200 300 400 500 Meters

1:5000

UTM 16N WGS84

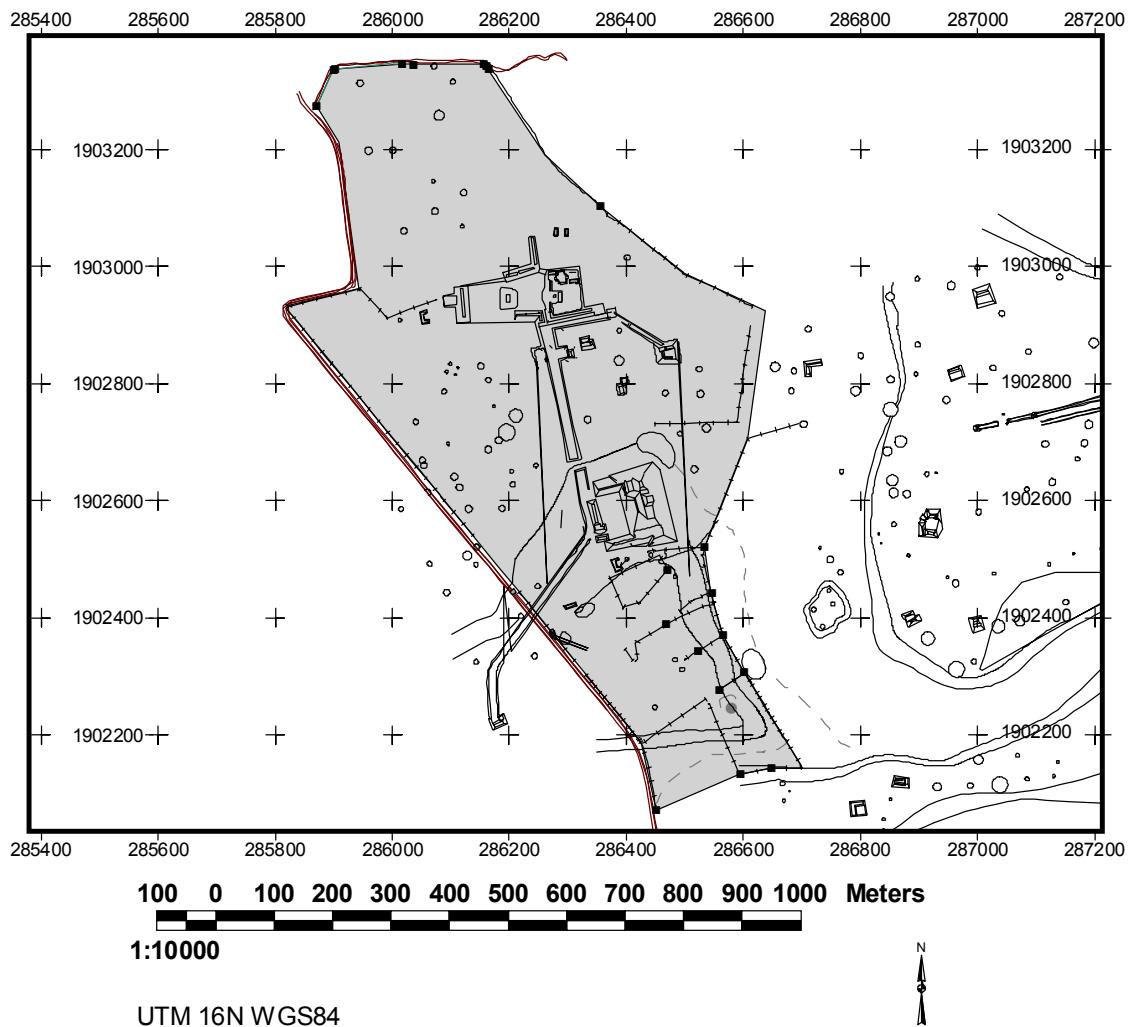
Baking Pot

The principal objective at Baking Pot was to determine the UTM coordinates of certain features at Central Farm for the purpose of defining a proposed boundary for an archaeological reserve to enclose the site. The intermittent kinematic method of survey was used with one-minute occupations of critical points. The data from the ProXL rover receiver was differentially corrected with base station data gathered at VBRS LM. The 95 % confidence limits on the horizontal precision of the points used to define the reserve is 1.05 meters, the 67 % confidence limits is 0.52 meters. The UTM locations in the description below have been rounded to the closest meter to reflect the degree of confidence. All coordinates are UTM Zone 16 N WGS84 Datum.

Proposed boundary description of the Baking Pot Archaeological Reserve

Commencing at the fence post at the western end of the fence separating the swine and the cattle units of Central Farm having UTM Coordinate N 1902071 E 286451, thence east following the fence line to a fence post having UTM Coordinate N 1902144 E 286702, thence north along the fence line marking the western edge of the seasonal drainage to a fence post having the UTM Coordinate N 1902519 E 286534, thence crossing the drainage and following the fence line at a bearing of approximately $20^{\circ}52'$ for a distance of approximately 202 meters to a fence post and turning point in the fence having the UTM Coordinate N 1902707 E 286608, thence following the fence line at a bearing of approximately $8^{\circ}45'$ for a distance of approximately 220 meters to a fence post having UTM Coordinate N 1902923 E 286639, thence following the fence line marking the eastern and northern boundaries with turning points at fence posts having the UTM Coordinates N 1902990 E 286497, N 1903102 E 286356, N 1903346 E 286157, N 1903345 E 286035, N 1903338 E 285902, N 1903273 E 285872, thence along the fence line marking the eastern edge of the Spanish Lookout Ferry road with turning points at fence posts having UTM Coordinates N 1902962 E 285945, N 1902925 E 285821, N 1902185 E 286426, thence to the point of commencement for an enclosed area of approximately 54.63 ha.

Baking Baking Pot Archaeological Reserve (Proposed)



Belize Valley Archaeological Reconnaissance Project

Plan:	W. Poe	2000	J. Conlon	1993-00
	J. Conlon	1993-00		
Survey	W. Poe	2000	S. Hayes	2000
	J. Conlon	1992-00	J. Ehret	1999-00
	M. Johnson	1996-97	C. Griffith	1994-96
	S. Brisbin	1992-94		

Barton Creek

Barton Creek Cave mouth datum

The Barton Creek Cave mouth datum is the highest point of the rock outcrop at the middle of the cave mouth. The datum was taped in two stages from the Barton Creek Cave mouth offset and the azimuth was shot with a Brunton compass mounted on a tripod. The Pathfinder Office program was used to correct from magnetic to true north. The slope distance is 73.10 m. and the azimuth is 269.5° (T). The datum is of slightly lower elevation than the offset but equipment was not available to determine an accurate vertical angle. The tape was stretched in two stages 50.30 m. and 22.80 m. The 50.30 m. stage was stretched over water and no correction was made for tape sag.

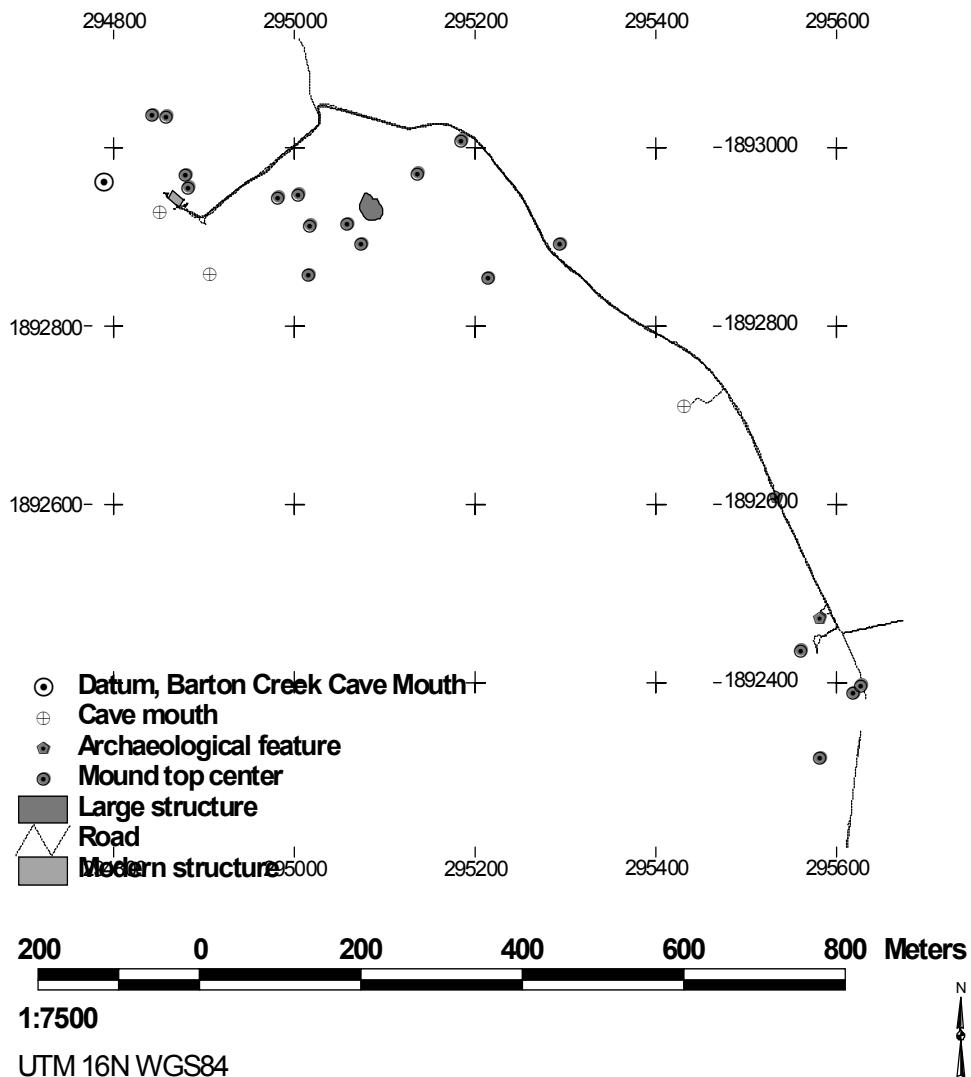
From the offset position of N 1892965.071 E 294812.505 HAE 82.989, with the horizontal distance assumed to equal the slope distance, the calculated coordinates of the cave mouth datum are N 1892964.433 E 294739.407 HAE 82.989. Considering the error inherent in the method used, it is reasonable to round the values and establish as the assumed coordinates of the cave mouth datum.

UTM 16N	WGS84		
Point	Northing	Easting	HAE
Barton Creek Cave mouth datum	1892964.50	294739.50	83.00

Following this survey a problem with the Brunton compass suggested that it would be prudent to shoot the azimuth again. The fence posts that had served as the triangulation points for locating the survey nail that marked the compass location had been removed and it proved impossible to locate the nail. It is recommended that this location be defined again in the 2001 season with GPS and laser rangefinder.

A number of mounds and archaeological features were mapped in the valley using the intermittent method. Some of the mounds in the Southeast portions of the valley were in heavy brush and were mapped as offsets with compass azimuth and short estimated distances.

Barton Creek Valley



Belize Valley Archaeological Reconnaissance Project

Plan: W. Poe 2000

Survey W. Poe 2000 S. Hayes 2000

:

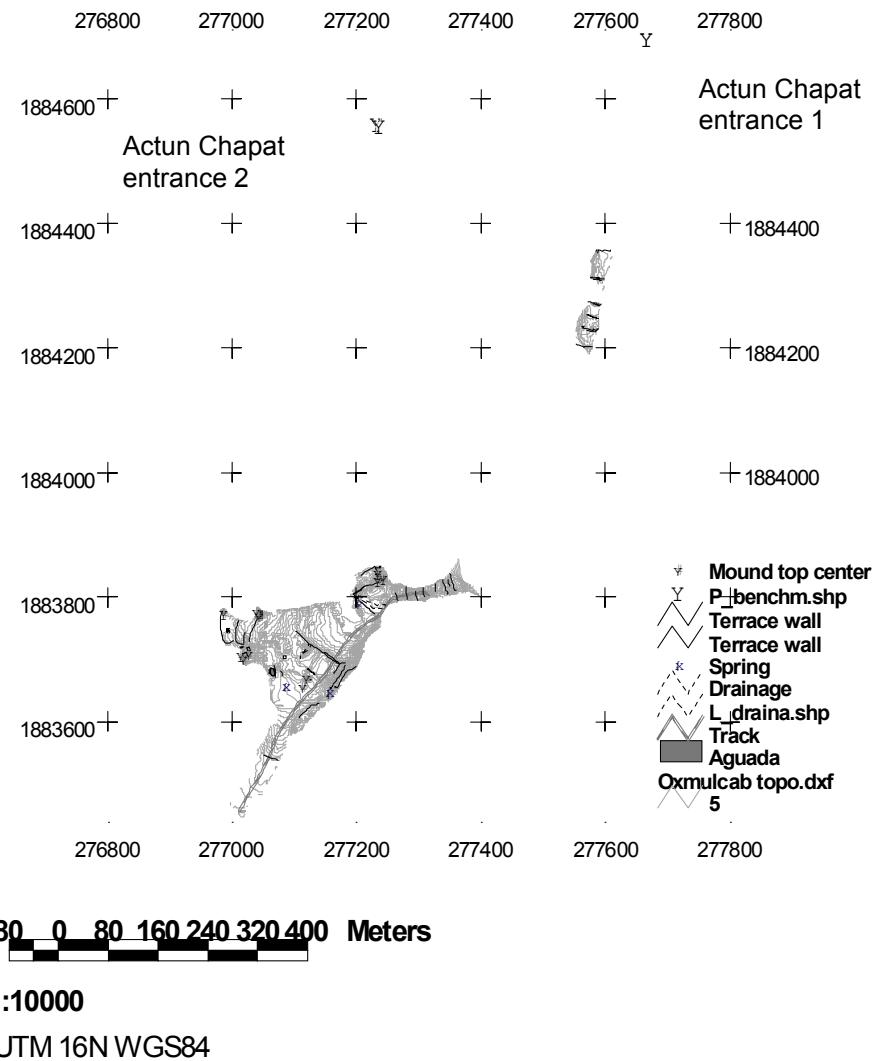
Oxmulcab

A milpa had been cleared along the trail to Entrance 1 of Actun Chapat. This provided the opportunity for mapping of weir terraces constructed across the seasonal creek channel of the narrow valley. The valley is quite narrow and satellite availability was limited.

The map on the following page displays the area in the southwest part of the valley that was mapped during the 1999 season along with the much smaller area in the northeast part of the valley that was added to the map during the 2000 season.

The mark on the map indicating Entrance 1 of Actun Chapat is in fact in the floor of the valley, an estimated fifty meters east of the entrance. The combination of the cliff face and the canopy make GPS acquisition at the cave mouth impossible.

Oxmulcab



Plan: W. Poe 1999-2000
 Survey W. Poe 1999-2000 S. Hayes 1999-2000
 : :

Pook's Hill

Objectives

The objectives of the GPS survey project at Pook's Hill included: 1) determining the Universal Transverse Mercator (UTM) coordinates of a number of survey control points used for mapping the archaeological site, and 2) gathering data for the construction of a topographic map of the site.

Methodology

Two strategies of GPS data gathering and processing were used depending upon the precision requirements of the objective.

Objective 1, determining the UTM coordinates of control points required the highest order of accuracy and precision. These data were gathered by the Static method described in the appendix below and processed with the GeoGenius™ program. Objective 2, Gathering data for the construction of a topographic map required a lower order of precision. These data were gathered with the Continuous Kinematic technique. These data were also processed in Pathfinder Office™.

Base Station Reference Position

VBRS PH is demarcated by a cross inscribed on a limestone block proximate to the northeast most cabana in the upper tier at Pook's Hill Resort. This is the Virtual Base Reference Station for the GPS Survey Project of BVAR season 2000 of the Roaring Creek Valley. Any future reliance on the location of this point should be checked by reference to the control points placed for site mapping.

The GeoGenius™ GPS postprocessing software was able to resolve the baselines between the Key West 1 CORS station, kyw1, and the BVAR and El Pilar GPS base stations and adjust the resulting network with the results reported above.

Control Points

Four control points have been established at the site. Datum 6 is in the center of the plaza. Datum 8 is at the top of the eastern shrine. The other two points are at arbitrary locations chosen for mapping convenience. Datum 6 has canopy high overhead. This impediment is reflected in the relatively high sigmas reported below. Datum 8 is clear to the Northeast but has high canopy in the other directions. The other two positions are relatively clear.

Static occupations of these points with the GPS rover for periods varying from twenty minutes to an hour resulted in the following determination of position. GeoGenius™ was used to carrier phase process these positions with the following results.

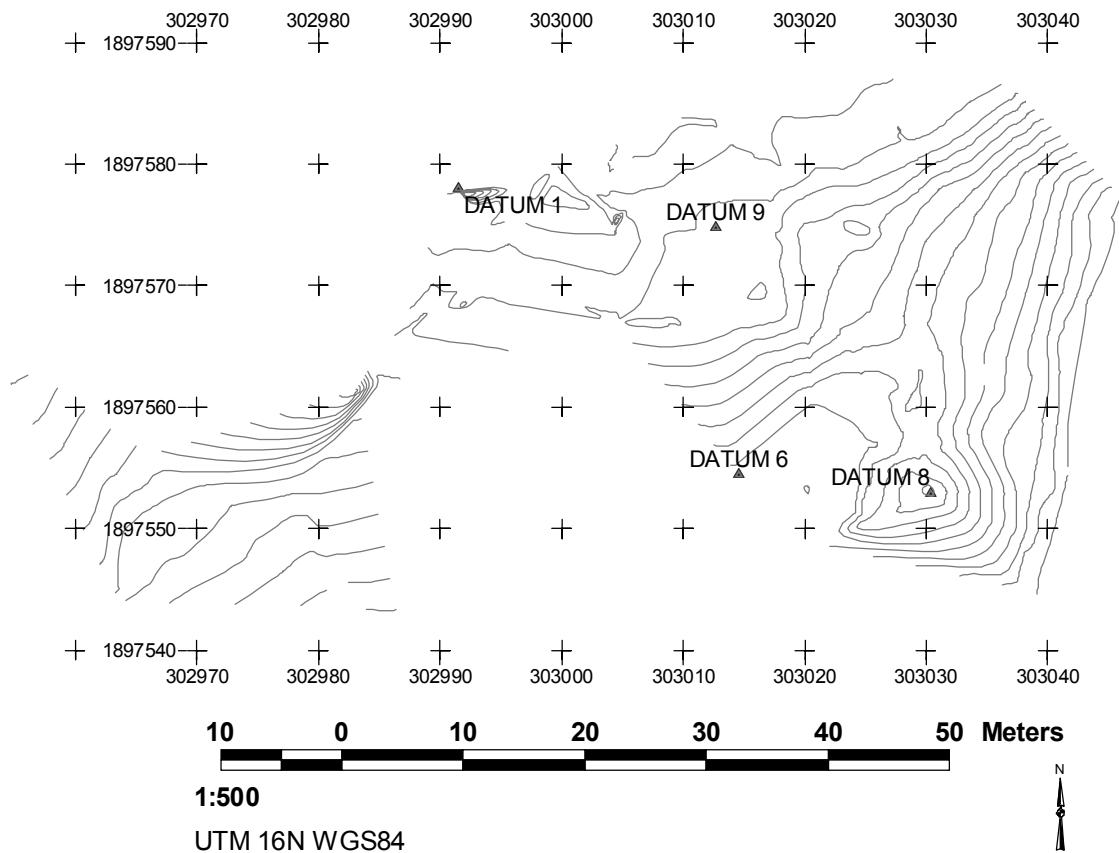
UTM Zone 16N WGS84

Point Number	Northing	Easting	HAE	Sigmas N, E, H (mm)		
PH_Datum_1	1897578.941	302991.936	83.612	0.7	0.9	2.7
PH_Datum_6	1897554.369	303014.391	78.596	2.2	31.8	48.4
PH_Datum_8	1897553.340	303031.533	80.851	1.0	1.1	3.8
PH_Datum_9	1897575.463	303013.433	81.982	0.5	0.4	0.9

Topography

The plazuela group itself has too much canopy coverage to use GPS successfully, however, a continuous kinematic technique was used to gather 1040 positions around the perimeter of the group to define the topographic context. These positions were carrier phase processed in Pathfinder Office™ and exported to a text file with the filter set to exclude all positions that exceeded either a horizontal 95% confidence interval of 5 cm. or a vertical horizontal 95% confidence interval of 10 cm. These data were imported into ForeSight™ and that program was used to generate the 0.5 meter contour interval map.

Pook's Hill



Plan: W. Poe 2000
Survey: W. Poe 2000 S. Hayes 2000

Roaring Creek

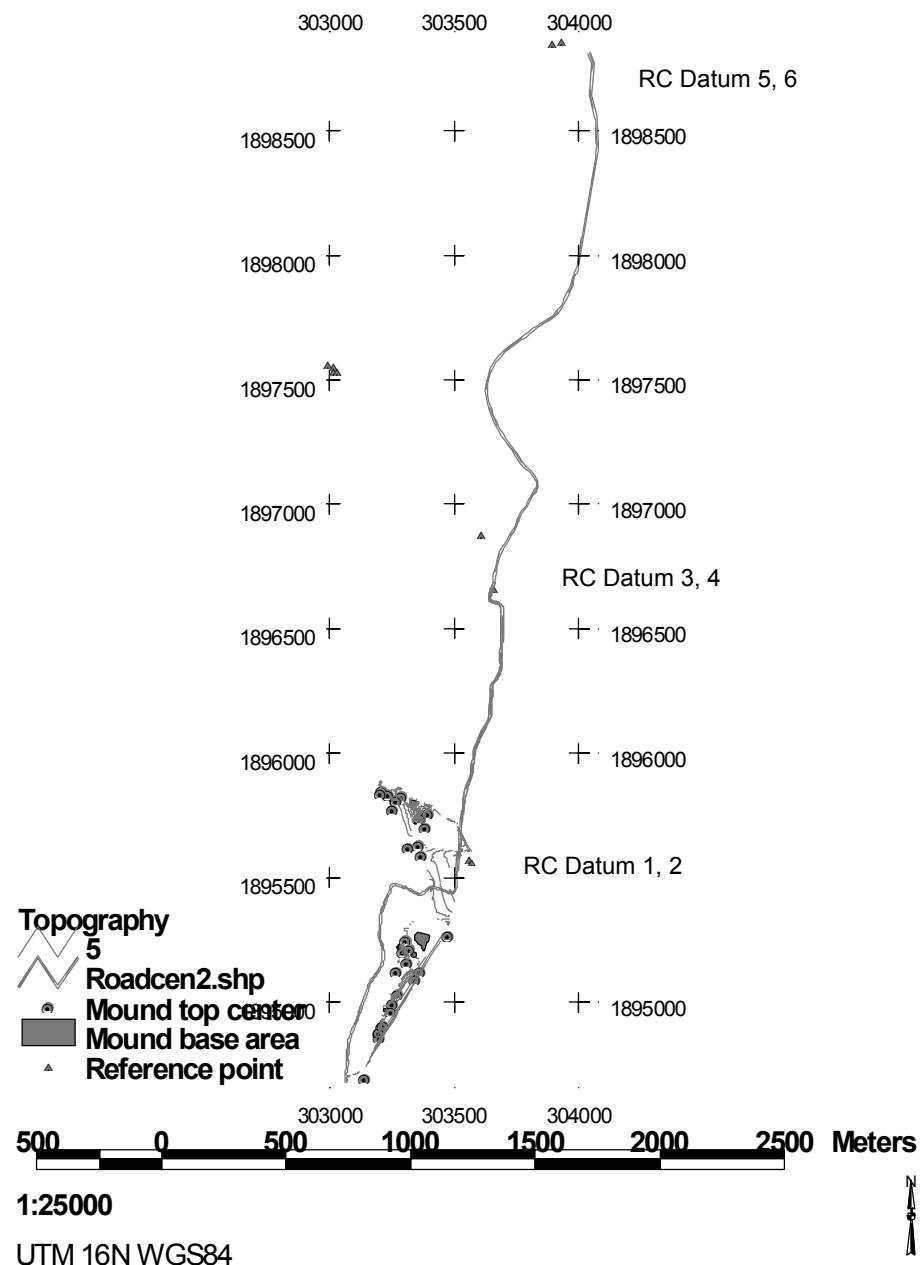
The mapping activities in Roaring Creek Valley during the 2000 season were preliminary and exploratory. There were two objectives to this project. Place and determine the UTM coordinates of three pairs of reference stakes to be used as base lines for transit mapping..Those points are described below.

RC_Datum_1	Stake	Roaring Creek Valley datums placed in pairs to create a baseline for transit mapping. Points 1 and 2 are in the vicinity of the mouth of Tarantula Cave.
RC_Datum_2	Stake	See above, RC_Datum_1
RC_Datum_3	Stake	Points 3 and 4 mark the ends of a sacbe connecting two groups
RC_Datum_4	Stake	See above, RC_Datum_3
RC_Datum_5	Stake	Top of a structure on the west side of a group
RC_Datum_6	Stake	Reference datum west of RC_Datum_1

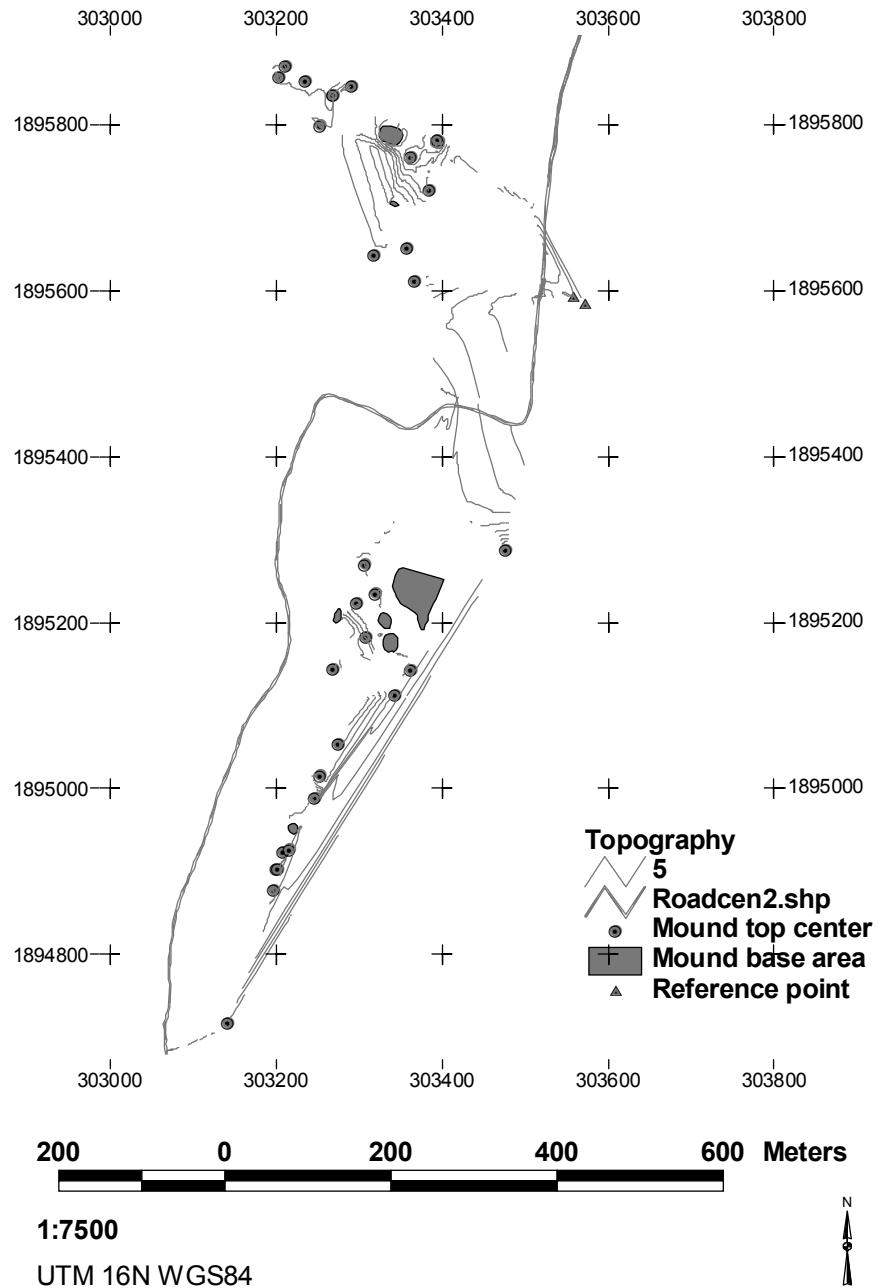
Point Number	Northing	Easting	HAE	Latitude	Longitude
RC_Datum_2	1895582.997	303571.757	69.336	N 17°08'11.22819"	W 88°50'47.24108"
RC_Datum_3	1896679.602	303663.785	66.998	N 17°08'46.92362"	W 88°50'44.48029"
RC_Datum_4	1896896.874	303608.611	65.749	N 17°08'53.97332"	W 88°50'46.41666"
RC_Datum_5	1898875.005	303930.265	60.196	N 17°09'58.41126"	W 88°50'36.17050"
RC_Datum_6	1898873.553	303895.932	55.272	N 17°09'58.35344"	W 88°50'37.33160"

The second objective was to begin the mapping of house mounds in the southern part of the plowed portion of the valley. Work was begun on this project but is quite incomplete.

Roaring Creek Valley



Roaring Creek Valley



Belize Valley Archaeological Reconnaissance Project

Plan:	W. Poe	2000		
Survey	W. Poe	2000	S. Hayes	2000
:				

Conclusions and Recommendations

Control point network

The control point network is a important foundation for archaeological research on a regional level. It will be very important as the network is expanded to maintain appropriate documentation of the methods used, the accuracy, and the precision associated with new points in the network.

Bacna

The mapping at Bacna is in the earliest stages. The area mapped for residential mounds needs to be expanded preferably at a fallow period.

Roaring Creek

The Roaring Creek Valley is very densely occupied. There are a number of substantial groups within the valley in thick bush. These sites are most likely protected from damage through agriculture. However, the residential mounds scattered through the valley will disappear through plowing. Considering the area to be covered, the archaeological mapping of the valley is a very large project.

Oxmulcab

In further opportunistic mapping of the site, as milpa operations permit, the GPS survey should be augmented with the laser rangefinder. Conditions of canopy and steep hillsides make mapping portions of the site impossible with GPS alone.

APPENDIX: GATHERING AND PROCESSING GPS DATA FOR ARCHAEOLOGICAL MAPPING

**Wm. Clay Poe
Sonoma State University**

ACCURACY

When used in the context of GPS mapping the term *accuracy* refers to the confidence with which the absolute location of the receiver is known. If the base station is placed on a point of known location then the accuracy is determined by the confidence with which that location is known. If, however, the base station is placed on a point the location of which is unknown, then the base station reference position is determined autonomously and the accuracy is that defined by the United States Department of Defense (DOD) for the L1 signal. The autonomous accuracy of the receiver is a function of the intentional degradation of the signal known as Selective Availability (SA).

SELECTIVE AVAILABILITY

Since the establishment of the GPS system the Department of Defense has controlled the accuracy of pseudorange measurements by degrading the signal available to nonqualified receivers through dithering, that is introducing digital noise, to the time and ephemerides data provided in the navigation message. With selective availability in operation users of the Standard Positioning Service had available a SPS Predictable Accuracy of 100 m horizontally and 156 m vertically 95 % of the time (2 drms).

In the first week of May 2000 Selective Availability was turned off. This increased the accuracy of the Standard Positioning Service dramatically. In principal the accuracy of the Standard Positioning Service should be the same as that of the Precise Positioning Service. The PPS Predictable Accuracy is 22 m horizontally and 27.7 m vertically 95 % of the time (2 drms). In practice the horizontal accuracy seems to be much better than the specification.

ACCURACY OF UNCORRECTED POSITIONS WITH SA TURNED OFF

On the day after Selective Availability was turned off the author recorded over 1100 positions in Santa Rosa, CA. The User Range Accuracy on all of the satellites used was 2.0 to 2.8 confirming that Selective Availability was not in use. The position was differentially code corrected from a very well surveyed position at Trimble Navigation, Sunnyvale, CA, 127 km distant. All of the more than 1100 uncorrected positions are within 7 m of the average of the uncorrected positions. The vast majority of the uncorrected positions are within 2 to 3 m of the average of the uncorrected positions in the horizontal plane. The average of the uncorrected positions is within 1.5 m of the code-corrected position. The proximity of the average of the uncorrected positions to the code-corrected position is not a

function of the occupation period. A much shorter occupation with many fewer positions recorded would have produced a very similar result. The distribution of positions in the vertical component is much closer to the 27 m specification of the U.S. Department of Defense. During the BVAR 2000 GPS project the base station was set to record a position once every fifteen minutes. Over the course of a number of days the base station recorded 436 positions. The following table shows the range and the two standard deviation, 95 % confidence level, interval of the data.

	Northing (m.)	Easting (m.)	Elevation (m.)
Range	9.347	9.384	26.110
2DRMS	3.270	3.701	9.503

From the distribution of the data it would appear that the actual accuracy is far greater than that specified by the DOD.

Precision

The term *precision* refers to the confidence with which the base line between the base station and the rover is known. With the Pathfinder Office™ software of Trimble Navigation™ the precision of a position is expressed as a unit length that is the error of the position in the northerly direction, the easterly direction and the vertical direction from the position's displayed coordinate. The precision of a feature is expressed as the average horizontal and the average vertical precisions of the positions that comprise the feature. Precisions are expressed at a confidence level, 68 %, 95 % or 98 %, representing respectively one, two and three standard deviations of the distribution of the data.

With the GeoGenius™ software of Spectra Precision Terrasat™ the precision of the baseline measurement is expressed in the lengths of the semi-major and semi-minor axes of error ellipses as well as in sigmas, standard deviations, of the data.

Differential code and carrier phase processing

There are two methods of differential processing that can be used to process GPS data, code processing and carrier phase processing. Traditionally mapping grade single frequency GPS receivers were used to collect data that was code processed and produced precisions that were better than 1 meter plus 2 ppm times the base and the rover given appropriate conditions of satellite geometry (PDOP) and signal to noise ration. Dual frequency survey grade GPS receivers were used with by land surveyors to collect data that was carrier phase processed producing far greater levels of precision.

Single frequency mapping grade GPS receivers are very practical for archaeological mapping purposes. Relative to dual frequency survey grade receivers they are economical, portable and rugged. They are very rapid to use to gather data that will be code corrected. This degree of precision is sufficient for a great number of archaeological projects, but it is insufficient for such tasks as the mapping of monuments, determination of alignments of

structures, the fitting of a local site grid to the Universal Transverse Mercator Grid system, or the generation of positions for fine scale topography.

Software developments now make it possible to use the carrier phase method of data processing with single frequency receivers to achieve typical horizontal precisions of 2 to 2.5 cm and vertical precisions in the neighborhood of 5 to 7 cm. There are, however, more stringent requirements for data collection if one wished to use this method.

DIFFERENTIAL CODE CORRECTION

GPS receivers generate the identity codes for the satellites synchronously with the transmission of the codes by the satellites. For code processing the critical measure is the time offset between the satellite transmission of the L1 signal and the receiver reception of the signal. The receiver shifts its generated code in time to match the code received from the satellite. The time difference multiplied by the speed of light is the distance of the receiver from the satellite. The position of the receiver is determined by solving the intersection of four spheres, the centers of which are the known locations of four satellites at a given epoch and the radii of which are the distances from the satellites to the receiver. With differential correction, relatively short base lines, and good satellite geometry this technique can produce sub-meter precision.

DIFFERENTIAL CARRIER PHASE PROCESSING

Carrier phase processing is an inherently more precise measuring device. The length of transmission of one bit of the code is 293 m, whereas the L1 carrier frequency has a length of 19 cm. In both cases the signal is digitized and is phase modulated.

The distance from the satellite to the receiver can be thought of as being measured in a certain integer number of wavelengths of 19 cm each plus a fractional cycle. Since the signal is digital the fractional cycle is measured as the elapsed time since that last phase shift. The receiver can determine the fractional cycle or phase to within a hundredth of a cycle or about 2 mm.⁹ The unknown number of full cycles between the satellite and the receiver is called the *integer ambiguity*.

The phase processor software is able to determine very precisely the location of the rover antenna by resolving this ambiguity. A search volume for the true position is created based upon the average and the standard deviation of the code solution. A least-squares approach is used to discover the unique set of assignments of integers to the satellite carriers that result in a single stable position. The three unknowns, the X, Y and Z coordinates of the rover receiver ought to be soluble from the carrier signals of three satellites.

⁹ The frequency of the L1 signal is 1575.42MHz. At the speed of light, 300,000 km/sec, it thus travels 190.425 mm for every shift in phase. It shifts in phase once every 0.63 nSec and the receiver clock can resolve to 0.01 nSec.

However, instead of the carrier signals themselves, the program uses the differences between the carrier waves of pairs of satellites received by the base and by the rover receivers. These are called *double differences*. These are used because in the double difference expression the clock errors of the satellites and the receivers drop out of the equation. It requires signals from four satellites to produce three double difference equations. In order to be able to test statistically for the best solution the data must be over-determined. Thus data from a minimum of five satellites is required for a carrier solution. The solution is strengthened with a greater number of satellites.

For single frequency receivers to collect an adequate quantity of data to resolve the integer ambiguity the base and the rover must maintain carrier lock on a minimum of five satellites for a minimum period of about 45 minutes. The number of satellites cannot be less than five, although it does not need to be the same five satellites throughout the period.

Since all of the data are processed after the survey it is not necessary to resolve the ambiguities prior to gathering other data. The algorithm that the carrier phase software uses for resolving the integer ambiguity does not depend upon the rover remaining in the same location for the 45-minute period, only that it maintain the carrier lock. A great deal of planning and care in execution of the survey is required in most instances in order to avoid loss of carrier lock as the rover receiver is moved from place to place in conducting the survey. Fortunately planning software is available to aid this part of the process. The satellite signals are very weak and maintaining lock on the carrier phase is particularly difficult with any degree of canopy cover. While this method of data processing is very precise, it is only practical in very open situations.

The accuracy of carrier phase processing is also a function of the distance between the base station and the rover. For much acceptable code processing the base and the rover may be as much as 300 km apart and still produce sub-meter results. With carrier phase processing the two must be much closer together. If the base is more than about 50 km from the rover, the carrier solution will probably be no better than the code solution. For horizontal 95 % confidence level precisions in the neighborhood of 2 cm or less it is necessary to occupy a position with the rover very near the base station, such as a few meters, for some significant period of time, such as 20 minutes, during the course of the survey.

FIELD PROCEDURES

All field procedures for data gathering assume the following conditions:

PDOP ≤ 4

Signal to noise ratio ≥ 6

Rover satellite elevation mask of 15°

Synchronized measurements between the base station and the rover. The usual data synchronization interval is 5 seconds. For code processing the base station receiver can be set to a multiple of the rover interval and the software will interpolate the intermediate correction. For carrier phase processing the synchronization must be identical.

Code

If only code processing is to occur, carrier mode can be turned off on the datalogger, the mode can be set to manual 3D, and files can be opened, closed and reopened as convenient.

Carrier

For all the data gathering for carrier phase processing, the carrier mode must be turned on, the mode must be set to overdetermined 3D. Files need to be left open to maintain continuous carrier lock and a file may not be reopened.

Static

In the classic static method of gathering GPS data the rover, as well as the base station receiver, remains stationary on a point for some significant length of time. With single frequency receivers a minimum occupation of thirty minutes is recommended. Change in the satellite geometry enhances the resolution of the carrier phase ambiguity. A separate file is created for each station so occupied. Using this technique the software is typically able to process the GPS data to the point that the integer ambiguity in the number of wavelength cycles between the antenna and the satellite can be resolved. If this occurs then the precision of the baseline length and azimuth between the base station and the rover will be very small, typically a few millimeters. If the data can only be resolved to a float solution then the precision will typically be around 2 cm.

Intermittent kinematic

The intermittent kinematic method is often called stop-and-go kinematic. Characteristic of this method is the successive occupation of a number of points with the rover receiver while maintaining continuous carrier lock not only during the occupations but throughout the process of moving as well. The quality of the data is a function of the length of the base line from the base to the rover, of the total length of time that the file is open with continuous carrier lock, and of whether or not there is a static initialization period during which the rover is stationary and relatively close to the base. With a static initialization period of twenty minutes at a baseline distance of approximately three meters, with each point occupied for a minimum of five minutes, and with the file open for a minimum of forty-five minutes, horizontal 95 % precisions of 2 cm or less and vertical 95 % precisions of 5 cm or less have been secured. With no static initialization period at a baseline distance of approximately ten kilometers, with each point occupied for only one minute, and with the file open for a minimum of forty-five minutes, horizontal 95 % precisions of approximately 25 cm and vertical 95 % precisions of 40 cm are typically obtained.

With single frequency receivers, it is recommended that the file be open for a minimum of 45 minutes in order to use the change in the satellite geometry to aid in the resolution of the integer ambiguity.

To be successful with this method the lines from point to point must have a good view of the sky. Careful planning and care in moving the rover receiver is also very important to the success of this technique.

Continuous kinematic

If the precision demands of the survey are not so great as to require the intermittent kinematic technique, it is possible to use a fully kinematic method that simply does not stop. This technique can be productive for such purposes as gathering topographic data for contour mapping. As with the intermittent kinematic method, it is crucial to maintain a clear view of the sky. It also remains important to keep the file open for a minimum period of about 45 minutes. This procedure is sometimes referred to as ambiguity resolution on the fly (AROF) or simply on-the-fly (OTF).

The precisions obtainable using this method are subject to the same variables as are those of the Intermittent Kinematic technique. Horizontal 95 % precisions of 25 cm or less and vertical 95 % precisions of 40 cm or less are typical.

**PALEOETHNOBOTANICAL INVESTIGATIONS OF SEVEN CAVES
IN THE ROARING CREEK, BARTON CREEK AND MACAL RIVER VALLEYS OF
WESTERN BELIZE:
GOALS, METHODS AND PRELIMINARY RESULTS**

**Christopher T. Morehart
Florida State University**

INTRODUCTION

Anthropologists and archaeologists have long been aware that caves were and are extremely sacred areas of the Maya landscape (Awe 1998; Bassie-Sweet 1991; Brady 1989; Brady and Ashmore 1999; Brady and Stone 1986; MacLeod and Puleston 1980; Pohl 1983; Pohl and Pohl 1983; Redfield and Villa Rojas 1934; Thompson 1959; Vogt 1969). The ancient Maya perceived caves as access points to the underworld. Post-conquest sources such as the Popul Vuh (Tedlock 1985), the Quiché Maya book of creation, refer to the underworld as *Xibalbá*. *Xibalbá* was the home of many powerful gods in the Maya pantheon. Thus, caves were the stage for a myriad of ceremonial activities that were heavily laden with cosmological import. Using sources from ethnohistory, ethnography, art history, epigraphy, and archaeology, researchers have developed numerous theories to interpret the nature of these rituals. Hypotheses that emphasize fertility rituals focus on the relationship between the underworld and gods associated with rain and agriculture (Awe 1998; Brady 1989). Other interpretations, however, are directed toward understanding the role that caves play in the transference and negotiation of political power (Brady and Ashmore 1999; Helmke 1998; Pohl 1983).

Archaeological theories on the use of caves by prehistoric Maya society have stemmed from observations of an incomplete database. Interpretations have been based on ceramic, lithic, architectural, monumental, osteological, faunal, and iconographic assemblages (Brady 1989; Gibbs 1997; Helmke 1998; Helmke and Awe 1998; Ishihara 2000; Pohl 1983; Stone 1995) to the virtual exclusion of botanical remains. Paleoethnobotany will provide archaeologists with a wealth of unexploited data with which to examine previous hypotheses and to further understand the ritual activity that occurred in caves.

In the following report, I will describe paleoethnobotanical investigations that were undertaken in a series of caves in the upper Belize Valley of western Belize. First, the general research design and ultimate goals of this study will be discussed. Second, the field and laboratory methodologies will be outlined. Third, although the analysis of botanical remains is not yet complete, some preliminary results can be made. This section will examine the significance and distribution of wood charcoal, particularly pine (*Pinus* sp.), in ancient Maya cave activities of western Belize as well as present initial results and interpretations of corn remains (*Zea Mays* L.) recovered from two caves, Actun Chechem Ha and Barton Creek Cave. Preliminary observations of textile fragments collected from Barton

Creek Cave will also be discussed. In reading this section, it is important to remember that paleoethnobotanical analysis is still ongoing. Thus, identifications and interpretations are subject to expansion, elaboration and change as research continues. Also, this section will rely heavily on comparisons with ethnohistoric and ethnographic records of the post-conquest Maya in order to increase the interpretative depth of the archaeobotanical assemblages. Although one cannot assume a one-to-one correspondence between the post-conquest and Classic Maya, the use of analogy of some sort (whether from ethnography, ethnohistory, replicative experiments or even from personal experience) is one of the most expedient methods with which to explain past behavior. Archaeobotanists commonly employ research from contemporary ethnobotany in order to reveal the economic potential of plant remains recovered from archaeological contexts. Thus, this approach is hardly new and represents the best way in which to frame a perspective on ancient Maya ritual plant utilization. Finally, the fourth section will focus on problems that were encountered in the field and propose suggestions for future research into cave paleoethnobotany in the Maya region.

RESEARCH DESIGN

In light of the minimal botanical data that has been recovered from caves in the Maya area, research was launched in June 2000 under the Western Belize Regional Cave Project with the primary intention of understanding the nature of ritual plant deposition. The goals of this research are four-fold:

One, identifying plant remains from ritual contexts will expand information on plants that were held as ritually significant by ancient Maya society. The majority of research that has been conducted on archaeologically recovered plant remains has largely focused on reconstructing the economic prehistory of the Maya. There have been virtually no efforts to systematically explore the plant assemblages that were utilized in ancient ceremonial activities. Because scientists working in the Maya lowlands have persuasively demonstrated that archaeological deposits in caves are ritual contexts (Brady 1989), plant remains collected from sealed cave contexts can be interpreted as residues of religious behavior. Ethnographic data on the contemporary Maya indicate that plants used in rituals were specifically selected due to various symbolic elements that are attributed to them (Flores and Balam 1997; Kintz 1990; Redfield and Villa Rojas 1934; Vogt 1976). Thus, each plant has its place not simply due to its economic significance but, rather, due to its cosmological and mythological salience and history. Other attributes assigned to plants also emphasize humoral qualities (Arnason et al 1980; Berlin et al 1974; Breedlove and Laughlin 1993; Brett 1994; Roys 1931). As a result, plants are used due to assessments of their hot or cold nature. These descriptions of plant selection provide a wonderful paradigm within which to explain the nature of botanical remains encountered in caves.

Two, the identification of plants recovered from caves will add to the artifactual assemblage and aid archaeologists in developing stronger interpretations of the types of rituals that were conducted in caves. Despite the myriad of theories proffered on prehistoric cave usage there has been no consensus. Botanical recovery will contribute more information toward this end. Anthropologists have long recognized the high degree of

similarity and overlap in Maya rituals. For example, Redfield and Villa Rojas (1934:128) state that among the Yucatec Maya of Chan Kom that “the resemblances among the different ceremonies are so great that, in describing one in detail, one describes much that occurs in many or even all of the others.” Consequently, although attempts have been made (Pohl 1983; see Brady 1989 for a contrary perspective), it is doubtful that increased data will allow archaeologists to identify diagnostic signatures of *specific* ceremonies. Despite this situation, paleoethnobotany will broaden the perspective from which many interpretations of ancient cave activities spring forth.

Three, compared to surface sites in the southern Maya lowlands, the preservation of plant remains in caves is generally much better. Thus, this research will add invaluable data to our present knowledge of ancient Maya plant/human interactions and potentially identify taxa in the archaeological record that have not yet been recognized by previous archaeobotanical research in the Maya lowlands.

Four, due to the numerous deposits and caves sampled, this research can reveal diachronic changes in the exploitation of plant resources as well as in the nature of cave rituals.

Theories on use of caves by the ancient Maya have focused on either fertility or political rituals (Brady 1989; Brady and Ashmore 1999; Helmke 1998; Pohl 1983). I believe that it is not necessary to rigidly separate these interpretations. Due to the high level of ideological and political integration as well as the high degree of dependency on agricultural practices in prehistoric Maya society, one cannot easily differentiate fertility rituals from their socio-political implications and vice versa. Appropriately, despite many different theories, there is much overlap in the archaeological record from ancient cave contexts. Indeed, as previously discussed, anthropologists have recognized that there is a great deal of similarity in the material components of many disparate contemporary Maya religious activities (Redfield and Villa Rojas 1934). Thus, I anticipate uncovering significant similarities in the botanical assemblage during temporally associated contexts. This will aid in obscuring theoretical boundaries and demonstrate the strong relationship between ideology and politics. Variation in plant remains will most likely be the reflection of diachronic ecological and social processes. For example, there is ample evidence of both environmental and social transformation during the Late to Terminal Classic in the southern Maya lowlands in the form of over population, drought, deforestation and warfare (Abrams and Rue 1988; Demarest et al 1997; Hodell et al 1995; Miller 1992; Paine and Freter 1996; Webster and Freter 1990). Changes in plant deposition in caves will demonstrate strategic decision-making in plant selection and ritual activity in lieu of these broader processes.

FIELD METHODS

Seven caves in the Macal, Barton Creek and Roaring Creek River Valleys of western Belize were selected for paleoethnobotanical sampling (Figure 1). Actun Chapat, Actun Halal and Actun Chechem Ha were investigated within the Macal River Valley. Barton Creek Cave was the only cave in the Barton Creek River Valley that was subject to examination. Finally, Actun Nak Beh, Twin Caves, and Tarantula Cave were sampled in the

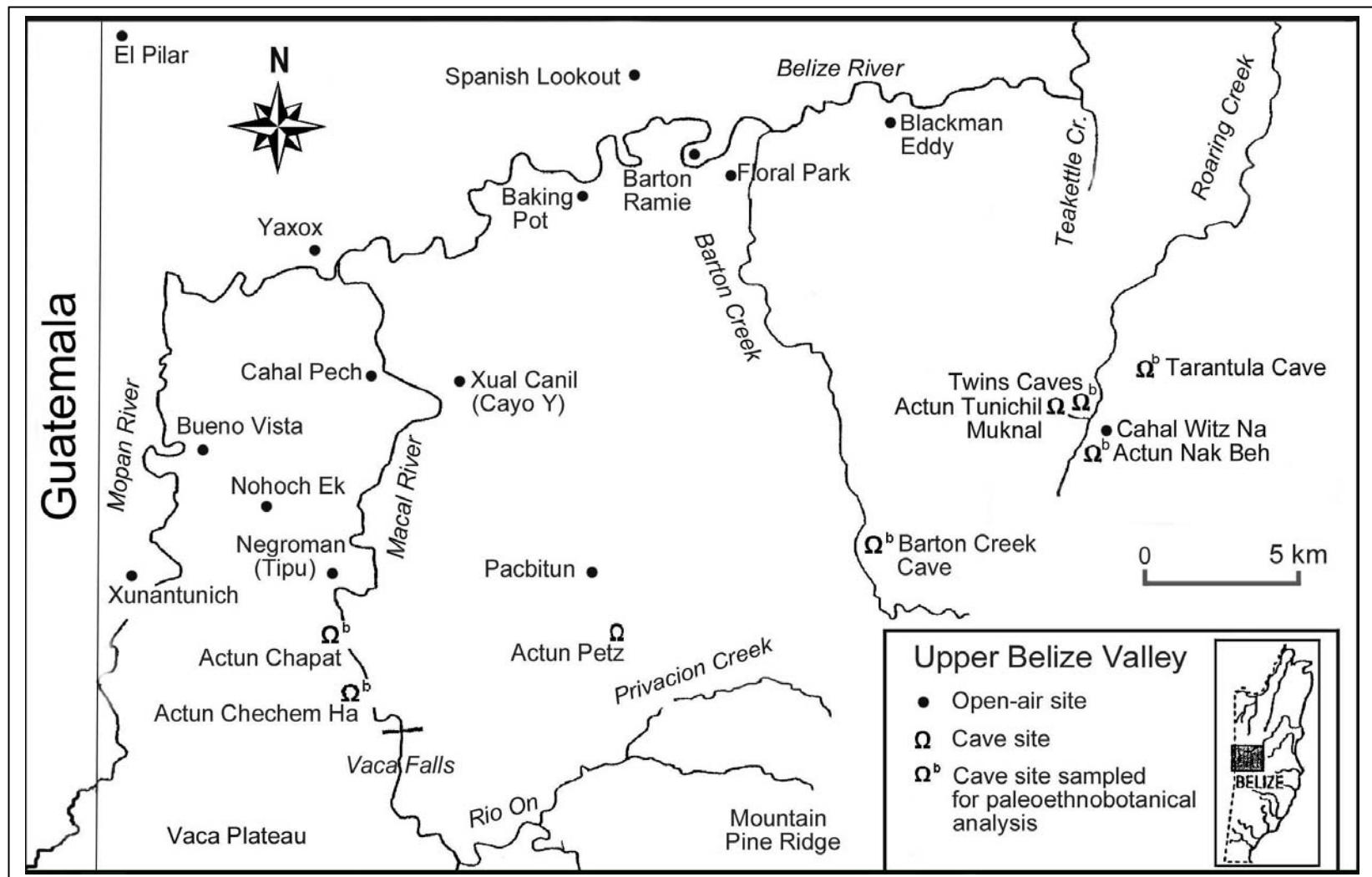


Figure 1: Upper Belize Valley showing locations of investigated cave sites in this study.

Roaring Creek River Valley. Botanical remains were yielded through flotation of excavated soil samples, from *in situ* collection of macrofossils and from matrix recovered from complete ceramic vessels.

Flotation Sampling

A blanket sampling strategy (Pearsall 2000) was applied for the recovery of flotation samples. This strategy emphasizes the collection of a standardized soil sample from every excavation context. Blanket strategies are useful in preventing the bias that stems from only sampling from visually apparent features. Due the large quantity of cultural contexts that were anticipated, a relatively small amount of soil, one liter, was chosen for standardization.

Excavated soil samples were processed using the manual flotation system developed by Struever (1968) and discussed by Pearsall (2000). A small, three-gallon bucket was modified by removing the bottom and attaching 1/16-inch nylon window screen with marine sealant. While in the field, local water sources were utilized to process samples. While in the lab, a 55-gallon steel drum was used. In order to prevent contamination, water in the drum was changed every three to five samples depending on the composition of the sample. The small bucket was immersed in the water source and agitated in a clockwise/counter-clockwise rotation. Soil was poured in slowly until the entire sample was processed. The light fraction was removed with a fine mesh sieve and placed on a small, water-permeable, square cloth. The heavy fraction was gently poured into a larger cloth square. Both light and heavy fractions were tied on a line and allowed to air dry.

Excavated Charcoal

All carbonized plant remains encountered during excavations were recovered for radiocarbon dating. Radiocarbon samples were later sub-sampled for botanical analysis. Charcoal was carefully wrapped in tin foil, and placed in labeled bags. Samples were then safely stored in a dry location in the project laboratory for subsequent analysis.

Matrix from Complete Vessels

All complete vessels discovered were sampled in order to obtain botanical remains. Complete vessels were encountered only in Actun Chechem Ha and consist primarily of ollas located on the surface of the cave floor atop elevated ledges. Due to the differential amount of matrix found in these vessels, samples were not standardized in the field. Rather, the amount of matrix in each vessel dictated the size of the sample. Samples were wrapped in acid free paper and tin foil and then placed in labeled paper and plastic bags. Matrices were stored in the project laboratory for botanical analysis.

LABORATORY ANALYSIS

Identification of all botanical remains is ongoing at the New York Botanical Gardens, Bronx, New York. Samples were rough sorted using a stereomicroscope at low magnifications. Carbonized wood was initially separated into monocots, hardwoods, and soft

woods (gymnosperms). Specimens were then cross-referenced with Dr. David Lentz's Central American wood collection for determinations of taxonomic affiliation. Other remains, such as seeds, fruits, and nuts, were segregated into groups defined by anatomical similarities and identified using comparative collections located in the Paleoethnobotanical Laboratory. A scanning electron microscope, located at the New York Botanical Garden's Harding Laboratory, will be employed in order to aid in the identification of difficult specimens.

Corncobs collected from cave deposits were measured with calipers for morphological analysis. Measurements focused both on quantitative and qualitative attributes and follow those applied by Wellhausen et al (1952), Bird and Bird (1980), Miksicek et al (1981), Lentz (1980) and Benz (1986). Quantitative measurements include ear, cob, and rachis diameter; pith diameter; cupule width and length; glume width; internode length; cob length; the number of cupules per 10 mm; row number and pairing; and kernel width, length and thickness. Qualitative measurements include cob cross-section shape; cob length shape; and kernel shape (see Tables 2 and 3). Measurements were compared to published keys of Central American and Mexican maize (see Benz 1986 and Wellhausen et al. 1952) in order to establish the corn's racial affinity.

Unfloated matrices collected from sealed vessels will be processed for preliminary microfloral analysis including pollen, starch grain and phytolith analysis. Extraction techniques will follow guidelines explained in Pearsall (2000). Recovered microfloral remains will be compared with modern material and electron microscopy will be employed for greater resolution of difficult specimens.

Finally, samples will be sent to Beta Analytic, Inc. for radiocarbon analysis.

PRELIMINARY RESULTS AND INTERPRETATIONS

Plants have a long history as integral components of Maya ritual assemblages. Indeed, the cosmological salience of the natural world permeates almost all aspects of Maya daily life. Thus, to separate ritual behavior from other facets of life can potentially be misleading and extremely biased. The majority of archaeological research in the Maya lowlands continues to discriminate between anthropologically developed categories such as politics, religion and economics without explicitly clarifying the high level of integration among these groupings. Investigations still continue in this manner primarily for heuristic purposes and in order to maintain relatively self-contained research goals. Although such approaches have made tremendous contributions to understanding prehistoric Maya society, the interpretative perspective presented here seeks to identify the ceremonial significance of archaeologically recovered plant remains that have been traditionally interpreted based solely on their economic utility. A survey of ethnohistoric and ethnographic literature reveals a wealth of information on the importance of plants in Maya ritual life that allows one to better understand plant remains recovered from ancient ceremonial contexts.

Wood Charcoal

Although much information has been recorded concerning the ceremonial use of plants among the contemporary Maya, relatively little data has been collected on the fuelwoods that are used for ritual burning. This is surprising because the vast majority of macrofloral material recovered from all caves sampled consists of wood charcoal. As already discussed, symbolic potency is one of the most important criteria in the selection of plants used during rituals. Consequently, among the ancient Maya, it is likely that the range of fuelwood utilized for ceremonial purposes was influenced by a combination of resource availability, practical concerns like burning and drying quality and the degree of heat (Metzger and Williams 1966) as well as symbolic saliency. For instance, Metzger and Williams (1966) discuss the use of particular species of fuelwood, known as *k'an te*, in crematory practices among the Tzeltal Maya of Tenejapa, Chiapas, Mexico. Berlin et al (1974) associate this fuelwood with three plants (*Diphysa robinoides*, *Pistacia mexicana* and *Eysenhardtia adenostylis*). Landa (Tozzer 1941) provides many interesting illustrations of ritual fuelwood among the 16th century Yucatec Maya. During the month Mac, a new-fire rite was undertaken in honor of rain and agricultural gods in which “[t]hey placed in the middle [of the court] a great faggot of dry sticks tied together and set upright, and first burning some of their incense in the brazier they set fire to the sticks” (Tozzer 1941:163). A similar ceremony took place on the first day of Pop. Tozzer (1941:note 759) states that rites involving new or virgin fires (*suhiu kak*) are also common among the contemporary Lacandon Maya of Chiapas, Mexico. Redfield and Villa Rojas (1934:144) discuss uses of plants in the earth oven built for first fruit ceremonies (*hol-che*) among the contemporary Yucatec Maya of Chan Kom. They state that “[w]hen the stones have become hot, upon them are laid bark of habin and choy or of tzalam and bohom.” Habin is *Piscidia* sp. (Kintz 1990). Tzalam and Bohom are likely species of *Cordia* and *Lysiloma* (Roys 1931). The taxonomic affiliation of choy is more uncertain, though it may be a species of *Indigofera* (Roys 1931).

Of all the wood charcoal recovered from the caves, pine (*Pinus* sp.) is one of the most dominant. Although the proportion of pine charcoal to hardwood charcoal is variable among the numerous caves sampled, all caves produced pine charcoal. Pine use was particularly significant in caves in the Roaring Creek River Valley (Figure 1). For instance, 97 % of all sampled contexts at Actun Nak Beh contained pine charcoal (Table 1). Twin Caves and Tarantula Cave also yielded substantial quantities of pine charcoal. In general, although pine was a component of the botanical assemblages from all cave sites, less pine was collected from caves outside the Roaring Creek River Valley. However, Actun Chechem Ha, a cave in the Macal River Valley that was primarily sampled for microfloral analysis of complete vessels (as well as corn cobs), yielded considerable pine charcoal (0.8 liters of a 1 liter flotation sample) from a five-stone hearth located on the surface of one of the inner tunnels (Crawl 3, see Ishihara 2000).

Pine charcoal is commonly recovered from archaeological sites in the Maya lowlands. Pine charcoal has been recovered from Pulltrouser Swamp (Miksicek 1983) and Cuello (Miksicek et al 1991) in northern Belize; from Dos Pilas (Lentz 1994, 1999) in the Petexbatún region of Guatemala; from Copán (Lentz 1991) and Yarumela (Lentz et al 1997), both located in Honduras; and from Cerén (Lentz et al 1996) and Cihuatán (Miksicek 1988), both in El Salvador. The likely use of most of these remains was for construction and as

domestic fuelwood. The use of pine as a source of fuelwood has long been acknowledged among the contemporary and ancient Maya. Thompson (1970:146) suggests that pinewood may have been a commodity that was exchanged from highland groups to lowland groups during the Classic period. Further, researchers have argued that the use of pine for domestic fuelwood was an important contributing factor in massive deforestation that is evidenced at sites like Copan (Abrams and Rue 1988; Abrams et al 1996).

The recovery of pine charcoal from ceremonial contexts in the Maya lowlands is not surprising. The ritual use of pine has been observed among many contemporary Maya groups (Thomson 1970:182). Among the Tzotzil Maya of highland Chiapas, Mexico, pine is one of the most significant ritual plants (Breedlove and Laughlin 1993; Vogt 1969, 1976). Pine needles, known as *shak toh*, from the species *Pinus montezumae*, are placed along the bases of crosses as well as over the floor. In discussing the ritual importance of these needles, Vogt states that “[f]or proper communication with the supernaturals, people must stand or kneel on *Shak Toh*” (Vogt 1969:393). Further, Thompson (1970:268) notes that the Tzotzil make offerings of pine branches in front of the crosses that are erected in caves. The Tzeltal Maya, also of highland Chiapas, Mexico, follow similar customs (Berlin et al 1974). Furthermore, Lothrop (1929 from Thompson 1930) describes that, during rites, the Quiché of Atitlan, Guatemala erect two posts joined by a cross bar which are then covered with pine boughs. Finally, Thompson (Thompson 1970:172) has described ceremonies in which individuals blacken their faces with soot from pine charcoal in preparation for auto-sacrifice.

The remaining wood charcoal recovered from the cave sites consists of various species of hardwoods. Due to the extreme variability in hardwood anatomy, identification of hardwood charcoal is more difficult than with softwoods (pine, for example, has very uniform and distinctive vascular tissue). As a result, analysis is still ongoing and the majority of hardwood specimens have not yet been identified. Despite this, a very brief description of already identified species is possible. Fig (*Ficus* sp., Moraceae [possibly *F. insipida*]) charcoal has been recovered from deposits from Actun Halal, Barton Creek Cave, and Actun Chapat. Many cave sites also yielded various different species of Leguminosae charcoal. Some of these specimens from Actun Chapat and Tarantula Cave are likely *Inga* sp. However, *Andira inermis* charcoal, also of Leguminosae, has been collected from Actun Nak Beh. Sapotaceae charcoal (most are probably from species of *Manilkara*) was recovered from Actun Nak Beh, Tarantula Cave, Barton Creek Cave, and Actun Chapat. Samples collected from Actun Chapat, Actun Halal and Barton Creek Cave yielded *Aspidosperma* sp. charcoal (Apocynaceae). Finally, Boraginaceae charcoal (possibly *Cordia* sp.) was identified in samples taken from Actun Chapat.

Zea Mays

Corncobs (*Zea Mays*) were recovered from Barton Creek Cave (Figure 2) and Actun Chechem Ha (Figure 3). Both quantitative and qualitative measurements were made of the specimens (Tables 2 and 3). All quantitative measurements were averaged and the standard error was equated. Mean values were then inflated 20 % to correct for possible post-depositional shrinkage (Miksicek et al 1981). Both raw and corrected figures were compared to measurements recorded for both modern and prehistoric maize recovered from

Provenience	Scientific Name	Part	Weight #	Time Period	ID #
E1, U1, L5	<i>Pinus</i> sp. <i>Andira inermis</i> <i>Attalea cohune</i> Meliaceae Combretaceae Unknown	Charcoal Charcoal Endocarp Charcoal Charcoal Residue	4.65 1.25 0.27 0.01 0.01 0.04	- - - - - -	LC 10010, 10011, 20004
E1, U1, L6	<i>Pinus</i> sp. Hardwood Dicot <i>Byrsinima</i> sp. <i>Rheedia</i> sp.	Charcoal Charcoal Charcoal Charcoal Charcoal	0.56 0.25 0.32 0.13 0.11	- - - - -	LC 10012, 10013 20005
E1, U1ext, L6	<i>Pinus</i> sp.	Charcoal	1.99	-	LC 10016, 10017
E1, U1, L7	<i>Pinus</i> sp. Leguminosae <i>Byrsinima</i> sp. <i>Attalea cohune</i> Unknown	Charcoal Charcoal Charcoal Endocarp Residue	0.67 0.08 0.21 0.01 0.54	- - - - -	LC 10014, 20006
E1, U1ext, L7	<i>Pinus</i> sp. Meliaceae <i>Byrsinima</i> sp. Poaceae	Charcoal Charcoal Charcoal Caryopsis	2.4 0.01 6.87 < 0.01	- - - 1	LC 10018, 20007
E1, U1, L8	<i>Pinus</i> sp.	Charcoal	0.28	-	LC 10015
E1, U1ext, L8 (SW & SE) Burial 2	<i>Pinus</i> sp. c.f. Rosaceae	Charcoal Fruit pit	1.19 0.78	- 1	LC 10019
E1, U1ext, L8, Burial 2	<i>Pinus</i> sp. <i>Byrsinima crassifolia</i> <i>Aspidosperma</i> sp. <i>Persea</i> sp. <i>Attalea cohune</i> <i>Cassia</i> sp. c.f. <i>Hymenaea coubaril</i> c.f. <i>Alvaradoa amorphoides</i> Meliaceae Combretaceae Moraceae Compositae Euphorbiaceae ?	Charcoal Pits, charcoal Charcoal Charcoal Endocarp Charcoal Charcoal Charcoal Charcoal Charcoal Charcoal Charcoal Achene Parenchyma tissue	25.55 2.08 0.51 0.61 0.02 0.32 1.5 0.12 0.58 1.23 0.02 < 0.01 0.01	- 3 - - - - - - - - - - 2 -	LC 10020- 10022(a), 20008

Table 1: Archaeobotanical remains recovered from Actun Nak Beh, Cayo District, Belize. (E= entrance, CH= chamber, U= excavation unit, L= excavation level, ext= unit extension, LC= Late Classic period, EC= Early Classic period, - = unquantified).

Mesoamerica and other areas in order to establish the corn's closest racial affinities.

Nine corncobs of variable preservation were collected from Ledge 2 of Barton Creek Cave (Area C, Feature 23) in association with Late Classic ceramics (Figure 2). Measurements of the cobs are presented in Table 2. Overall, the preservation of the cobs is remarkable with at least one specimen having an almost completely intact husk (Cob 1c). This is significant because the majority of *Zea Mays* remains recovered from other sites in the Maya lowlands consists primarily of kernel and cupule fragments. Other plant and organic material associated with the cobs consists of pine and hardwood charcoal (including Apocynaceae charcoal), *Zea Mays* stem fragments, and textile fragments. All botanicals are carbonized.

The Barton Creek Cave cobs show the most affinity to the Chapalote-Nal Tel maize complex described by Wellhausen et al (1952) and Mangelsdorf (1974) as an ancient, primitive race. Corn from this complex has been recovered from archaeological sites over a broad temporal and geographical span in Mesoamerica. Benz (1986) refers to this maize complex as the Isthmian Alliance. Chapalote-Nal Tel is composed of short, tapered popcorns with 8-12 rows of non-dented kernels. It is found at lower elevations in more tropical environments. The specimens from Barton Creek have a slightly closer morphological resemblance to Nal Tel, a type that is today found primarily in the Yucatan, than to Chapalote (see also Benz 1986:200-244).

Chapalote-Nal Tel type corn has been found at numerous sites in the Maya lowlands and was likely one of the most dominant types grown during prehistoric Maya society (Lentz 1999). Formative period deposits from Cuello in northern Belize yielded corn fragments that have affinities to Chapalote-Nal Tel (Miksicek et al 1981). Chapalote-Nal Tel corn has also been reported from Copan (Lentz 1991) and Cerén (Lentz et al 1996). Finally, smooth, non-dented kernel fragments characteristic of Chapalote-Nal Tel were recovered from Terminal Classic strata at Pook's Hill (Morehart, unpublished notes), a small plazuela group in the Roaring Creek River Valley of western Belize.

During 1998 excavations of Actun Chechem Ha, uncarbonized corncobs were collected in association with large, Late Classic ollas (Ishihara, personal communication 2000). Only seven cobs were available for metric and non-metric analysis (Figure 3). The remaining cob material was in such a fragmentary state (likely due to post-excavation disintegration) that measurements were not possible. Also, no kernels were preserved in any specimen from Actun Chechem Ha. Measurements for the Chechem Ha cobs are listed in Table 3.

Particular caution must be held when interpreting the corncobs from Actun Chechem Ha. The cobs seem to have morphological similarity with Gallinazo maize recovered from the Chicama Valley of Peru (Bird 1970, 1979 from Miksicek et al 1981; Bird and Bird 1980), especially in cupule width and length; cupule wing width; and rachis diameter. However, differences in cob length between Gallinazo and Actun Chechem Ha cobs are striking. Gallinazo cobs have a mean length from 42.0 to 49.5 mm whereas the mean cob length for the Chechem Ha cobs is 18.32 mm (21.88 mm: 20 % correction factor) (Table 3). Therefore,

it is likely that the cobs collected from Actun Chechem Ha are underdeveloped making comparisons with other archaeological specimens difficult. On the other hand, the mean row number (10) is in accord with Chapalote-Nal Tel maize. Thus, while mean row number is not an absolute indicator of racial affinity, given the available data on prehistoric maize from the Maya lowlands (especially in lieu of the immaturity of the present cobs) it would be imprudent to associate the Actun Chechem Ha corn with any other maize complex besides Chapalote-Nal Tel.

Corn is one of the most potent components of Maya ritual assemblages. This is not surprising due to the heavy reliance upon maize agriculture during ancient Maya society. Maintaining a milpa and growing maize is an important part of Maya identity (Steinberg 1999). Indeed, Maya groups, such as the Quiché of highland Guatemala, believe that modern man was created from corn (Tedlock 1985). A great variety of maize, each with its own mythological history and humoral quality, is grown by the contemporary Maya (Thompson 1970; Ventura 1996; Vogt 1976). These symbolic properties are defining features in the selection of maize for ceremonial activities among many modern Maya like the Mopan (Steinberg 1999).

Maize is used in many different forms (both in processed and unprocessed states) during numerous disparate ceremonies among the post-conquest Maya. One of the interesting features of the corncobs from Barton Creek Cave and Actun Chechem Ha is that they appear to be largely unprocessed. This is especially the case with the Barton Creek cobs in which some still have the remains of the husk intact. Most ethnographic accounts of the ritual use of unprocessed maize are in association with agricultural rituals. For instance, among the Yucatec Maya of Chan Kom unprocessed corn is used during first fruit ceremonies, known as *hol-che*. Redfield and Villa Rojas (1934:144) state that, during these rites, “[t]he ears of maize, wrapped in their husks, are laid upon this bark and the pib [earthen oven] is closed...At about three in the morning the men gather to open it. The first twenty-six ears of corn...are hung from...the altar in thirteen pairs, the husks of each pair being tied together.” Further, the Tzotzil Maya of highland Chiapas, Mexico hang unhusked ears of maize from wooden crosses in order to protect the stored, harvested maize (Vogt 1976:56). However, Ventura (1996) has recorded an additional practice among the Jakaltek Maya of highland Guatemala in which the dead are buried with tortillas, a gourd full of *pozol* (a beverage made from ground corn dough and water) and an ear of corn to provide food for the deceased’s journey through the underworld.

The corncobs from Barton Creek and Actun Chechem Ha are probably the remnants of an ancient agricultural ritual. This interpretation is particularly salient with the maize from Chechem Ha, a cave that yielded no burials (Ishihara 2000). On the other hand, though no human remains were recovered in direct association with the Barton Creek cobs, Barton Creek Cave itself yielded numerous burials (Mirro, personal communication 2000). Thus, while it is likely that the corncobs represent a past agricultural ceremony, the possibility that they were deposited as “food” for the many interred individuals, perhaps ancestors (Brady 1989; McAnany 1995), cannot be completely ruled out. Indeed, other caves in the Maya lowlands where corncobs have been recovered have also yielded significant human remains, such as Cueva de las Pinturas, a cave located in Petén, Guatemala with evidence of

Provenience	Specimen #	Cupule Width	Cupule Length	Cupule Wing	Glume Width	Rachis Dia.	Cob Dia. Max	Cob X-sec Shape	Cob Length	Ear Dia.	Long Shape	Row #	Kernel Width	Kernel Length	Kernel Thick
F23, CC3	1a	6.88	2.26	0.9	2.27	11.21	-	C	50.36	30.02	T	10	7.71	8.86	4
F23, CC3	1b	8.32	1.68	1.18	2.12	11.76	15.4	C	35.4	-	T	10	8.32	8.48	4.29
F23, CC3	1c ¹	-	-	-	-	-	-	C	49.98	23.38	T	10	-	-	-
F23, CC1	1d	5.56	2.4	0.98	2.1	-	19.25	-	-	29.12	-	-	6.8	6.86	5.2
F23, CC6	1e	-	-	-	2.75	11.88	17.6	C	21.82 ²	-	T	10	-	-	-
F23, CC6	1f	6.33	2.2	0.94	2.6	12.16	16.04	C	21.42 ²	-	T	10	-	-	-
F23, CC6	1g	-	-	-	-	-	-	C	-	19.2 ²	-	-	7.38	8.44	5.7
F23, CC6	1h	-	-	-	2.41	10.68	-	-	-	-	-	-	7.46	7.08	5.01
F23, Screen	1i	4.72	2.1	1.28	1.84	-	15.7	C	31.4	-	T	12	7.26	6.01	4.04
Average		6.36	2.13	1.06	2.3	11.54	16.8	-	41.79	27.51	-	10.33	7.49	7.62	4.71
20%Correction		7.63	2.56	1.27	2.76	13.85	20.16	-	50.15	33.01	-	- ³	8.99	9.14	5.65

Table 2: Morphological measurements of maize from Barton Creek Cave. (C= circular, T= tapered, ¹= husk intact [difficult to obtain all measurements], ²= fragmentary [not used to calculate overall mean], ³= not affected by shrinking, ⁴= estimated based on angle measurements).

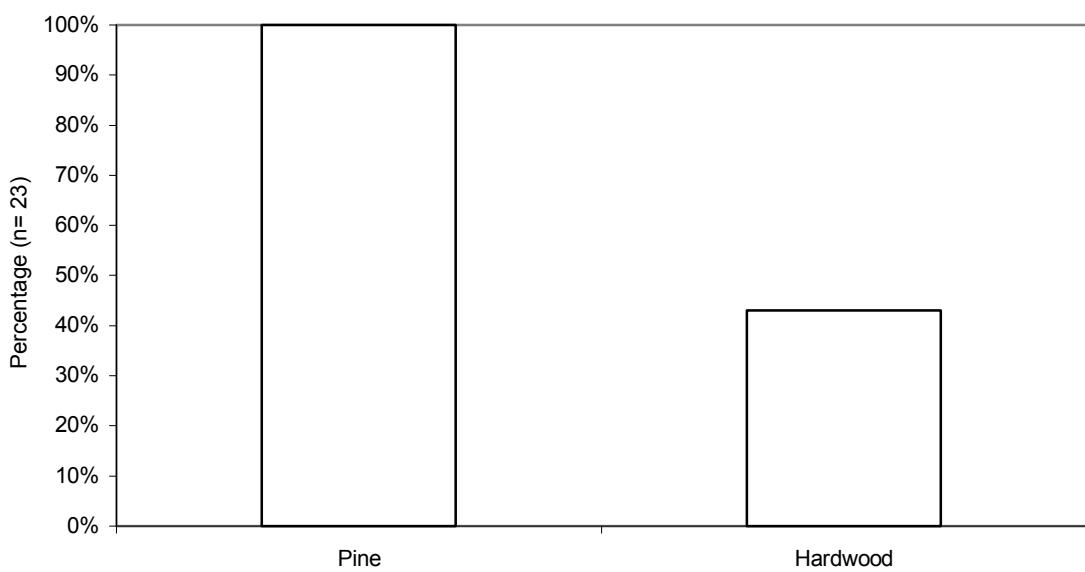


Figure 2: Comparison of pine and hardwood charcoal from archaeological contexts at Actun Nak Beh.

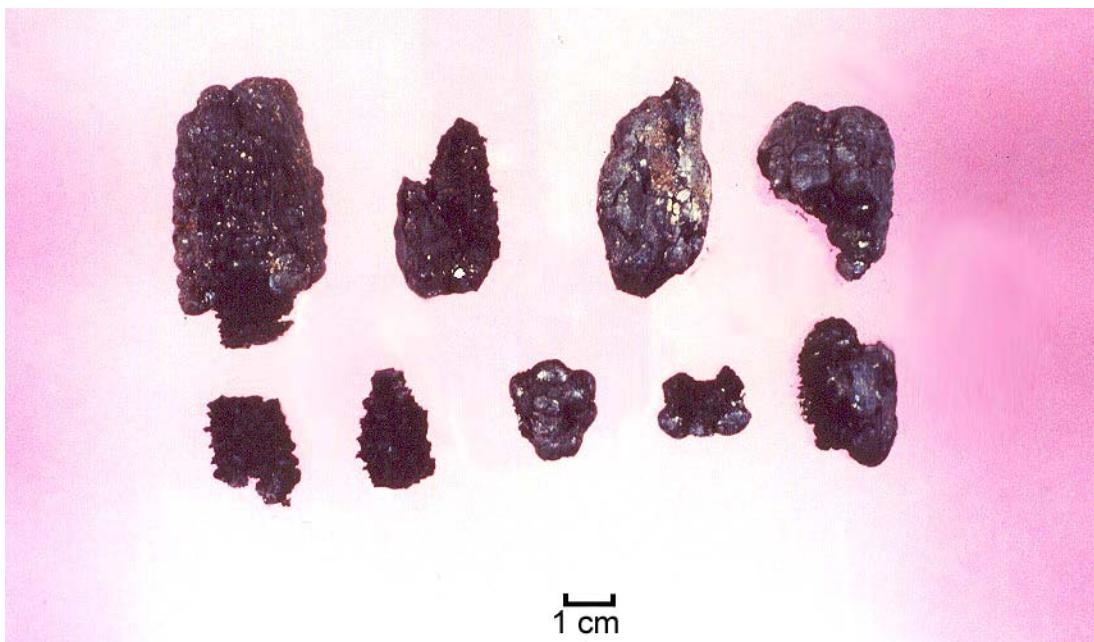


Figure 3: Maize cobs recovered from Barton Creek Cave (Cob designations, left to right, top to bottom: 1a, 1b, 1c, 1d, 1e, 1f, 1g, 1h).

Provenience	Cob	Cupule Width	Cupule Length	Cupule Wing	Glume Width	Rachis Dia.	Cob Dia.	Cob Length	Cob X-sec Shape	Long Shape	Row #
CCH, L 6, Olla 3	2a	4.22	1.68	1.08	2.44	6.68	9.4	18.26	C	T	10
CCH, L 6, Olla 3	2b ¹	-	-	-	2.86	-	10.18	20.6	C	T	10
CCH, L 6, Olla 3	2c ¹	-	-	-	2.84	4.68	8.72	18.88	C	S	10
CCH, L 6, Olla 3	2d	3.54	1.2	0.88	1.6	6.84	7.52	13.72	C	T	10
CCH, EP 3	2e	3.56	1.48	0.8	2.18	5	7.5	22.01	C	T	10
CCH, EP 3	2f	5.22	2.26	1.2	2.6	5	10.22	12.96 ²	C	T	10
CCH, EP 3	2g	4.92	1.56	1.12	1.9	5.2	7.76	15.92	C	T	10
Average		4.2	1.64	1.02	2.35	5.57	8.76	18.23	-	-	10
20% Correction		5.2	1.9	1.23	2.81	6.684	10.51	21.88	-	-	- ³

Table 3: Morphological measurements of maize cobs from Actun Chechem Ha. (C= circular, T= tapered, S= straight, X-sec= cross section, Dia.= diameter, ¹= well preserved glumes [difficult to obtain cupule measurements], ²= fragmentary [measurement not used to calculate overall mean], ³= row number not affected by shrinkage).

significant Preclassic utilization (Brady et al 1997); Naj Tunich, also located in Petén, Guatemala (Brady 1986, 1989); and Gordon's Cave #3, located in the Sesesmil River Valley near the site of Copan, Honduras (Brady 1995). Finally, the Cenote of Sacrifice, located in Yucatan, Mexico, has yielded copal offerings with corncob impressions (Coggins and Ladd 1992:350). Though not a cave *per se*, similar ritual behavior has been recorded between cenotes (and waterholes) and caves (Vogt 1976).

Textiles

A fairly well preserved, carbonized textile fragment was recovered from a flotation sample from Barton Creek Cave (Ledge 2, Area C, Feature 23) (Figures 4 - 6). The specimen was collected in association with Late Classic ceramics. Other botanical remains yielded from this deposit include corncobs (see above), *Zea Mays* stem fragments, and pine and hardwood charcoal. Analysis of the textiles is not complete. However, some initial observations of fibers and manufacturing techniques are possible.

One of the most extensive collections of Precolumbian textiles was recovered from the Cenote of Sacrifice near the site of Chichen Itza, Yucatan, Mexico (Lothrop 1992). Thus, I will often refer to these specimens for comparison with the Barton Creek textiles.

Although electron microscopy will be needed in order to obtain a higher, clearer resolution of the fibers, preliminary microscopic analysis at high magnification revealed long, narrow, unicellular fibers characteristic of cotton (*Gossypium* sp.). Although other vegetal fibers, such as agave, were used in cloth production (Lothrop 1992; Sayer 1988, 1990), cotton has long been recognized as one of the most important fibers in the manufacture of Mesoamerican textiles from antiquity to the present. It was an economically important cultigen that was grown in order to make cloth for tribute and trade (Thompson 1970; Tozzer 1941). Landa (Tozzer 1941:64) recorded that elite members of 16th century Yucatec Maya society maintained improved lands that were sowed with cotton. Further, Landa states that “[c]otton is gathered in wonderful quantity and grows in all parts of the land and there are two kinds of it. One they sow every year...the other lasts five or six years” (Tozzer 1941:200). Cotton is still grown by modern Maya of both highland and lowland communities (Atran and Ucan Ek’ 1999; Berlin et al 1974; Breedlove and Laughlin 1993; Redfield and Villa Rojas 1934:42).

Numerous archaeological sites in the Maya lowlands have yielded evidence of cotton cultivation. One cotton seed and probable cotton pollen was found at Cerros, located in northern Belize (Crane 1995). Other sites in northern Belize where cotton has been recovered include Colha (seeds) (Turner and Miksicek 1984), Cuello (seeds) (Miksicek 1991), Pulltrouser Swamp (pollen) (Wisemen 1983) and Albion Island (pollen) (Wisemen 1990). Finally, paleoethnobotanical research at Cerén (Lentz et al. 1996) and Cihuatán (Miksicek 1988), both located in El Salvador, have yielded cotton seeds.

One of the difficulties in analyzing fragmentary textiles is distinguishing between warp and weft elements (Lothrop 1992). The textiles recovered from the Cenote of Sacrifice demonstrate a slight predominance of warps over wefts as well as much finer spun warps (Lothrop 1992:35). Thus, these criteria are used to tentatively interpret the Barton Creek textiles (Figures 4 and 5). The yarns of both the warp and weft elements are Z-spun. Z-spun yarns is the dominant technique recorded for the textiles from the Cenote of Sacrifice where over 390 pieces have Z-spun warp and wefts in the base cloth (Lothrop 1992:37). Further, both the warp and weft elements of the Barton Creek textiles are S-plied (Figure 6). Thus, overall, the warps and wefts are composed entirely of Z-spun, S-plied cords. Textiles with warps and wefts of S-plied cotton have also been recovered from the Cenote of Sacrifice (Lothrop 1992:46). Diameter measurements and the number of twists per 1 cm of warp and weft elements are likely to be biased by preservation but are useful in distinguishing tightness of twist (see Hurley 1979) and overall textural differences in the cloth. The warp elements appear to be much looser with roughly 0.68 mm cords and 12 turns/cm. The weft elements have a slightly tighter twist with about 1.1 mm cords and 16 turns/cm.

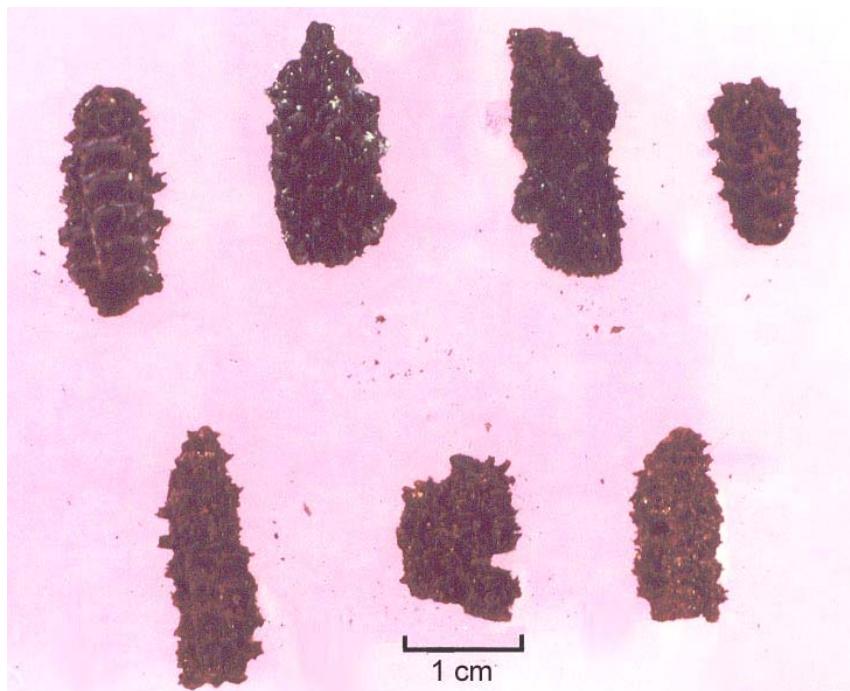


Figure 4: Maize cobs recovered from Actun Chechem Ha
(Cob designations, left to right, top to bottom: 2a, 2b, 2c, 2d, 2e, 2f, 2g).

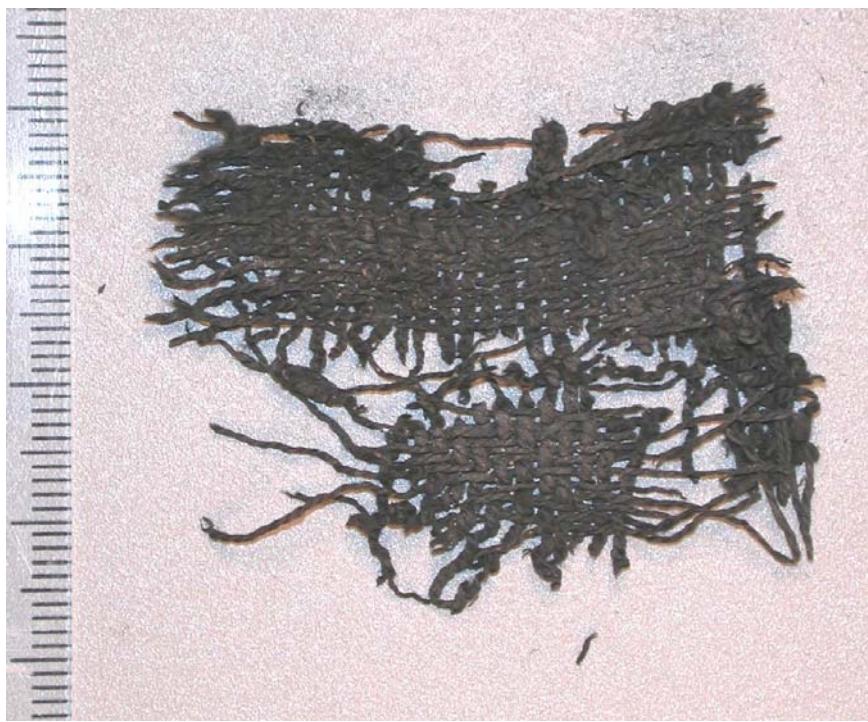


Figure 5: Textile fragment from Barton Creek Cave.

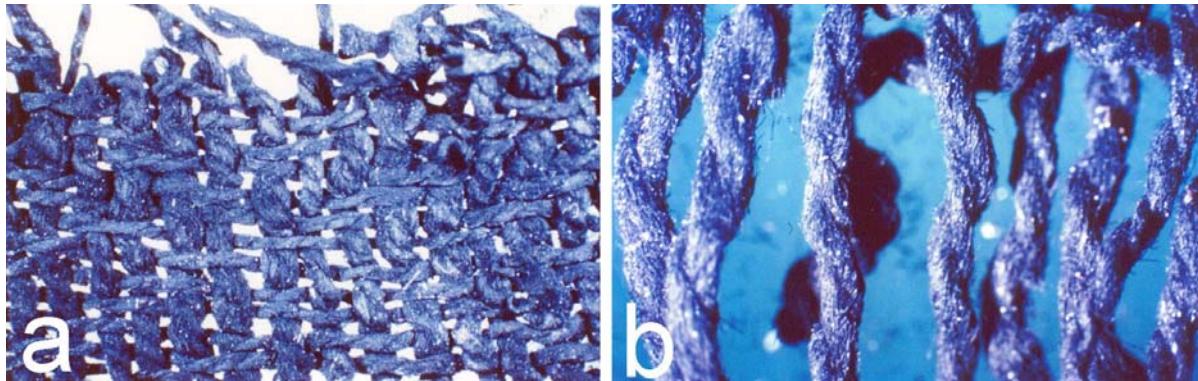


Figure 6: Close-up views of textile fragment from Barton Creek Cave. **6a.** View showing weaving technique. **6b.** View showing Z-spun, S-plied elements.

The Barton Creek textiles were invariably woven on a backstrap loom. Depictions of backstrap looms appear in Precolumbian figurines as well as in numerous codices. The use of the treadle or foot loom is used for weaving wool and did not begin until after the Spanish introduction of Merino sheep in the 17th century (Osborne 1974). The weaving technique used in the Barton Creek textiles is more uncertain and appears to be inconsistent throughout the fragment (Figure 5). Many warp and weft elements appear to adhere to a basic, one-over/one-under weave, also called a plain weave (Sayer 1988). Plain weaves constitute the bulk of the textiles recovered from the Cenote of Sacrifice as well (Lothrop 1992). However, parts of the fragment appear to have elements of a basket or extended tabby weave (Sayer 1988) in which pairs of warp and weft elements alternate in a two-over/two-under pattern. These descriptions of the weaving technique of the Barton Creek textiles are very tentative and more definite interpretations must await further analysis. Also, because the condition of the textiles is fragmentary no end or side selvage treatment is discernible. Finally, additional weaving techniques, such as supplementary weft brocading and laid-in supplementary wefts, are not apparent.

Textile traditions have a long, significant history among the Maya. Indeed, today individual communities can be differentiated by the designs of their costumes (Osborne 1974; Sayer 1988, 1990). Thus, textiles are an important component in defining Maya identity. The discovery of textiles from ceremonial deposits in the Maya lowlands is not surprising. Numerous accounts illustrate the utilization of textiles during rituals among the post-conquest Maya. Textiles were used to wrap idols and sacrificial victims that were offered to the deities (Tozzer 1941). This behavior may explain the discovery of textiles from some ritual contexts in the lowlands. As said, numerous textiles were retrieved from the Cenote of Sacrifice in Yucatan, Mexico (Lothrop 1992). Although it is not certain whether these textiles were remnants of the clothing worn by individuals sacrificed, the recovery of numerous human remains and accounts of this behavior among the 16th century Maya (Tozzer 1941) make this interpretation plausible. More direct evidence of this activity has been recorded from Gordon's Cave #3 near in the Sesesmil Valley outside of the Classic period site of Copan, Honduras. Here archaeologists have recovered human bone wrapped in textile fragments (Brady 1995; Rue et al 1988). It appears that these textiles may have

disintegrated after excavation making analysis of the fragments not possible. The textiles found at Barton Creek Cave, however, were not in direct association with any human remains. Rather, numerous corncobs (see above) were recovered from that feature. Thus, while uncertain, it is likely that these remains represent the remnants of an ancient bag or some carrying device that, at one time, held the corncobs that were deposited in the cave.

The discovery of textiles from Barton Creek Cave allows broader interpretations into the ritual life of the prehistoric lowland Maya. Although argumentative, it appears that cotton textiles were reserved for more elite individuals whereas the rest of the population used fabric made from other vegetal fibers such as agave or bark cloth made from fig trees (*Ficus* sp.). Indeed, Landa (Tozzer 1941) indicates that the nobility reserved tracts of improved land for the production of cotton and oversaw the manufacturing as well as the trade and tribute of textile goods. Also, depictions of tribute cloth are found in many works of Classic period Maya art. This information is significant, because one of the difficulties of cave archaeology in the Maya lowlands is discerning the status of cave users during ancient Maya society (Awe 1994, 1998; Helmke 1998). If differential access to cotton cloth was indeed prevalent among the prehistoric Maya, perhaps the textiles recovered from Barton Creek Cave are evidence that elite groups were using the cave for ritual purposes. Furthermore, the Barton Creek textiles permit discussion of possible gender roles in ritual activities. Because weaving is performed predominantly by women (Osborne 1974; Sayer 1988; Tozzer 1941), this data provides insight of the role of women in, at least, the preparations for religious affairs. Similar functions have been observed concerning women's role in raising livestock that is sacrificed and ceremonially consumed by the Maya (Pohl 1983).

PROBLEMS AND SUGGESTIONS FOR FUTURE RESEARCH

Because paleoethnobotanical investigations are a new addition to the research conducted by the Western Belize Regional Cave Project, certain problems were anticipated and encountered. Many of these stem from the fact that this was largely a learning experience for the principal botanical investigator. Despite this latter situation, it would be helpful to make such problems explicit in order to aid future paleoethnobotanical research that is conducted in caves, and further, by this project.

First, although a blanket sampling strategy was emphasized in the collection of flotation samples, every archaeological context was not sampled. This situation occurred in some caves more than in others. Overall, however, this was most likely the result of communication problems and due to general inconveniences on the part of excavators. Another reason that every context was not sampled involves the nature of the soil encountered during excavations. Many of the matrices encountered in cultural deposits consisted of extremely compact clays. Manual flotation is a rather inefficient method with which to extract botanical remains in these situations. Thus, soils that could be floated with more expediency were emphasized over those that could not.

Despite the fact that flotation samples were not taken from every excavation context as originally intended, the available botanical database was greatly extended by combining macrofloral material from sub-sampled radiocarbon samples. However, the amalgamation of *systematically* collected flotation samples with largely *unsystematically* collected macrofossils creates critical limitations on the scope of the quantitative analyses that can be applied to the botanical assemblages. This is an important issue to be dealt with because one of the ultimate goals of this research is to obtain a diachronic understanding of plant deposition in cave sites of the southern Maya lowlands rather than simply producing a static laundry list of plant remains. Among the available quantitative measurements for paleoethnobotanical analysis absolute counts and ubiquity are two of the most commonly employed (Pearsall 2000; Popper 1988). In lieu of the current problems concerning the comparability between differentially collected samples, ubiquity analysis is the most appropriate to the present investigations. Ubiquity reduces the biases that stem from preservation (discussed below) and, especially in this case, disparate recovery techniques by simply assigning a score of present or absent to taxa. Thus, differences in the count or weight of individual taxa from one spatially and temporally associated context are not relevant. Further, because absolute counts from single contexts are not considered, ubiquity is a relatively simple and well-equipped analytical tool to macroscopically explore long-term chronological variation in plant assemblages.

Another more apparent problem that stems from performing archaeological research within the Neotropics concerns preservation. The hot, humid environment is not conducive to long-term preservation of organic remains. Surprisingly, many of the caves yielded numerous, well-preserved botanical samples. However, once removed from archaeological contexts, botanical remains begin to deteriorate at an accelerated pace. Because those researchers conducting paleoethnobotanical investigations were unable to be at every site each day many soil samples remained, unprocessed, in field labs for extended periods of time. This undoubtedly led to the further decomposition of plant remains in flotation samples. In the future, more individuals (especially students) should be trained in basic flotation procedures and flotation equipment should be made available at every site. This latter suggestion was not initiated this field season due to a lack of funds for paleoethnobotanical research.

Another issue that has important implications for future research concerns the nature of the botanical assemblages themselves. The current study has focused primarily on the identification and analysis of macrofloral remains collected through flotation. This approach has yielded a limited diversity in the plant parts recovered. As previously discussed, wood charcoal was by far the most dominant plant part. In fact, wood charcoal is so prominent that samples that yielded other plant parts (seeds, palm endocarps, etc) can almost be considered anomalous. Taken alone these results can lead to seriously misleading interpretations of ancient Maya ritual plant use by de-emphasizing the importance of other plants and plant parts. Ethnographic sources indicate that a myriad of different taxa are utilized during ceremonies. These plants are used in a variety of forms including wood, vines, seeds and flowers (Flores and Balam 1997; Vogt 1976). Furthermore, numerous plants are used in a processed state such as breads and beverages like balche (made from *Lonchocarpus* sp.). Many of these remains are likely only to be preserved microscopically as pollen, starch

grains and/or phytoliths. For example, pollen samples yielded a dominance of an unknown flower pollen from all excavation levels at Gordon's Cave #3, located near Copan, Honduras (Rue et al 1988). This material has been interpreted as remnants of ancient floral offerings. Flotation is poorly equipped to recover such remains. Although microscopic analysis is planned for samples collected from complete vessels from Actun Chechem Ha, systematic recovery of matrices for microfloral remains was not applied during excavations at other cave sites. In the future, soil samples should be collected for possible pollen, starch grains and phytoliths in addition to those taken for flotation. The combination of both recovery techniques will greatly increase our present knowledge of ritual plant deposition and is a logical extension of the present study.

SUMMARY

Archaeological investigation into the use of caves by prehistoric Maya society is a relatively new avenue of research for archaeologists working in the Maya area (Brady 1989). Only in the last two decades have full-scale projects been launched with the primary goal of understanding ancient Maya cave activity (e.g. Awe 1998; Brady 1989, 1997; Goldstein and Prufer 1999). Despite the increased attention that caves have begun to receive, there has been virtually no systematic sampling of botanical remains from cave contexts. Thus, an entire database has been left unexamined by archaeologists.

Paleoethnobotanical investigation is a powerful tool to understand the nature of ritual activity as well as to explain past relationships between Maya society and their environment. Preliminary analysis and interpretations of botanical remains recovered from caves in the upper Belize River Valley have demonstrated great potential of caves for the recovery of well-preserved organic material. For example, among the material collected during the course of this research textile fragments and wonderfully preserved corncobs amplify the importance of archaeobotanical investigations. Other remains recovered, such as wood charcoal, provide information of plants used for ritual as well as broader inferences of ancient Maya plant/human interactions. Due to the high number of spatially and temporally distributed deposits sampled, this material may provide further interpretations of changing patterns in plant exploitation and ceremonial practices on a regional and diachronic scale. Finally, although analysis is not complete, when used in conjunction with ethnographic and ethnohistoric accounts of post-conquest Maya life, this data allows broader discussion of other facets of ancient Maya society such as politics, social organization and gender roles.

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A PRELIMINARY REPORT ON THE INVESTIGATIONS IN CHAMBER 3B, ACTUN CHAPAT, MACAL RIVER VALLEY, CAYO DISTRICT, BELIZE

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INTRODUCTION

The cave site of Actun Chapat is located in the Macal Valley within the foothills of the Maya Mountains, approximately 12 km south of the modern town of San Ignacio. Members of the Belize Department of Archaeology in 1982 conducted preliminary reconnaissance of the site. At that time, members of the reconnaissance team identified such architectural features as walls, terraced and raised platforms, as well as human remains, and disturbed ceramic artifacts dating between 300 B.C. and A.D. 1000. Additional investigations of Actun Chapat were not conducted until the summer of 1999, when the Western Belize Regional Cave Project initiated the continuing reconnaissance, mapping and testing of the cave (see Ferguson 2000). The site of Actun Chapat is somewhat unique, in that it houses a large corpus of architectural constructions, perhaps the largest in western Belize. The largest and most abundant forms of construction in Actun Chapat are terraced platforms, of which there are over 30. The following will provide a preliminary discussion of the investigations conducted within Actun Chapat during the first one-month session of the 2000 field season.

INVESTIGATIONS

Investigations in Actun Chapat during the 1999 field season focused on the testing of some of the architecture within the area adjacent to the sinkhole entrance (Entrance II), within the penumbral zone of the cave. The Entrance II area contains the most numerous and diverse types of artificial construction in the cave. During the 2000 field season we continued to examine the prehistoric architecture in the cave, but moved to Chamber 3B, an area located approximately 120 m from Entrance I, but within the dark zone of the site. While the number and types of architecture within this area are far fewer than in Entrance II, it was important to test this area (the second of three known to contain architecture within Actun Chapat), in an attempt to fully comprehend the nature and purpose of architecture within the cave. The third area, Ledge 5 is within the light zone of Entrance I, and thus the testing of the architecture located in the dark zone of Chamber 3B would allow for a more thorough and contextually significant analysis of these constructions. Data retrieval was not limited to the investigation and excavation of architecture within Chamber 3B, but also included the surface collection of many areas within Chamber 3B. Investigations also included the examination of regularities and disparities in the patterns of architectural constructions within Chamber 3B and associated artifacts, as well as a comparison of data from Entrance II and Chamber 3B.

The research conducted at Actun Chapat during the 2000 field season was conducted under the auspices of the Western Belize Regional Cave Project (WBRCP) (Awe 1998, 1999; Griffith et al. 2000). The information recovered at Actun Chapat will ultimately contribute to ongoing investigations by the WBRCP concerning the temporal, social, regional and differential use of caves by the Precolumbian Maya of western Belize (Awe 1998:2).

DESCRIPTION OF CHAMBER 3B

As indicated above, Chamber 3B is located approximately 120 m from Entrance I in the dark zone. The area in question is located at the southern most extreme of a large chamber (Chamber 3), but which the author designated as Chamber 3B due to the fact that it is easily differentiated from the rest of the chamber by its surrounding terrain. Chamber 3B is located in an area measuring approximately 20 x 15 m, and is more or less demarcated by the wall of the cave, and large concentrations of breakdown. Interestingly, Chamber 3B is further differentiated from the rest of Chamber 3 in that the ground surface does not exhibit the ankle-breaking scattering of cave rocks that the rest of the chamber does. Its surface actually contains few rocks, and is predominately covered by dirt and bat guano. In fact, it is possible that the Maya purposely cleared all debris from this area and may have used the material (rocks and speleothems) for the construction of the seven terraces within Chamber 3B (Terraces 20 - 26), and the two walls (Walls 3 and 4) that served to close off the entrance to Chamber 4 at the southwestern end of Chamber 3B. The clearing of the debris from Chamber 3B would also have facilitated the ease by which activities in this area might have been conducted. Of further note is the fact that as with the terraces in Entrance II, there is no evidence to suggest that the Maya were modifying any of the construction materials (making cut blocks), or plastering and painting of the rocks as is typical of surface site construction. Instead, it was evidently important to have the architecture maintain a cave appearance, rather than exhibit a tailored appearance typical of architecture at surface sites, hence the use of existing cave formations within these constructions. Of further mention is the fact that Terraces 20, 21, 25, 26, and the area immediate to the cave wall in the vicinity of the walled off chamber, all had dense concentrations of sooty ash, with charcoal flecks and fragments interspersed along the cave wall. It appears as though this ash was swept to the edges of the wall, leaving the majority of the area free from the debris associated with some sort of burning activity. The central, low and flat area of Chamber 3B also exhibits areas with high concentrations of ash. Unfortunately, Chamber 3B has been subject to the same looting activities as Entrance II. More than 5 looter pits were identified in this area.

EXCAVATIONS

Due to time constraints and unforeseen difficulties working in the complete dark zone, only three units were placed in Chamber 3B. Unit designations were continued from the previous year of investigations, as were terrace numbers (units start in Chamber 3B at Unit 10, terraces began at Terrace 20). Datum numbers were designated according to the larger survey of the cave, and were assigned beginning at Datum 100. Profiles of two of the terrace walls (Wall 5 of Terrace 22) (Figure 1), and Wall 7 of Terrace 24 (Figure 2) were also completed, as were surface collections of the central ceramic cluster, Looter Pits 1-3 on

Terrace 20, and Terraces 22, 23, 25, 26. The surface collections were, in part, completed due to the fact that so few ceramics, diagnostic or otherwise, were recovered from excavation units. Since the ceramics on the surface far out number those being found through excavations, this would thus at least provide us with a very general chronology of use for Chamber 3B. Additionally, those materials retrieved through surface collections would allow us to examine correlations with ceramic types and time periods with material recovered in excavations. All excavation units measured 1 x 1 m; they were excavated with trowels, geological picks, and whisk brooms, and were screened through 1/4 inch screens (unless the matrix from the entire level was collected for floatation). All units were excavated in both cultural and natural levels.

Unit 10, Terrace 20

Unit 10 was placed on the highest and most western of the terraces in Chamber 3B (Terrace 20), and in an area of the terrace void of looter pits. A dense lens of ash was detected at surface level, and prompted the placement of Unit 10. The unit was set up 5 degrees west of north. Seven levels were excavated in Unit 10, and the excavation descended to a maximum depth of only 32 cm below datum. Very few artifacts were recovered, and they included a total of 36 ceramic sherds. No artifacts were retrieved below Level 5. The stratigraphy in Unit 10 contained several layers of burnt material and ash, however, the matrices were mostly concentrated in the northeastern corner of the unit (Figure 3). Some levels (Levels 3, 6 and 7) were not detected in all areas of the unit. A stain of a burnt piece of wood was collected from Level 5 (Figure 4). Excavation was terminated when sterile natural cave deposits were reached.

Unit 11, Terrace 26

Unit 11 was placed on a north-south axis on Terrace 26 after animal bones were collected from the exposed matrix associated with Looter Pit 4. The bones included several unidentified burnt fragments and others that appeared to be reptilian. The placement of the unit along a north-south axis allowed us to conduct a salvage excavation of this material, and also test the highest and easternmost portions of the terraces in Chamber 3B. Unfortunately, looting activity had destroyed a substantial portion of the terrace wall (Wall 9). A plaster floor was unearthed (Level 6) that went underneath the wall in the northern section of the unit, and was deteriorated along the western wall of the unit (see Figure 5 for illustration of remnant floor and wall). Like Unit 10, very few artifacts were recovered from Unit 11 (11 ceramic sherds in total), and not all levels were detected throughout the unit. A drilled, small conch shell was retrieved from Level 6 on the floor. Unit 11 contained 6 stratigraphic levels, and was excavated to a maximum depth of 60 cm dbd. The first two levels were disturbed due to the looting activities. A charcoal “pit” was discovered along the eastern wall of the unit in Level 4 (Figure 6), but charcoal was present throughout all stratigraphic levels.

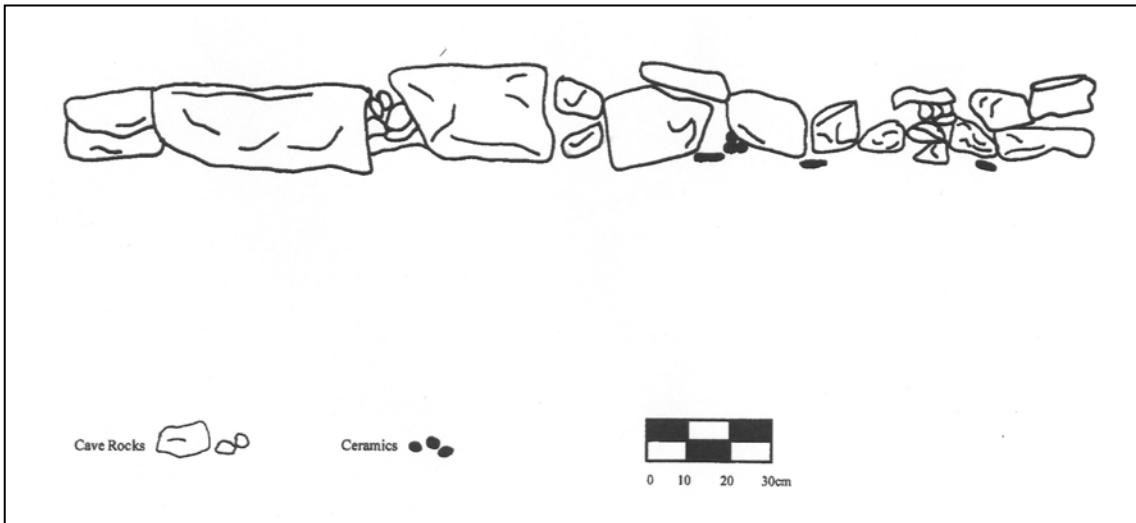


Figure 1: Profile of Wall 5, Terrace 22 (Terrace faces west).

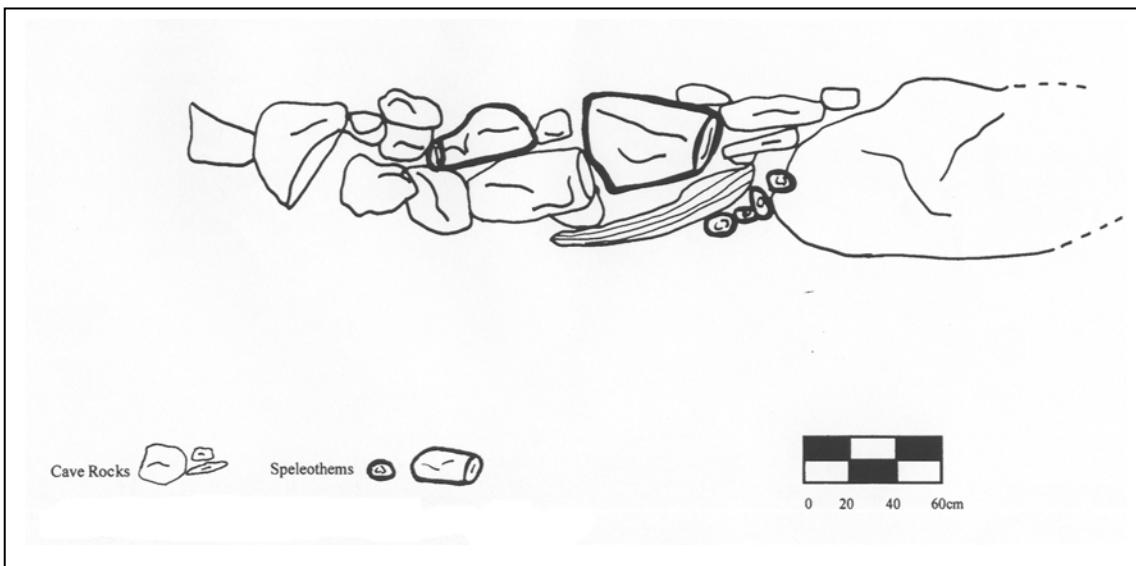


Figure 2: Profile of Wall 7, Terrace 24 (Terrace faces west).

Unit 12, and Unit 12-EXT

Unit 12 was placed along a north-south axis just to the east of the second entrance to the walled chamber (Chamber 4, where Wall 4 is located), adjacent to the southern wall of the chamber. The area was void of looting activity and the unit was placed to partially cover the entrance. While this unit did not test the architecture directly, its location incorporated an area where ash was visible on the surface. Only four levels were excavated in Unit 12, to a maximum depth of 38 cm dbd (Figure 7). (Note: While three stratigraphic levels associated with the burning episode were visually detectable, they are considered part of one episode, and thus were excavated as one level). Burning was detected in this unit in the form of charcoal surfaces, oxidized matrices of a deep, homogenous red colour, as well as dispersed ash and charcoal.

Due to its relative location to the central area of the chamber, and the large cluster of surface ceramics immediately to its north, the number of artifacts recovered from Unit 12 and its extension were higher than the other units. One hundred and four pottery sherds were recovered from this unit. Unit 12-extension was initiated in the area encompassed by Unit 12's backstaking and the cave wall. The unit was expanded so as to fully explore a "pit" of loose dirt and concentration of ceramics that was identified as a cache in Level 3 of Unit 12-extension (CHP00-F/1) (Figure 8). Only 49 sherds were recovered from this concentration, but due to its relative density, it was tentatively designated as a cache. Unit 12-extension was terminated (as was the larger unit) upon detection of the natural cave surface, at a maximum depth of 27 cm dbd. Due to its proximity to the cave wall, it was not as deep as Unit 12 proper and only had 3 levels.

CONCLUSIONS

The architecture in Chamber 3B was not as extensive as that in Entrance II. This was presumably due to the darkness of the area, and hence difficulty in constructing more elaborate or high terraces, but also may have had to do with the area itself being less steep, and thus not requiring as high or as wide of constructions. While burning was evident on some of the terraces within the Entrance II area, it would appear that the activities associated with the terraces in Chamber 3B involved more regular burning activities. Similar to the Entrance II constructions, few artifacts were recovered from within the construction fill of the terraces, and the material collected in surface collections was much more numerous. This is typical of other caves investigated by the WBRCP (see Ferguson 1999). It is hoped that future research will allow us to determine the nature of prehistoric activities on the terraces in Actun Chapat, and to ascertain the nature of cave use in the Belize River valley.

Acknowledgements

I would like to thank the Department of Archaeology and the Acting Commissioner, Dr. Allan Moore for granting the Western Belize Regional Cave Project the permission to continue investigations in Actun Chapat. I would also like to thank Dr. Jaime Awe for once again allowing me to participate in the cave research. Additionally, I would like to thank the numerous students who contributed to the investigation of Actun Chapat. The field school students have been an integral part of our research, and we could not have done it without them. Finally, I would like to thank the staff of the Cave Project who made day after day a joy, most especially the Chechem Ha crew of Jon “C.B.” Spenard, Christopher Morehart and Cameron Griffith, as well as Sherry Gibbs, who helped keep me sane when we were in town.

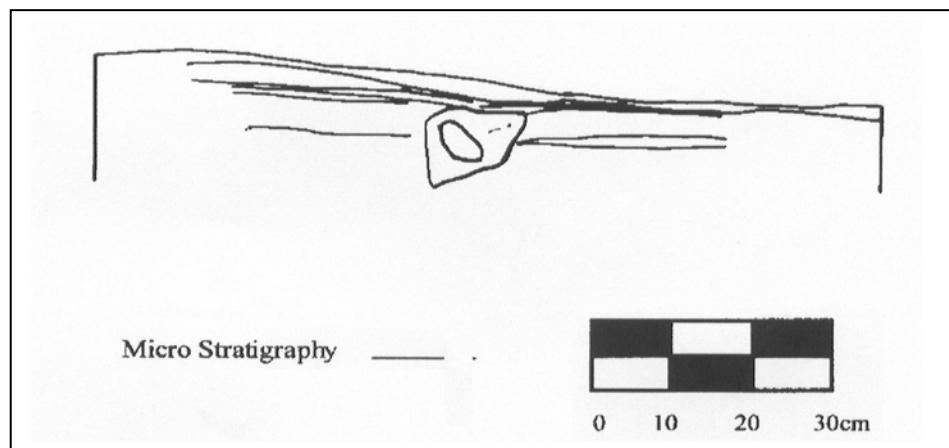


Figure 3: Stratigraphic profile of eastern wall of Unit 10.

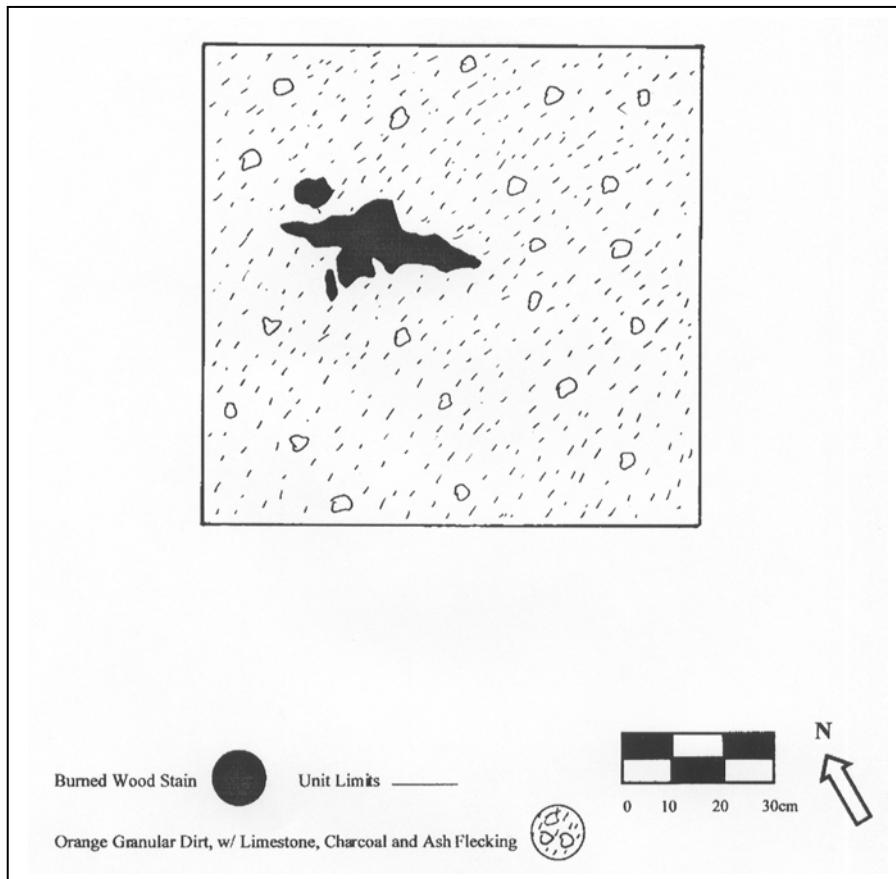


Figure 4: Top plan of Unit 10, Level 5, Terrace 20 with burned wood stain.

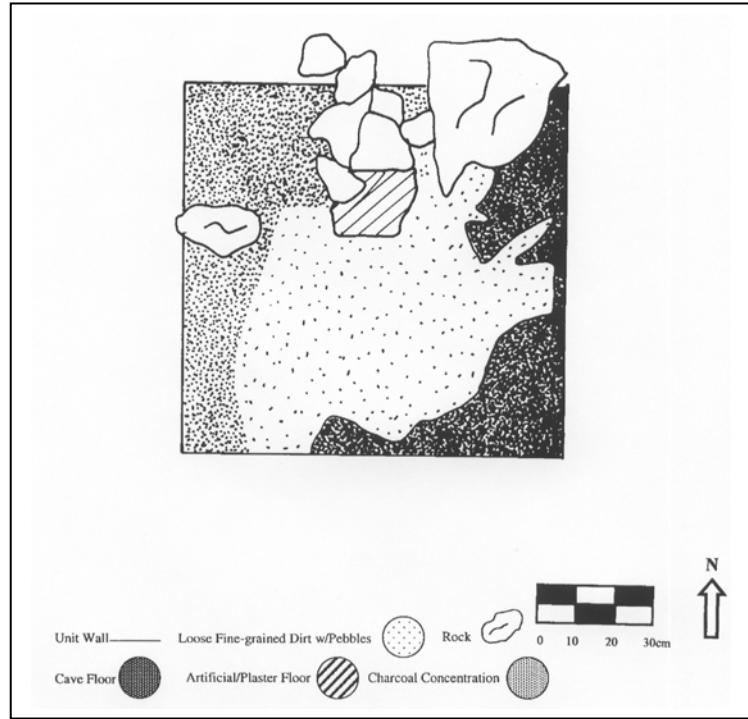


Figure 5: Top plan of Unit 11, Level 6, Terrace 26.
Note fragmented wall and artificial floor.

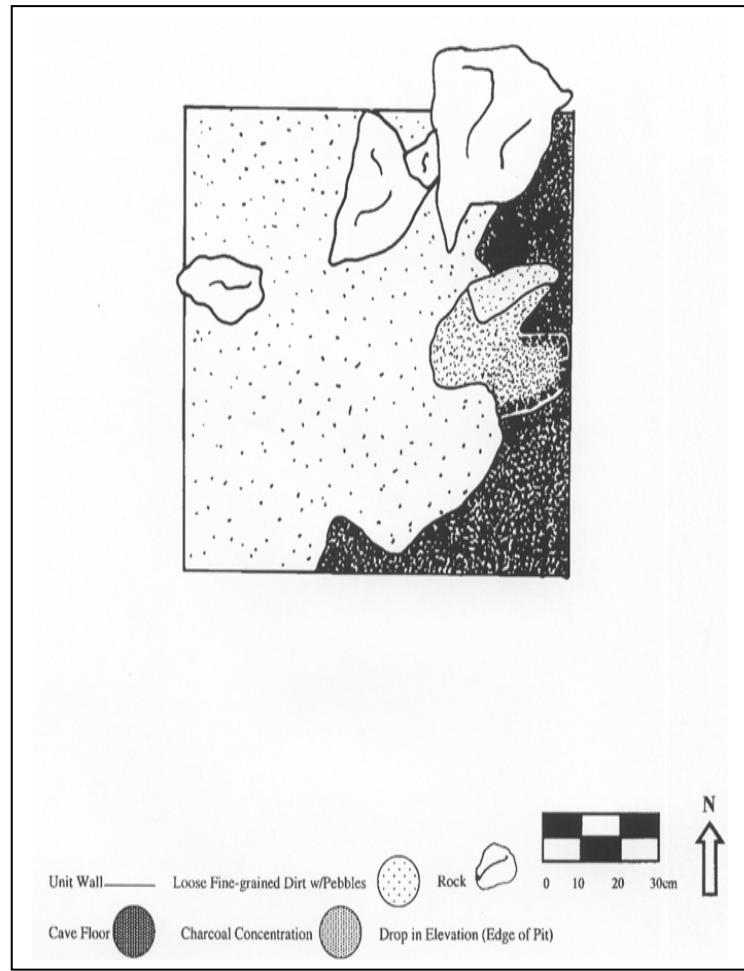


Figure 6: Top plan of Unit 11, Level 6, Terrace 26.
Note charcoal concentration.

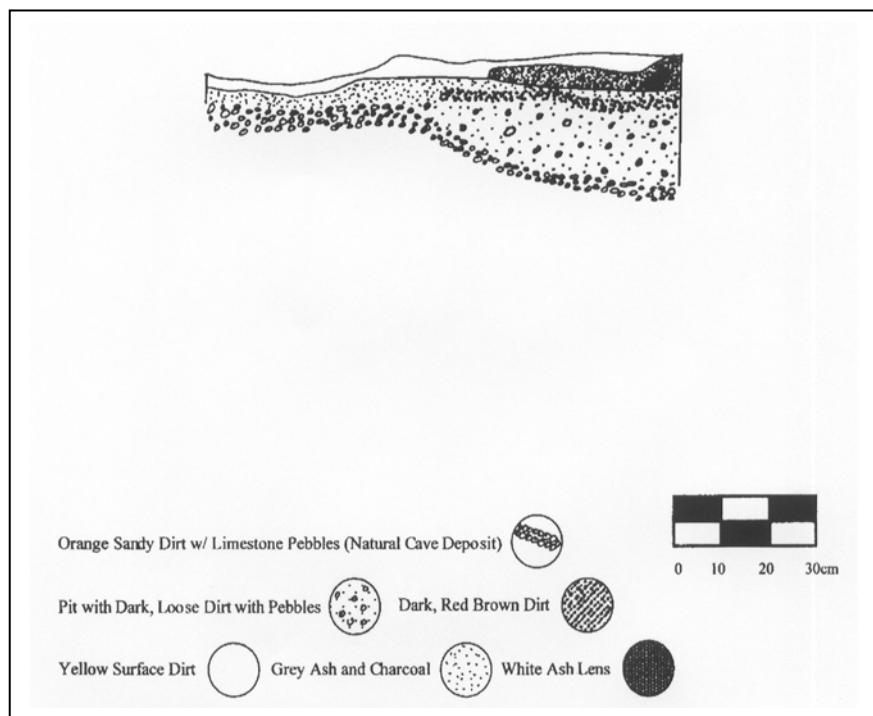


Figure 7: Stratigraphic profile of southern wall of Unit 12.

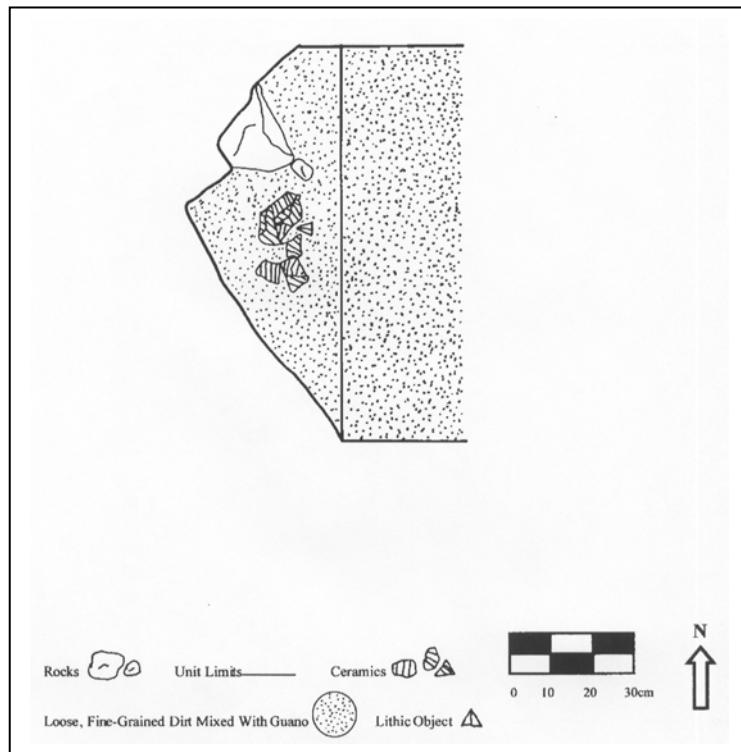


Figure 8: Top plan of Unit 12-EXT, Level 3. Ceramic concentration (CHP00-F/1).

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**A PRELIMINARY REPORT ON THE EXCAVATIONS AND CONTINUED
INVESTIGATION OF ACTUN HALAL, MACAL RIVER VALLEY, CAYO DISTRICT,
BELIZE**

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INTRODUCTION

During the 2000 field season the Western Belize Regional Cave Project (WBRCP) returned to Actun Halal. In the month of June a small group of staff and students conducted excavations and continued mapping operations at this cave site. The site was chosen for excavation because of its similarity in morphological and cultural features with other caves under investigation by the project. Specifically, Actun Halal shares many characteristics with Actun Uayazba Kab, which is located in the neighboring Roaring Creek Valley. Both Actun Halal and Actun Uayazba Kab have large, open entrances that make them more akin to rockshelters than caves. In addition, both caves also contain petroglyphs in the form of simple faces. The investigations in the 2000 season were geared to shed further light on the similarities and differences between Actun Halal and other caves in the region.

LOCATION AND PHYSICAL DESCRIPTION

Actun Halal is located near Actun Chapat, just south and uphill from a small arroyo in the Macal River Valley in western Belize. The cave is relatively small, with two clamshell-shaped entrances separating a cave passage 26 m long. The cave passage varies in width from 4.5 to 8 m. The majority of the cave is in the light zone, although there is a passage that provides access to two small chambers: Chamber 1, which is in the penumbral zone, and Chamber 2, which is in the dark zone (Figure 1).

There are stalactites and stalagmites throughout the cave, although dripwater activity and travertine formation is more prevalent in the area around Entrance 2. Active dripwater activity was documented as a part of the 2000 investigations, and the extent to which the dripwater covered the cave floor and formations was included in the map (Figure 2). Just south of Entrance 2, there is an alcove which contains a flowstone “waterfall,” where the entire wall is covered with thin, vein-like formations of sparkling calcium carbonate (Griffith 2000).

The cave floor is split north-south by a low, two to three course high wall comprised of large limestone rocks. This wall separates the higher elevation surface of the area just inside Entrance 2 from the lower surface of Entrance 1. At either end of the wall there are large stalagmitic formations, approximately 3 m in height. Both of these formations are the tallest stalagmitic formations in the cave and have been modified by the ancient Maya.

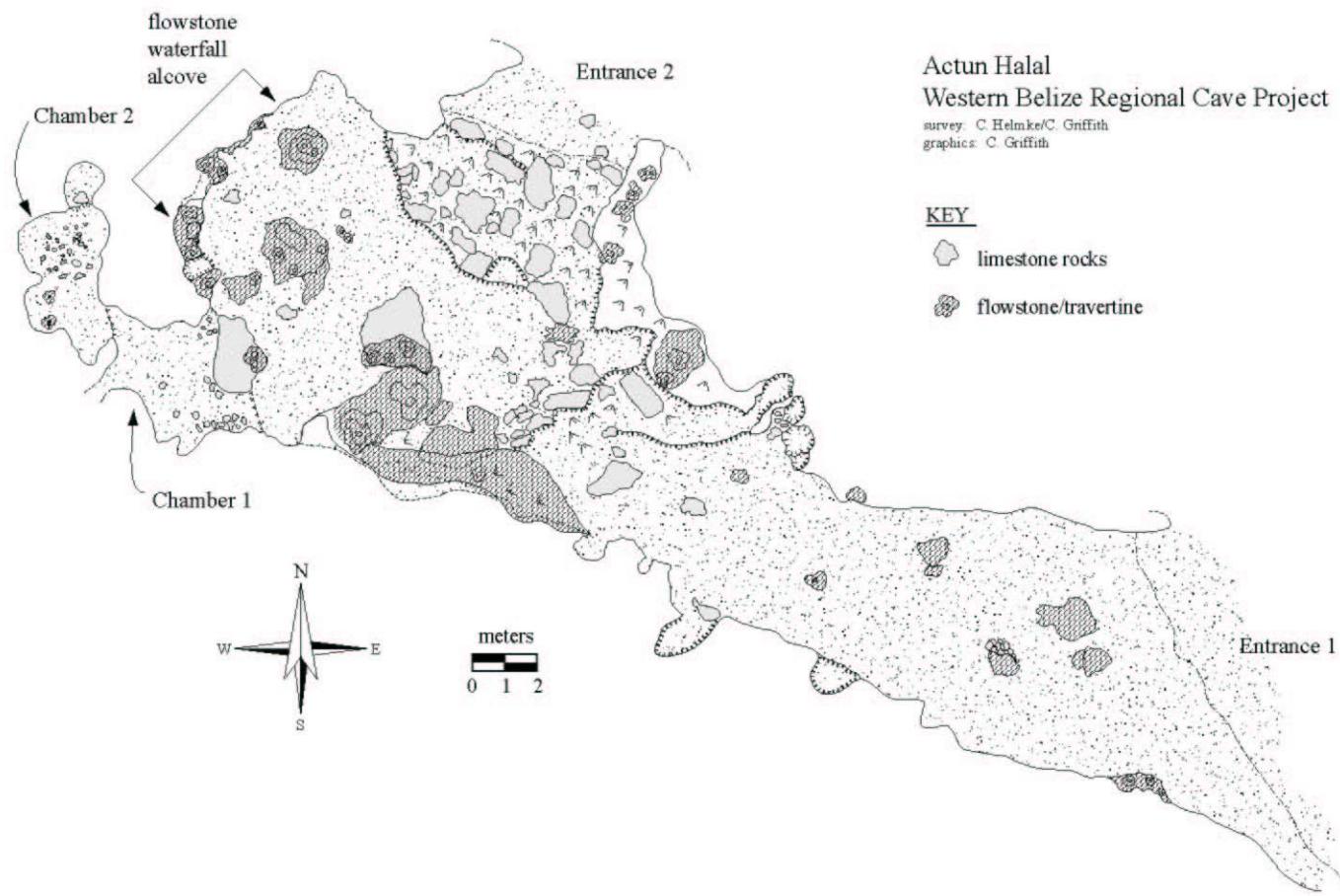


Figure 1. Plan view of Actun Halal.

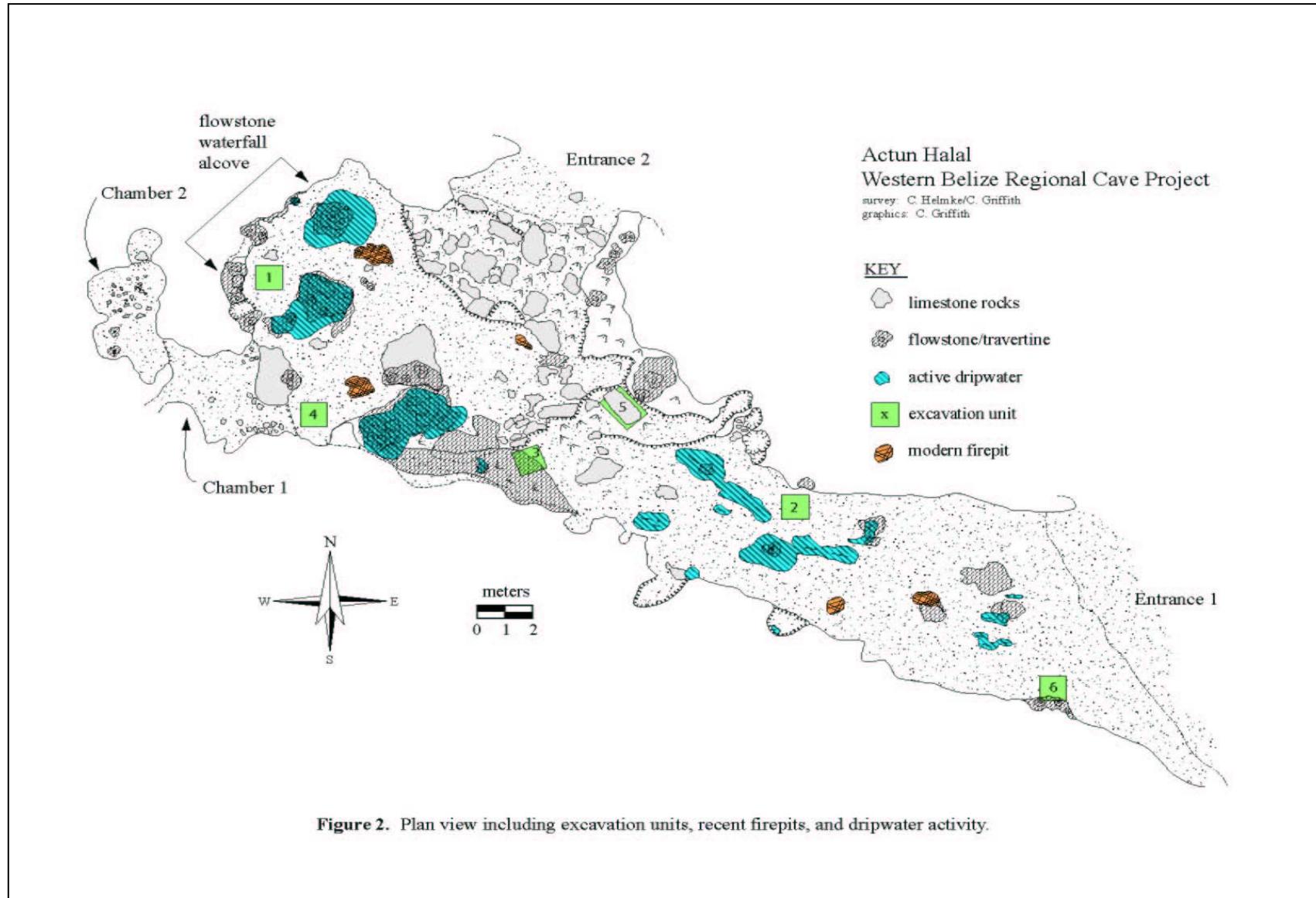


Figure 2. Plan view including excavation units, recent firepits, and dripwater activity.

The surface of the cave is dusty, light-brown dirt mixed with bat guano. The daily activities of the bats, swallows, gibnuts, and tarantula wasps that inhabit the cave keep the floor covered with a blanket of leaves, cohune nuts, insect carcasses, and heart of plum seeds.

EXCAVATIONS

The 1999 investigations in Actun Halal revealed that Entrance 2 of the cave contains an alcove with flowstone formations and petroglyphs. Previous research by the WBRCP at the cave site of Actun Uayazba Kab yielded the remains of 11 individuals, most of which were interred in an alcove in one of the cave entrances. This alcove contains flowstone formations and two simple faces carved into the cave rock. The similarity between these two contexts helped to guide the placement of excavation units in Actun Halal. Units were initiated in order to compare the subsurface components in two similar alcoves from two caves from different regions of Belize. A spatial analysis of the 1999 surface collections in Actun Halal also influenced the placement of the excavation units this season (Griffith and Helmke 2000).

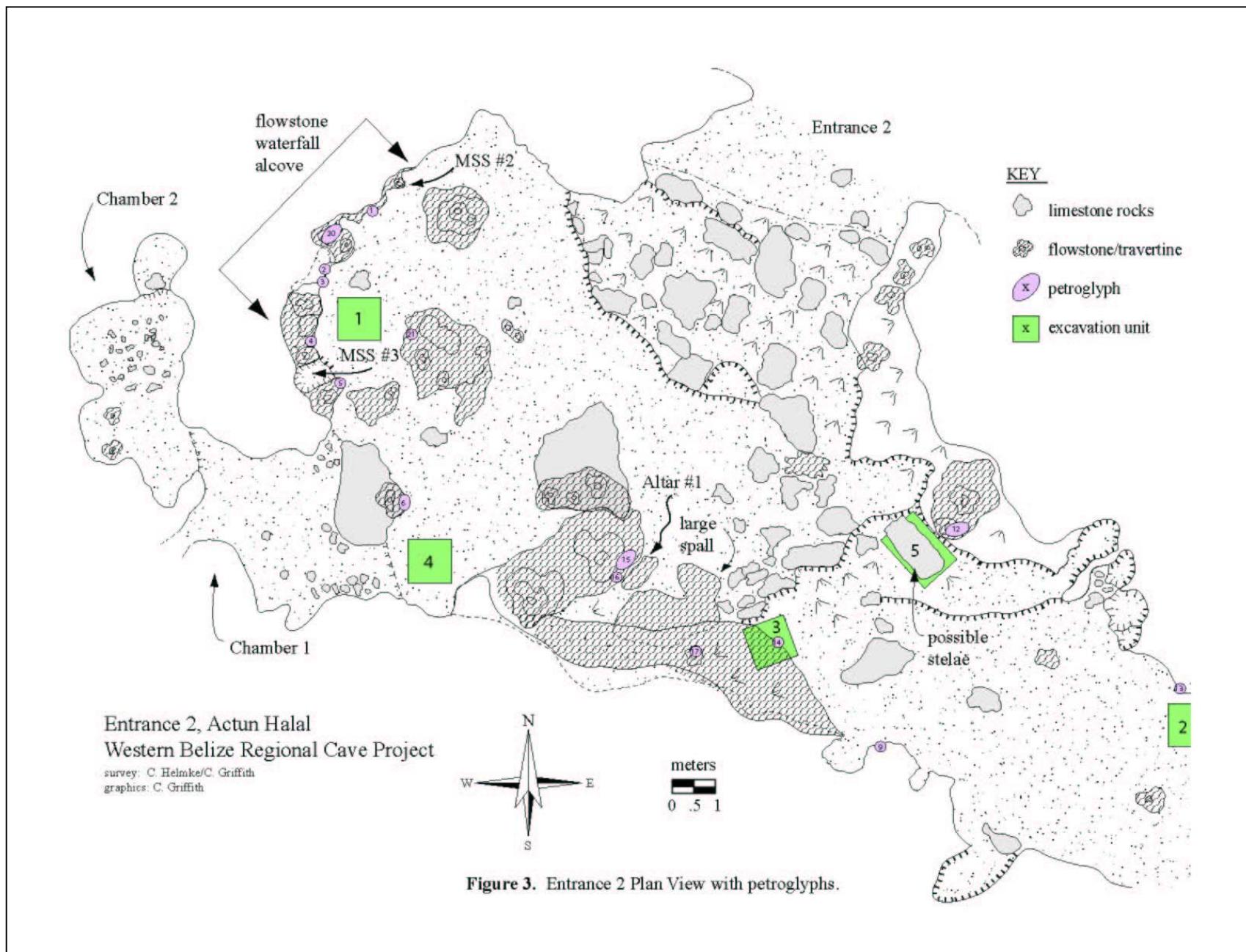
A total of six 1 x 1 m excavation units were placed in Actun Halal. Units 1 and 4 were placed within Entrance 2 (Figure 3) and Units 2, 3, 5, and 6 were placed in Entrance 1 (Figure 4). Units 2 and 3 were placed along the cave walls beneath possible petroglyphs in order to investigate the possibility of burials in association with the carvings. Unit 4 was placed in front of a small passage leading further underground. Unit 5 was placed around a large limestone rock, in an attempt to ascertain whether or not the down-facing side was carved or otherwise modified. Unit 6 was placed near the dripline of Entrance 1 near an area with modified flowstone formations. All units were excavated in stratigraphic and arbitrary levels, with whisk brooms, trowels and hand picks. All matrices were screened through 1/4-inch screens. Where applicable, carbon samples were taken and soil samples were collected for floatation.

What follows below is a detailed description of the excavations by unit. Observations as recorded in the field are noted, as well as preliminary interpretations of contexts where applicable. A detailed analysis of the ceramic assemblage is presented in a separate paper (see Ishihara, this volume).

Unit 1

Location: Flowstone Waterfall Alcove, Entrance Two

Unit 1 was placed in a small area between the flowstone waterfall and a large stalagmitic formation in Entrance 2. The unit measured 1 x 1m and was situated below Petroglyphs 2, 3, 4, 5, and 20 and in close proximity to Petroglyph 21. The surface prior to excavation was guano, small pebbles, brown dirt, heart of plum seeds, and leaves. The area near Unit 1 also contained modern garbage and evidence of the floor being swept. This and the presence of recently-deposited candle wax located on a stalagmitic feature near Unit 1 were most likely from hunters or one of the tour groups that used the cave as a campsite (separate personal communications from Gilberto Puc, William Pleytez, and Ken and Phyllis Dart, 2000).



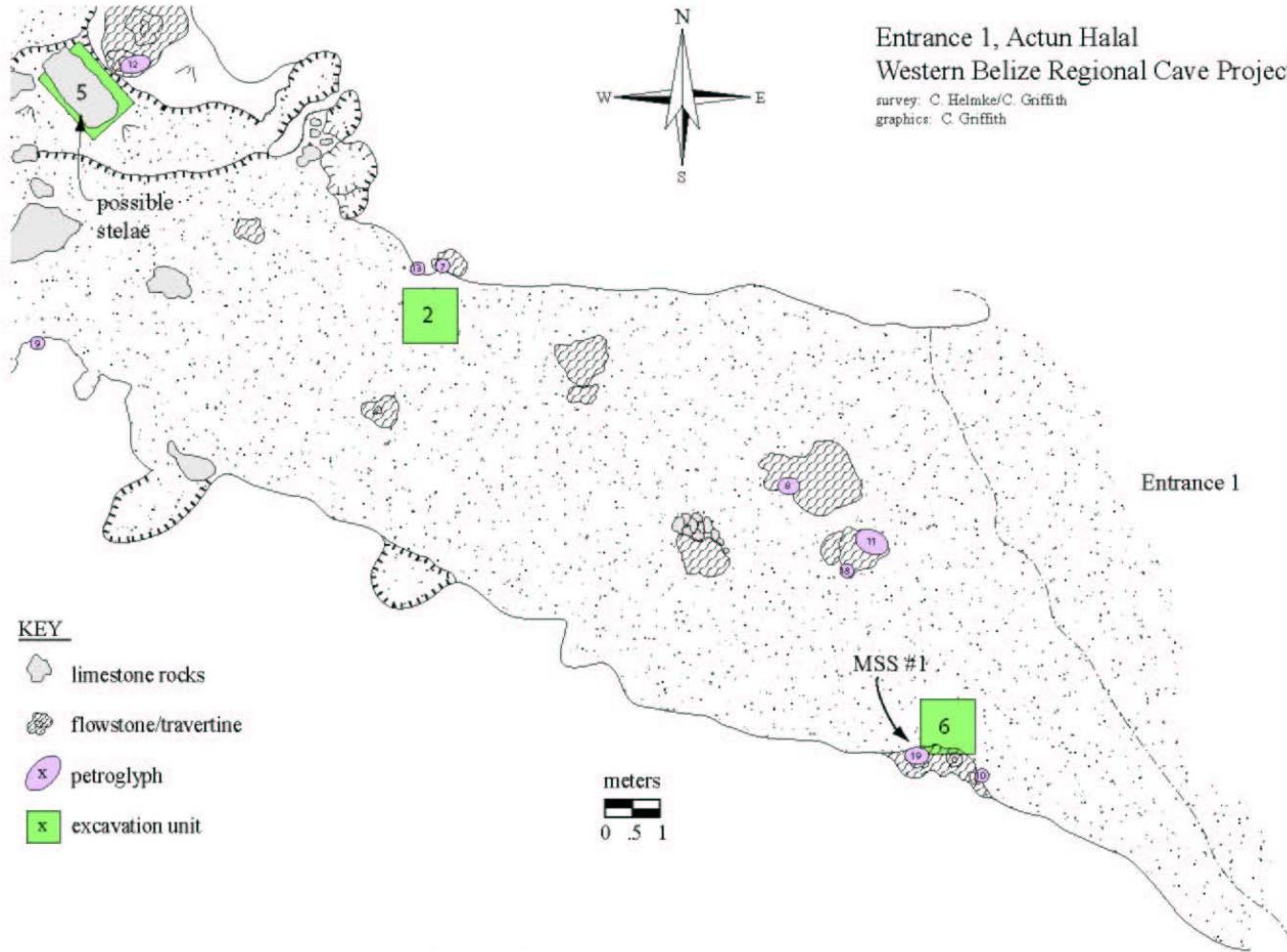


Figure 4. Entrance 1 plan view with petroglyphs.

Level 1 consisted of a matrix of dirt, dried guano, and dried leaves. Ceramic sherds were recovered throughout the level for a total of 57 sherds. Eleven animal bones were recovered as well as many land snail shells and insect casings. In the center of the unit there was a calcium carbonate deposit from above where a dripping cave formation was located. Level 1 descended to a maximum depth of 7 cm below surface where a matrix change was reached.

Level 2 was initiated due to a change in the matrix to darker, more compact dirt that contained less guano but larger rocks than Level 1. Traces of charcoal began to appear throughout the matrix at a depth of 17 cm, although no concentration was apparent. The matrix in the northeast corner of the unit was more compact due to a mixture of travertine that was extremely powdery and gritty. This difference in matrix is due to the periodic dripping and subsequent spattering of calcium carbonate-rich water dripping from a stalactite above.

Land snail shells were present throughout Level 2 but were not collected. Artifacts recovered include 76 ceramic sherds, 10 chert flakes, 3 speleothems, and 11 animal bones. The lithics were concentrated near the top of Level 1 and the speleothems were found in the northwest corner, also near the top of the level.

The matrix of Level 3 consisted of dark brown dirt that was compact, finely sorted, and gritty. The matrix contained an abundance of land snail shells and flowstone fragments. In the southwest corner of the unit a concentration of burnt bone was recovered. The bone was fragmented and of a white and blue color. The small size of the fragments and the degree to which the bones were burnt made them difficult to identify.

The matrix changed to a more compact and pebbly soil where the burnt bone was located. The excavation was terminated at a maximum depth of 30 cm due to the change in matrix and the concentration of burnt bone and ash. The southeast corner contained a small amount of charcoal concentrated in one area. The northwest corner contained a substance located between other rocks that appeared to be a type of fill or sealing agent that was difficult to penetrate. Artifacts recovered from Level 3 include 10 ceramic sherds, 1 chert flake, 74 animal bones, 1 human molar, 4 jute shells, 1 conch shell fragment, and 2 seeds.

The matrix of Level 4 was a dark, compact soil that included pieces of eroded limestone spalls. There was also an increase in the amount of rock appearing in the unit at the start of the level. A fragment of a human tooth was found near the center of the unit along with other bits of bone, some of it burnt, and a chert flake. A piece of burnt bone, which had been modified into a scoop shape approximately 2 x 3 cm long was also located. Very eroded pieces of limestone and a small speleothem were found near the center of the unit.

Land snail shells were again present throughout this level. The southwest corner of the unit contained larger rocks and orange-brown colored compact dirt. The southeast corner contained a burnt root that may be the source of much of the ash in the level. The artifacts recovered from Level 4 include 8 ceramic sherds, 5 chert flakes, 30 animal bones including a burnt bone, 2 speleothems, 1 modified burnt bone, and 1 human tooth in a poorly preserved

condition. At a depth of 34 cm below surface the matrix changed to light brown clay that had a distinct humic odor.

Level 5 was initiated due to the change in matrix. This matrix consisted of a claylike, light to medium-dark colored earth. Human cranial bone fragments were discovered in the northeast corner at a depth of 35 cm. The north wall of the unit at this depth contained more human bone that was likely cranial fragments. Based on the dearth of bone with similar preservation from the rest of the unit it is possible that the excavation was placed just south or southwest of a human burial, and that the northwest corner of Unit 1 caught the fragmentary remains of the skull. A ceramic sherd was found in association with a burnt piece of bone in the northeast corner at a depth of 35 cm.

The area by the south wall of the unit contained many roots and multiple rocks. In the northwest corner at a depth of 39 cm there was a concentration of land snail shells. At 45 cm the matrix changed to granular sand with very small pebbles. This signaled the end of Level 5. Artifact totals for Level 5 included 8 ceramic sherds, 1 piece of waxy unidentified material, 1 chert flake, 9 animal bones, 1 chert burin, 3 human bone fragments, 1 speleothem, and 1 seed. Level 5 was excavated to a maximum depth of 45 cm below surface.

Level 6 could not be initiated until a large speleothem, which measured 90 cm long, 60 cm wide, and 30 cm thick, was removed from the unit. This speleothem was propped up against the cave wall, extending from the east wall of the unit to beyond the center of the unit. Artifacts from this level included 1 seed, a secondary flaked chert flake, 1 bone fragment, and 1 ceramic sherd. A concentration of burnt limestone and charcoal was encountered in the northeast corner of the unit at a depth of 59 cm, which prompted the termination of Level 6.

The matrix of Level 7 consisted of light brown soil that had a clay-like consistency. Limestone pebbles and travertine spalls were included throughout the matrix. Rocks measuring 2 to 3 cm in diameter were present throughout the northern and eastern portions of the unit. High concentrations of charcoal continued to be found in the northeast corner at 65 cm depth. Two speleothems, a chert nodule, and 2 animal bones were collected. In addition, a red, hard substance (possibly cinnabar) was recovered in the screen from the northeastern corner of the unit. At a depth of 75 cm the matrix changed to include a predominance of rocks, ranging from 2 to 8 cm in diameter. This marked the end of Level 7.

Level 8 was begun due to the concentration of rocks in the bottom of the unit. The rocks ranged from 2 to 8 cm in length and the supporting matrix was a clay-like dirt of a medium brown color mixed with small limestone pebbles. Numerous fragmentary animal remains were recovered from depths of 81 to 86 cm in the northwest corner of the unit. Chert and possible cinnabar were also collected. Thirty to 50 cm from the west of the north wall the matrix contained numerous animal remains. Similar deposits were noted in the matrix on the east wall. The remainder of the unit was rock. The matrix dirt changed to loose, silty dirt, but continued to contain many animal remains. This new matrix signaled the end of Level 8 at 89 cm below surface. Collections from Level 8 include 2 chert flakes and numerous animal remains.

The matrix of Level 9 consisted of loose, silty dirt mixed with animal bones. Three small bones were recovered, as was one speleothem. The western wall of the unit exposed the cave wall of the flowstone waterfall alcove. The Level 9 excavation was terminated when it became impossible excavate further due to the abundance of large rocks and speleothems. These rocks were unable to be removed as their size exceeded that of the unit. Due to the abundance of speleothems measuring over one meter in length, expansion of the unit to at least twice its size would have been necessary in order to proceed further. The time constraints on the excavation did not permit such an endeavor, so Unit 1 was terminated at Level 9, at a maximum depth of 97 cm below surface.

Unit 2

Location: Center of cave, North wall, below Petroglyph 7

Unit 2 was a 1 x 1m square unit placed approximately eight meters west of the dripline of Entrance 1. The unit was established in order to explore the subsurface context beneath Petroglyph 7, a carving on the north cave wall that resembled a face. Unit 2 was located about 95 cm south of Petroglyph 7 and 30 cm south of the base of the north cave wall. The unit was directly in the path of the wash that periodically flows east from Entrance 2. The surface of Unit 2 was composed of extremely loose guano and humus, which was comprised of decomposing vegetation such as heart of plum and leaves.

Excavations of Level 1 proceeded by lightly brushing through the loosely compacted humus and guano layer at the surface of the level. The humus layer extended to a depth of approximately 4 cm. Eventually a slightly more compacted soil was encountered. This matrix was excavated until a lighter, more compact stratigraphic change became apparent. A dusty ashy layer was reached which marked the end of the level at a maximum depth of 8 cm below surface.

Numerous ceramics were recovered from Level 1. Among the 138 sherds recovered was a Pabellon molded-carved fragment (see Ishihara, this volume). Also recovered from Level 1 were 5 chert flakes, an obsidian blade, and 9 animal bones. In addition to the chert flakes the broken tip of a biface was collected. This artifact may be the fragmentary remains of a knife.

Level 2 was initiated due to an apparent difference in soil compaction and texture compared to the loose soil of Level 1. Level 2 was continued to an average depth of 28 cm below surface. The level was terminated at this depth because there was significant decrease in artifact concentration. Despite this stratigraphic discrimination very little change in soil composition was apparent. At this depth the north cave wall was revealed, extending south into the unit from the north unit wall.

Artifacts collected from Level 2 include 93 ceramic sherds and 20 chert flakes. Also, a large secondary flake was recovered which may have been a tool. This lithic, which is composed of a lightly mottled red chert that is similar to many of the lithics recovered from both Levels 1 and 2, may have served as a scraper. Nineteen animal bones and one jute shell, and one broken obsidian blade were also collected from within the level.

Level 3 was begun due to the decrease in concentration of artifacts in Level 2. Thus, this may simply be an arbitrary discrimination because there was very little differentiation in soil texture and color compared to Level 2. The level was excavated until a layer of medium-sized limestone rocks in the north half of the unit was reached. In the process of leveling the unit to the surface of these rocks, small white limestone flecks were revealed in the southern portion of the unit. Because the medium-sized stones and the limestone flecks may have indicated the remnants of a plaster floor with subsurface fill, the level was terminated at this point at a maximum depth of 46 cm below surface.

Fewer artifacts were recovered from Level 3 as compared to Levels 1 and 2. Twenty-three ceramic sherds, 4 chert flakes, 2 animal bones, and 4 jute shells were collected from Level 3.

Level 4 was begun in order to explore the potential limestone fill, which was thought to be indicative of an antique construction episode. As excavation of Level 4 continued, the north cave wall extended further south into the north unit wall. Further, the cultural nature of the supposed limestone fill became more and more dubious. Initially, it seemed to be fill or ballast because, stratigraphically, the limestone seemed to have a roughly even horizontal distribution along all the unit walls. Secondly, the loose nature of the yellowish limestone pebbles appeared to be evidence that the stones were intentionally filled in to create this level surface. However, as investigations continued, it became apparent that the loose nature and ballast-like composition of this limestone was a result of depositional processes within the cave in antiquity. Thus, in a sense, with every strike of the trowel or rock pick we were creating our own “fill”. In other words, this limestone occurs naturally at this depth.

Level 4 yielded 6 ceramic sherds and 1 chert flake. However, it is possible that this sparse assemblage may represent intrusive deposition. The sherds and lithic fragment were not collected *in situ* from the unit but were recovered from the screen. Thus, it is possible that these artifacts may have fallen from the unit wall at a higher depth or may have been accidentally knocked in from the surface. This is extremely significant because, despite efforts during the excavation in the compact, pebble-filled matrix, no artifacts were collected from within Level 4 with tight provenience.

Level 4 was excavated to a maximum depth of 90 cm below surface. At this depth, the north cave wall encompassed approximately 60 cm of the north half of the bottom of the level. Level 4, and hence Unit 2, were terminated due to the questionable nature of Level 4 and in light of time constraints.

Unit 3

Location: Center of cave, South wall, below Petroglyph 14

Unit 3 was a 1 x 1 m excavation unit placed under a karst and flowstone overhang along the south wall of the cave. Given the evidence of human remains recovered from Unit 1 (see above), Unit 3 was initiated in order to test this area for possible human remains and mortuary

contexts. Petroglyph 14 is located on a stalagmitic bulb on the overhang, 3 meters above the unit. Unlike other units placed in Actun Halal, Unit 3 was not set along a north-south axis. Rather, it is aligned along a 70° - 250° axis to coincide with the retaining wall in the center of the cave as well as to encompass the distribution of surface ceramics.

The surface of Unit 3 was littered with organic debris, including heart of plum and cohune (*Attalea cohune*) fruit seeds. Also, numerous ceramic sherds were encountered on the surface. The matrix of Unit 3 consisted of loose humus and bat guano mixed with fist sized and larger limestone rocks. Level 1 continued until a dense concentration of ceramics in the northwestern section of the unit was uncovered. The rest of the unit at this depth was marked by a distinctive layer of ash, and thus signaled the need to end the level 23 cm below surface. Artifacts recovered from Level 1 include 88 ceramic sherds, 75 animal bones, 2 chert flakes, 1 small quartz crystal, and 2 fragmentary human bones. A small, deciduous human molar was lost from the screen during excavation. Despite efforts to find the tooth in the guano surrounding the unit it was never relocated.

Level 2 was comprised of a dry, lightly compacted ash-silt matrix. Also, many carbonized botanical remains were present in the level. Many of these appear to be morphologically similar to the organic debris discovered on the surface of the unit, possibly indicating that the same plant remains that are on the modern surface also covered the cave surface in antiquity. This may further indicate that this area of the cave may not have been regularly maintained and cleaned by the ancient Maya.

In the northwestern section of the unit we discovered one sherd that had a small, broken obsidian blade resting on top of it. This was revealed when a large limestone rock was removed from the unit. The distribution of ceramics in this feature (Feature 1) measured 60 x 65 cm. The matrix consisted of silty and ashy, light brown soil with numerous small limestone rocks.

Numerous artifacts were recovered from Level 2, including 483 ceramic sherds, 7 chert flakes, 31 animal bones, 2 shells, 5 human bones, 1 obsidian blade, and one speleothem. One of the sherds recovered from this level contained a series of painted hieroglyphs (see Ishihara, this volume for illustration and type:variety information). The excavation of Level 2 was terminated at a depth of 42 cm below surface.

The matrix of Level 3 consisted of a silty, brown soil that was initially somewhat clay-like. As excavation proceeded the soil became much looser. The density of ceramics decreased with depth and the number of animal bones (particularly bat) increased strikingly. Excavation of Level 3 continued until medium sized limestone breakdown was uncovered and a change in soil color became apparent at a depth of 66 cm below surface. Level 3 yielded 130 potsherds, 8 chert flakes, 1 obsidian blade, and many animal bones.

The matrix of Level 4 consisted of a light brown, somewhat mottled soil with small limestone inclusions. This level yielded fewer cultural remains than the previous levels and was terminated when large limestone breakdown was encountered in the northern section of the unit. The artifacts recovered from Level 4 include 40 ceramic sherds, three chert flakes,

numerous animal remains and several pieces of charcoal. The level was excavated to a maximum dept of 70 cm below ground surface.

Large limestone rocks in the northern half of the surface of Level 5 restricted further excavation to only the southern portion of the unit. Any attempt to remove the stones would have caused the unit walls to collapse. Further, due to time constraints, we were unable to extend the unit to encompass these rocks. The matrix of Level 5 was a light brown, silty clay with numerous limestone inclusions. The number of artifacts continued to decrease in Level 5, and only 29 ceramic sherds, 5 pieces of carbon, and limited animal remains were recovered before the level was terminated at a maximum depth of 89 cm below surface.

Level 6 was begun due to a striking change in soil texture. Unlike level 5, this matrix was a light-brown silt devoid of limestone inclusions. No artifacts were encountered in level 6, indicating that we had reached culturally sterile soil. The only remains recovered were 6 animal bones. This fact, combined with time constraints, forced us to terminate excavations of Unit 3 at a maximum depth of 98 cm below surface.

Unit 4

Location: Entrance 2, SE Entrance to Chamber 1

Unit 4 was located near the southeast entrance to Chamber 1, south of the Flowstone Waterfall Alcove, and 1 m south of Petroglyph 6. The surface was littered with human garbage and natural surface debris. The unit was established in attempt to ascertain whether this area had similar mortuary contexts as those encountered in analogous areas in other caves in the Western Belize region (Ferguson 1999; Gibbs 1998, this volume; Griffith 1998).

The surface level of Unit 4 was comprised of a dry, fine-grained loose mix of guano and soil with limestone inclusions and pebbles. The surface also contained modern garbage, leaves and sticks. This layer was excavated to an average depth of 2.5 cm below surface revealing a more compact surface. The matrix associated with Level 1 was virtually the same as that on the surface, but more compact, and included a more dense concentration of ceramics. Level 1 was terminated upon detection of a burnt, ash matrix horizon at an average depth of 9 cm below surface. 204 ceramic sherds were recovered from Level 1.

The ash concentration that marked the beginning of Level 2 protruded from the southwest corner of the unit, along the southern unit wall and into the center of the unit. The matrices associated with the rest of the unit were comprised of brown, fine-grained, dusty, dry dirt with limestone inclusions, pebbles and rocks. Artifacts recovered from Level 2 included 164 ceramic sherds, 8 tertiary and 2 secondary chert flakes, 52 animal bones, one *Pomacea* shell and three human bones. A sample of the ashy soil matrix was also collected. Level 2 was excavated to an average depth of 14.8 cm below ground surface.

Level 3 was comprised of brown, fine-grained, dry dirt with limestone inclusions, and a significantly larger concentration of limestone pebbles and rocks. Roots were also prevalent in this level. Artifacts recovered from Level 3 included 62 ceramic sherds, 20 chert flakes, 54

animal bones, and 3 speleothems. Level 3 was excavated to an average depth of 22 cm below surface.

Level 4 was initiated upon detection of a compact reddish-brown, clay-like matrix with limestone inclusions. The matrix change was also demarcated by an absence of rocks in the soil. This matrix was much more compact and hard than in previous levels due to its clay-like nature. A concentration of animal bones (Feature 1) was found in matrices associated with Level 4 as well as within a visually distinct matrix defined the following level, Level 5. Level 4 was excavated to an average depth of 38 cm below surface. The artifacts from this level not associated with the feature include 18 ceramic sherds, 7 chert flakes, 4 speleothems, 1 jute shell and 15 animal bones.

The area of the Feature 1 measured approximately 60 x 35 cm and was comprised of a more granular, yet clayish matrix. The bones were first encountered at a depth of 39 cm in Level 4, and continued to a depth of 49 cm in Level 5. The bones were excavated by level and numbered. Bones 19-49 were recovered from Level 4, and bones 1-18 were excavated from Level 5. Other bones were recovered from around the feature, but were not able to be drawn/photographed *in situ*. These bones were collected by appropriate level, and Level 4 yielded 24 additional animal bones while Level 5 contained 37 additional animal bones. A total of 110 bones associated with the feature were recovered. In addition, 3 ceramic sherds, 1 chert flake, and 2 *Pomacea* shell fragments were recovered from the feature. No artifacts were otherwise unearthed from Level 5. Level 5 was comprised of a matrix with a grayish hue, due to an increased presence of limestone inclusions, and was excavated to a depth of 49 cm below surface.

Level 6 consisted of a dark brown, granular, clayish matrix with grayish limestone inclusions. This level was initiated at the bottom of the feature, but did not coincide with a change in matrix color or consistency. A few rocks were present along the eastern wall of the unit as excavations proceeded. At a depth of approximately 58 cm below surface, from the northwest corner of the unit, animal teeth and some small bones were unearthed. Artifacts encountered within Level 6 included 2 chert flakes, 20 bones and botanical items (3 seeds and 4 wood fragments). No cultural materials were recovered in the last 20 cm of Level 6.

Level 6 was excavated to an average depth of 64 cm, and was terminated at what was initially perceived to be sterile, non-cultural deposits (non-Maya). The matrix encountered at the bottom of Level 6 resembled those associated with sterile deposits in Actun Chapat, and which had proven time and time again to be devoid of cultural materials. However, a test pit was excavated within the unit, and an additional collection of animal bones was encountered. This prompted the initiation of level 7.

The matrix associated with Level 7 was comprised of an orange, damp dirt with a high density river-type pebbles, ranging in size between 5 to 10 cm, and larger fist-sized limestone cobbles. A large piece of limestone spall measuring 92 x 52 cm also had to be removed from the unit. Artifacts recovered from Level 7 include 5 chert flakes, 31 animal bones, and one tool. The tool, which is partially patinated, is likely an expedient tool such as a scraper or small chopper. One of the animal bones was a tooth from a large mammal (possibly extinct). This

tooth has been tentatively identified as belonging to a horse or camelid (Marilyn Masson, pers. comm., 2000; see also Appendix A below). Level 7 was terminated at an average depth of 83 cm below surface when undulating limestone that prohibited further excavation of the unit was reached.

Unit 5

Location: Center of cave, North wall, encompassing possible stela monument

Unit 5 was initiated in an attempt to view the underside of a large limestone rock that lay perpendicular to and on top of the rock wall in the center of the cave. The dimensions of the rock and its location within the cave raised suspicions that it might have served as a crude stela monument. The previous documentation of crude limestone monuments in cave sites in the Maya area (Awe *et al.* in press) as well as the flat “base” and rounded “top” of the megalith contributed to these suspicions.

The side of the stone that was facing up did not exhibit signs of carving or painting. The sheer size of the limestone slab suggested that attempts to move it or flip it over would be dangerous and potentially damaging to the stone, something that would have been particularly risky if the underside contained carving. Unit 5 was initiated to see if the removal of the dirt around and underneath the stone would permit us to view the underside without moving it. The unit was placed so as to encompass the limestone block and allow for the removal of the dirt below and around it.

Unit 5 measured 1 x 1.5 m on a 42 degree azimuth and was excavated in one level. It was dug to a maximum depth of 24 cm below surface, reaching a layer of flowstone. The matrix consisted of loose dirt with rocks scattered throughout it. The northeast corner of the unit was dug to 6 cm below surface, the northwest to 24 cm below surface, the southeast to 14 cm below surface, and the southwest was dug to 11 cm below surface. Five ceramic sherds, eight stone objects, and three speleothems were recovered. The level and unit were terminated when it was determined that the excavation was deep enough to view the underside of the block.

The view facilitated by the excavations indicated that the underside was most likely not carved, but the curiosities of crewmembers were not fully appeased. A determined group using a makeshift hoist finally flipped the slab on its side. The underside proved to lack carving or evidence of paint, yet the question of whether or not the megalith was a stelae monument remains.

The block measures 168 cm long, 90 cm wide, and 46 cm thick and has a rectangular shape with one rounded end. These dimensions fall within the typical proportion ratios for stelae monuments at surface sites (see Helmke 1997). The fact that the slab was found laying perpendicular to the rock wall in the cave with the rounded or “top” at the bottom of the wall suggests the possibility that the slab was standing at one time. If this were the case, and if the base of the slab is near its original location, the hydrological activity of rainwater coming in Entrance 2 and flowing down to Entrance 1 may have ultimately toppled the megalith. This,

however, is highly speculative, and the tangible data merely indicates the presence of a large, rectangular limestone slab within the cave.

Unit 6

Location: Entrance 1, below Modified Stalagmitic Shelf #1

Unit 6 was placed at the base of modified Stalagmitic Shelf 1 (shelf #1) in Entrance 2. The unit measured 1 x 1m, with the south end of the unit encompassing the cave wall below shelf #1. The surface matrix was typical of the rest of the cave: light brown dirt mixed with guano, leaves, fruit seeds, and small limestone rocks. This unit was established to determine if the subsurface contexts below the stalagmitic shelf differed in any way from those elsewhere in the cave.

Below the surface layer the matrix of Level 1 was more compact, fine, silty brown dirt with inclusions of rootlets, land snail shells, large roots, flowstone spall, and small mud casings made by insects. The northeast corner of the unit yielded bluish burnt limestone amidst a very dry and more compact dirt that may have been baked from a burning episode. This area also contained numerous land snail shells and small limestone pebbles. This matrix change signaled the end of the level at a maximum depth of 15 cm below surface. Level 1 yielded 32 ceramic sherds, 5 lithic fragments, 6 animal bones, and one speleothem.

The matrix of Level 2 was fairly compact, light grayish-brown silty dirt. The grey color was contributed by a concentration of ash and charcoal extending from the western wall to the center of the unit. Artifacts recovered include 8 ceramic sherds, 7 stone fragments, 2 animal bones and 1 jute shell. The soil became markedly more compact at an average depth of 32 cm below surface that signaled the end of the level.

Level 3 was comprised of a matrix of dark brown hard packed soil with ash, charcoal, and limestone pebbles mixed throughout. Six ceramic sherds were recovered from this level until it was ended by accident due to excavator error at a maximum depth of 36 cm below surface. This premature termination of Level 3 was not detrimental in any way, it simply means that Level 4 and Level 3 were the same with regard to matrix and other stratigraphic concerns.

The matrix of Level 4 was the same as Level 3, and as excavation progressed there was an increase in limestone chips and pebbles in the soil. At a depth of 47 cm a concentration of charcoal and ash was revealed against the north wall of the unit. There were at least two land snail shells within this concentration that were burnt. It is likely that these snail shells were in the wrong place at the wrong time, but the evidence of burning may indicate that the Maya were using the snails in a ritual burning episode. In the northwest corner of the unit at a depth of 49 cm a concentration of eight modified shell beads were located. Level 4 yielded 8 ceramic sherds, 16 animal bones, and 8 shell beads. The level was terminated at a maximum depth of 51 cm below surface.

Level 5 consisted of a dark brown, compact silty soil with many root inclusions. Nine more shell beads were recovered from the northwest corner at the beginning of the level but following this discovery the artifact concentration dropped severely. Level 5 was excavated to a maximum depth of 85 cm below surface when a yellowish brown layer of limestone pebbles and sand was encountered. The artifacts from Level 5 include 17 chert flakes, 8 jute shells, and 8 animal bones.

Level 6 was begun due to the change in matrix composition from dark soil to yellowish silty sand supporting limestone pebbles and small limestone rocks 2 to 6 cm in diameter. This level was excavated to a maximum depth of 110 cm below surface and no artifacts were recovered from the level.

PALEOETHNOBOTANICAL INVESTIGATIONS

Paleoethnobotanical recovery was carried out at Actun Halal in conjunction with the excavations. A blanket sampling (Pearsall 2000) strategy was implemented in order to systematically collect soil samples for flotation. Soil was processed through the manual flotation system developed by Struever (1968). Light fractions were rough sorted under low magnification. Wood charcoal was separated into monocots, hardwoods and softwoods. Other plant parts, such as seeds and endocarp fragments, were segregated into groups based on anatomical similarities. Plant material was then compared with modern specimens for identification.

Analysis of macrofloral material recovered through flotation is still ongoing. However, some brief observations of particular taxa are possible. The dominant macrofloral material recovered consists of wood charcoal. For example, pine (*Pinus* sp.) charcoal has been recovered from numerous deposits (Unit 2 Level 2, Unit 3 Level 1, Unit 3 Level 2, and Unit 3 Level 2/ Feature). The recovery of pine from ceremonial contexts is not surprising. Pine has a long history of ritual use among the Maya (Vogt 1976) and represents one of the dominant wood charcoals recovered from caves investigated by WBRCP (Morehart, this volume). The remaining wood charcoal is composed of various species of hardwoods. Most of these specimens are not yet identified. However, fig (*Ficus* sp) charcoal was yielded from at least one context (Unit 3 Level 2).

Although a blanket sampling strategy was implemented, not every context was sampled for plant remains (See Morehart, this volume, for a discussion on sampling difficulties). However, the botanical database was greatly increased by subsampling available radiocarbon samples. In general, Actun Halal yielded less archaeobotanical remains than other caves investigated by WBRCP. This is likely due to the rock shelter morphology of the entrances, which resulted in greater exposure to heat and humidity. This factor probably led to an increased decomposition of culturally deposited organic remains. Poor preservation is a common problem with many paleoethnobotanical studies in the neotropics.

Overall, despite sampling and preservation problems, archaeobotanical recovery and analysis was an important component of the research conducted at Actun Halal. The information provided allows us to better understand the utilization this cave. Further, because

botanical investigations at Actun Halal were part of a larger, regional analysis (Morehart, this volume), these data offer key insights into ritual plant use over a broader spatial and temporal area.

CAVE MODIFICATIONS AND ROCK ART

In addition to the excavations, the archaeological investigations included the documentation and recording of modifications to the cave. During the brief initial visit to Actun Halal in the previous field season investigators recorded six petroglyphs in the cave. The 2000 investigations revealed an additional 17 petroglyphs, bringing the total number of petroglyphs to 23. In addition to the petroglyphs, 1 altar, and three unique artificial modifications to formations in the cave were documented (Figures 3 and 4). The petroglyphs and modifications were fashioned into the limestone walls and travertine formations throughout the cave. The majority of the petroglyphs are simple faces, with two round eyes and a line for a mouth, which were either carved or pecked into the soft limestone of the cave. In many cases it appears that the ancient Maya were exploiting the natural bulbous morphology of the stalagmitic formations within the cave, using short, squat formations as skull-like shapes upon which they would fashion simple facial features. Petroglyphs of this type have been documented in many caves in the Maya area by several researchers (Bonor 1989; Bonor & Klemm 1995; Brady *et al.* 1997; Helmke and Awe 1998; McNatt 1995; Stone 1995).

Actun Halal contains modifications to the cave formations that go beyond simple faces pecked into travertine. Many of the modifications resemble sculptures rather than simple carvings in the cave rock. In keeping with the procedure developed by Helmke and Awe (1998:149) for Actun Uayazba Kab, the images in Actun Halal are all designated as petroglyphs. However, the individual descriptions provide specific details about the extent of three-dimensionality and depth for each petroglyph. Modifications that appear to be architectural in nature, rather than artistic, have been designated separately (e.g. altars and shelves).

Methods

A series of measurements were recorded for the petroglyphs and various modifications located within the cave. The measurements taken, where applicable, include height above surface¹, dimensions of bulb or formation, dimensions of carved area, dimensions of eyes, dimensions of mouth, distance between eyes, distance from eyes to mouth, and the azimuth, or the angle that a petroglyph is ‘facing.’ This system was developed based on the simple carved faces; more elaborate or unique images have additional measurements in many cases, while some of the standard categories were not applicable. Petroglyphs were numbered in the order of their discovery.

The height above surface measurement was taken from the ground surface to the top of the stalagmitic bulb bearing the petroglyph. In the cases where this measurement was not applicable, the top of the petroglyph was defined as the top of the carved area or the top of the

¹ It must be noted that the height above surface measurements for petroglyphs 1-6 may differ from those recorded in 1999 in some instances (see Griffith and Helmke 2000). This is due to the fact that a standardized system for where to take the measurements was not developed until the 2000 season.

eyes. The dimensions of the bulb or formation bearing the petroglyph were measured. This consisted of the height and width (and depth, where if different from the width) of the formation. It must be noted that the widths of formations are typically variable, and that the width measurement was taken either at the area of carving or, where stated, as a maximum width of the formation.

The dimensions of the carved area consisted of a width and height measurement. The total width was calculated by measuring the distance between the outer edges of the carved features, such as the outer edges of eyes, or edges of mouth if the mouth extended beyond the eyes. The total height was calculated by measuring the distance between an imaginary line connecting the two eyes tangent to the top edges to the bottom of the mouth or nose feature. In cases where the carved area included a flattening of the flowstone to provide a border within which the petroglyph was carved, the distance between the outer edges of this modification was measured as the total carved area.

The dimensions for the eyes included height, width, and depth. In the case of round eyes, a diameter is given. Measurements were taken on the right eye first, then the left, and are presented this way in the text. The designations right and left refer to the viewers right or left. The dimensions of the mouth include height, width, and depth as well.

The measurement for the distance of the mouth below the eyes was taken from an imaginary line connecting both eyes, tangent to the inferior aspects of the carved eyes, to the top aspect of the mouth. In many cases the ‘mouth’ is more of a round or triangular shaped feature, which may indicate that a nose was the intended feature. This designation is indicated in such instances. An azimuth for each petroglyph was recorded. This bearing indicates the direction the petroglyph is ‘looking’ or oriented. This measurement was calculated by drawing an imaginary line perpendicular to and away from the center point in a plane connecting the two eyes and taking the compass reading on this line. If one were to stand on this line and look at the petroglyph they would be essentially “face to face” with the petroglyph. This measurement was recorded in an attempt to identify various prime vantage points for viewing the petroglyphs, in hopes that patterns might emerge.

The different petroglyphs in Actun Halal were categorized into types based on how they were fashioned. There are three main different techniques of production evident in the petroglyphs.

- 1) Small, shallow features were either pecked, carved, or gouged into the cave rock. The typical features represented are eyes, a mouth, and occasionally a nose. These petroglyphs are referred to as simple faces.
- 2) Large, deep features were created by extensive carving rather than pecking. The features are again typically eyes, and mouths, and noses. Some petroglyphs are either unique in design or larger in size than the simple faces. These petroglyphs are referred to as large faces.
- 3) Large, deep features were formed by hollowing out columnar formations and travertine within a flowstone conglomeration to create negative space within the body of the

formation. In these instances the Maya were modifying either stalagmitic formations or groups of flowstone columns to create hollow eye-holes and sometimes mouths. The sharp, jagged, and unnatural edges of the flowstone within the recesses of the sunken areas evince the intentional clipping or breakage of the formations. These formations are referred to as Hollowed-eye visages. The term ‘visage’ was chosen in lieu of ‘face’ because in the majority of the cases from within Actun Halal and other sites where hollowed eye features have been documented the eyes are the only features represented.

The Petroglyphs

Petroglyphs 1a and 1b

Location: Entrance 2, Waterfall Alcove

Type: simple faces

Petroglyphs 1a and 1b are both located on a small stalagmitic bulb which measures 11 cm high and 10 cm wide. The initial reconnaissance of the cave identified only one petroglyph on the bulb. This season’s investigations revealed another crude face on the same small stalagmite, thus prompting the designation of P1a and P1b. The top of the stalagmitic bulb is 130 cm above ground surface. The area of carving is only 7 cm high by 8 cm wide and consists of two very small simple faces carved into the bulb. Petroglyph 1a has two small, carved depressions that are 1 cm and 0.8 cm in diameter, respectively. Both carved depressions have a depth of 1 cm, this modified area probably served as eyes. Two centimeters below the eyes there is a depression 2 cm wide, 1.5 cm high, and 1 cm deep that serves as a mouth. The top of the bulb has been modified above the eyes providing a cranium-like shape.

Petroglyph 1b is similar to P1a with two depressions 1.5 and 1 cm in diameter as eyes. Two centimeters below the eyes is a depression 4 cm wide, 1 cm high, and 0.5 to 1 cm deep. The bulb is covered with light green moss, which coupled with the general erosion of the bulb, makes discerning the mouth of P1b a difficult endeavor.

Petroglyph 2

Location: Entrance 2, Flowstone Waterfall Alcove

Type: simple face

Petroglyph 2 is located on a flowstone vein that contains a stalagmitic bulb in its center. The top of the bulb is 133 cm above the ground surface. The carved area of Petroglyph 2 is 9 cm wide and 10 cm high. The right eye consists of two 0.8 cm wide and 2 cm high holes within an outer depression that is 6cm high, 2cm wide, and .5cm deep. The left eye is a 7 cm high, 3 cm wide, and 1 cm deep depression that has evidence of spalling around the area. There is a triangular depression 3.5 cm below the eyes that is 2 cm wide, 1.5 cm high, and 1 cm deep. This could have served as a mouth, but more likely it was a nose for the simple face. The stalagmitic bulb that contains P2 is very eroded, exhibiting spalling of the limestone as well as green moss and dark stains from swallow feces.

Petroglyph 3

Location: Entrance 2, Flowstone Waterfall Alcove

Type: simple face

Petroglyph 3 is carved on a partially developed stalagmitic bulb. The top of the bulb is 150 cm above the ground surface, and the bulb is 25 cm high and 15 cm wide. The area of carving is 7 cm high and 7 cm wide. P3 is a simple face with two eyes and a mouth. The eyes are 1.3 cm and 1.8 cm in diameter, respectively, and both are .5cm deep. Four centimeters below the eyes there is a horizontal depression 1 cm high, 4 cm wide, and 0.5 cm deep that serves as a mouth for the feature. Petroglyph 3 is facing an azimuth of 115 degrees, and the bulb on which it was carved contains green moss, swallow feces, and evidence of spalling.

Petroglyph 4

Location: Entrance 2, Flowstone Waterfall Alcove

Type: simple face

Petroglyph 4 is located on a large stalagmitic bulb that is 50 cm wide and 80 cm high. The carved area measures 9 cm wide and 9 cm high. Petroglyph 4 is a simple face with two eyes and a mouth. The right eye is 2.5 cm in diameter and 1 cm deep. The left eye is 1.6 cm in diameter and .8 cm deep. Three and a half cm below the eyes is the mouth, which is 2 cm high, 9 cm wide, and 1 cm deep. Petroglyph 4 is facing 91 degrees and is 120 cm above the surface. The stalagmitic bulb of Petroglyph 4 has swallow feces and white and green lichens on it, as well as small ‘micropores’, approximately 1/20 mm in diameter. It is possible that these pores are due to the erosive action of acidic bat urine, swallow feces, or lichen formation.

Petroglyph 5

Location: Entrance 2, Flowstone Waterfall Alcove

Type: simple face

Petroglyph 5 is located on a stalagmitic bulb that is part of a larger stalagmitic formation. The bulb is 10 cm high and 12 cm wide, and the top of the bulb is 87 cm above surface. Petroglyph 5 is a simple face with two eyes. There may have been a mouth but this area is extremely eroded. The right eye is 2.5 cm in diameter and 0.5 cm deep, and the left eye is 3 cm in diameter and 1cm deep. The top of the stalagmitic bulb contains numerous stains from swallow feces and is covered in green moss, yet the vertical aspect of the bulb where the face is located is devoid of moss. Petroglyph 5 faces 64 degrees

Petroglyph 6

Location: Entrance 2, North of the SE entrance to Chamber 1

Type: simple face/undetermined

Petroglyph 6 is located on a stalagmitic formation that is 63 cm wide and 1.07 m high. The modified area is ovoid, and measures a maximum width of 39cm and a maximum height of 56 cm. The nature of P6 is difficult to ascertain. It appears that there may be multiple carvings or images involved, one of which appears to be a simple face in the lower portion of the carved area. The carved area is a section of the formation that has been flattened vertically, which appears to define as a background or border for the simple face and for the other carving. The top of the carved area is 1.42 m from the ground surface. The carved simple face in the lower section has two eyes, both 4 cm in diameter and 1 cm deep, and a mouth that is 2.2 cm high, 14 cm wide, and 1 cm deep. The upper portion of Petroglyph 6 may have contained another simple face, but the poor preservation of the stone makes this possibility extremely difficult to determine with certainty. The stalagmitic formation is covered with bat guano, swallow feces, green moss, white lichen, and contains evidence of micropores and spalling over the entire surface. The simple face in the lower portion of Petroglyph 6 faces 78 degrees.

Petroglyph 7

Location: Center of cave, North Wall

Type: simple face with large mouth

Petroglyph 7 is located on a stalagmitic bulb of grayish-white travertine. The top of the bulb is 1.36 m above the surface and the formation is 40 cm high and 56 cm wide. The area of carving and modification is 38 cm high and 30 cm wide. P7 is a simple petroglyph with two eyes and a mouth. The eyes are 5 cm and 4.5 cm in diameter and 1.5 cm and 1.8 cm deep, respectively. Three centimeters below the bottom of the eyes is a depression 7 cm long and 2.5 cm high, this serves as either the mouth or nose. The triangular shape of this depression may be indicative that it is a nose, particularly in light of the fact that the nose feature on Petroglyph 12 is triangular in shape. Further supporting the idea that the triangular depression is a nose is the fact that 7 cm below the horizontal depression there are small stalagmitic, bacon formations that might have served as a gaping tooth-filled maw for the feature. There are six of these bacon formations that range from 4 to 8 cm in height and 1 to 4 cm in width. The depth of the negative spaces between the bacon formations extending into the flowstone bulb ranges from 1 to 8 cm. These formations connect to the karst rock below. The east and west sides of the bulb appear to have been modified in such a way as to give the modification a cranium-like appearance, (i.e. the sides are rounded with the face placed in the center, resulting in a form resembling a human or humanoid skull). The top of the bulb also appears to have been flattened. The stalagmitic bulb is coated with green moss or lichen and also includes swallow feces and guano. A petroglyph with similar features is Petroglyph 27 in Actun Uayazba Kab (Helmke and Awe 1998:163-164). Petroglyph 7 faces 195 degrees.

Petroglyph 8

Location: Entrance 1, 3m within dripline.

Type: large, uniquely carved face

Petroglyph 8 is located on a stalagmitic formation within Entrance 1. The formation is 1.55 m long and ranges between 50 cm and 70 cm in width. Its maximum height is 88 cm

above surface. The carved area measures 24 cm wide and 28 cm high. Petroglyph 8 is located on the southern aspect of the western portion of the formation. It is a simple face yet it is different from the others because the eyes and mouth are triangular. The tops of the eyes of P8 are 60 cm above the surface. The eyes are isosceles triangles hewn into the rock with smaller central bore holes providing depth to these features, which may have been intended to be pupils. The bases of the triangular eyes are 9 cm and 8.5 cm, respectively and both are 12 cm high. The central holes are 2 cm wide 3.5 cm high and 1.5 cm wide and 3 cm high, respectively. One centimeter below the bottom of the eyes is the nose, which is again an outer isosceles triangle, but also includes an inner isosceles triangle as well. The outer triangle is 9 cm wide and 14 cm high, and the inner triangle is 5 cm wide and 10 cm high. The flowstone is grayish-white and is covered with moss, lichens, and guano. This formation receives direct sunlight from the east through Entrance 1. Petroglyph 8 faces 185 degrees.

Petroglyph 9

Location: Entrance 1, South wall

Type: simple face

Petroglyph 9 is a simple face carved in the karst wall of the cave. The top of Petroglyph 9 is 1.37 cm above the surface. The area of carving is 13 cm wide and 10 cm high. The eyes are 3 cm and 2.5 cm in diameter and 0.8 cm and 1 cm deep, respectively. There is a horizontal depression 1.5 cm below the eyes that is 8cm wide, 2cm high, and 0.5 cm deep. The features of Petroglyph 9 are the same color as the surrounding karst, which makes it difficult to detect the petroglyph. The karst around P9 is covered with light brown lichens and calcium carbonate accretion as well as green lichens or moss, spider webs, guano and swallow feces. Petroglyph 9 receives light from both entrances. In addition to P9 there is a biconically drilled hole 70 cm east of P9 in the same karst rock. This hole flanks a cylindrical half-tube within the karst; which may have been used for burning, placement of artifacts, or light sources. This biconically drilled hole is 1.34 m above the surface and 3 cm in diameter. Approximately 64 cm west of Petroglyph 9 is another biconically drilled hole located west/southwest. This hole is drilled in a columnar, ridge-like flowstone formation that is connected to vertical karst rock at the southern wall of the cave. This biconically drilled hole is 1.22 m above the surface and 3 cm in diameter. Petroglyph 9 faces 14 degrees.

Petroglyph 10

Location: Entrance 1, within Modified Stalagmitic Shelf #1

Type: undetermined

(see description below of Modified Stalagmitic Shelf #1)

Petroglyph 11

Location: Entrance 1, 1 m west of the dripline

Type: large carved face

Petroglyph 11 is located on a large stalagmitic bulb yet within proximity of Entrance 1. The formation is 85 cm by 80 cm. The top of the formation is 58 cm above the surface. The area of carving is 56 cm maximum width by 33 cm maximum height, and is in the shape of a parallelogram that follows the natural shape of the formation. Petroglyph 11 has two eyes, 10 cm and 12 cm in width, 8 cm and 6 cm in height, ranging from 1 to 3 cm deep, respectively. The top of the carving is a flat shelf ranging from 2 to 8 cm in depth that serves as a 'browridge' for the face. Twelve cm below the left eye is another flat area 3 cm deep and 12 cm wide that serves as a possible mouth. However the prominent features on Petroglyph 11 are the eyes whereas the mouth feature on is ill defined. A border circumscribing the carved eyes on the eastern edge of the formation is well defined. This border meets up with the brow ridge shelf and is difficult to detect on the western side. The stalagmitic formation receives direct sunlight from Entrance 1. In addition, the location of the formation in Entrance 1 has made it subject to climbing and other human activity as it serves as a perfect seat. The southern portion of this flowstone formation was subject to active drip water during the course of the investigations (see map for drip activity). Petroglyph 11 faces 48 degrees.

Petroglyph 12

Location: Center of cave, North wall

Type: Hollowed-eye Visage with nose

Petroglyph 12 is located on a large stalagmitic formation that contains multiple bulbs. The tallest bulb on this formation is 3.60 m high, and maximum width of the stalagmitic conglomeration is 2.10 m. Petroglyph 12 is a hollowed-eye face with eyes that were formed by hollowing out small bacon formations and travertine and clipping the bell formations within the body of the stalagmite to create negative space within the body of the formation (Figure 5). The area of modification has a maximum width of 95 cm and maximum height of 58 cm. The eyes are 30 cm and 21 cm wide, and 18 cm and 21 cm high. They both range from 10 - 45 cm deep. The space between the eyes is 24 cm wide. Petroglyph 12 has a prominent nose bridge and triangular nose feature that is comprised of a flowstone bell. From the top of the bridge to the end, where it exhibits evidence of having been clipped or shaved down, is 51 cm in length. The base of the nose is 34 cm wide tapering to 25 cm wide at the base of the bridge. The top of the orbits is 2.15 m above the surface. Below the nose is the limestone karst wall that is covered lightly in grayish flowstone, but has been protected by flowstone activity by the bell formations. The flowstone on this formation is covered by bat guano, green mosses, lichens, leaves, and other humic deposits. Petroglyph 12 faces 144 degrees.

Actun Halal
Petroglyph #12
WBRCP 2000
Drawing: D. McCarron



Figure 5: Illustration of Petroglyph #12.

Petroglyph 13

Location: Center of cave, North wall

Type: Hollowed-eye Visage with hollowed mouth

Petroglyph 13 is a hollowed-eye face with a grotesque mouth. The area of modification is a maximum of 51 cm high and 65 cm wide. Petroglyph 13 is carved into a grey flowstone sheet that coats the limestone karst of the wall. This sheet of travertine is essentially an extension of the stalagmitic bulb that contains Petroglyph 7. Petroglyph 13 is below and slightly to the west of Petroglyph 7. It appears that the Maya cut a border in the flowstone that served to define the top of the head or cranium on the top and the west side only. The flowstone is gray unlike that which holds Petroglyph 7, which is bright white. The eyes of P13 are 19 cm and 24 cm wide and 13 cm and 9 cm high, respectively. The space between eyes measures 4 cm, and 9 cm below the eyes is the mouth cavity. The flowstone has been modified to produce a nose-like feature that splits the mouth cavity into two sections. This feature is 24 cm in length from the top of the orbits. The mouth cavity is a maximum of 20 cm high and 20 cm wide and the depth ranges from 8 to 22 cm. The eyes range from 3 to 17 cm deep and 4 to 12 cm deep respectively. The height from surface to the top of the modified area is 80 cm. The top of the eyes is 24 cm below the top of the modified area. The flowstone contains microspalling, guano, and swallow feces. Petroglyph 13 faces 210 degrees.

Petroglyph 14

Location: Center of cave, South wall

Type: simple face with hollowed mouth

Petroglyph 14 is located on a large stalagmitic bulb formation that adheres to the south karst wall. P14 extends north and away from the wall, hanging above the location of Unit 3. The bulb appears to have been modified in the shape of a cranium or skull, and the northern aspect appears to have been flattened vertically to accentuate or define a vertical plane where a face was carved. Petroglyph 14 exhibits two very shallow eyes, 8 cm and 6 cm in height, 10 cm and 6 cm in width, and 0.5 and 0.3 cm deep, respectively. The space between the eyes is 11 cm. 19 cm below the eyes are fledgling bacon formations that hang within a hollowed hole measuring 33 cm high, 27 cm wide, and 17cm deep. These formations and the hole serve as a gaping maw of a grotesque visage. Due to the extremely shallow nature of the eye features the "face" of Petroglyph 14 is extremely difficult to make out. However, the modification to the bulb results in a skull-like shape. In conjunction with the snarling mouth, these two images make this petroglyph one of the more prominent in the cave. The flowstone bulb exhibits grey staining from active drip around the area of the eyes. The top of the bulb is covered with green lichens, swallow feces, and guano. There are signs of heavy burning on the flowstone underneath the bulb, within the mouth, and behind the formation on the south wall. Petroglyph 14 faces 15 degrees.

Petroglyph 15

Location: Entrance 2, South wall.

Type: Hollowed-eye Visage

Petroglyph 15 is a hollowed-eye formation in a tall stalagmitic formation (Figure 6). The top of this formation measures 2.65 m above the surface. The top of the stalagmitic bulb has a gentle lilt to the north or right. Petroglyph 15 exhibits modification below the top of the flowstone bulb that defines a cranium-like feature. Below this are two hollowed out eyes with an area between them that consists of unmodified bacon columns (Figure 6). The dimensions of the eyes are 33 cm and 24 cm high, 30 cm and 38 cm wide, and 23 cm and 37 cm deep, respectively. Evidence of bacon formations being clipped within the eye hollows is due to the sharp, unnatural edges of these formations. This formation exhibits light green lichens, root impressions, guano, swallow feces, and rootlets. The top of Altar 1 (see below) is 49 cm below the bottom of the orbits of Petroglyph 15. Petroglyph 15 faces 136 degrees.

Petroglyph 16

Location: Entrance 1, Flowstone Waterfall Alcove

Type: simple face

Petroglyph 16 is a simple face carved in a small, partially developed stalagmitic bulb. The top of the bulb is 95 cm above surface. Petroglyph 16 has two pecked eyes that are not on a horizontal plane, which gives this simple face an odd, slanted appearance. The eyes are both 2 cm in diameter, and 1 cm and 1.5 cm deep, respectively. There is a horizontal depression 25 cm below the eyes which serves as a mouth. The ends of the mouth appear to be carved upwards to reach the eyes. The mouth is 1.5 cm high, 5.5 cm wide and .3 cm deep. The stalagmitic bulb exhibits guano, microspalling, and green moss. Petroglyph 16 faces 123 degrees.

Petroglyph 17

Location: Entrance 1, South wall

Type: simple face

Although Petroglyph 17 is one of the many simple faces in the cave it is one of the most intriguing. Petroglyph 17 is located on a sloping stalagmitic bulb with an ovoid shape (Figure 7). The carving is a simple face with two circular eyes and a horizontal mouth. The flowstone bulb is attached to a vertical column yet the bulb extends out beyond the column and away from the south wall of the cave. The surface of the bulb upon which the carving is located is sloped, whereas the majority of the other carved formations in the cave exhibit carving on flat, vertical surfaces. The stalagmitic bulb is 29 cm high, 25 cm wide, and the flat, carved slope has a vertical azimuth of 36 degrees. The location of the face on the formation and the orientation of the bulb give the appearance of an individual with their head tilted back and up to the sky. This overall effect is reminiscent of a skull with a sloping forehead, similar to the shape of ancient Maya skulls that have been subjected to intentional cranial modification. The flowstone bulb exhibits green lichens and is grayish in color on the eastern half due to recent dripwater activity. The flowstone below petroglyph 17 exhibits signs of burning and spalling. Petroglyph 17 faces 343 degrees.

Actun Halal
Petroglyph #15 and
Altar #1
WBRCP 2000
Drawing: R. Ishihara/
D. McCarron

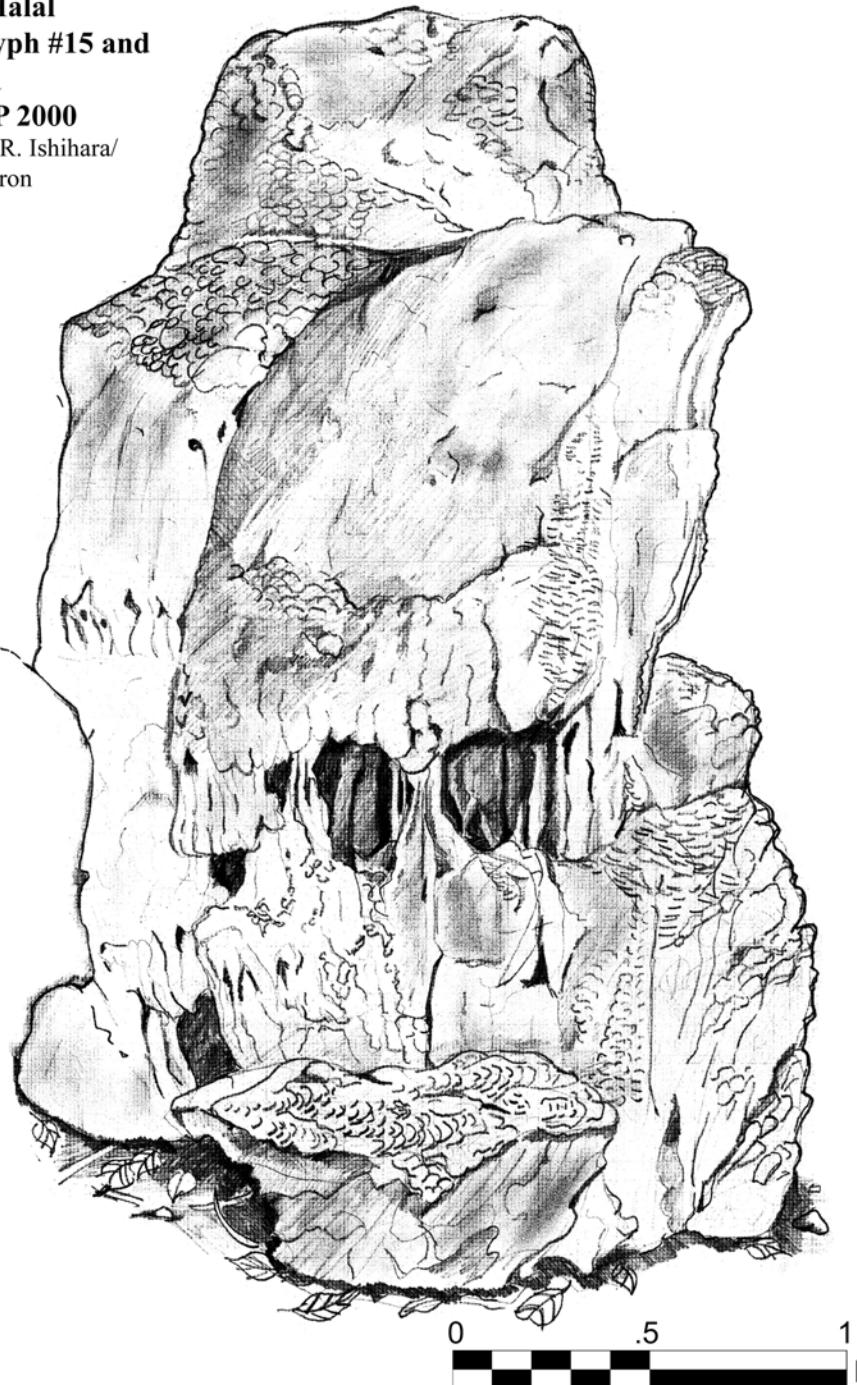
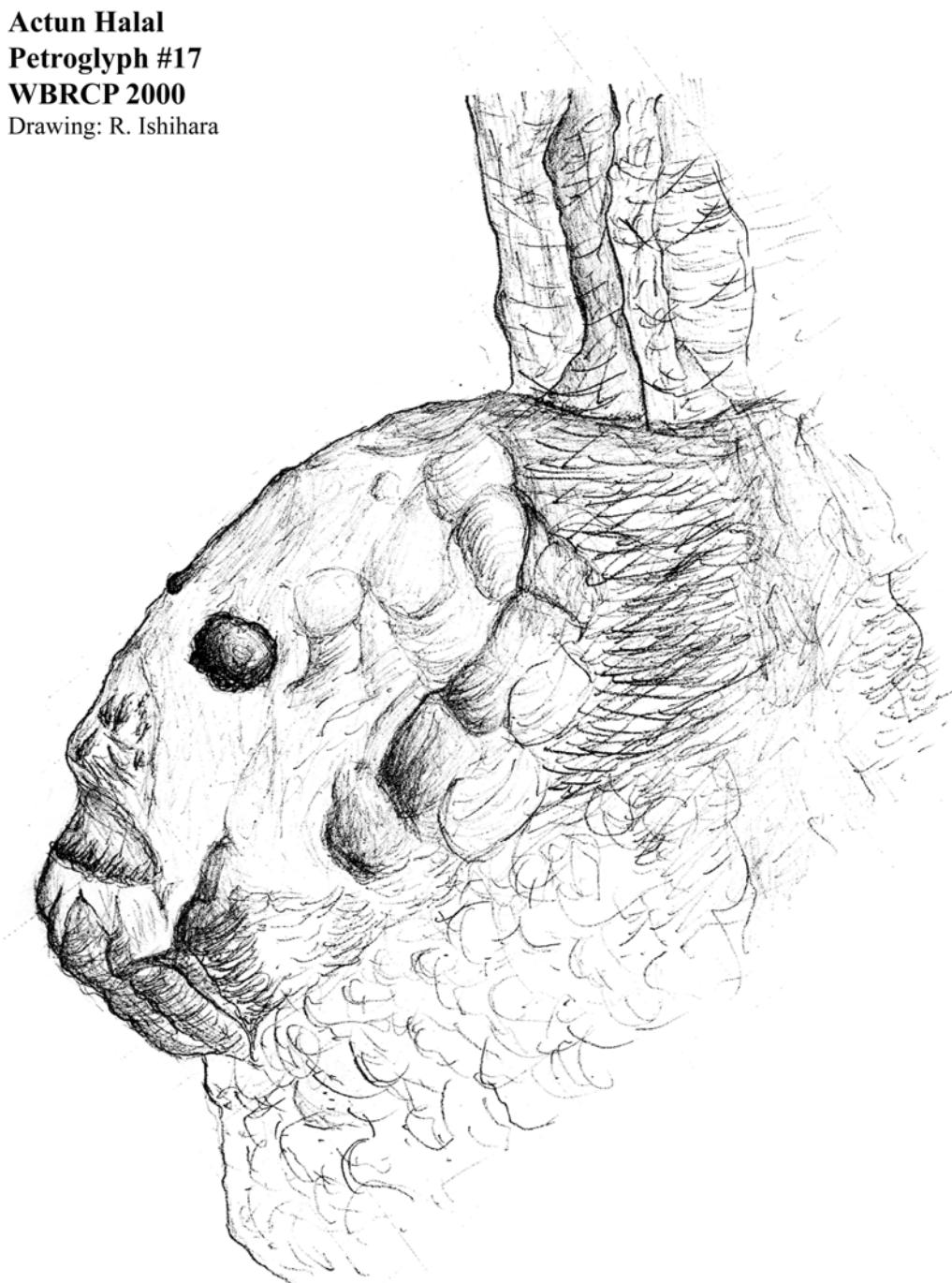


Figure 6: Illustration of Petroglyph #15.

Actun Halal
Petroglyph #17
WBRCP 2000
Drawing: R. Ishihara



0 5 10
CM

Figure 7: Illustration of Petroglyph #17.

Petroglyphs 18a and 18b

Location: Entrance 1, 3 m within dripline.

Type: simple faces

Petroglyphs 18a and 18b are located on a stalagmitic bulb just within the dripline of Entrance 1. The modified area of the formation is low to the ground on the base of the formation. This area is rectangular with rounded upper corners and measures 34 cm high and 50 cm wide. Both 18a and 18b fall within the same carved outline. Petroglyph 18a is a simple face with two eyes and a mouth. It was covered by rootlets and has deteriorated immensely due to this and other factors. The flowstone exhibits green lichens rootlets, guano and spalling. Dirt has splashed up onto the carved area from the active drip stone directly in front of the formation. Petroglyph 18b is on the same carved rock face as 18a, it is a simple curved face with two eyes and a mouth. Petroglyph 18a faces 228 degrees; Petroglyph 18b faces 227 degrees.

Petroglyph 19

Location: Entrance 1, modified stalagmitic shelf one, bulb one.

Type: undetermined

Petroglyph 19 is located on and below the northern aspect of bulb one of modified stalagmitic shelf 1. The top of bulb one is 1.19 m above the surface. The carved area of petroglyph 19 is 24 cm wide, 25 cm high, and the top is 92 cm above the surface. The vertical aspect of this bulb has been modified, yet the level of deterioration makes it difficult to ascertain what has been carved in the flowstone. The extensive spalling from the lichens and moss that cover the flowstone has made it impossible to ascertain the form and nature of petroglyph 19. Petroglyph 19 faces 10 degrees.

Petroglyph 20

Location: Entrance 2, Flowstone Waterfall Alcove

Type: Hollowed-eye visage

Petroglyph 20 is two hollowed out eyes with a partially cleaved central flowstone column serves as a nose bridge. Petroglyph 20 is carved out of the rippled bacon and bell formations within the Flowstone Waterfall. These formations have been clipped or cleared to result in the hollowed eyes (Figure 8). The flowstone formations in the hollows of the eyes have been completely removed, exposing the limestone karst wall in the depths of the orifices. The eyes measure 46 cm and 51 cm high, 23 cm and 28 cm wide, and 17 cm and 12 cm deep, respectively. The central flowstone column between the eyes has been slightly modified on the north aspect (right eye) where as the left side (south aspect) has been untouched. This formation constitutes a distance between the eyes ranging from 6 to 17 cm. The flowstone formations within which petroglyph 20 was carved exhibit green lichens, swallow feces, guano, and spider webs. Petroglyph 20 is located in the approximate center of the Flowstone Waterfall Alcove. This placement and the large size of the visage relative to the other petroglyphs make Petroglyph 20 the most prominent petroglyph in the Flowstone Waterfall. Petroglyph 20 faces 134 degrees.

Actun Halal
Petroglyph #20
WBRCP 2000
Drawing: R. Ishihara

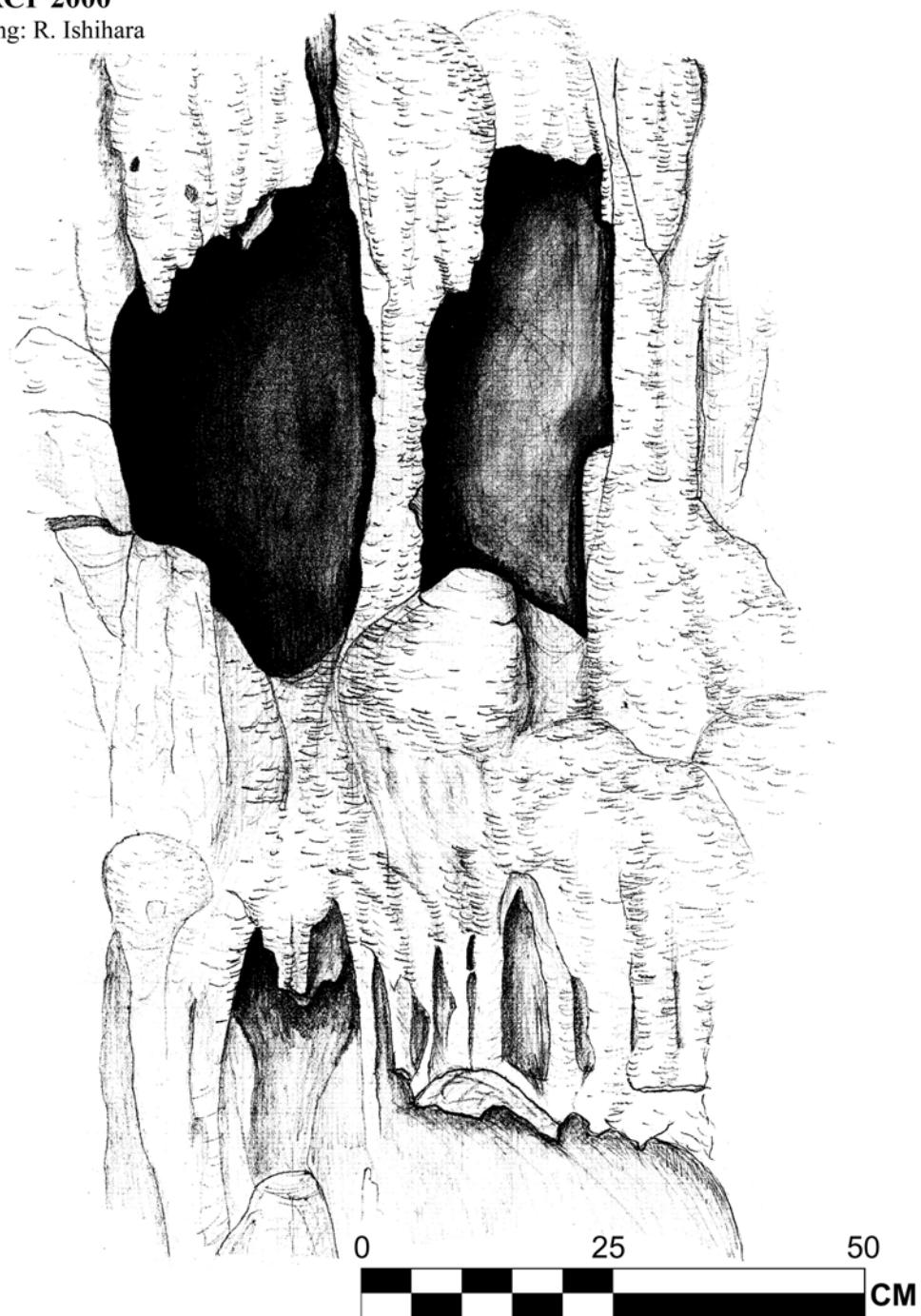


Figure 8: Illustration of Petroglyph #20.

Petroglyph 21

Location : Entrance 2, Flowstone Waterfall Alcove, stalagmitic conglomeration.
Type: simple face

Petroglyph 21 is a simple face with two eyes and a mouth. The eyes measure 5 cm and 3 cm high, 4 cm and 5 cm wide, and 6 cm and 3 cm deep, respectively. The mouth is 1.5 cm high, 10 cm wide, and 2 cm deep. Petroglyph 21 is carved into the base of a large, amorphous stalagmitic blob that is topped by multiple bulbs. Petroglyph 21 is carved on the slope of the west side of this conglomeration near the base. Petroglyph 21 is best viewed from the Ahau throne (see below) and was not noticed until someone sat in the throne. The stalagmitic formation contains dirt, guano, swallow feces, green lichen, leaves, and roots. Petroglyph 21 faces 285 degrees.

Other Cave Modifications

Large Spall

Location: South wall

The large spall is a flowstone rock mass measuring 2.1 m wide and 1.9 m high. An area just above and to the south of the spall is comprised of rough, jagged travertine approximately the same size and shape of the spall. This indicates that the spall was once attached to the wall here and broke free at some point. It is possible that the flowstone was weakened from ritual burning underneath this formation. The weight of human traffic on the formation may have been a contributing factor as well. Portions of this fragment appear to have been modified yet this could simply be the result of modern (or ancient) human traffic upon it following the deposition.

Altar 1

Location: South wall, Below Petroglyph 15.

Altar 1 is a large fallen speleothem that is located just below Petroglyph 15. The speleothem formation is a piece of flowstone curtain that was most likely placed in its current location by the Maya. Subsequent to its placement it has accumulated dripstone spatter on the top and north and west sides. The flat top measures 99 cm maximum north-south and 52 cm maximum east-west, with a long axis azimuth of 40 degrees and a wide axis azimuth of 134 degrees. The top is 70 cm above the surface. Altar 1 is not perfectly level on the top surface, yet is very close to level nonetheless. This could be due to: a) its original placement, b) slumping of floor matrix, c) differential flowstone accumulation, or d) upheaval resulting from the massive limestone spall event that took place in this area. By itself a piece of fallen flowstone with additional travertine accumulation on the flat surface is not that visually striking. However, when regarded in context with Petroglyph 15 the significance of this feature is obvious.

This configuration is similar to the altar/petroglyphic panel context in Actun Uayazba Kab (Helmke and Awe 1998:152).

Modified Stalagmitic Shelf #1

Location : Entrance 1, South wall, 2 m within dripline.

Modified Stalagmitic Shelf #1 is comprised of a group of modified stalagmitic bulbs as well as a long stalagmitic formation attached to the karst wall that has been incorporated into the feature (Figure 9). Modified Stalagmitic Shelf #1 is 1.50 m wide and 2.72 m from the surface. There are two main stalagmitic bulbs that make up the feature. The western bulb (bulb 1) is 40 cm wide, 23 cm high, and 30 cm thick. The top of bulb 1 is 1.19 m above the surface. The eastern bulb (bulb 2) is 16 cm wide, a maximum of 26 cm high, and 19 cm thick, with the top measuring 1.18 m above the surface. The northern aspect of bulb 2 and the southern aspect of bulb 1 have been shaved vertically. Between these two areas of modification there is a narrow flowstone platform or ridge that is 29 cm long and 13 cm wide. There is a shallow depression between the karst wall and the two bulbs. This depression is essentially nestled between the flowstone bulbs, the flowstone ridge and the wall. This depression is a basin of travertine 37 cm long and 19 cm wide. In the southern part of the depression there is a hole in the karst wall measuring 7 cm high, 4 cm wide, and 14 cm deep. The basin is white flowstone that was covered by a layer of guano, heart of plum seeds, land snails, leaves, twigs, and bark. The flowstone ridge between the bulbs and the depression provide have a shelf-like appearance. The limestone karst of the cave wall 180 cm above the shelf is naturally formed in an arch. The eastern portion of the arch has flowstone formations that drip down from above that have been clipped to accentuate the morphology of the arch. The east side of the arch is a stalactitic vein adhered to the wall. Within this formation there is a modified stalagmitic bulb, the eastern aspect of which has been shaved vertically (Petroglyph 10). The flattened area of Petroglyph 10 has evidence of eroded carving. However, this formation is badly weathered because it is in direct sunlight for several hours a day, and because it is covered with dark green and black lichens that have caused the formation to spall dramatically. The placement of the carved area within the stalagmitic formation as well as the overall morphology are similare to the formation that bears the “scream” petroglyph in Actun Uayazba Kab (Petroglyph 23, Helmke and Awe 1998: 160). The bulbs that comprise shelf #1 are also covered by the same dark-green/black lichen and have been subject to the same spalling. Petroglyph 19 is located within bulb one of modified stalagmitic shelf one.

Modified Stalagmitic Shelf #2

Location: Entrance 2, Flowstone Waterfall Alcove

This feature consists of a central bulbous stalagmitic formation with a flat top, which is flanked by two “shelves” of varying sizes and elevations. This formation is covered entirely in bright white travertine deposits. The source of the pure white travertine is a small stalactite “spout” hanging above that measures 22 cm high, with a maximum of 8 cm wide (Figure 10). This spout has a bulbous tip with a circular hole at the bottom, measuring 8 cm in diameter.

Below the spout is a travertine vein of white flowstone that travels down the limestone wall and flattens out to a thin coat of white deposit before reaching the stalagmitic shelf.

The central stalagmitic bulb is 79 cm above surface and 31 cm in diameter. The north shelf is 64 cm above surface and 20 cm wide. The south shelf is 52 cm above surface and 18 cm wide. Both shelves are flat and appear to be associated with small niches in the limestone wall. The maximum depth of the niches was 26 cm. In regards to the south shelf, the maximum depth was 21 cm. In addition to niche-like features, behind each flowstone shelf is a round hole that extends back into the karst cave wall. The hole from the north shelf is 7 cm in diameter and 14 cm deep. The hole in the south shelf is 11 cm in diameter and 7 cm deep.

Modified Stalagmitic Shelf #3

Location: Entrance 2, Flowstone Waterfall Alcove, south wall

Modified Stalagmitic Shelf #3 is a flat surface between stalagmitic flowstone formations in the south wall of the Flowstone Waterfall Alcove. The flat surface appears to have been carved or smoothed, and is a perfect ‘seat’ for humans. This feature was given the field name, “The Ahau Throne.” The stalagmitic formations flanking the flat surface appear to have been slightly modified to make them more vertical in nature. This modification appears on the inner aspects, i.e. those on either side of the flat ‘seat’ area, effectively resulting in a seat basin with armrests. The flat ‘seat’ area of shelf #3 is 42 cm wide, 76 cm deep and the stalagmite formations on the north side are a maximum of 35cm high and on the left they range from 20 –103 cm. The height of the ceiling above shelf #3 is 115 cm. The stalactitic formations above shelf #3 have been clipped to achieve an arch-like appearance above the configuration. This feature is recessed within the southern part of the Flowstone Waterfall Alcove and the back of it meets with the karst wall. The flat surface of shelf #3 resembles a seat and the stalagmitic formations on either side are excellent armrests. When an individual sits in the seat of shelf #3 they are looking out towards Entrance 2. Their right hand rests naturally and comfortably on top of the bulb that bears Petroglyph 5 and Petroglyph 4 flanks them on the left. If the individual looks straight ahead while seated they are staring directly at Petroglyph 21. When the individual seated in shelf #3 is viewed from the side (from the center of the cave looking west into the Flowstone Waterfall Alcove) the overall appearance is that of Chac or an Ahau seated within a cave entrance looking out, as depicted in many iconographic scenes. The azimuth of the seat facing out is 50 degrees.

DISCUSSION

The excavations in Actun Halal yielded artifact assemblages that are, in many respects, both similar and different to those in Actun Uayazba Kab. Although it was expected that Halal would contain human remains and plaster floors like those found in Uayazba Kab, only limited human remains were recovered and no plaster surfaces were located. However, the nature and location of the human remains that were discovered indicates that the excavations may have missed primary interment areas (see Unit 1 above). Thus, there may be burials in the flowstone alcove in Halal, just next to where Unit 1 was placed.

Actun Halal
Modified Shelf #1
WBRCP 2000
Drawing: K. Sylor



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Figure 9: Illustration of Modified Shelf #1.

Actun Halal
Modified Shelf #2
WBRCP 2000
Drawing: D. McCarron

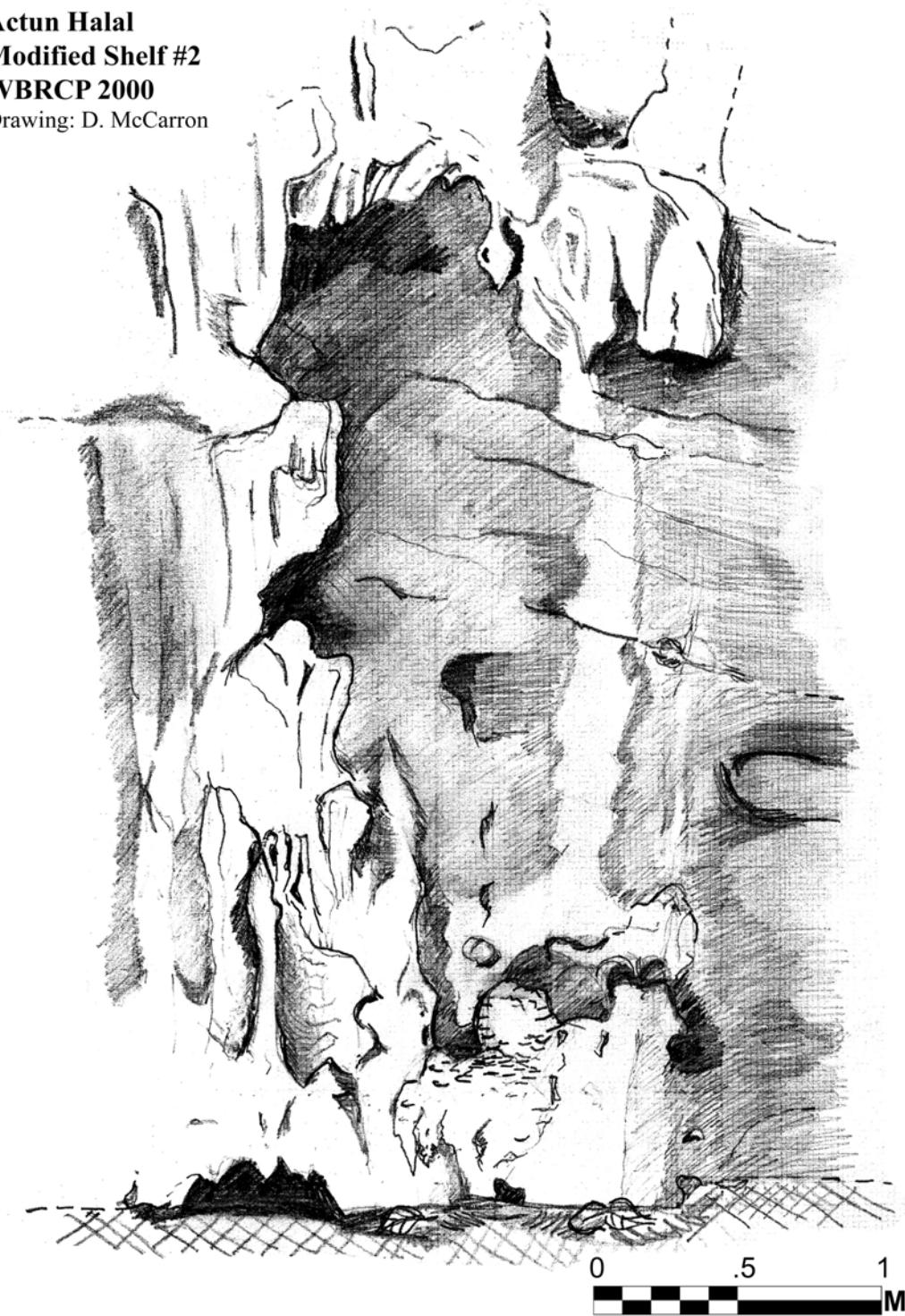


Figure 10: Illustration of Modified Shelf #2.

Unit 5 and the possible stela monument also proved to be frustrating. The down-facing side of the long rock was flush with the flowstone below, which made it difficult to determine whether or not carving was present. After the rock was flipped the fact remained it was plain on both sides, yet it appeared to have been modified into its present rectangular shape with a rounded end. Until similar megaliths identified as stelae are located in other caves, the nature of this large rectangular rock in Actun Halal remains enigmatic.

One of the most diagnostic ceramic sherds from the cave came from Unit 3, Level 2. The sherd represents portions of two glyptic collocations (see Ishihara, this volume). Due to the fragmentary state of the text, it is not possible at present to identify it as part of a PSS. It is more likely that the segment represents part of the nominal-titular clause (Kettunen and Helmke n.d.). Stylistically the specimen may be attributed to the Naranjo area group of early Late Classic polychromes (cf. Reents-Budet 1994).

The detailed account of the petroglyphs was designed to present a thorough description of the various rock art and cave modifications in Actun Halal. It is hoped that the presentation of the unique modifications in Actun Halal, specifically the Hollowed-eye Visages and Modified Stalagmitic Shelves, will aid other researchers in identifying similar features in Maya caves. Further interpretation of this diverse assemblage will appear at a later date. For a current interpretation of similar rock art from caves in Belize readers are directed to the analysis of the art from Uayazba Kab by Helmke and Awe (1998).

One of the most interesting finds from the investigations in Actun Halal came from the excavations in Unit 4. In the lower levels, beyond the strata that contained artifacts from the ancient Maya, various animal bones and a crude stone tool were found. One of the bones has been preliminarily identified as a tooth from an extinct horse. The tool is a scraper with evidence of use-wear on the edges. If the tooth is in fact equid, this could prove to be one of the more exciting archaeological contexts at the site. The context may date to the Archaic (roughly 7000-3000 B.C.) or possibly earlier to the Paleoindian period (roughly 10000-7000 B.C.). If Archaic, the context would be one of two secure contexts from this time period from the country. If Paleoindian, this would be the first ever context from this time period recorded for western Belize. Further analysis of the artifact assemblage from the lower strata of Unit 4 is underway. It is hoped that investigations will be conducted by the WBRCP in the near future to further explore all strata in Actun Halal, ancient Maya and otherwise.

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APPENDIX:
PRELIMINARY ANALYSIS OF ANIMAL REMAINS FROM ACTUN HALAL

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INTRODUCTION

The faunal remains from Actun Halal were recovered from five 1 x 1 m excavation units. They have been numbered from the entrance to the deep interior of the cave as follows: Unit 6, Unit 2, Unit 3, Unit 4 and Unit 1. The species which have thus far been identified in this assemblage are presented in Table 1. This brief treatment should be considered a very preliminary analysis of the animal materials recovered from the cave. In addition, several more units, located in different parts of the cave would provide a more complete sampling of the distribution of animal remains throughout the cave. This notwithstanding, some preliminary observations can be made at this point.

PRELIMINARY OBSERVATIONS

1. A significantly greater number of animal bones were recovered from the interior of the cave than from nearer the entrance (Table 3). While this may well be related to how the cave was used both by humans and animals, it may also have to do with where the excavation units were placed with respect to certain cave features. For example, animals use the cave walls to help them navigate the lightless interiors and against which to build their nests. Thus excavation units abutting or near walls can be expected to contain more animal remains particularly of species which routinely inhabit caves (e.g. Agouti paca).

2. Very few of the mammalian species identified so far in the assemblage naturally inhabit or routinely frequent cave interiors. For example, bats live in cave interiors and their remains in a faunal assemblage would not at all be surprising. On the other hand, the two deer species (White Tailed Deer and Red Brocket Deer) identified in this assemblage are not cave dwellers, and presence of their remains should be particularly noted. However, jaguars (which was identified in the assemblage) do enter caves to seek out prey and it could also have brought its kills into the cave to be devoured at a later time (i.e. using the cave as its lair or den). It should be kept in mind that there are other ways that faunal material that would not be expected to be found in caves could still be deposited deep inside: (a) the animal may have fallen into the cave by way of a fissure or "chimney;" (b) it could have been washed in by the same route; (c) it could have been deposited in the cave as part of a predators feces (e.g. as undigested remains as in owl pellets); and (d) animal remains could have been introduced into the cave by humans as a part of their cultural behavior (subsistence, ritual, etc.).

3. The faunal evidence for human activity in the cave is indicated by the presence of several animal species which do not enter caves as part of their normal behavior. Certainly the freshwater snail *Pachychilus indorum* was introduced from the outside. Likewise, the two deer species may have also been brought in by humans. There is no evidence on the bones of animal tooth marks (gnawing) or scratches from rolling/tumbling or being vigorously moved by water. The fact that several of the bones were burned also argues for human involvement in their presence in the cave.

4. Except for the few bones which were modified into tools and/or from use, none of the bones have butcher or cut marks on them. This would suggest that the animal carcasses were most likely processed, if they were at all, somewhere outside the cave.

5. There may also be a prehistoric component in the cave (Unit 4, Level 7).

Abbreviations used in the tables below

avs – Aves	lng bn – long bone	sml – small
bn – bone	md – medium	sp – species
cmplt – complete	mlsc – Mollusca	unfsd – unfused (“immature”)
dt – distal	mml – Mammal	v sml – very small
frg – fragment/fragmentary	MNI - Minimum Number of Individuals	
lg – large	fsd – fused (“mature”)	NISp - number of identified specimens
px – proximal		

I Mollusca (Invertebrates)

Pachychilus indiorum: Common Jute (Smooth, Coiled variety) (NISp = 12; 6.7%)

Pomacea sp. probably flagellata: Apple Snail (NISp = 9; 5.1%)

Orthalicus sp., provisional identification: Florida Tree Snail (NISp = 1; 0.6%)

II. Aves

Bird species (NISp = 7; 3.9%)

III. Mammalia

Very Small Species (less than .99 kg)

Oryzomys sp., probably couesi: Rice Rat (NISp = 9¹; 5.1%)

Cryptotis micrura: Guatemalan Small Eared Shrew (NISp = 2; 1.1%)

Small Species (1.0 – 24.9 kg)

Agouti paca: Paca (Gibnut) (NISp = 8; 4.4%)

Dasyurus novemcinctus: Nine-banded Long-nosed Armadillo (NISp = 3; 1.7%)

Felis (Leopardis) pardalis: Ocelot (NISp = 2²; 1.1%)

Medium Species (25.0 – 49.9 kg)

Mazama americana: Red Brocket Deer (NISp = 7; 3.9%)

Odocoileus virginianus: White-tailed Deer (NISp = 60³; 33.7%)

Tayassu pecari: White-lipped Peccary (NISp = 3; 1.7%)

Large Species (more than 50.0 kg)

Panthera onca: Jaguar (NISp = 54; 30.3%)

??Equus sp.?? (If Equus, then this species predates the Maya.) (NISp = 1; 0.6%)

Not included in these counts are the following unidentified specimens:

Mollusca: 4; Mammalia- general: 12, small: 1, medium: 5,

and 78 calcined bones which very likely Odocoileus.

In addition, several very fragmentary possibly human bones were recovered.

Notes: 1. Includes two rodent bones.

2. Includes one small felid bone.

3. Does not include 78 calcined bones from Unit 1 Level 3

Table 1: Animal species identified and the number of identified specimens (NISp =178) in the faunal assemblage from Actun Halal.

Unit	Level	Class	Size	Bone/Shell	Species	NISp
1	1	Mml ((?Mml	V Sml Lg	Femur, px, fsd, left Phalange I, cmplt, px unfsd/dt fsd	Rodent form Homo sapiens?	1 1))
2	No specimens					
3		Mml Mml Mlsc Mlsc? Mlsc	V Sml Md-Lg	Long bone shaft section ca. 78 frgs (.07 kg) calcined bns, mostly Md but also a few may be from a Lg species Shell,cmplt w/ tips present Shell disc Shell frg	Rodent form Pachychius indorum To be identified “	1 78 1 1
4		Mml Mml	Md? Md	Lng bn frg, modified/tool?, calcined Phalange I, frg Antler, frgs, burned	Unidentifiable Odocoileus virginianus “ “	1 1 34
					(MNI = 1 combined with Level 3's 78 calcined bones)	
5	No specimens					
6		Mml	Sml	Long bone shaft section Scute, frg	Unidentified Dasypus novemcinctus	1 1
			Md	Calcnaeus, cmplt, fsd, burned	Unidentified	1
7	Mml	Sml		Phalange II, cmplt, px/dt fsd Scute frg	Prov. ident. Agouti paca Dasypus novemcinctus	1 1
8	Mml	Sml		Phalange II, cmplt, px/dt fsd	Felid form	1
Unit	Level	Class	Size	Bone/Shell	Species	NISp
2	1			No bones		
2		Avs Mlsc Mml		Beak, frg Shell, frg Maxilla (both sides)	Bird (to be identified) Pachychilus indorum Oryzomys sp. prob. couesi	1 1 1
			V Sml	Mandible, right side	“ “	1
					(MNI = 1)	
3		Mml Mlsc Mml	Md	Premolar ² Bone frg	Odocoileus virginianus Unidentified	1 1
			V Sml	Shells, cmplt, w/ tips broken Humerus, dt, fsd	Pachychilus indorum Probably Oryzomys sp.	4 1

Table 2: Breakdown of the Actun Halal faunal sample by unit, level, animal class and number of identified specimens.

Unit	Level	Class	Size	Bone/Shell	Species	NISp
3	1	Mlsc		Shell frg, w/ tip broken	<i>Pachychilus indiorum</i>	1
		Mml		Bone frg, modified/pointed	Unidentifiable	1
	2	Avs		Humerus, shaft section, tooth puncture	Unidentified	1
				Tibiotarsus,frg	"	1
	2	Mlsc		Shell, frgs	<i>Pomacea</i> sp.	2
		Mml	V Sml	Mandible, cmplt, right side	<i>Cryptotis micrura</i>	1
				Mandible, cmplt, left side	"	1
					(MNI = 1)	
		Mml	Md	Accessory Metapodial, cmpt	<i>Odocoileus virginianus</i>	1
		Mml	Md?	Scapula frg	Unidentifiable	1
3	((?Mml	Lg		Unidentifiable bone frg	<i>Homo sapiens?</i>	1))
		Avs	Sml	Humerus, cmplt	Bird sp.	1
				Ulna, px	Bird sp.	1
					(MNI = 1?)	
		Mml	V Sml	Pelvis, frg	Rodent form	1
		Mml	Md	Phalange II, dt, fsd	<i>Odocoileus virginianus</i>	1
				Vertebral frg	? ? <i>Odocoileus virginianus</i>	1
				Bone frg	Unidentified	1
					(MNI = 1)	
Unit	Level	Class	Size	Bone/Shell	Species	NISp
4	1	Mlsc		Shell, with tip broken	<i>Pachychilus indiorum</i>	1
		Mml	Md	Phalange III, cmplt, px/dt fsd	<i>Mazama americana</i>	1
				Rib frg	Prov. ident. <i>Mazama america</i>	1
	2	Mlsc		Shell frg	Prov. ident. <i>Orthalicus</i> sp.	1
		Mml	Md?	Worked bone (bloodletter?)	Unidentifiable	1
		Mml		Bone frg	Unidentified	1
	((?Mml	Lg?		Vertebral frg	<i>Homo sapiens?</i>	1))
		No bones				
	3	Mlsc		Shell, with tip broken	<i>Pachychilus indiorum</i>	1
				Shell frgs	<i>Pomacea</i> sp.	2
		Avs	Sml	Bone frg	Unidentified	1
		Mml	Sml	Scute frg	<i>Dasyurus novemcinctus</i>	1
		Mml	Md	Phalange II, cmplt, px/dt fsd	<i>Agouti pacá</i>	1
		Mml	Md	Long bone shaft frg	Unidentified	1
				Sesamoid bones	<i>Odocoileus virginianus</i>	6
				Accessory Metapodial	"	1
				Pelvis, frg	? ? <i>Odocoileus virginianus</i>	1
					(MNI = 1)	
			Lg	Phalange I, cmplt 8 + 1 probable	<i>Panthera onca</i>	9
				Phalange II, cmplt 4 + 1 probable	"	5
				Phalange III, cmplt	"	5
				Tarsal bones	"	2
				Navicular Cuboid	"	1
				Sesamoids	"	2
				Astragalus, right side	"	1
				Calcaneus, right side	"	1
				Metapodials, right 7, left 2, unk 3	"	12
				(1 diseased with a healed fracture)	(with Level 5: MNI = 1)	

Table 2 (continued). Breakdown of the Actun Halal faunal sample by unit, level, animal class and number of identified specimens.

Unit	Level	Class	Size	Bone/Shell	Species	NISP
4	4	Mml		Bone frgs	Unidentified	3
		(?Mml	Lg	Bone frg	Homo sapiens?	1))
	5	Mml	Md	Ulna, shaft section	Probably Mazama Americana	1
				Sesamoid	Probably Mazama Americana	1
		Mml	Lg	Phalange II	Panthera onca	3
				Phalange III	" "	5
				Tarsal bones	" "	3
				Sesamoid	" "	1
				Patella	" "	1
				Metatarsal	" "	2
				Caudal Vertebra	" "	1
					(with Level 5: MNI = 1)	
6	6	Mml		Bone frg	Unidentified	1
		Mlsc		Shell frgs	Pomacea sp.	5
		Mml	Sml	Scapula, right , fsd	Agouti pacas	1
		Mml	Sml	Phalange III frg	Prov. identif. Felis pardalis	1
		Mml	Md	Isolated teeth	Odocoileus virginianus	5
				Maxillary frg, left side	" "	1
				Sesamoids	" "	4
				Pelvis, frg	" "	1
				Vertebral frgs	Probably " "	2
					(MNI = 1)	
7	7	Mml		Worked/modified bone frg	Unidentifiable	1
		Mml	V Sml	Femur, shaft section	Rodent form	1
				Long bone, shaft section	" "	1
		Mml	Sml	Isolated Incisor frg	Agouti pacas	1
		Mml	Md	Maxillary frg, left side	Mazama americana	1
				Mandibular frg, right side	" "	1
				Antler frg	" "	1
					(MNI = 1)	
		Mml	Lg	Maxillary frg	Prov. identif. Tayassu pecari	1
				Isolated tooth frg	" " " "	1
8	8	Mml		Accessory Metapodial	" " " "	1
					(MNI = 1)	
		Mml	Lg	Isolated Molar?	Prov. identif. Equus sp.??	1
				Bone frgs	Unidentified	3
Unit	Level	Class	Size	Bone/Shell	Species	NISP
6	2	Avs		Bone frg, worked (bloodletter?)	Bird?	1
		Mlsc		Shell, with tips broken	Pachychilus indorum	2
		Mlsc		Shell frg	Unidentified	1
		Mml	V Sml	Mandible	Oryzomys sp.	1
		Mml	Sml	Scapula, fsd, left side	Agouti pacas	1
				Metatarsal II, px	? Agouti pacas	1
				Ulna, dt, unfsd	? " "	1
				Rib frg	? " "	1
		Mlsc		Shell frg	Unidentified	1

Table 2 (continued): Breakdown of the Actun Halal faunal sample by unit, level, animal class and number of identified specimens.

Unit	Cave Locus	NPIS ¹ (x14)	% Found in Unit	Mlsc NISp	% NISp	Aves NISp	% NISp	Mml NISp	% NISp	Total NISp	(%)
6	Entrance (light)	3	21.4	4	40.0	1	10.0	5	50.0	10	(3.6)
2	Entrance	4	28.6	5	45.5	1	9.1	5	45.5	11	(4.0)
3	Middle	6	42.9	3	18.8	4	25.0	9	56.3	16	(5.8)
4	Deep (interior)	10	71.4	10	8.7	1	0.9	104	90.4	115	(41.4)
1	Deep	6	42.9	4	3.2			122	96.8	126	(45.3)
Totals		(14	100.0)	26	9.4	7	2.5	245	88.1	278	(100.1)

Notes: 1. Provisional number of Identified Species. For the Actun Halal assemblage it is 14.

Table 3: Gross breakdown of major animal classes by unit, level and number of identified specimens (NISp).

Unit	Cave Locus	# of Indiv Ident Spec. of <i>Odocoileus virginianus</i>	% MNI	#of Indiv Ident. Spec. of <i>Panthera onca</i>	% MNI	Totals
6	Entrance	---		---		---
2	Entrance	1		(1?)		1
3	Middle	3		1		3
4	Deep Interior	21	28.0	1	72.0	1
1	Deep	35	1			35
Totals		60 ¹	52.6	3 (max 4)	47.4	114

Note: 1. Does not include 78 calcined bones from Unit 1, Level 3.

Table 4: Comparison between the two most common mammals species in the sample (*Odocoileus virginianus* and *Panthera onca*).

Unit #	<i>Felis pard.</i>	<i>Agouti paca</i>	<i>Dasy-pus</i>	<i>Mazama amer.</i>	<i>Odocoileus</i>	<i>Tayassu pecari</i>	<i>Panthera onca</i>
6		4					
2					1		
3					3		
4	1	3	1	7	21	3	54
1	(1)	1	2		35 ¹		
Totals	2	8	3	7	60	3	54

Note: 1. Does not include 78 calcined bones from Unit 1, Level 3.

Table 5: Breakdown by unit of the raw bone counts of the edible mammalian species which might have contributed to the Mayan's diet.

REPORT ON A RECONNAISSANCE MISSION TO ACTUN UCHENTZUB (FLOURCAMP CAVE), CAYO DISTRICT, BELIZE

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INTRODUCTION

Actun Uchentzub, otherwise known as Flourcamp Cave, is located in the Macal River Valley of Cayo District, close to the Black Rock River Lodge. To reach the cave one follows a well-trodden trail that leads westward from the road, about one mile from the lodge. The trail leads directly to the entrance of the cave. The hike was almost entirely up-hill, with varying degrees of slope, and took the crew approximately 30 minutes to reach the cave. Members of this reconnaissance trip included WBRCP staff members Mike Mirro, Caitlin O'Grady, Christina Halperin, Eric White, Alice Stearns, Chris Morehart, Yasuko Kono, and myself. Approximately three and a half hours were spent at the cave.

The main objectives of the reconnaissance to Actun Uchentzub were to visit the site, assess its archaeological potential, and to observe the level of damage from looting and tourist activity. The WBRCP has been investigating the cave sites of Actun Chechem Ha, Actun Chapat, and Actun Halal, all of which are located upriver from Uchentzub. One of the major goals of the Project is to examine caves on a regional level (Awe 1998), thus Uchentzub could potentially add to the existing database of cave sites in the Macal River Valley.

DESCRIPTION OF THE CAVE

The cave is comprised of a sinkhole approximately 10 m in diameter and 5 to 10 m deep, with numerous lobes of chambers stretching out in all directions (Figure 1). Although the sinkhole is overgrown with vegetation, a modern path led us to the entrance of the main chamber without difficulty. The largest chamber, Western Chamber, has a wide, rocky and high (10 m or so) entranceway facing east. Large columns fill the lower areas of this chamber. Most of the cultural material was found in the higher areas of the chamber, especially in the alcoves or crawlways blocked off by artificial walls.

On the southeastern side of the Western Chamber is a somewhat smaller chamber less than half the size of the former. A modern ladder had been placed at the junction of the only passageway inside the cave. The lower area inside the smaller chamber had a very high ceiling, unlike the tight and sloping crawlspaces at the back end of the chamber, in which much of the better preserved fragmented artifacts were located.

Along the vertical wall of the sinkhole were several smaller chambers or alcoves. In the entranceway of one, we observed what seemed to be an uncarved slab of slate approximately 0.40 x 0.25 x 0.5 m. Unfortunately, no photos were taken nor any sketches made. Otherwise, there was not much cultural remains in these smaller chambers except a bed of leaves, probably laid down by a local hunter or looter (Mike

Actun Uchentzub
(Flour Camp Cave)
Macal River Valley,
Cayo District, Belize
Plan and Profile Views
Sketch
28 October 2000
Illustration: Michael Mirro
BVAR, WBRCP 2000

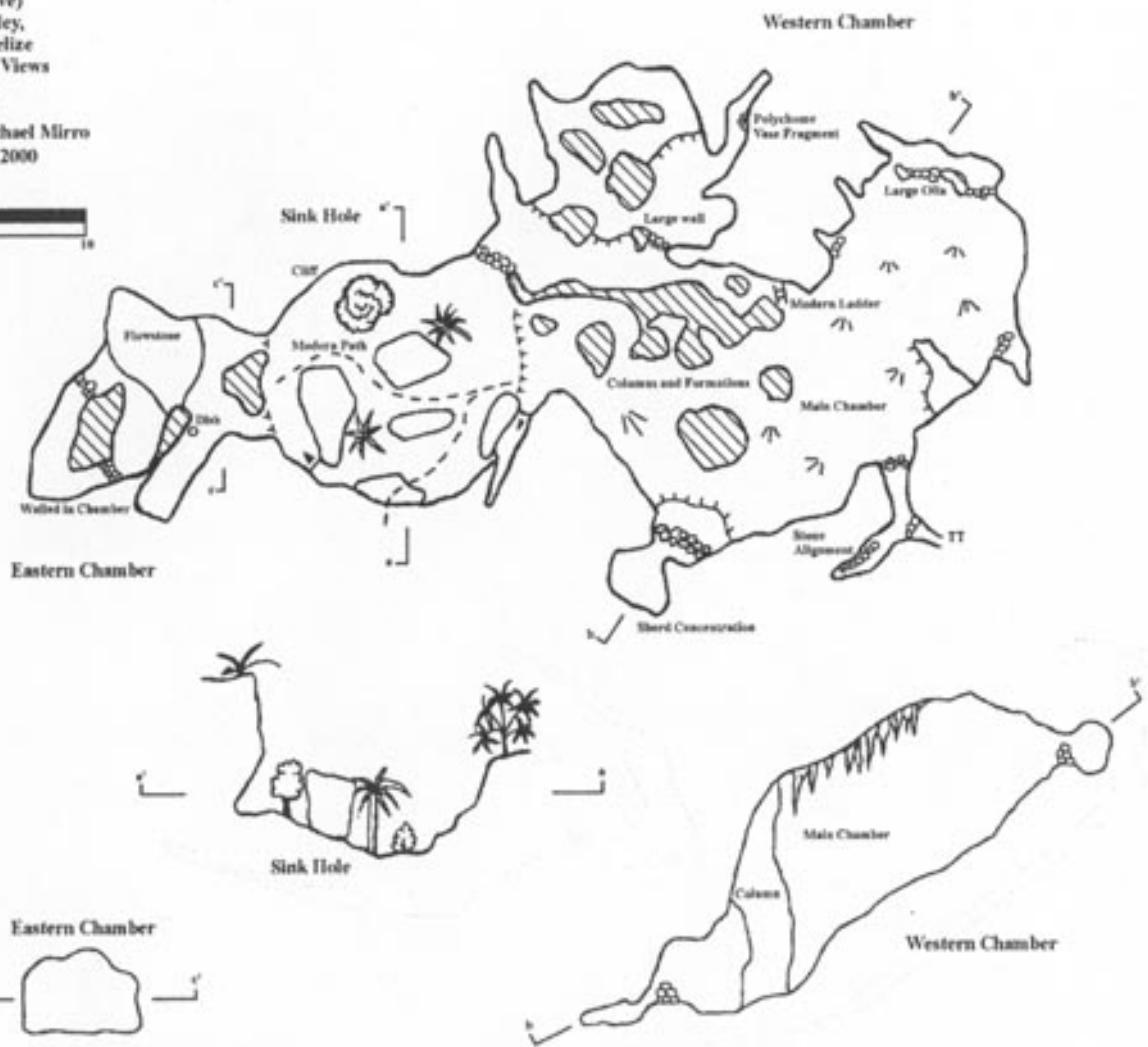


Figure 1: Sketch plan and profile view of Actun Uchentzub (Flourcamp Cave).

Mirro, personal communication, 2000). Although we did not encounter many bats in the main chamber of the cave, one of the smaller alcoves in the sinkhole contained a large number of them.

On the opposite side of the Western Chamber there was another small chamber of similar size to that described above. This Eastern Chamber contained well-constructed artificial walls which stood about 1.5 m wide by about 2 m high. One wall enclosed the deeper end of the small chamber. The other side was enclosed by smaller artificial walls constructed with uncut limestone rocks and speleothems framed by columnar cave formations.

At the time of the reconnaissance, the cave appeared dry, although it was evident that that was not the case in earlier times since the ceilings encased myriads of stalactites and columnar formations were frequent. In the entrance area of the main chamber, especially in the outer areas of the entrance, one could see clearly that stalactites had been mined or broken at one time. Much of the ceiling was cleared of stalactites. Moreover, columns had formed along one part of the cave wall, and they had been cut out into an area large enough for two people to stand. It was, however, noted by Mike Mirro that the activity, particularly the mining of stalactites, might be recent. As for other human activity, it was obvious that looters had vandalized the cave. There were numerous looter pits in almost all areas where artifacts could be observed on the surface. The modern ladder and other “tourist-friendly” activities such as the placement of certain sherds atop conspicuous areas (presumably for display) were recent modifications by tour guides.

HISTORY OF ARCHAEOLOGICAL INVESTIGATIONS AT THE CAVE

Peter J. Schmidt includes a mentioning of this cave in his article “Postclassic Finds in the Cayo District, Belize” (1977), a paper presented at the 39th International Congress of Americanists held in 1970. He notes that Actun Uchentzub was discovered in 1968 and excavated in 1970 (Schmidt 1977:107). Schmidt (1977:107-108) reports and apparently has collected several artifacts from one of the chambers, of which he names “Cave 1.” These artifacts include four incense burners, the basal fragment of one partial incense burner, one plain globular wide-mouthed jar, four conical lumps of copal (one possibly mixed with rubber), one staff-like wooden object, one fragmentary wooden disk or plate, one irregular wooden object with traces of burning, one pottery disk, one ceramic effigy hand, and one rectangular jade bead. He demonstrates typological similarities of the incense burners with those of the Caban Complex at Tikal, which dates to the Early Postclassic and also a resemblance to those of the Hocabá and Tases Complexes of Mayapán, which are of Middle and Late Postclassic periods. Schmidt provides a map of “Cave 1,” but does not supply a larger map of the entire cave. Yet similar formations and morphologies show that the chamber he speaks about is most likely the Eastern Chamber on the WBRCP sketch plan drawn by Mirro.

Another mentioning of this cave appears in James Gifford’s publication on the ceramic analysis at Barton Ramie (1976). Gifford uses the name “Black Rock Caves,” but this is presumably a different name for the same cave, as the area surrounding this cave is known for its “black rock” or slate. However, Gifford does not specify any of the proveniences for the Black Rock Caves specimens; he only indicates which types were found in the Black Rock Caves collection. Ceramics from the Barton Creek phase (late Middle Preclassic) through the New Town (early Postclassic) are reported by Gifford (1976); these

ceramic groups include Paila Ceramic Group, Quacco Creek Ceramic Group, San Felipe Ceramic Group, Vaquero Creek Ceramic Group, Stumped Creek Ceramic Group, Old River Ceramic Group, Aguacate Ceramic Group, Monkey Falls Ceramic Group, Balanza Ceramic Group, White Cliff Ceramic Group, and Mountain Pine Ceramic Group.

It is interesting to note that one of the ceramic type:varieties in Gifford's collection, Mountain Pine Red: Old Jim Variety, was exclusively established by the Black Rock Caves collection (Gifford 1976:195). Likewise, two other types San Pedro Impressed: San Pedro Variety and Rosario Incised: Rosario Variety were established based on 12 and 36 sherds, respectively, excavated from Black Rock Caves. The Mountain Pine ceramic group sherds comprise 54 % of the total collection from Black Rock Caves (Gifford 1976:193). Mountain Pine Red: Old Jim Variety was established based on 30 sherds.

EVIDENCE OF MODIFICATION AND ARCHITECTURE

It is significant that numerous artificially constructed walls were encountered. The walls are of varying sizes and are constructed with undressed limestone rocks and speleothems, many times utilizing the already existent natural cave formations as frames, such as columns, and filling the space between the columns and cave walls with rocks and speleothems. It is noteworthy that the walls used to enclose alcoves and crawl spaces are mostly located in the higher elevations within the chamber. Most of the artifacts were in these areas that were enclosed or partly closed off by artificial walls.

Though there are several well-preserved walls throughout Actun Uchentzub, the most impressive, well-constructed wall was found in one of the smaller chambers. It enclosed an area in the deeper part of the small chamber, where it is high enough to stand and large enough for several people to walk around. The height of this large wall is at least 2 meters and over 1 meter wide (Figure 2a). This large wall stands on one end of the enclosed area, while the other end is constricted by a high, natural cave wall (bedrock) accompanied by a small wall constructed by filling in the open gaps.

No types of cave art including petroglyphs and pictographs were identified, though this could be due to weathering, the brief visit that did not allow for intensive investigations, and/or the nature of the investigation which did not necessarily seek out simple face petroglyphs or modified speleothem sculptures (for a definition, see Griffith and Morehart, this volume).

ARTIFACTS

The artifacts encountered were all ceramic vessels and sherds (Figure 3), with the exception of one mano fragment, one or two chert cores, and one slate slab mentioned earlier. However, it should be realized that due to extensive non-archaeological modern activities observed within the cave, the artifacts we encountered are far from being an accurate representation of the artifact assemblage of this cave. Also no skeletal or faunal materials were encountered.

As noted above, the artifacts we located were found in small alcoves or tight crawl spaces in the relatively higher areas of the cave at the edges of the chamber. Interestingly, a great majority of these discrete areas containing artifacts were enclosed or closed off by artificial walls made of varying sizes of undressed stones and/or speleothems. This is

a.



b.

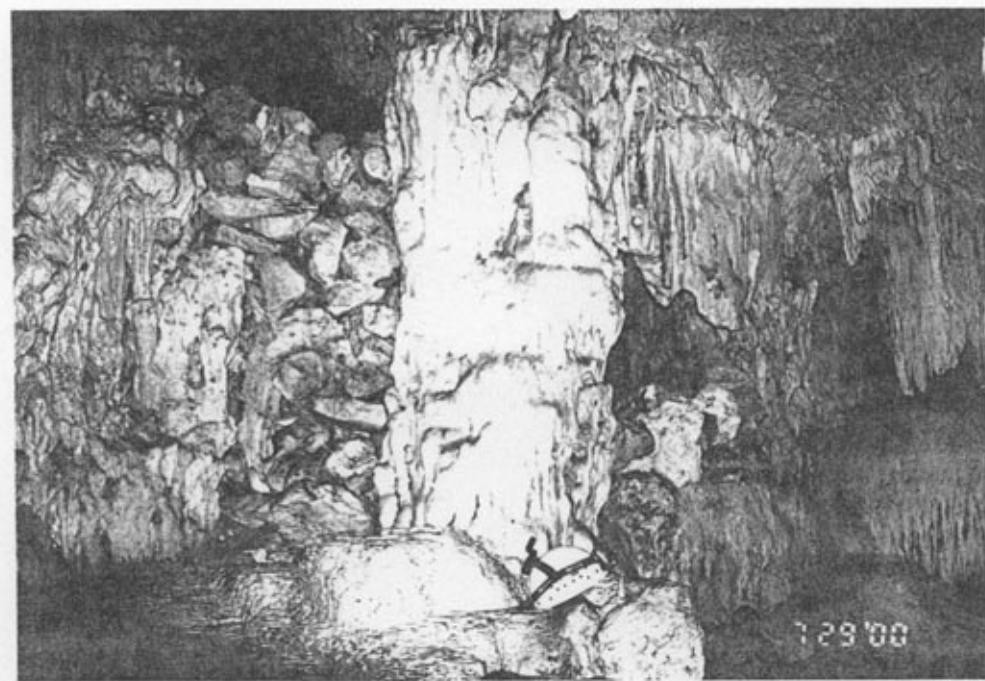


Figure 2a, b: Photos of artificially constructed walls in Actun Uchentzub.
Note the caver's helmet in the foreground for scale.

noteworthy as it signifies that discrete spaces for use were demarcated in antiquity, and this may lend to further study in spatial utilization of the ritual context in caves.

There was an abundance of large, wide-mouthed Cayo Unslipped and Alexanders Unslipped jars, narrow-necked Tinaja Red jars, and large-sized Mount Maloney Black bowls, of which most were of LC II date, based on LeCount's lip microseriation (1996:145-7,150). There were also Roaring Creek Red bowls, Platon Punctated-Incised bowls, and Silver Creek Impressed bowls and/or dishes. A thin-walled bowl or vase with vertical sides and slightly pointed lip with an orange-red slip, possibly of a Late Classic date, was also found in two large pieces (probably 2/3 of vessel wall, no base). Although the two sherds were located separately a few meters from each other, this most likely reflects modern artifact movement, judging from the careful placement of the sherds on a flat stone at waist-level and the presence of much modern human activity in the cave. A Benque Viejo Polychrome with red-and-black-on-orange painting on the interior was found, though weathering made it difficult to discern the painted design (Figure 4). The exterior exhibited red-and-orange vertical stripes, similar to the tripod dishes found at Yax Caan chultun #1 (Griffith et al. 2000) (similar designs are illustrated in Smith (1955:Fig.435b), noted as being related to Saxche-Palmar Polychrome Group).

In a tight crawl space, the base fragment (approximately 1/3 of base remains; base diameter is approximately 20 cm) of a Zácatel Cream Polychrome or Cabrito Cream Polychrome vase (Figure 5) (a similar type to the Actún Balam vase, see Pendergast 1969) with an interesting painted design was encountered stacked at the bottom of a few olla and/or other sherds. The orange painted design depicted a standing figure with a feathered garment worn around the waist draping down between the legs. On both ankles were spiked ankle bracelets, suggesting the figure would be wearing wrist bracelets as well (Caitlin O'Grady, personal communication, 2000). The figure seems to be holding a staff or a staff-like object vertically on his/her left side. A band of red-orange paint lines the bottom of the vase. According to O'Grady, one of the reconnaissance crew members, the ankle bracelets are reminiscent of a typical outfit of the Jaguar God of the Underworld when he is shown in an anthropomorphic form. If this is indeed true, the presence of this vase with a depiction of the JGU would not be surprising since caves are thought to be portals to the Underworld.

In the same area further into an even tighter crawl space, was a red-slipped rim sherd with a labial flange. Consultation with Christophe Helmke (personal communication, 2000) has led to type this specimen as Sierra Red characteristic of the Middle Preclassic.

In the smaller chamber extending out from the larger chamber, a large, wide-mouthed jar (rim diameter is over 40 cm) of an Alexanders Unslipped: Alexanders Variety was encountered on the cave floor. This jar sherd displayed an interesting raised design on the shoulder of the jar. The design consists of a horizontally encircling ridge on the neck/shoulder juncture and extending just below it are two, possibly three "tau-shaped" designs in raised relief. Jaime Awe (2000 personal communication) suggested that the tau-motif is often used as a cave motif. The design, as Christophe Helmke suggested, is characteristic of the Terminal Classic, with similar designs seen in Daylight Orange: Darknight Variety and Mount Maloney Incised type at Xunantunich. Karl Taube (personal communication, 2000) has suggested that the ridge encircling on the vessel exterior just above the "Ik-shape" indicates that it most likely represents textile, such as a rope with "Ik" designs, as a decorative feature on the vessel.

DISCUSSION

Examination of the ceramics from the surface collections at Uchhentzub allows a temporal assignation to the Late Classic to Terminal Classic period. Though there were several looter pits (one or two at each area where there was a high concentration of ceramics), there tended to be a pattern in the placement of artifacts within the cave. However, it must be recognized that Gifford (1976) assigns types as early as the Middle Preclassic to sherds retrieved from Black Rock Caves.

Although the artifact assemblage of this cave site cannot be considered complete, the abundance of unslipped jars and large-sized monochrome bowls may give insight, as these are ubiquitous vessel types in a Late Classic cave ceramic assemblage, though not restricted to it. While not as numerous or conspicuous, the presence of outflared bowls and dishes, particularly tripods also add to the typical Late Classic assemblage. My question here is, why the large, wide-mouthed plain jars and large incurving Mount Maloney Black bowls in caves? What is their significance, ritually and functionally?

At Actun Chechem Ha, a cave in the same vicinity investigated in earlier seasons (Ishihara 2000a, 2000b), Mount Maloney Black bowls are found closely associated with Cayo Unslipped and Alexanders Unslipped jars, sometimes placed as if to lid the jars. Were the pair of these jars and bowls considered one set and does this have some special meaning? Similar to the Chechem Ha collection, the Uchentzub jars do not seem to have been placed for the collection of *zuhuy ha*, since the majority of the cave is dry and they do not seem to be placed specifically underneath dripping stalactites. I make this point here because it is too often the case that the presence of ollas in cave contexts is blindly placed in direct association with the collection of *zuhuy ha*, as was suggested by Thompson (1975). Though there were several large, intact jars, many were fragmented, probably intentionally broken (i.e. killed), and scattered within the recesses of the enclosed walls. It is unfortunate that looting activity has prevailed within the cave, but I believe there are still important data that could be retrieved from the spatial relationship between the existing artifacts, architecture, and cave features. Lack of time prevented the crew from conducting detailed mapping of the archaeologically significant areas with the artifacts plotted in.

The presence of the elaborately painted Zacatel Cream or Cabrito Cream Polychrome vase plus the jade bead reported by Schmidt (1977:108, Fig.8) offer the possibility that the cave was used by people with higher status or those of the upper class, though the limited specimens prove inconclusive. It is important to recognize here that if the cave had been utilized by people of the upper class or of a single “class” and not communal property, then the large plain jars and monochrome black bowls must have been used by those people of the upper class, hence not indicative of lower class people due to the pottery’s so-called crudity. Therefore, lack of “elite markers” in the archaeological record at cave sites may not clearly reflect the people who brought the pottery inside and utilized the cave. Caution should be heeded with making direct correlations between the presence of so-called elite ware and artifacts and elite usage of the cave. Conversely, so-called utilitarian ware or plain vessels such as Cayo Unslipped jars should not be considered as evidence of non-elite use.

SUMMARY

Although the cave has been highly disturbed and some investigations have been undertaken in the past, I feel it would be of interest to examine more closely the remaining

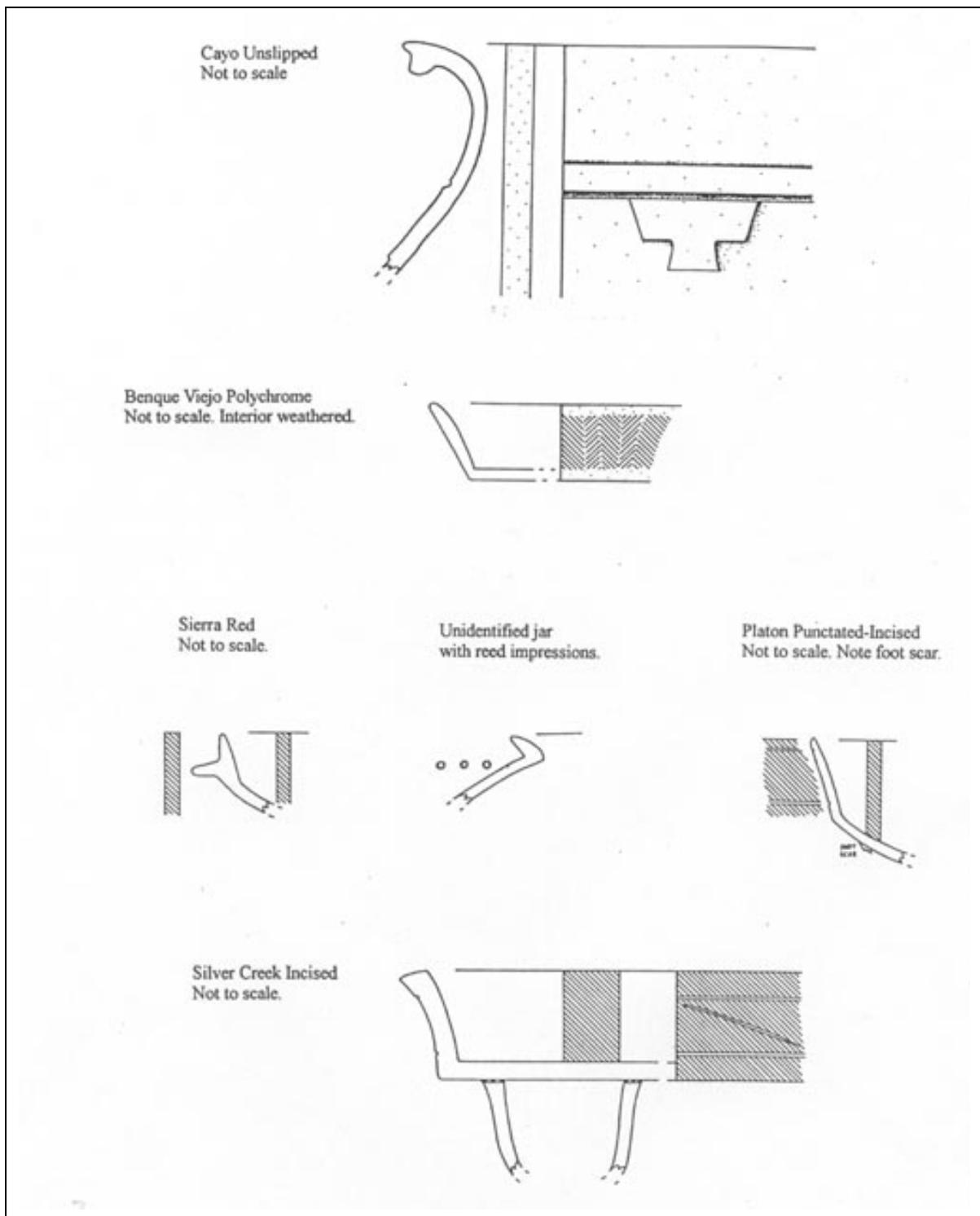


Figure 3: Sketches of selective ceramic sherds from Actun Uchentzub. Not to scale.

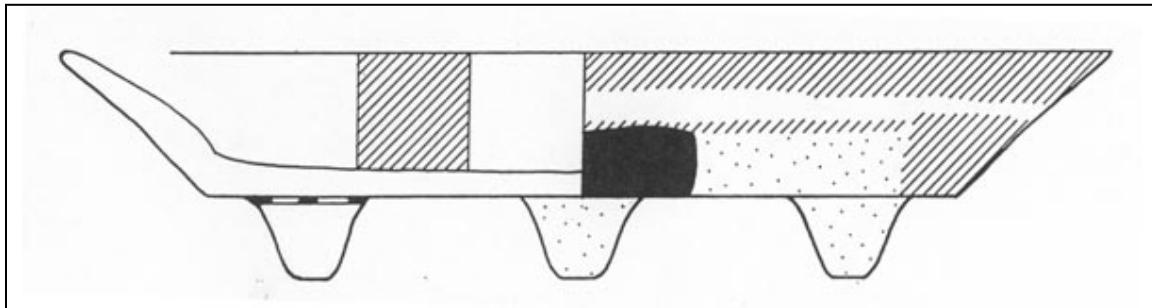


Figure 4: Benque Viejo Polychrome tripod dish with nubbin feet.
Rim diameter = 19 cm.

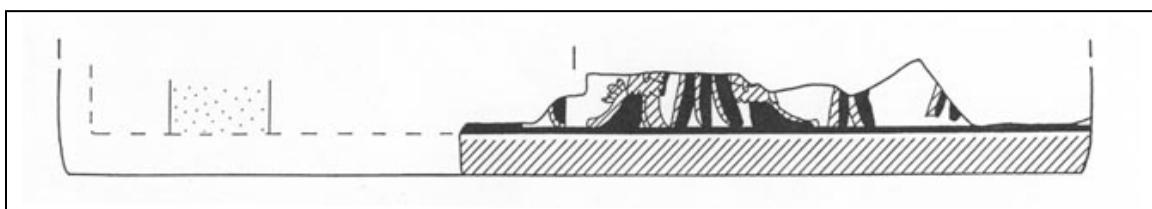


Figure 5: Zacatel or Cabrito Creame Polychrome vase. Base diameter = 20 cm.

unslipped jars and scattered Mount Maloney Black jars, which have escaped the interest of looters and previous scholars. As these pottery are one of the most commonly found in cave sites in this area, data from these vessels may provide useful in not only aiding to establish chronology by form (i.e. seriation), but also to ascertain the symbolic significance and/or functional use that these vessels played in the ritual setting of the cave.

If the cave had been utilized in earlier times as Gifford (1976) has noted, it may be possible to more systematically examine the clustered pottery within the enclosed confines of the walls and define more clearly the cave ceramic assemblage, in particular the plainware of earlier periods, since these most likely have evaded looters' and tourists' eyes and hands. Previous research at cave sites have not focused on these commonly found "crude-ware," and since these presumably thought "domestic ware" are in such abundance at cave sites, their significance—ritually and symbolically—are in need of more research and explanation.

In future investigations at cave sites in this vicinity of the Macal River Valley, I hope to pursue studies and investigations on the ceramics found at cave sites, defining a cave ceramic assemblage as well as refining the chronology laid out by Gifford (1976). Furthermore, I hope to help elucidate the ritualistic aspect that pottery plays in cave settings.

Acknowledgements

I would like to first thank the Project Director, Dr. Jaime Awe, for allowing me the opportunity to conduct research as part of the Western Belize Regional Cave Project. I also would like to thank all of the WBRCP and BVAR staff and students, especially Mike Mirro for his help during the recon trip and Christophe Helmke for always being of great help with ceramics. My gratitude goes out to the Belize Department of Archaeology for permitting us to conduct research at the numerous cave sites.

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REPORT ON THE CERAMIC ANALYSIS FOR SOME CAVE SITES IN THE MACAL RIVER VALLEY, CAYO DISTRICT, BELIZE

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INTRODUCTION

Given the ubiquity of ceramics at Maya surface sites, not surprisingly, ceramics is one of the most commonly found artifact type at cave sites. However, there have been few studies focusing on the ceramics found in cave contexts, and only a fraction of those studies (e.g. Reents-Budet 1980) have placed cave ceramics within the larger framework of Maya cave research and Maya ceramic analyses in general.

Recently, Maya cave sites have begun to receive attention because of their potential to lead to a better understanding of the ritual aspect of the ancient Maya (e.g. Awe ed. 1998; Brady 1989; McAnany ed. 1998; Reents-Budet and MacLeod 1997). One major factor that allows for this is the nature of the cave environment to preserve not only the condition of the artifacts themselves, but also the contexts of the artifacts in which many cases signify ancient disposition of the artifacts. In order to better understand the nature of cave use, it is of utmost importance to record detailed context of the archaeological material found in the cave, followed by a close examination of the artifacts utilizing methodology that allows for future comparative studies.

Although J. Eric Thompson (1975) had compiled a list of ancient Maya cave use, recent research aims for more concrete and finer details of the nature of cave utilization. Obtaining a better understanding of the nature of cave use in the realm of Maya ritual stands as one of the ultimate goals to the Project's investigations at cave sites. In addition, the Western Belize Regional Cave Project addresses several questions (Awe 1998) of which ceramic analyses encompassing various cave sites hopes to help elucidate. Identifying the time span a cave was in use is one of the basic problems to be addressed. Another is examining changes in spatial utilization through time. Certain ceramic assemblages along with other artifacts may indicate the types of activities and rituals carried out in caves and the subjects involved in the activities. Contextual information of the artifacts, including associations of artifacts with other artifacts, architecture, and cave features (i.e. cave formations, cave wall, niches, alcoves, ledges), will be important in identifying the ritual significance of the artifact disposition.

In the previous season, ceramics at Actun Chechem Ha, a cave site in the Macal River Valley, were investigated (Ishihara 2000a; Ishihara 2000b). Type:variety assignations based on the ceramic sequence outlined by Gifford (1976) at Barton Ramie and by Sabloff (1975) at Seibal were established, and temporal and spatial distributions of the pottery within the cave were examined. For the analysis at Actun Chechem Ha to be of any significance in

the wider perspective, a comparative study with other cave sites in the vicinity should be considered. Numerous cave sites have been identified in the Macal River Valley and a few have been investigated. Surface collections and excavations have been conducted in Actun Halal (Griffith, this volume) and Actun Chapat (Ferguson, this volume) in seasons 1999 and 2000, and Yax Caan chultun #1 (though not a “cave” site per se, WBRCP has accorded it to have ritual significance due to its subterranean nature) (Griffith et al. 2000) was excavated in field season 1999. The ceramics from these three sites were the subject of analysis this field season of 2000.

With the ceramic analysis at Actun Chechem Ha as a platform to build on for future ceramic analyses of cave sites in the Macal River Valley and beyond, I stress the need to provide data that can be later used for comparative studies between different cave sites and between cave sites and surface sites. One means for accomplishing this is to assign type-variety names including the type description along with an illustration consisting of a rim-profile and other pertinent information such as decorative features and to provide comparative data from other sites. Furthermore, context, alias provenience, should be reported explicitly and clearly referring to the cave site’s plan map. As mentioned above, the *in situ* location of artifacts within the cave oftentimes have been preserved, and thus have the potential of providing valuable information regarding the nature of activity including spatial utilization.

My goal this season has been to explore the various physical attributes of ceramics and, in turn, to extract the potentially significant elements of ceramic sherds/vessels deemed useful for future analysis.

METHODOLOGY

Based on the ceramic analysis form utilized in previous seasons (Ishihara 2000, Moyes 2000), this season I have attempted to standardize data collection of ceramics found in caves in an effort to compile a more thorough and more consistent cave ceramics database. A revised ceramic datasheet (Figure 1) was formulated, combining insights from numerous staff that have had experience with cave ceramic analysis (Christophe Helmke, Mike Mirro, and Christina Halperin, personal communication 2000).

The kinds of data collected are shown in the sample datasheet. One of the attributes of foremost importance is the modal attribute, or the vessel form¹. Jars, bowls, and dishes are the prominent vessel forms, though in fewer numbers, vases are found as well. “Other” forms can be shoe pot, comal, lid, or modified sherd. In the case of jars, I measured rim thickness and neck height. Certainly, particular characteristics or any appendages such as flange, ridge, basal break, and tripod support should be noted accompanied by a precise illustration, or at the least a sketch. Lip shape (provide a sketch illustrating its character) can also be of great significance when designating type names, and perhaps even demonstrating temporal change. Slip, including color and surface finish, is another important trait in the identification of types. In many cases, paste is a useful item in determining ware (e.g. Pine Ridge Carbonate, British Honduras Ash) and type. Paste description should include paste color, presence of and color of core, temper, and consistency

WBRCP 2000 [CERAMICS DATASHEET]	VESSEL #: _____ PROJ #: _____	DATE: CAT NAME:
SITE: _____	AREA: _____	TYPE: _____
CONTEXT: _____	UNIT: _____ LOT: _____	LEVEL: _____ ILLUSTRATED? VARIETY: _____
FORM: <input type="checkbox"/> JAR [rim: thick(>8mm)/med-thick(5-8mm)/thin(2.5-5mm)/egg-shell(<2.5mm)] <input type="checkbox"/> BOWL <input type="checkbox"/> VASE <input type="checkbox"/> DISH <input type="checkbox"/> PLATE <input type="checkbox"/> OTHER	[orifice--neck: large--wide / small--narrow] [neck: high (>5cm) / low (<5cm)	
Sherd represents (circle all that apply): LIP---NECK---SHOULDER---BODY---BASE---		
% vessel present: < 30% / 30-49% / 50% / 50-74% / 75-99% / 100% (whole)		
% rim intact: < 30% / 30-49% / 50% / 50-74% / 75-99% / 100% (whole)		
CHARRING:interior:LIP---NECK---SHOULDER---BODY---BASE //exterior: LIP---NECK---SHOULDER---BODY---BA		
RESIDUE: NO / YES--sampled? Y / N. Describe _____.	PLANT REMAINS: _____	
Assoc.with? [ROCK/SPELEOTHEM/CAVE FORM./ARCHIT] Describe _____		
CALCITIC DEPOSIT?N/Y--location: _____;%coverage: _____;KILLHOLE:N/Y--location, dimensions _____		
Rim/lip chipped? If yes, what % of entire lip/rim is chipped? _____ %	Sketch top view:	
DIMENSIONS: height of vessel: _____ cm	width of vessel: _____ cm	
rim diameter: _____ cm	rim thickness: _____ mm	thickness: _____ -- mm
CORING: NO / YES--core color: _____	PASTE EXT/INT SAME: YES / NO	
PASTE(EXT): red/ brt orange/ orange/ lt orange/ brown/ lt brown/ tan/ buff/ gray/ black/ _____		
PASTE(INT): red/ brt orange/ orange/ lt orange/ brown/ lt brown/ tan/ buff/ gray/ black/ _____		
TEMPER: untempered / fine / med-fine / med-coarse / coarse		
ash/ calcite/ quartz(angular)/ sand(rounded)/ hematite/ mica/ grog(color: _____)/ _____		
SLIP (base color)--soft/hard/ thin/thick / waxy/matte/glossy/ crazing/ mottled/ eroded		
int: red/ orange-red/ red-orange/ orange/ lt orange/ brown/ black/ cream.Location _____		
ext: red/ orange-red/ red-orange/ orange/ lt orange/ brown/ black/ cream.Location _____		
DECORATIVE FEATURES: 1. Painting. Int / Ext. Color / Description.--		
2. Incising. 1)Fine line. 2)Grooved. 3)Scratched.		
3. Impressing. 1)Punctating. 2)Notching. 3)Stamping. 4)Perforating. 5)Patterned impressing.		
4. Appliques. 1)Basal applique. 2)Decorative element. 3)Notched basal applique. 4)Fillet. 5)Handle.		
5. Striations.Location _____ Well-defined / Faint. 1)Horizontal. 2)Diagonal. 6.Other. _____		
Provide 'to-scale-illustration' or sketch the profile:		

Figure 1: Sample of ceramic data sheet.

of paste. Note decorative features such as any painting, incising, impressing, appliquéd, or striating and a description including a sketch.

Other information in question are: percentage of vessel present, percentage of rim intact or present (there are many instances where the rim/neck portion of a jar is found intact), presence of any charring, and if so, the location of it (exterior side of the vessel/sherd or interior, in which case may signify ritual fire use, and also on what part of the vessel), any residue or plant remains (these could be highly relevant to the identification of organic material of ritualistic significance and also of the type of activity carried out in the cave context), any possible association with a rock, speleothem, cave formation, and/or architecture such as wall, bench, or floor and provide a description of the situation, any calcitic deposit on the ceramic and how much of it is covered (this can indicate artifact movement and help determine primary or secondary context), presence of a kill hole and location, any chipping of the rim/lip, and if so, how much of rim/lip is chipped providing a top view, and lastly, dimensions of vessel including rim diameter (if sherd is small, give a possible range), rim thickness, body thickness (give a range from thinnest to thickest measurement), and if available, height and width of vessel.

RESULTS AND DISCUSSION

Yax Caan chultun #1

During the 1999 field season Christophe Helmke conducted a preliminary examination of the vessels from the Yax Caan chultun (Griffith et al 2000). All specimens were illustrated to scale this season in 2000 and a more complete examination was undertaken. Type designations and illustrations are included elsewhere (Griffith et al 2000).

It is noteworthy that of the 23 total vessels represented, over half (13 out of 23) are jars. The fact that jars comprise the majority of the ceramic assemblage is common at cave sites, as is the case at Actun Chechem Ha. However, at the Yax Caan chultun, only one of those jars is intact and the rest are only the rim-neck portions or rim-neck-shoulder portions of the jar without the body. The body sherds of these jars were not found in the chultun at all (Ishihara, field notes 1999). This could mean that the vessels were either killed before deposition (and the other fragments disposed of) or that the partial jars were used for something other than containers. Also of interest is that one partial jar was found placed inverted. This is not an unusual scene at cave sites, though the reasoning behind the placement of an inverted jar is unknown. Though not a perfect “lip-to-lip” cache, there is a partial Mount Maloney Black bowl placed inverted covering another smaller Mount Maloney Black bowl; further research is needed to understand the significance of such “lip-to-lip” caches².

I hereby also point out the presence of small chinks on the rims and lips of the vessels. As I have mentioned elsewhere (Ishihara 2000b) with the Actun Chechem Ha material, it has been noted that “a possible second type of ‘ritual killing’ of a vessel is the breaking off of a small piece from the rim” (Reents-Budet and MacLeod 1997:59). Many

dishes and bowls at Chechem Ha were found to have a small portion of the rim broken off; the chipped off sherds were not to be located, though this could be due to lack of thorough excavations and reconstructions. At the chultun at Yax Caan, the breaking off of a part of the rim may act as an alternative for the better known circular kill hole since all but one of the specimens lack the body of the vessel.

Actun Halal

Reconnaissance of this rockshelter was carried out during the field season of 1999 in which artifacts on the surface were collected. Results of the preliminary ceramic analysis are reported elsewhere (Griffith 2000).

This past field season, a second and more thorough examination of the ceramics was attempted, but analysis was difficult since much of the ceramics excavated from the units were highly fragmentary and weathered. Also the sherd count was low overall making it difficult for any quantitative comparisons. The results of the type:variety analysis are outlined in Figure 2 (see Figure 3 for sketches of representative samples).

Two Sierra Red bowl sherds (including one specimen that has the red slip of a Sierra Red on the exterior, but the black slip of a Polverio Black on the interior) with horizontally everted, grooved rims and outflared walls were found in two different areas of the cave, from Level 2 of Unit 3 and of Unit 4. However, the rarity of Preclassic pottery in this cave is inconclusive evidence of activity dating back to the Late Preclassic period.

Early Classic pottery is scarce as well. Throughout the cave, Early Classic sherds are few, most of which were found in Unit 3: 4 Minanha Red bowls or dishes, 1 possible small-flanged Dos Arroyos-Actuncan Orange Polychrome, 1 or 2 possible incised Pucte Brown bowl or dish, and 1 possible Caldero Buff Polychrome.

The majority of the sherds appear to date to the Late Classic, particularly to the Spanish Lookout phase. Tinaja Red jars characterized as having a vertical or outflaring neck, thin-walled, a red to brown or at times a black slip on the exterior and neck interior are the most common jar type. Surprisingly, the cruder, unslipped Late Classic jar of the Cayo Unslipped type is very limited as is its predecessor type, Zibal Unslipped. Contrary to the ceramic assemblage at Actun Chechem Ha, jars are not the predominant vessel form at Actun Halal where bowls comprise almost twice as many jars. This quantitative observation perhaps relates to the nature of cave use with cave morphology, since Actun Halal, on the whole, is a rockshelter whereas Actun Chechem Ha is a deeper, tunnel-like cave.

Apart from jars, incurving bowls with rounded sides, a common form in caves, are found in abundance in the Late Classic period. Fugitive Black ware, including the types Mangrove Brown-black, Teakettle Black, Meditation Black, and Mount Maloney Black, is the most common and Garbutt Creek Red bowls which share similar vessel forms are also found. If LeCount's (1996:146-147,150) lip microseriation of Mount Maloney Black bowls proves to be applicable to the previously mentioned types with similar vessel forms, then 6 to 8 specimens are of Late Classic I (A.D. 600-700) and 3 to 4 specimens are of Late Classic II

UNIT 1		
LEVEL 1 (52 unidetified body sherds)		
JAR	Tinaja Red:V.Unsp.	1 rim
BOWL	Uacho Black on Orange	1 base
BOWL	Belize Ceramic Ware	1 base
BOWL	Fugitive Black Ware	1 body
BOWL/DI		
H	Pucte Brown ?	1 flange?
LEVEL 2 (49 unidentified body sherds)		
JAR	Fugitive Black Ware	2 body
?	unidentified: ash ware	25 body
LEVEL 3 (10 unidentified body sherds)		
LEVEL 4 (7 unidentified body sherds)		
BOWL ?	Fugitive Black Ware	1 body
LEVEL 5 (8 unidentified body sherds)		
LEVEL 6 (1 unidentified body sherd)		
UNIT 2		
LEVEL 1 (125 unidentified body sherds)		
JAR	Vaca Falls Red ?	1 body
JAR	Fugitive Black Ware	4 body
BOWL ?	Dolphin Head Red ?	1 body
VASE	Pabellon Modeled-carved	1 body
LEVEL 2 (82 unidentified body sherds)		
JAR	Zibal Unslipped	3 rim
JAR	Tinaja Red: V.Unsp.	1 rim
BOWL ?	Pucte Brown-incised	1 body
BOWL	Garbutt Creek Red form	1 rim
	Tinaja Red ?: brown slip	
BOWL ?	exterior	1 rim
BOWL/	unidentified: brown slip	
DISH	interior	1 base
BOWL	unidentified: unslipped	1 rim
BOWL ?	unidentified	1 rim
LEVEL 3 (18 unidentified body sherds)		
BOWL	Mount Pleasant Red form	1 rim
VASE	Pabellon Modeled-carved	1 rim
LEVEL 4 (6 unidentified body sherds)		
UNIT 3		
LEVEL 1 (82 unidentified body sherds)		
BOWL	Garbutt Crk form	1 rim
BOWL?	Saxche Orange	2 body
	Mangrove Brown-black:	
BOWL	Mangrove V.	1 rim
BOWL/DI		
SH	Actuncan-Dos Arroyos	1 flange
BOWL/DI		
SH	Belize Ceramic Group	1 rim
LEVEL 2 (448 unidentified body		
sherd)		
JAR	Zibal Unslipped	1 rim
JAR	Zibal Unslipped	1 rim
JAR	Zibal Unslipped ?	1 rim
JAR	CayoUnslipped ?	1 rim
JAR	Tinaja Red form	1 rim
JAR	Tinaja Red	1 rim
JAR	Fugitive Black Ware	1 body
JAR	unidentified	1 rim
BOWL	Sierra Red	1 rim
BOWL	Minanha Red	1 rim
BOWL	Minanha Red	2 rim
BOWL	Mangrove Brown-black	1 rim
BOWL	Teakettle Bank ?	2 rim
BOWL	Meditation Black	1 rim
BOWL	Mt Maloney Black	2 rim
	Garbutt Creek Red: Garbutt	
BOWL	V.	1 rim
BOWL	Garbutt Creek Red: V.Unsp.	5 rim
BOWL	Vaca Falls form	1 rim
	Vaca Falls form (same vessel	
BOWL	as in L3)	1 rim
BOWL	Late Classic form	3 body
BOWL ?	Roaring Ceerk form	1 rim
	Orange Walk Incised (or	
?	earlier)	1 body
BOWL/DI	Dos Arroyos (Saturday	
SH	Creek ?)	1 rim
BOWL/DI		
SH	Uacho Black on Orange	1 rim
BOWL/DI		
SH	Belize Red: Belize V.	1 rim
BOWL/DI		
SH	Dolphin Head Red ?	1 rim
LEVEL 3 (118 unidentified body sherd)		
JAR	Tinaja Red-black slip	1 rim
JAR	Fugitive Black Ware	3 body
JAR	unidentified: unslipped	1 rim
	Dolphin Head Red (2	
BOWL	vessels)	5 rim/body
BOWL	Vaca Falls Red: Vaca Falls V.	1 rim
	(may be same vessel as in	
	L2)	
BOWL/DI	Actuncan-Dos Arroyos	
SH	Orange Poly	1 base
LEVEL 4 (38 unidentified body sherds)		
BOWL	Mangrove Brown-black	1 rim
	Unid: red-orange interior,	
?	black exterior	1 base
LEVEL 5 (28 unidentified body sherds)		

BOWL	Dolphin Head Red	1 rim
------	------------------	-------

UNIT 4		
LEVEL 1 (192 unidetified body sherds)		
JAR	Cayo Unslipped	4 rims
JAR	Tinaja Red	1 rim
JAR	Fugitive Black Ware	2 rims
BOWL	Vaca Falls Red: Vaca Falls V.	2 rims
BOWL	Fugitive Black Ware	1 rim
BOWL/DI		
SH	Saturday Creek	1 rim
BOWL/DI		
SH?	Caldero Buff Polychrome	1 body
BOWL	Mangrove Brown-black	1 rim
		17
BOWL ?	Minanha Red (1vessel)	rim/body
LEVEL 3 (59 unidentified body sherds)		
LEVEL 2 (145 unidentified body sherds)		
	Sierra Red (int)/Polvero	
BOWL	Black(ext)	1 rim
BOWL?	Mars OrangeWare ?	1 rim
CUP?		
smallbowl		
?	unidentified: unslipped	1 base
LEVEL 4 (18 unidentified body sherds)		
LEVEL 5 (3 unidentified body sherds)		

UNIT 5		
LEVEL 1 (8 unidentified body sherds)		

UNIT 6		
LEVEL 1 (29 unidentified body sherds)		
JAR ?	unidentified	1 rim
BOWL	Vaca Falls Red: Vaca Falls V.	1 rim
BOWL	unidentified	1 rim
LEVEL 2 (6 unidentified body sherds)		
BOWL ?	Dolphin Head Red	1 body
BOWL	unidentified	1 rim
LEVEL 3 (3 unidentified body sherds)		
JAR ?	Fugitive Black Ware	1 body
BOWL	Roaring Creek Red ?	1 body
BOWL/DI		
SH?	Dolphin Head Red	1 body

Figure 2: Results of type:variety
assignations at Actun Halal by
excavated units.

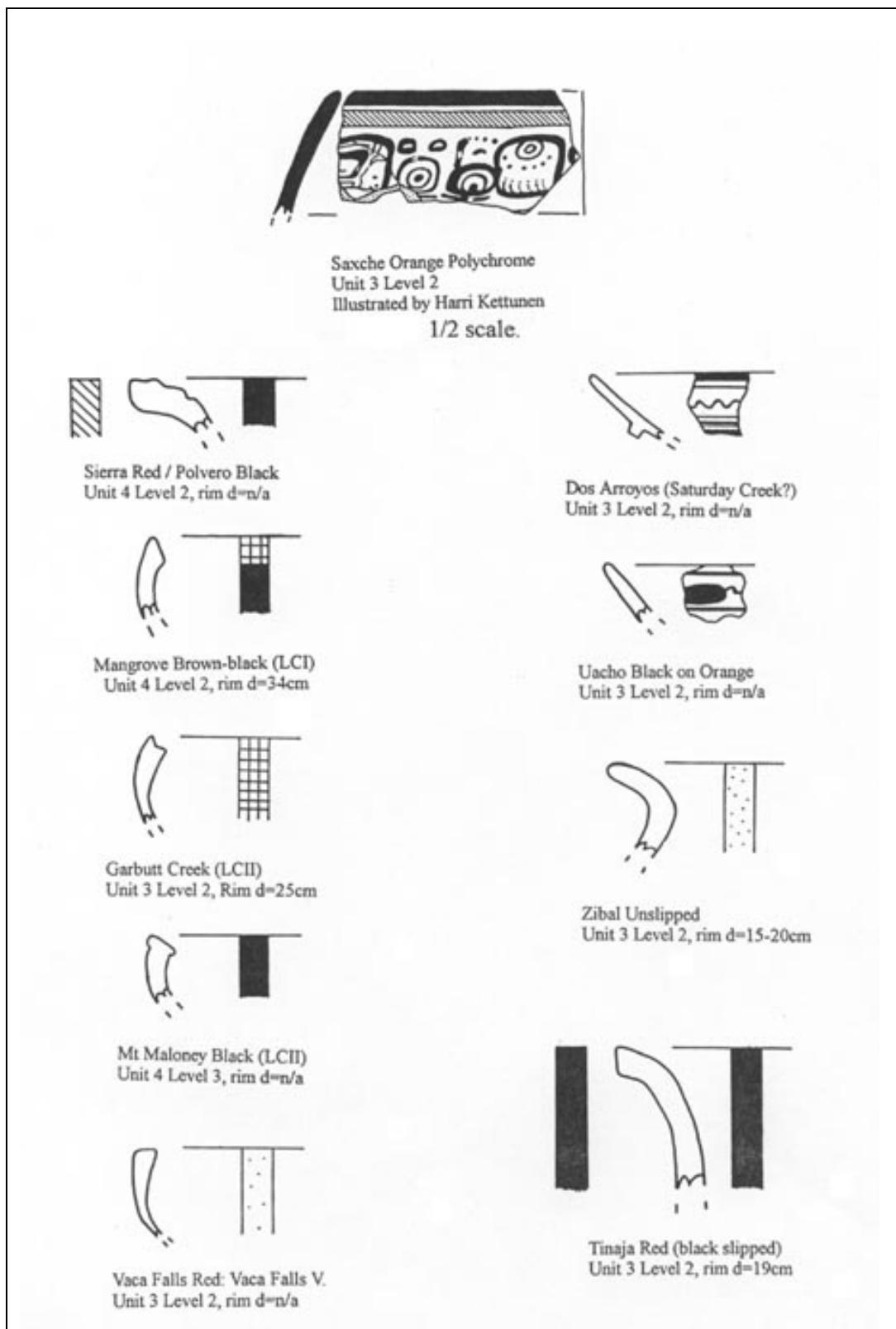


Figure 3: Sketches of rim profiles of representative specimens from Actun Halal.
Note not to scale.

Form	n	% of ceramic assemblage
JAR	22	33.33%
BOWL	37	56.06%
BOWL/DISH	6	9.09%
VASE	1	1.52%
Total	66	100.00%

(A.D. 700-800). Other bowls have been designated to the types Vaca Falls, Dolphin Head Red, and Belize Red.

Another point of interest is the modal attributes of the ceramic assemblage at Actun Halal. Generally, it has been reported from numerous cave sites that jars are the most common vessel form (c.f. Csank 1998:78, Reents-Budet and Macleod 1997:51, Ishihara 2000b). However, at Actun Halal, as mentioned earlier, bowls dominate the scene³; over half of the total vessels represented are bowls, and jars comprise only a third (Figure 4).

As noted earlier, perhaps this difference in ceramic assemblages lies between deep caves and rockshelters, possibly indicating a difference in cave utilization. However, it could simply be a result of excavation technique in that the units excavated do not accurately represent the ceramic assemblage of the entire cave. Yet it does seem plausible that the different morphologies of a deep cave and a rockshelter would provide settings for different activities, thus leaving behind dissimilar artifact assemblages. This will be an interesting aspect to examine for future investigations of rockshelters, as data is still sparse.

As for a spatial observation of Actun Halal, of the six units excavated Unit 3 yielded by far the greatest amount of ceramics, surpassing the amount of sherds excavated from both Unit 4 and Unit 2 combined. This clustering of sherds in one area indicates that activity focused mainly in the area of Unit 3. The area's ritual importance may be emphasized by the presence of a Late Classic Saxche Orange Polychrome bowl with glyphs lining the rim. Also, the only Dos Arroyos Orange Polychrome flanged vessel from the cave comes from this same unit. Unit 4 contained the two other polychromes, Caldero Buff Polychrome and Saturday Creek Polychrome, and the only bichrome type, Uacho Black-on-Orange, was found in Units 1 and 3. Unit 2 revealed a couple of sherds of a Pabellon Modeled-carved vessel. It is quite plain that the elaborately decorated vessels are limited in number at Actun Halal, but that these few sherds are found in specific areas within the rockshelter. The ceramic data alone is inconclusive of why this Unit 3 area, and also the areas of Unit 4 and Unit 2, were attributed with some ritual significance; future analysis calls for an integrated examination of these areas combining the ceramic information, other artifacts, cave morphology, and comparative examples from other cave sites in order to obtain a wider and fuller perspective.

Actun Chapat

During the 1999 field season, surface collections and excavations were conducted in the Entrance 2 area (the Sinkhole Entrance) focusing on the terraced areas along with the flat area at the base of the terraces (Ferguson 2000). The surface collection amassed to an excessive amount of pottery; the majority of the ceramics from the 1999 field season have been analyzed this season.

A similar approach to the Yax Caan chultun and Actun Halal material was utilized. I assigned type names established by Gifford (1976) and Sabloff (1975), and took notes on the various attributes of each diagnostic sherd, mainly following the datasheet illustrated earlier. Non-diagnostic sherds (unslipped body sherds and unidentifiable slipped body sherds) were only made note of a sherd count.

The Entrance 2 area appears to have been utilized from the Barton Creek phase of the Middle Preclassic through the Spanish Lookout phase of the Late Classic. No Protoclassic types have been found, but this may be due to the lack of the ability to recognize types representative of this period. The ceramic types identified in the sample (Figures 6a, b) are listed by time period and rim sherd count in the following table (Figure 5).

Regarding the Preclassic material, bowls are the predominant form, as all 5 of the Sierra Red specimens and 4 of the 6 Hillbank Red specimens are bowls. The spatial distribution of these Preclassic sherds demonstrate that almost all (16 out of 18) of the Preclassic material is recovered from the flat, lowest areas at the base of the terraces, namely the Looters' Pits #1 - 3 area on the western end of Terrace A and Area 1, the spacious Area 1 at the bottommost level among the terraces, and Terrace 1 which is one of the lowest terraces. The total number of fragmented Preclassic vessels represented is 18 vessels.

For the Early Classic, the number almost doubles, being 31 vessels. The majority of the vessels are either a bowl or possibly a dish. With the exception of a few specimens (5 sherds from Terraces 8, 14, 15), the spatial distribution of these Early Classic material clusters below the invisible horizontal line connecting Terraces 4, 11, and 5.

Late Classic sherds of both the Tiger Run phase and the Spanish Lookout phase can be found in all areas of the terraced Entrance 2 area, notably the upper terraces such as Terraces 8, 10, 14, and 15 as well as the lower area where Looter Pits #1 through 3 are located and Area 1. The amount of Late Classic ceramics increases drastically as well. It should be kept in mind, however, that the vast amount of later ceramics may simply result from the accumulation of the latest activities; in other words, earlier material may have been discarded or removed at some point after their ritual use in the cave in order to secure space and accommodate for later activities.

In summary, this vast amphitheater-like area just adjacent to the Sinkhole Entrance has produced evidence for Preclassic utilization of the wide, level area at the base of the terraces. During the Early Classic there appears to be increased activity on the lower

TYPE	JAR	BOWL	B/D	B-brk	B/V	VASE	
Preclassic (total vessel count: 18)							
Hillbank Red	1	4		1			
Starkey Incised	2						
Sierra Red		5					
Polverio Black	1						
Flor Cream (Sierra Red?)		1					
Sampoperro Red		1					
Laguna Verde		1					
unidentified		1					
Early Classic (total vessel count: 31)							
Pucte Brown	1	5	2				
Dos Arroyos			5				
Boleto			2				
Batellos		2					
Yaloche Cream		1	2		1		
Sibal Buff?				1			
Minanha Red		2	1				
Hewlett Bank		2					
Lucha Incised		1	1				
Balanza Black			1				
Dos Hermanos		1					
Tunich			1				
Tiger Run (total vessel count: 101)							
Orange-walk	1	3					
Mountain Pine	6	1	4				
Saturday Creek			14				
Uacho		3	3				
Saxche		1	3				
Juleki			1				
Macal		3					
Silkgrass		2					
Mount Maloney (LC I)		18-19					
Mangrove		4					
Meditation Black		1-2					
Teakettle		1					
Garbutt (LC I)		5					
Zibal Unslipped	26						
White Cliff							
						1	
Spanish Lookout (total vessel count: 274)							
Cayo Unslipped					132-3		
Cayo/Alexander					5		
Tu-tu Camp					1		
Alexander					18		
Cayo/Tinaja					6		
					30-3		
Tinaja Red					1		
Mangrove (LC II-)					2		
					36-3		
Mt. Maloney (LC II-)					7		
Garbutt (LC II-)					10		
Rubber Camp					2		
Martins Incised					1		
Dolphin Head					10	1	
Rosario Incised					1		
Vaca Falls				1?	2	1	
Kaway Impressed					2		
Roaring Creek					1	2	
Benque Viejo					1		
Platon Punct-Inc					1		
Sliver-Creek						1	
Palmar					2		
Zacatel					1	2	1
Late Classic form					2		

Figure 5: Ceramic types at Actun Chapat (Entrance 2) by time period and vessel form. (B/D = bowl/dish, B-brk = bowl with basal break, B/V = bowl/vase).

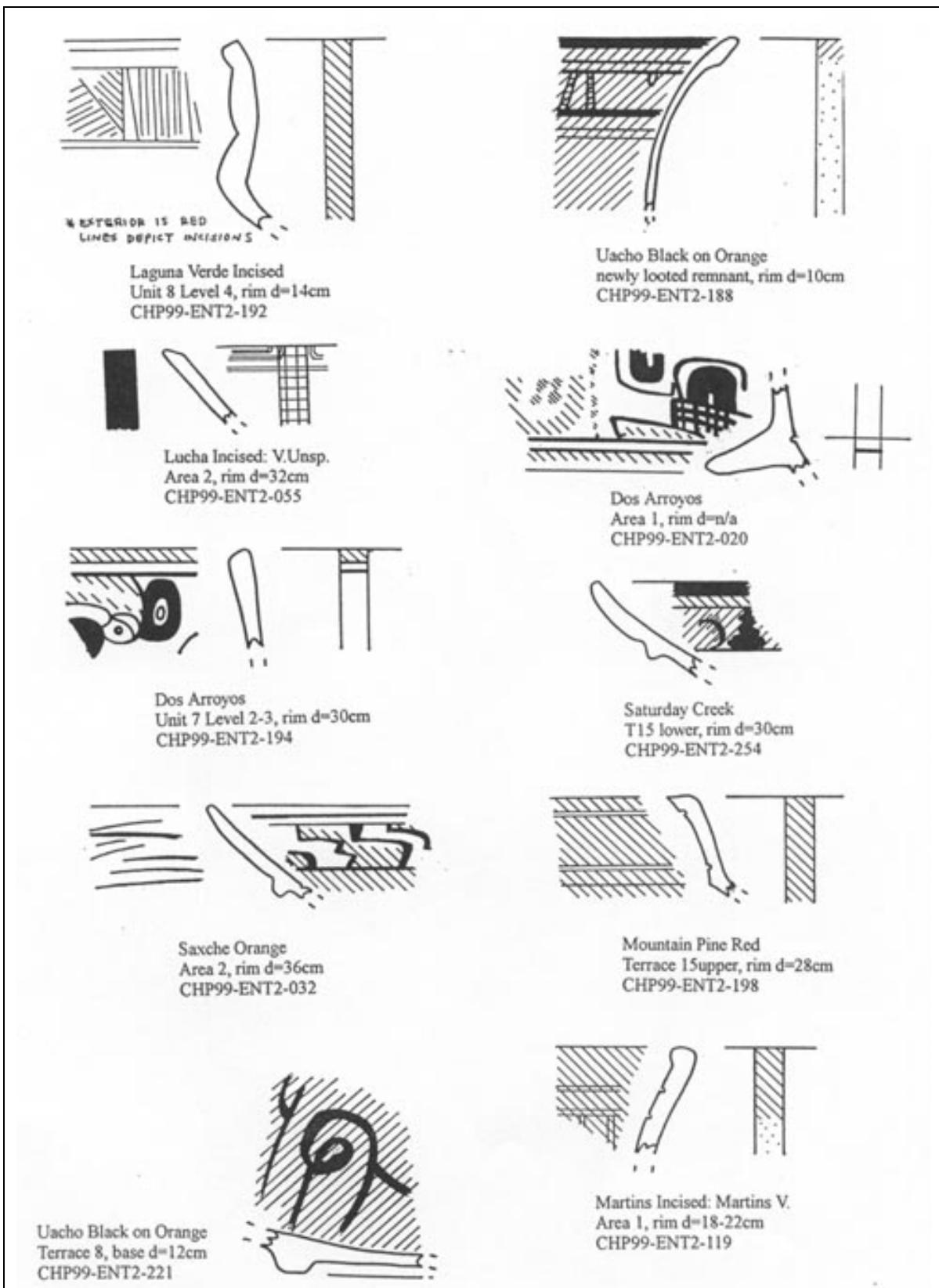


Figure 6a: Sketches of rim profiles of representative specimens from Actun Chapat (Entrance 2 Area). Note not to scale.

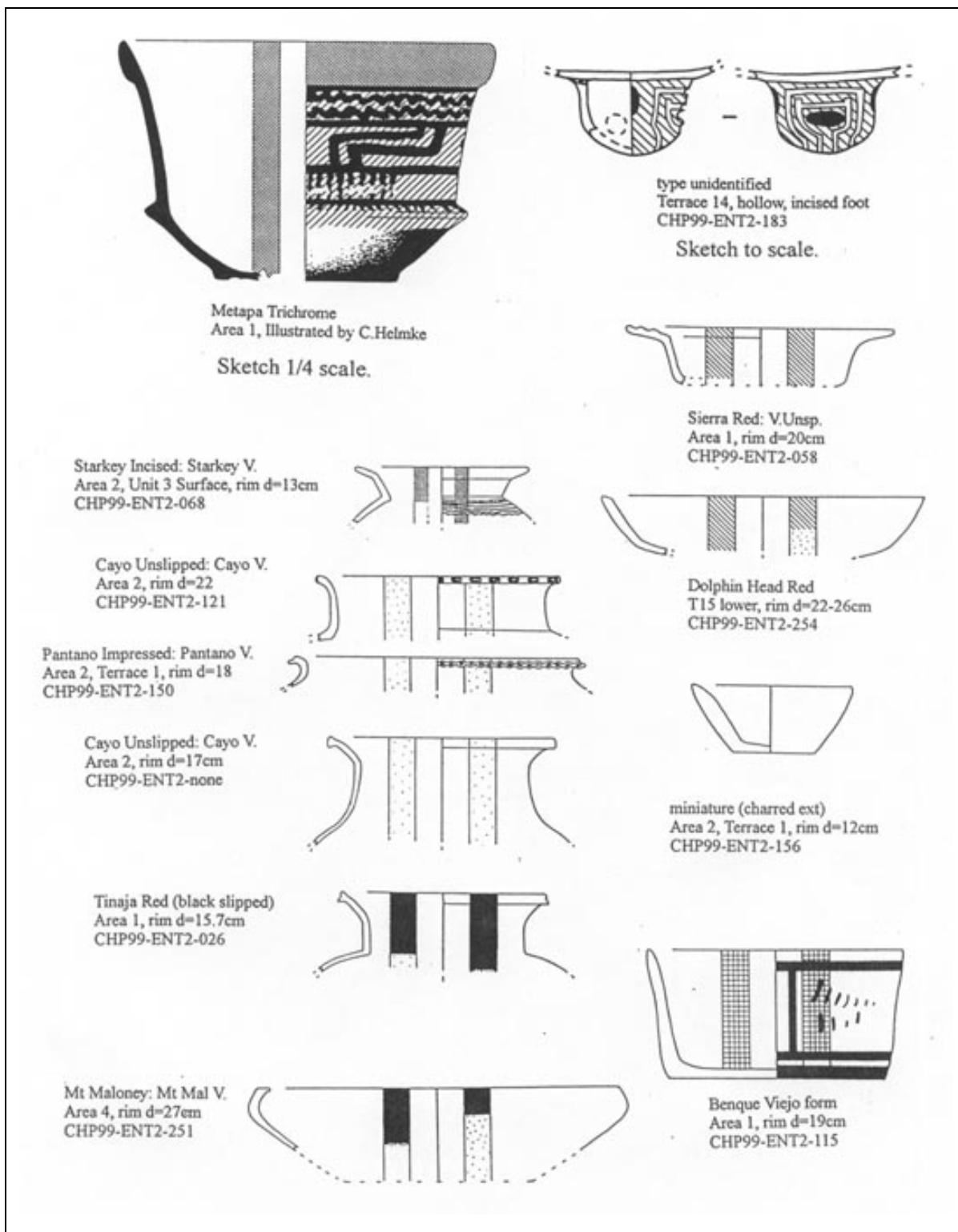


Figure 6b: Sketches of rim profiles of representative specimens from Actun Chapat (Entrance 2 Area). Note not to scale.

terraces, and finally in the Late Classic, use of the entire area, including the higher terraces literally escalates. It is possible that the construction of the lower terraces were undertaken earlier and in separate episodes than the higher terraces, of which the higher terraces may have been added on in the Late Classic. This is difficult to conclude since only a couple of 1 x 1 m units have been put in the lower terraces, and they yielded few diagnostic sherds. If only sherds earlier than the Late Classic are present within the ballast of the lower terraces, then it may be safe to say that the lower terraces were built before the Late Classic. Furthermore, the ceramics excavated from Unit 7 on Terrace 8 may support this hypothesis. Within the ballast of Terrace 8 were contained not only Late Classic (Spanish Lookout) sherds, but also Early Classic sherds and even one from the Preclassic. Though it is possible that the foundation of Terrace 8 had been built in the Preclassic times judging from the presence of a Preclassic sherd in the fourth level of the unit, it is still secure to conclude that the greater part of Terrace 8 was built in the Late Classic, during or after LC II due to the presence of the latest-dated ceramic in the unit, a LC II bowl of Garbutt Creek Red form.

The latest utilization of the area may be dated to the Terminal Classic period. Numerous Cayo Unslipped jars with pie-crust lips were found, as well as the Mount Maloney Black bowls with the horizontal lips (LeCount 1996:146-147,150), both of which are characteristic of the Terminal Classic. There are also many Tinaja Red jars (if indeed the Tinaja Red type can be attributed to the Terminal Classic).

A final point of interest focuses on the number of jars versus non-jars (bowls, dishes) by terrace. At the bottom of the terraces on Terrace A (jar:11, bowl:3, lid?:1), Terrace 1 (jar:36, bowl:18, bowl/dish:3, miniature:1), and Looters' Pits #1-3 (jar:49, bowl:25, bowl/dish:3, modified sherd:1), jars surpass the number of bowls. On the other hand, on the upper terraces such as Terrace 4 (jar:6, bowl:11, bowl/dish:1, bowl/vase:1), Terrace 8 and 9 (jar:1, bowl: 9, bowl/dish:3), Terrace 10 (jar:0, bowl:6), and Terrace 14 and 15 (jar:26, bowl:25, bowl/dish:14, bowl/vase:2), the number of bowls and dishes is greater than the number of jars. There seems to be a pattern that on the lower terraces, there are more jars than bowls, while on the higher terraces, there are more bowls than jars. The mid-line dividing the lower and upper is around Terrace 4; this is the same dividing line mentioned earlier, in which Terrace 4 depicted the general limit for Early Classic use. Could Terrace 4 be a significant marker temporally and functionally? The presence of a plaster "bench"⁴ built atop a retaining wall on Terrace 11, adjacent to Terrace 4 may provide support in this direction. Also there are stairs leading down from Terrace 11 onto Terrace 4, which accentuates the importance of this area.

Returning to the difference in vessel forms found in the lower and upper terraces, perhaps this is related to cave activity. As one ascends the terraces, there are more bowls than jars; as one descends the terraces, jars are more numerous than bowls. It cannot be inferred at this point what type of activity relates to vessel form or vice versa. Up until now, the exact role of pottery in caves has not been a central focus of research; though Thompson (1975:xiv) had noted jars to be used to collect *zuhuy ha*, he does not mention other vessel forms, and Brady (1989:217) suggests small flat-bottomed bowls and some jars to be used as incense burners at Naj Tunich. I agree with Brady in that various vessels may be used as

incense burners as I noted some at Actun Chechem Ha; but what about the vessels that are not used as incense burners or are not for the collection of *zuhuy ha*? The diverse vessel forms and types that comprise cave ceramic assemblages argue for more complex and diverse roles of pottery in the cave. Further investigations pursuing the understanding of spatial utilization, temporal utilization of various areas, and the types of activities based on ceramic assemblages and the pottery themselves will hopefully help elucidate some of these questions while integrating and interacting with other aspects of the cave.

PROBLEMS ENCOUNTERED

There were several problems that I encountered during data collection in the field and the subsequent analysis of the material. First, because vessel forms become highly important within the realm of cave ceramic analysis due to their potential in helping to understand the nature of ancient cave use in various ways, the categorization of vessel forms plays a key role. The categories that have been used most commonly throughout Maya ceramic analyses in general are based on that defined by Sabloff (1975): jar, bowl, dish, plate, and vase. However, I feel that these groups are too inclusive considering the diversity that each form encompasses. Certainly, a verbal description may suffice, but if vessel form proves to be directly relevant to cave activity, then a more detailed categorization (e.g. differentiating between a vertical sided bowl (Zacatel Cream) versus an outflared bowl (Belize Red) versus an incurving bowl (Mount Maloney); restricted neck jar versus a wide orifice jar) will be more helpful and convenient⁵. Utilizing a code to simplify long and detailed category names, such like what LeCount (1996) used for ceramic attributes, may be useful.

Another major problem I have constantly faced is dealing with unslipped jars. The Late Classic jars, such as Cayo Unslipped and Alexanders Unslipped, have been somewhat well described, but earlier unslipped jars especially of the Preclassic and Early Classic are highly ambiguous or simply ignored. Thus data collected for jars tend to be slanted towards one end, and do not accurately reflect the temporal sample within a given assemblage.

A third point of concern is the typology and chronology of Fugitive Black Ware. LeCount (1996) specifies her lip microseriation to Mount Maloney Black types; but since the black monochromes of the Late Classic probably have a continuous development if not a parallel one, the microseriation could be integrated into Gifford's typology and the chronology refined in order to be more widely applicable.

SUMMARY

Ceramic data from Maya cave sites has only started to accumulate. Further investigations are necessary in order to contribute to the still young database. Future studies are anticipated to utilize the database to help elucidate the role that the pottery played in cave activities as well as to clarify the nature of cave activities, finally leading to an enhancement of knowledge of the role of cave utilization within Maya society.

Although I emphasize a comparative study between numerous cave sites, it should be

noted that caution need be taken with regard to conducting comparative ceramic analyses between cave sites. Indeed, the accumulation and procurement of a general cave ceramic database will lead to the clarification and definition of a ‘cave ceramic assemblage.’ Conversely, because the morphology of the caves under investigation thus far vary drastically, a direct comparative study may not be appropriate. If cave ritual activity is relative to a cave’s morphology, then, a variation in the artifact assemblage between different caves can be anticipated. Therefore, cave morphology, context, and other artifacts must be taken into consideration when assessing ancient utilization of the cave and the type of ritual activity.

Nevertheless, the methodology in collecting ceramic data from cave sites is still at the stage of development. Problems such as those mentioned above should be addressed and the results used as building blocks to improve our current methods of analyses. New approaches should be attempted and improvised and attempted again. Ceramic analyses conducted at surface sites may provide a model for those at cave sites, but the different characteristics of cave artifacts as well as of cave assemblages should be realized to its full potential in understanding ancient Maya cave activity.

The ultimate objective of the study is to help understand the ritual behavior of Maya cave use through archaeological remains, particularly through pottery, while referring to information obtained through other fields such as ethnography, ethnohistory, and iconography. For example, ethnography is particularly helpful in reconstructing ritual scenes of the ancient Maya from ritual ceremonies that still continue today. Because symbolism and ideology do not materialize directly, and because the artifact disposition that archaeologists find today in caves are only the end results of a ritual activity, deciphering the nature of ancient Maya cave use, needless to say, is a difficult and challenging task. However, data accumulation from further studies and fieldwork shall pave the way to a clearer understanding of Maya cave utilization and its role within ancient Maya society.

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NOTES

¹ Basic vessel forms are based on those defined in Sabloff (1975:23) as follows: 1) Plate: vessel with height less than 1/5 its diameter. 2) Dish: vessel with height between 1/3 and 1/5 its diameter. 3) Bowl: vessel with height no more than equal but no less than 1/3 its diameter. 4) Vase: an unrestricted or simple restricted vessel with height greater than diameter. 5) Jar: a necked vessel, whose height is greater than its maximum diameter, with an independent restricted orifice.

² There is a "lip-to-lip" cache of elaborately painted bichrome dishes with basal ridges in Actun Chechem Ha atop a high ledge (Ishihara 2000a).

³ Vessel count is based on rim count after subtracting the number of sherds that possibly refit.

⁴ According to field notes written by Josalyn Ferguson in 1999 (in possession by the Project Director), the plaster "bench" is approximately 2.40m wide by 3.00m long. The floor of the area immediately in front of the "bench" is plastered.

⁵ In my analysis, I have added a vessel form "BOWL/DISH" to signify that the vessel may be either bowl or dish, depending on the height to diameter ratio. Most often, this category particulates rather shallow bowls or dishes with a basal flange or ridge.

EXCAVATIONS OF STRUCTURE F-2, CAHAL PECH, CAYO DISTRICT, BELIZE

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INTRODUCTION

During the 2000 field season, investigations began at Structure F-2 at the site of Cahal Pech. Cahal Pech is a medium-sized Maya center located in the modern town of San Ignacio (Figure 1). Structure F-2 is a large building located in the southern edge of the site core. The mound is approximately 19 meters long and 9 meters wide (Figure 2). The building borders two plazas, the G plaza to the east and the F plaza to the west. Previously designated as “service plazas” by Ball (1993), it was thought that the structures in these two courtyards might have served as dwellings for subservient elite assistants.

The goals of the investigations at F-2 were twofold. The first objective was to clear the terminal phase architecture of the structure for consolidation by the Government of Belize Tourism Development Project. The second goal of our investigations was to determine the actual status of the occupants living at F-2. Were the occupants indeed “service” personnel, or did they enjoy a higher status, such as artisans, scribes, or lesser elites?

METHODOLOGY

We began our investigations by setting up eighteen 2 x 2 m excavation units across the southwestern portions of the structure. Through these excavations we expected to locate the front of the structure and find the internal rooms of the building. As our investigations continued, we expanded our excavations and set up an additional 19 units with the intent of clearing the terminal phase architecture. These additional units focused on finding the sections where Structure F-2 corners and adjoins with Structure F-1, uncovering the central doorway, and clearing the eastern side of the structure. In addition to clearing the terminal phase architecture, we also set up four penetrating units along the central axis of the building and six additional penetrating units inside the platform. Additional units were also placed in the plaza, including two in Plaza G and four in Plaza F.

ARCHITECTURE

During the 2000 field season we completely cleared the terminal phase architecture of Structure F-2 and tested all other phases of occupation. We uncovered 9 major and 7 minor modifications of the building (Figure 3). The nine major phases are discussed below.

The Ancient Maya Ruins of
CAHAL PECH
Cayo District, Belize
(Final Phase ca. AD 800)

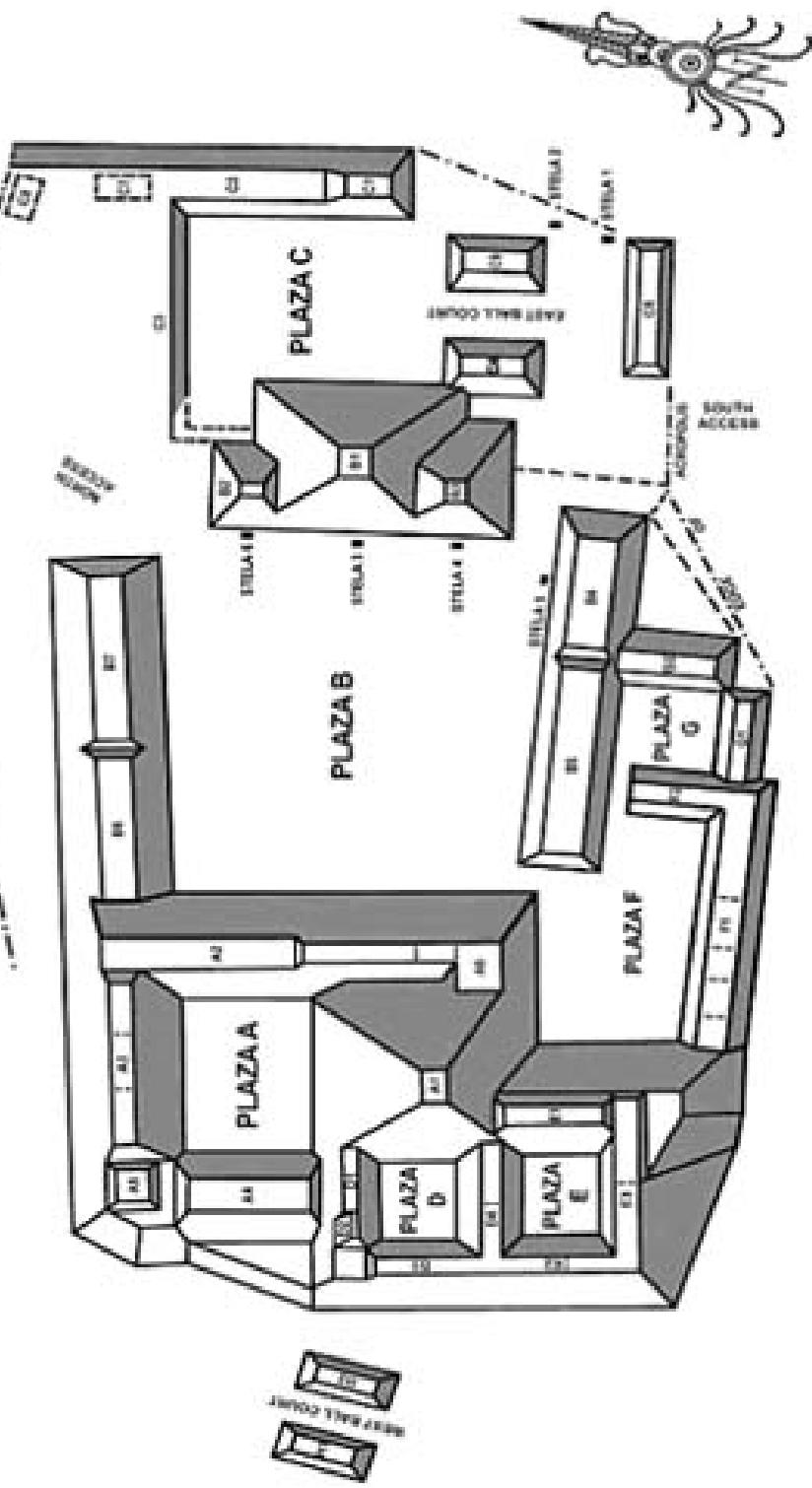


Figure 1: Plan view of Cahal Pech.

Plan View of
Structure F-2,
Cahal Pech,
Cayo District.

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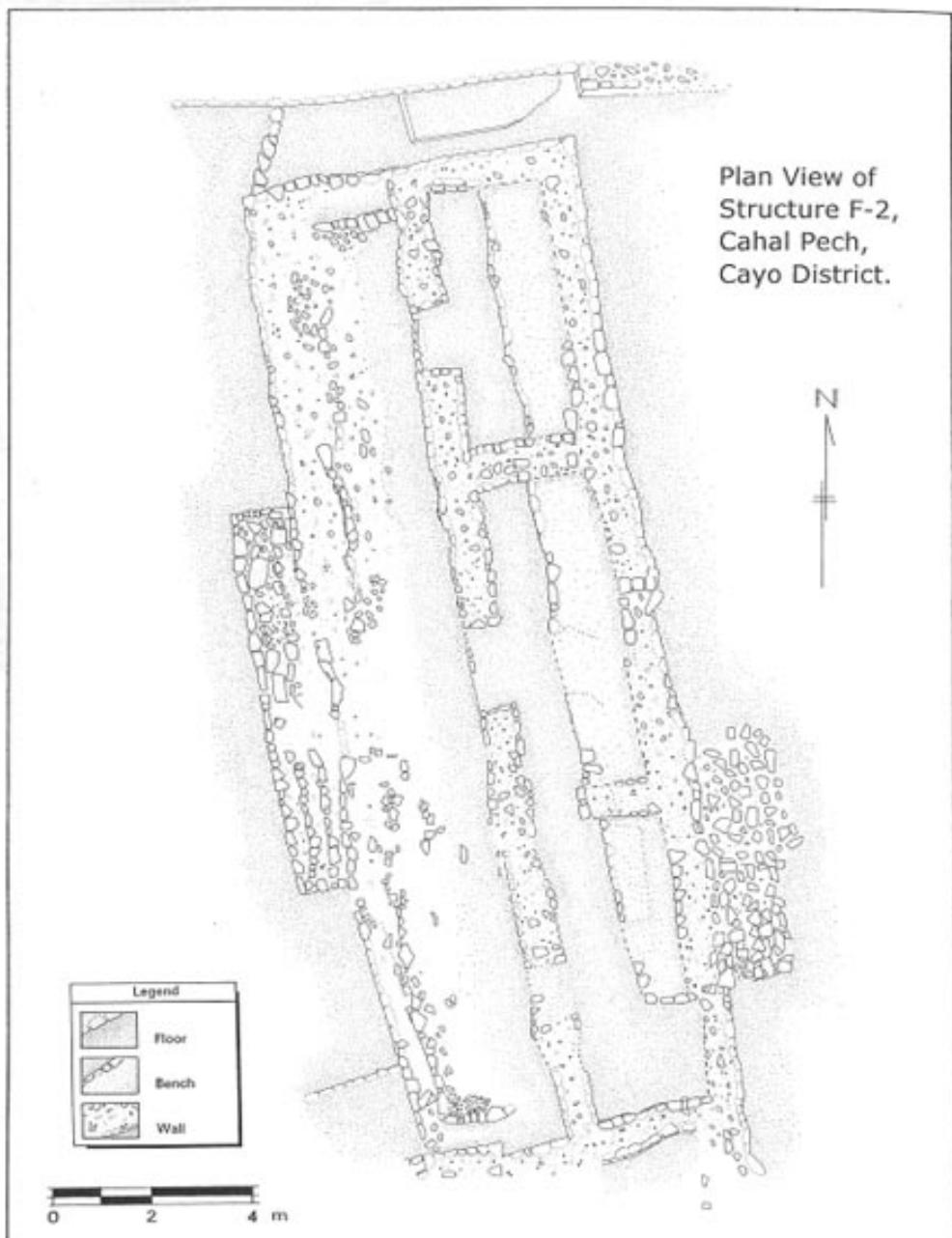
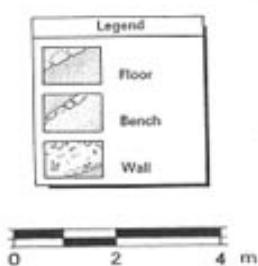


Figure 2: Plan view of Structure F-2.

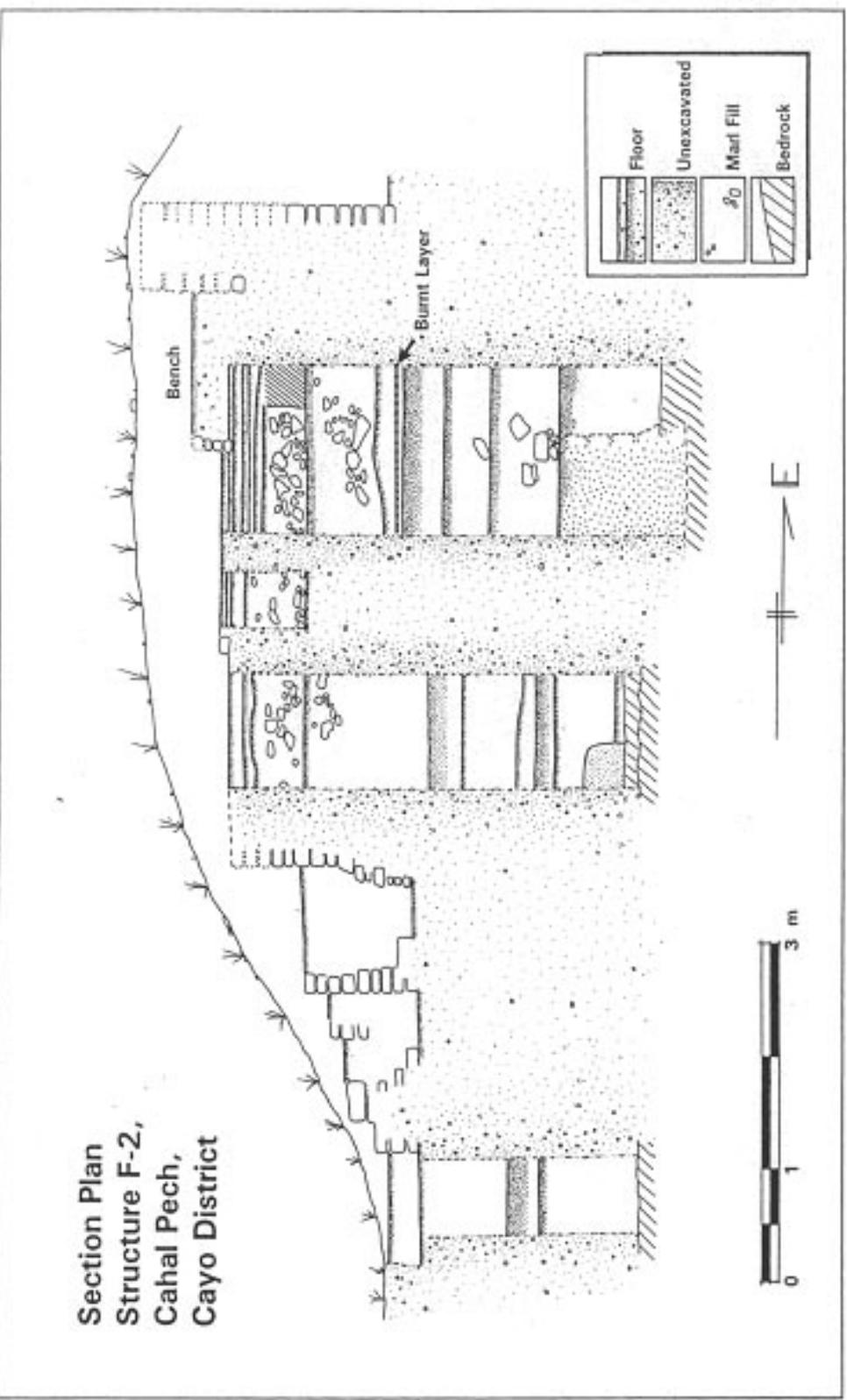


Figure 3: Section plan of Structure F-2, Cahal Pech.

Structure F-2/1st was exposed in Unit 23, approximately 3 m below the plaster floor of the terminal building. The walls of this platform were covered in stucco, so much so that no cut stones were visible through the plaster. The building was 50 cm tall and was built directly above bedrock. Ceramics from the fill of the platform dated to the Middle Preclassic period.

Structure F-2/2nd was recorded in both Units 21 and 23, with a total surface area of 2.5 x 2 m exposed. This building was also constructed during the Middle Preclassic, and consisted of a slightly higher platform (85 cm tall) that encased Structure F-2/ 1st. Construction techniques were similar to the earlier platform, with the building covered in a thick layer of stucco. Individual stones were slightly easier to distinguish, with the majority of the platform made from large (roughly 30 cm thick and 50 cm long) limestone blocks. The building increased the surface area of Structure F-2/1st by at least 2.5 m on the western side of the building. None of the units exposed the steps or terraces of the platform.

Structure F-2/3rd was a small extension of Structure F-2/2nd, with no increase in the height of the building. This construction phase was only identified in Unit 23, and is characterized by the extension of the previous platform floor. The total size of this extension is unknown. This construction phase appears to have taken place in the Middle to Late Preclassic period.

Structure F-2/4th was located in both Units 21 and 23. The floors in these two units do not align, suggesting terracing or steps were part of the architecture. The floor in Unit 23 reflected a 50 cm increase in height from F-2/3rd, while the floor sequence in Unit 23 showed only a 4 cm increase in height. This construction phase appears to have taken place in the Late Preclassic period.

Structure F-2/5th was uncovered in both Units 21 and 23. Due to the limited nature of the excavations at this level, we could not determine the shape or extent of the building. As floors in the two units did not align, it is again possible that terracing or steps were part of the architectural design. The floor in Unit 21 was 40 cm higher than Structure F-2/4th and the floor in Unit 23 was only 20 cm above the previous phase of construction. The ceramics from this level included Middle to Late Preclassic sherds, suggesting that the building was constructed during the Late Preclassic period.

Structure F-2/6th was again exposed in Units 21 and 23. As only plaster floors were uncovered, it is impossible to say anything about the size or shape of the building. The floor in Unit 21 is 30 cm higher than the previous plaster floor. It is probable that the building was terraced, as the floors are not in alignment. However, it is interesting to note that the platform floor for Structure F-2/6th is in alignment with the penultimate Plaza G floor. Perhaps the structure was wider during this phase than any construction phase after it.

Structure F-2/7th was only located in Unit 21. The plaster floor associated with this construction phase was very uneven, and directly under this floor was a cached base of a polychrome plate with graffiti incising. The ceramics in the fill date the floor to the Classic period.

Structure F-2/8th was found in Units 21, 22 and 23, and these floors are all in alignment. In Unit 21, this floor is roughly 60 cm from the previous phase, and in Unit 23 the floor is 1 m above F-2/7th.

Structure F-2/9th or the terminal phase, was completely cleared during the 2000 field season (Figure 4). The walls were constructed from shaped limestone blocks that retained earthen fill. The structure did not support a vaulted roof, however, it is probable that a thatched roof covered the building. The walls and floors were plastered and were probably painted red (we have found evidence of red painted plaster from earlier levels), but poor preservation of the terminal architecture has destroyed most traces of paint and the plaster on the walls.

From the west (or F Group plaza), we have learned that Structure F-2 had a three-step outset staircase leading to two terraces. The first terrace is 1 m high. The second terrace was the platform for the masonry superstructure and extends 1.80 m west of the masonry superstructure. This platform supports three doorways leading into the superstructure. Two of the doors provide access into one long, narrow room, while a third provides access into a separate, smaller room on the north side of the structure. The larger room (Room 1) is roughly twice the size of the smaller room (Room 2). The central doorway is slightly wider than the other two and is directly centered between the two smaller entrances.

The structure is composed of two rooms lined with benches on its eastern side. With the exception of a 1.3 m section at the south end of the room (and the upright dividing walls), these benches continue the entire length of the building. Because of the width of the benches (approximately 1.60 m), the walking space inside the building is small, with each corridor about 1.2 m wide.

At the southern end of the building, excavations revealed that F-2 joined with Structure F-1 at both terraces and that the superstructure also was interconnected. There appears to have been a doorway between the two structures at some point during the Late Classic period, but this doorway was subsequently blocked off during the terminal phase. On the north end of Structure F-2, we uncovered a 7 m long and 1.4 m wide walkway between F-2 and Structure B-5. Excavated previously, this walkway appears to have provided the only access to Plaza G.

A single 2 x 4.5 m axial trench was initially placed to determine what the structure looked like on its eastern side (the back of the structure). We suspected that we would find a series of terraces or steps that would lead to the top of the platform. Surprisingly, we found a wall 1.3 m tall that restricted access from the G plaza to Structure F-2. After clearing approximately two thirds of the back wall we believed that the entire back of the structure limited access to F-2. However, in our last two excavation units we located a staircase (approximately 3 m wide) that led down to the G-plaza on the southern section of the building. The staircase was very poorly preserved with the exception of a 1 m section at the southern end of the stairs.

This staircase would have been unusable during the terminal occupancy of the building. A bench had been constructed in Room One to block the entrance to F-2 from the back. Why these stairs were constructed after the initial wall was built and then subsequently blocked is unknown. It is possible that during some period the occupants of Structure F-2 wanted relations with those in the G-Plaza, however why they would want such relations and then subsequently terminate them is unknown. Regardless, the structure clearly faces the Elite Residential area, and in the last occupation phase, the only way to access this building was to enter through the F-Plaza staircase.

EXCAVATIONS

Forty-two units were placed in our efforts to clear the terminal architecture, an additional 10 penetrating excavation units were placed in Structure F-2 (in relation to the architecture). Of these 10 penetrating units, 4 were on the central axis, 2 were in the northern doorway and 4 were in Room 1. Two units were also excavated in the G-Plaza and five were excavated in the F-Plaza. Because of our interest in both the occupation and status of those living at F-2, we spent a great deal of effort to locate a cache inside the building. Due to this focused excavation strategy, the majority of our penetrating units are located in doorways or central areas of the building.

Structure F-2

Of the ten units excavated inside Structure F-2, only two (Unit 21, 1 x 1.5 m and Unit 23, 1 x 1 m) were excavated until bedrock. A third unit, Unit 22, was placed just inside the doorway to search for the elusive cache. The unit was only 0.50 x 0.50 m, and was terminated after reaching the forth floor, approximately 1 m from the surface when no cache was unearthed. The fourth central axis unit (Unit 17) was placed into the stairs and excavated approximately 1 m below the terrace floor. No caches were located.

Unit 41 (1 x 1.5 m) was placed in the southern doorway to search for a cache or burial, as none were located in the central doorway. This unit was terminated after finding cigarette butts and unit string about 1.4 m from the terminal floor level. After this unit was abandoned, three more units (1 x 1 m) were placed in Room 1. These units uncovered a sequence of Late Classic floors, including a number of replastered floors for the terminal phase building. Cache 1 was located in Unit 47, Level 8, at the north end of Room 1. This cache consisted of a single mano fragment, a broken pottery fragments and over 200 eaten jute (see the section on caches). No burials and no further caches were unearthed in any of the units. We terminated all excavations approximately 1.4 m from the terminal floor.

Two units (1 x 1 m) were placed in the northern doorway (Room 2), one directly inside (Unit 46) and a second (Unit 45) just outside the doorstep. These units were not continued until bedrock because they were placed specifically in search of a terminal phase cache. Three floors were uncovered in Unit 46 and four floors were uncovered in Unit 45. All dated to the Late Classic period. Unfortunately, no cache was located and we stopped the excavation after excavating 1.3 m from the terminal floor.



Figure 4: Structure F-2 after consolidation.

F-Plaza Excavations

Five units were excavated in the F-Plaza. Two were on the central axis of F-2, one directly at the base of the stairs and a second 3 m from the building. The two central units, Unit 24 and Unit 56 were continued until bedrock. Unit 24 (0.70×1.5 m) was located at the base of the staircase. Three floors were uncovered, with the earliest dating to the Preclassic period and the last two floors dating to the Classic period. No features or caches were found in this unit. Unit 56 measures 2×2 m and was located 3 m from the base of the stairs on the central axis. This unit uncovered 7 plaster floors as well as numerous other architectural features. The remains of three distinct structures could be ascertained from the masonry architecture uncovered under the Late Classic plaza. The earliest structure uncovered in Unit 56, F-2/1st, dated to the Middle Preclassic period, with the subsequent phase, F-Plaza/2nd, dating to the Late Preclassic period. Structure F-Plaza/3rd included an increase in the level of the floor and probably provided the plaza floor for a five course high structure. F-Plaza/4th is represented by a new plaster floor approximately 30 cm higher than F-Plaza/3rd. However, this floor does not cover the architecture found directly to the east, and it appears that only the level of the plaza floor was modified during this time. The ceramics from the fill of F-Plaza/4th all date to the Preclassic period. F-Plaza/5th raises the level of the plaza floor 35 cm to match the level of the structure. Again, this floor appears to have been constructed during

the Preclassic period. F-Plaza/6th is a 35 cm increase in the floor level. This floor appears to date to the Classic Period. Due to the limited nature of our excavation, no other architecture was related to this construction phase. F-Plaza/7th is a single course of limestone blocks sitting on the earlier F-Plaza/6th with the terminal floor extending to the south and the older penultimate floor still exposed to the north.

Three other units were placed in the plaza area in search of terminal phase caches. Two units (0.50 x 0.50 m) were placed at the northern and southern junction between the outset staircase and the building, while a third (1 x 1 m) was placed on the southern end of the plaza, in the corner between F-2 and F-1. Unfortunately, no caches were located and all units were terminated approximately 1 m from the terminal plaza floor.

G-Plaza

Two units were placed in the G-Plaza. Unit 57 (2 x 3 m) was placed in the center of the staircase, and Unit 50 was placed roughly 3 m east of the staircase. Unit 57 removed much of the ill preserved eastern staircase and uncovered Cache 2, a ceremonial laurel-leaf point (see section on caches for details). This unit was continued down for approximately 1 m before excavations were terminated.

Unit 50 was initially placed in the G-Plaza to give the workers a place to mix the white lime and cement to consolidate the building. Architecture was uncovered 3.4 m below the surface. G-Plaza/1st was a single course, 15 cm high wall aligned east-west and probably constructed during the Middle Preclassic period. Very little of this wall was exposed due to depth.

Plaza G/ 2nd was a 1.86 m high retaining wall built during the Preclassic period. This wall was on an angle (approximately 30 degrees) possibly to prevent collapse and was 10 courses high. The limestone blocks were faced and were large, with most exceeding 20 cm wide and 30 cm long.

Plaza G/3rd was a plaster floor built 20 cm above Plaza G/ 2nd. Little can be said about this level, except that it evidenced replastering and the limestone floor was quite soft. It almost appeared as though it had not been fired and had never hardened.

Plaza G/4th was built 30 cm above Plaza G/3rd. It was replastered and two burials were found under it. These burials were both found in holes in the plaster floor (see section on burials). It appears that after they were interred, the floors were not replastered.

Plaza G/5th was the terminal floor found 20 cm above Plaza G/4th. This floor was poorly preserved, with only the ballast remaining. This floor was the terminal plaza floor of Plaza G.

BURIALS

Two burials were found during excavations at Structure F-2 and the surrounding vicinity. Both were uncovered in the G-Plaza, in Unit 50. This unit was approximately 3 m from the base of the back staircase, and roughly aligned with the middle of the stairs. Both individuals were located under holes in Plaza G/4th.

Hole 2 was on the northern edge of the unit, forcing us to extend 2 m to the north. Within this hole, approximately 67 cm from the surface, we discovered a sub-adult individual covered in a thick layer of plaster. This individual is approximately 12-16 years of age, with the gender undeterminable (Rhan-Ju Song, personal communication). This individual was found with head to the south, feet to the north, lying on his/her left side. The individual was in the supine position and was very well preserved with almost all bones completely intact. No grave goods were found associated with this individual.

The second individual was located in Hole 3, found in a second extension on the southeastern side of the unit. Very little was preserved, with only a few scull fragments and teeth remaining. However, we do know that the individual was a young child and had his/her head to the south and feet to the north. Again, no grave goods were associated with the burial. Further analysis of both individuals will be undertaken in the future.

CACHES AT STRUCTURE F-2

Five caches were located in and around Structure F-2. All were excavated, drawn and photographed *in situ* before removal. Cache 1 was located in Unit 47, Level 8, at the north end of Room 1. This cache consisted of ceramics, jute and a mano scattered under a room-dividing wall. The ceramics appear to be from more than one vessel and approximately 200 eaten jute were found. It is possible that a ritual feast occurred for this cache (as all the jute are eaten) but we are uncertain as to the ritual or purpose of the cache.

Cache 2 was a laurel-leaf biface, located approximately 1 m from the southern edge of the back staircase, with the tip almost touching the back retaining wall. The biface is made of a honey-colored chert and quite thin. This point measures 15 cm long and its maximum width is 4.5 cm. This was the first elite-quality cache that was found at Structure F-2.

Cache 3 was found in Unit 21, Level 8 (Figure 5). The base of a polychrome plate was found cached in the fill, 10 cm under the plaster floor of F-2/7th. The ceramic was carved with ancient graffiti, providing one of the few recorded instances of ceramic graffiti. The sherd has intricate incisions of a ruler sitting in his temple, with a mountain in the background. This ruler has his arm outstretched and appears to be pointing at something or someone. The temple he is sitting on contains three large terraces all of which have some decoration. It is possible that the decoration was painted and/or stuccoed onto the building. The ruler is sitting on a bench atop these three terraces inside what appears to be a matted room. The temple also includes a roofcomb that is also decorated with a mat pattern. A

large mountain or temple sits in the background. The incision of the building is similar to graffiti found at the site of Tikal.

Cache 4 consisted of ceramics uncovered in Unit 50-extension 2, Level 2, in the G-Plaza. These ceramics were slipped red, and all appeared to be from the same vessel. The vessel is only partially complete, but appears to be a cylinder vase. Nothing was found in association with the ceramics.

Cache 5 consisted of numerous ceramics and a single corn kernel located just north of Unit 45. This was noted during consolidation of the building and was mapped and removed

CACHES ON STRUCTURE B-5

Cache 1 was located in the passageway between Structures B-5 and F-2. The cache was on Terrace 1 of B-5, 40 cm east of the step leading into the passageway between the two structures. This cache consisted of numerous broken ceramics, including a crocodile head whistle, two bird heads, and a complete vessel neck of a jar. A jaguar tooth pendant and a mano fragment were also cached.

Cache 2 was also located in the passageway between Structures B-5 and F-2. It was located directly on Terrace 1, about 30 cm east of the step leading into the passageway. Although the two caches are in approximately the same area, they do not appear to be related. Cache 2 is the remains of a broken polychrome cylinder vase, which appears to be complete. The vessel had a PSS across the top but a more detailed analysis is necessary to determine the image.

SPECIAL FINDS

Because Structure F-2 was being consolidated, a number of interesting finds were uncovered while fixing the superstructure walls and terraces. The most notable was found on the southern end of the second terrace. A second incised "graffiti" sherd with the face of Tlaloc or Chac carved onto it was uncovered (Figure 6). Although not a cache like the other graffiti sherd, this artifact supports one possible belief that the residents of the house were artisans.

Two chert projectile points and one obsidian projectile point were located in the humus layer above structure F-2. One of the chert points was located inside Room 1, 1 m south of the central doorway. A second was located on the back of the structure, on the central axis. The single obsidian point was located at the base of the front outset stairs, on the southern edge. Smaller points have been dated to the Late Postclassic (Chase 1982), however, given the location of these artifacts (in the humus layer) it is possible that these points were left here by Maya returning to the site after abandonment.

EXCAVATION RESULTS

Investigations at F-2 have only begun to shed light on the status and occupations of these living there. Joe Ball (personal communication) suggested that F-2 was the residence of the servants. He believed this because of the close location of the buildings to the elite residential area, the non-corbelled arched buildings that make up the G-Plaza and F-Plaza, what he referred to as shoddy building techniques, and from the debris found in the passageway leading to this royal elite area. Ball admits that his conclusions were not certain, and were made on the basis of cross-cultural comparisons. In the excavations of the 2000 field season, the evidence for “service” status for occupants of F-2 is not as clear.

During our strip excavation of the terminal phase it was evident that F-2 did not support a corbelled arch superstructure. The interior superstructure walls were only partially preserved (the highest being 7 courses high), but in our clearing of tumble we can postulate that the walls would have stood about 1.3 m high. Because of the large amount of collapse, few artifacts found in Level one can be securely noted as being *in situ*. However, the architecture does allow us to speculate about the status of the occupants. I agree that the people living at F-2 were not of the same status as those living in the D, A or E plazas. The architecture is not as tall nor is the roof made of corbelled arch stones. However, when comparing the preservation of the architecture uncovered on A-2 as well as other structures in the elite residential area, the preservation of F-2 was similar. This suggests that F-2 was not put together in a shoddy manner, but was as well built as some of the elite administrative and residential buildings. F-2 is a beautiful, large, and impressive structure that would have been too extraordinary for use by servants.

It would seem reasonable that if Structure F-2 were the home of servants, the elites living in the site core would have made the home of these servants face away from their palace structures. However, F-2 faces directly into the elite residential area and away from the G-group. Perhaps this indicates some alliance with the people living in the larger monumental structures.

It is also reasonable that given the small size of the hill that the site is built upon, servants would have been forced to live in the periphery and walk to the site each day. Elite families have grandparents, aunts, uncles, children and “in-laws”; all who would have wanted to live in the site core.

Also one would expect that if F-2 were the home of servants, we would have found evidence of cooking, weaving or some other activity that would link them to a service for the elites. After clearing the debris off the entire building as well as clearing the plaza from anywhere between 2 to 5 m from the structure, we found no evidence of any activity linking them with service jobs. We did not uncover a single hearth, almost no animal bones or shells were uncovered and there were no middens around the structure. Few implements for procuring food were found, and those that were found were from the collapse or fill. From

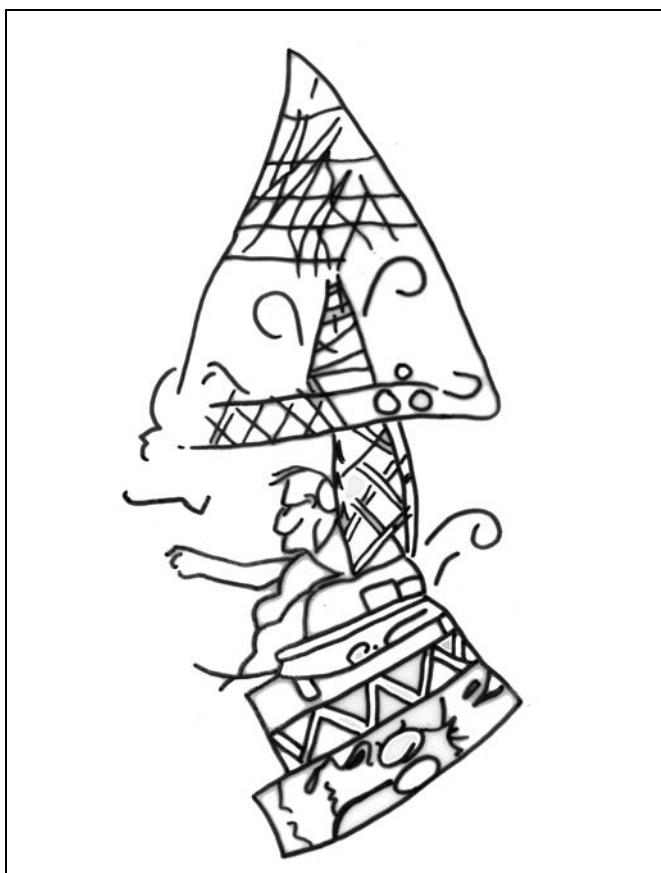


Figure 5: Graffiti found on cached ceramic sherd in Structure F-2.

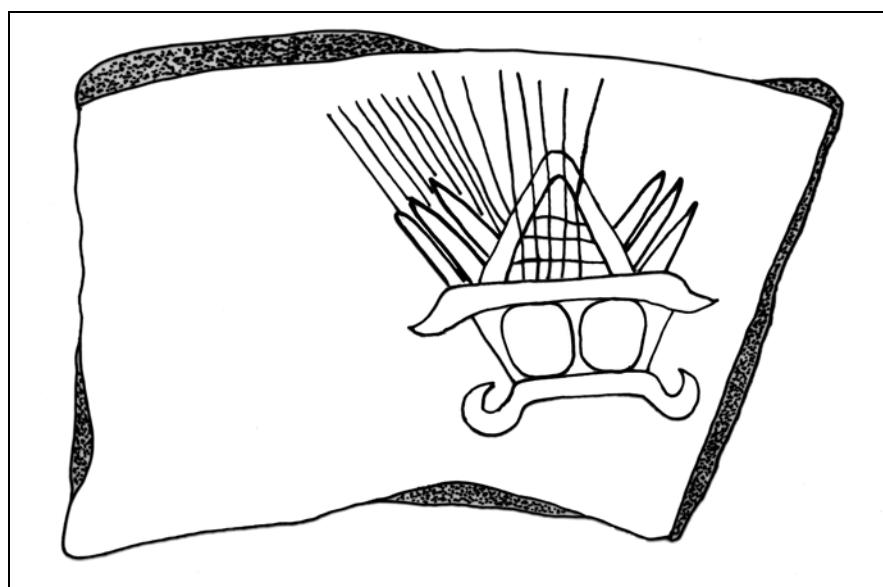


Figure 6: Graffiti found on ceramic sherd at Structure F-2.

both the architecture and the artifacts uncovered, it appears that those living at Structure F-2 were not servants.

Although the architecture revealed some clues about the residents of F-2, we were hoping that through excavations we would uncover a cache or burial that would give us strong evidence regarding the status of the people living at F-2 during the terminal phase. The laurel-leaf point suggests that those living at Structure F-2 had some access to wealth, however, due to the limited nature of the offering (only the one blade) it does not suggest royal elite wealth. A possible cache and a second artifact were found that might provide a link between those living at F-2 and their status or profession. The remains of a polychrome plate with incised graffiti were found in the fill of F-2 under a succession of replastered floors in the platform. Someone with knowledge of artistic perspective and Maya art carved the graffiti into the plate. The second graffiti sherd had the head of Tlaloc or Chac carved on it. Could the residents of F-2 have been some scribes or artisans, or were they lower level elites with enough status to live in the site core?

DATING

The ceramics uncovered during the 2000 field season range in date from the Middle Preclassic to the Late Classic period. The earliest occupation at F-2 appears to have begun with a small Middle Preclassic platform about 60 cm high. The architecture appears quite crude, with river cobbles and limestone blocks covered in a thick layer of plaster. To acquire ceramics from which to date this structure, we tunneled into the western wall of Unit 23 and placed a 40 cm by 40 cm unit in the platform. The structure that covered our earliest building (or Structure F-2/10th) measured approximately 40 cm higher and 2 meters wider on its' eastern side. Both of these structures appear to have been constructed in the Middle Preclassic period.

The next three construction phases also appear to have exclusively Preclassic ceramics in the fill. One or two Early Classic construction phases have been detected. The last 2 construction phases (not including the 4 to 5 different replastering of the terminal floor) appear to have been built during the Late Classic period. Very little evidence was found for Terminal Classic or Postclassic occupation at F-2. A single side-notched obsidian arrowhead was found in the humus layer, and two side-notched chert arrowheads were also uncovered in humus layers. The obsidian arrowhead is thought to be of very late origin (i.e. Late Postclassic) by Dr. Elizabeth Graham (personal communication), though the chert arrowheads are thought to appear by the Terminal Classic period. There is evidence at other structures at Cahal Pech of post-abandonment caches and it is probable that any late material found at the site is in relation with people returning after its abandonment.

CONSOLIDATION

The consolidation of Structure F-2 was a learning process for all involved. Our objective was to replace the architecture that was still *in situ* (through drawings and photos) but reset the stones with a new plaster/cement mix. Our intentions were to only use cut

stones from our excavations for rebuilding, but as we ran out of stones, we began to use stones from around the site. We did not build any walls above the height we had evidence for (through the collapse recorded and from what was preserved) but we did rebuild sections to make the architecture clearer to those visiting the site.

We began by consolidating Terrace 1 and the front outset staircase. Although the staircase was well preserved and required minimal re-building, two rows of cutstones were needed to bring terrace one to the correct height. We were certain of this height, as the floor of Terrace 1 was preserved in places and we had the base of Terrace 2. Terrace 1 was not a straight wall. We discovered that there were three sections of the wall, with the two outer sections angled slightly back. While consolidating, we noted that this terrace continued behind the staircase, suggesting that the stairs were a modification of an earlier building.

Terrace 2 was more difficult to consolidate due to the discrepancies between the north side and south side of the terrace. On the south side of the building, Terrace 2 appeared to be well preserved and was 50 cm from Terrace 1. On the north side of the building, however, Terrace 2 also appeared to be well preserved and it was 80 cm from Terrace 1. The center of Terrace 2 had been completely destroyed by a cedar tree, and we were left with the question of which side to preserve. The construction techniques appeared to differ between the two sections. The south end was constructed with large cut stones, a style different to the rest of the building. The north side was constructed with smaller cut stones, more closely resembling the rest of the architecture. Due to the similarity of the north side of Terrace 2 with the rest of the building, we made the decision to consolidate that line of stones and rebuild the rest of the wall roughly 80 cm from Terrace 1.

The superstructure was relatively easy to consolidate due to good preservation with the exception of the southern doorway. During excavations we discovered that the southern section of Room 1 had been excavated previously. Although we do not know who excavated there, they removed the southern portion of the doorway. With this section missing, we were unsure as to the width of the door. To solve this problem we took measurements of the northern doorway, and applied them to the southern one. As the outer doorways began at the same distance from the central doorway, the building was most likely symmetrical and this is the way we decided to consolidate it.

The back or eastern wall proved the most difficult to consolidate. During occupation, this wall would have risen over 2.6 m high, but when it was found, the wall was only 1.4 m tall. A large number of collapsed cutstones were found at the base of the wall and we used them for consolidation. Many of these stones had broken however, and we were forced to scavenge stones from other piles around the site to build the wall to a reasonable height.

Structure F-2 was completed in November 2000. The stairs leading to the second terrace were plastered to protect the building from tourists who will be climbing the structure. However, to blend the structure with the densely forested surrounding, grass was planted on both Terrace 1 and Terrace 2. Within the next few months the area should dry substantially, and tourists will be allowed to climb on the building.

CONCLUSIONS

Excavations during the 2000 field season proved fruitful. The terminal architecture of Structure F-2 was uncovered and we now know that the structure had an outset staircase facing the F-Plaza, had two terraces that led to a masonry superstructure, and that the roof was made of thatch and not a corbelled arch. We also know that the structure faced the F-Plaza, with an earlier and smaller “side” staircase leading to the G-Plaza that was not used during the terminal phase of the building.

We have also addressed the status of the occupants of Structure F-2. Our belief is that they were not merely servants of the elites, but could be non-royal elites or artisans. This is supported by the high quality of architecture, the graffiti sherds uncovered, the orientation of the building, and the single laurel-leaf point. We were fortunate that funds were obtained for the majority of the excavation and for the consolidation of the building through the Tourism Development Project of the Government of Belize.

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PRELIMINARY REPORT OF EXCAVATIONS AT STRUCTURE D-1, CAHAL PECH, CAYO DISTRICT

**David Lee
Belize Valley Archaeological Reconnaissance**

INTRODUCTION

The site of Cahal Pech is located in the western Belize Valley, within the geographical limits of the town of San Ignacio, capital of the Cayo District. The main public centre of the site is located on a hilltop on the southwestern edge of town. The natural hill elevates the ancient acropolis so that it is visible from most of the neighbouring sites in the area.

The site core of Cahal Pech is composed of some 35 buildings arranged around 8 plazas. The site has been visited and investigated for nearly a century, but intensive excavations did not take place until the late 1980s when the expansion of San Ignacio town threatened to destroy the site. In order to prevent the destruction of the site, the Belize Government declared it a reserve and intensive investigations began in 1988 under the direction of Jaime Awe. Investigations continued at the site until 1995, and then resumed this past summer.

Previous investigations (Awe 1992) indicate that the site was occupied in the Early Preclassic (ca.1100 B.C.), and was abandoned in the Late Classic period (between 800 and 850 A.D.). The geographical restriction of the hilltop resulted in an elaborate series of structural renovations at the site, making the site core of Cahal Pech an interesting location for the study of ancient Maya architectural design (Figure 1).

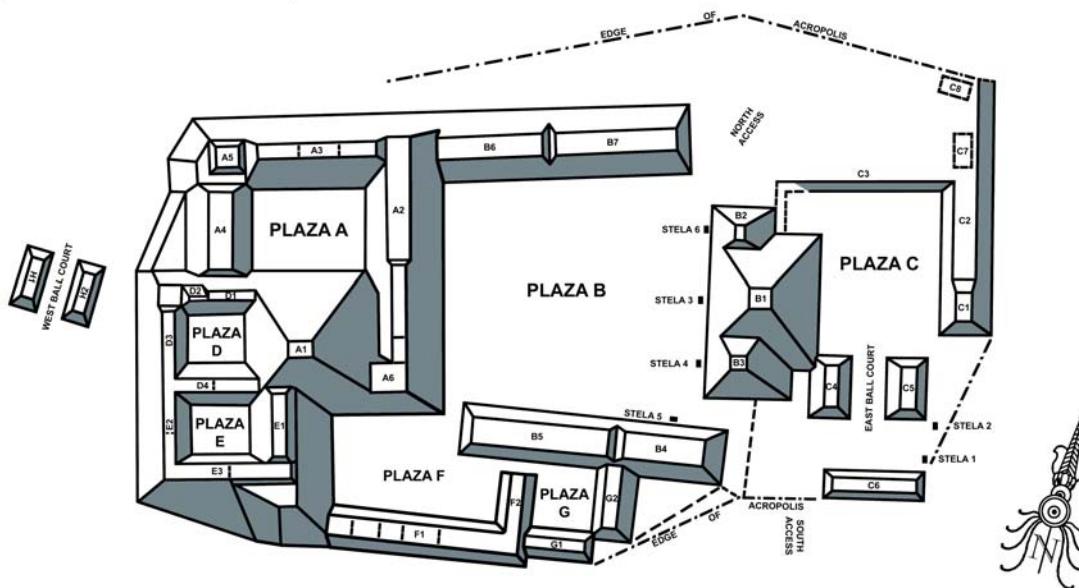
Plaza D is located on the western edge of the acropolis centred between the primary residential complex and Plaza A. Structure A-1, on the southern side of Plaza A, is the highest pyramidal structure at the site and forms the eastern side of Plaza D. Plaza D is elevated approximately seven to eight metres above Plaza A's southwest corner. There are four identifiable structures in Plaza D. Structure D-1 forms the north side of the plaza, D-2 the western side, E-1 the southern side, and as mentioned above, A-1 lies on the eastern edge. On the southeast corner of the plaza, there is a single access point leading to the residential complex.

RESEARCH OBJECTIVES

Plaza D was selected as a site for investigation in the 2000 excavation season for a number of reasons. First, Plaza D received little attention in the investigations conducted at Cahal Pech in the late 1980s and early 1990s. During that time, only one unit in the plaza and one unit on the northern side of D-1 were placed in this group of structures. Second,

Fig. 1

The Ancient Maya Ruins of
CAHAL PECH
Cayo District, Belize
(Final Phase ca. AD 800)



Computer Rendering by: David F. Lee
Based on Original Map by BVAR Project 1989

investigations hoped to ascertain if there was a point of access to Plaza D from Plaza A, as it was hypothesized that elucidating patterns of movement through the site might shed light on the function of Plaza D. Finally, investigations were aimed at excavating Structure D-1 with the idea that the architecture might be consolidated for the archaeological reserve in conjunction with a pending multi-year development project funded by the Government of Belize through the Inter-American Development Bank.

EXCAVATIONS

A series of 15 units were placed in Structure D-1 to expose the terminal structure by removing the humus layer and collapse (Figure 2). Field school students and volunteers conducted this work. All units were aligned to magnetic north. All matrix excavated was sifted through a $\frac{1}{4}$ -inch metal screen. Material collected during excavation was collected and recorded using a modified lot system. This system divided the material collected by units (horizontal) and by levels (vertical), and subdivided the material by non-repeating sequential lots (both vertical and horizontal).

In general, the placement of units followed a strategy with three objectives: 1) to define the outer dimensions of the structure; 2) to investigate the structure interior; and 3) to determine the relationship between D-1 and the structures adjacent to it.

To this end, initially, units were placed based on surface features of the mound. There were two visible “saddles” or depressions in the mound top. The western one was initially thought to be the gap between Structures D-1 and D-2. The eastern “saddle” that was symmetrical with the exposed doorway across the plaza in Structure E-1 was believed to be the doorway of D-1. Units were placed over each of these “saddles”.

Upon excavation, however, the western “saddle” was found to be a doorway leading from Plaza A to a passage that passed through the centre of D-1. Both of these doorways had been blocked in subsequent renovation(s). The presence of these doorways indicated that the structure continued further to the west than was previously thought. The eastern “saddle” was actually formed by the accretion of soil where the eastern end of the building meets with the double course spine wall (a continuation of the structure’s north wall) that connects D-1 to A-1 (Figure 2).

The passageway was filled with collapse from the roof of the structure. The presence of numerous bevel-edged stone slabs indicated that the roof was a vaulted corbelled arch, consistent with the construction throughout Plaza A to the south and the residential complex to the north. Vault stones were present in the fill, found stacked at an angle. The fill in this area was a whitish-grey limestone marl fill, containing large quantities of plaster. At the level of the terminal occupation floor, plaster from the roof had dissolved and re-conglomerated into a mass of pure white plaster (Figure 4). One fragment of plaster with blue pigment was found within this level, indicating that part of the interior had been painted in this colour.

Figure 2: Plan View
Cahal Pech
Structure D-1



The terminal floor was found in excellent preservation, a characteristic consistent throughout Cahal Pech. The floor was extremely hard and consistently level throughout the structure, varying by only centimetres throughout the excavation. Remnants of paint were also visible on the floor surface.

Following the excavation of the passageway, additional units were initiated to expose the structure interior to the east of the blocked passage. A well-preserved plastered bench feature was found, centred in a doorway on the south side of the structure (Figure 3). The bench has bevelled “armrests” on each side. On the east, the bench abuts the eastern structure wall; on the west, the bench is free-standing, edging onto the passageway mentioned above. Sections of red paint were preserved on the western “arm” and on the western side of the bench. The curving edges of the bench and the careful attention to detail on the western side of the bench where the armrest flared out at the top and then angled down to meet the bench surface, as well as detail on the outside of this armrest where the sloping outer face ended with a gentle curve, indicate that this feature was built, not only for its functionality, but for aesthetics as well. The south interior wall (Figure 5) contained intentional penetrating holes into the wall, perhaps related to curtain retainers.

The western extent of excavations exposed a room wall, the southern half of which, at one time, had been an interior dividing wall between rooms within Structure D-1 (Figure 2). The northern half of the western wall consists of another blocked doorway, easily distinguishable by the difference in construction technique and stone used. Clearly, at one time, a passage connected these two rooms. This alters previous interpretations of Plaza D (which were based on results from small areas of exposure) since it is now clear that Structure D-1 continued further to the west.

Excavations on the exterior of the structure were taken down to the level of the terminal plaza floor in Unit 3. The plaza floor was found approximately 1.2 metres below surface. The terminal plaza floor was in excellent preservation. Collapse from the D-1 superstructure was visible throughout the excavation indicating that at least part of the vaulted roof had collapsed forward into the plaza.

Once the exterior of the structure wall was established, additional units were placed adjacent to Unit 3 on the east to follow the front of the structure. Excavations in Unit 4 in the other “saddle” established the presence of the spine wall described above, and so it was clear that D-1 cornered to the north several metres west of A-1. While time did not permit excavation of the entire exterior, the extent of Structure D-1 was established through the excavation of the interior wall of the structure, abutting the east end of the bench.

In summary, the excavations exposed the terminal phase of the eastern room of Structure D-1 which was a vaulted range-type structure. The eastern room contains a bench feature, and originally had four points of entry: two from Plaza D on the south, one from Plaza A on the north, and one from the western room of structure D-1. In a renovation, or series of renovations, three of these access points were blocked. Though not proven by excavation, it seems likely that there was another doorway on the south side of the structure further to the west. This would create the symmetry typical of Maya monumental structures,

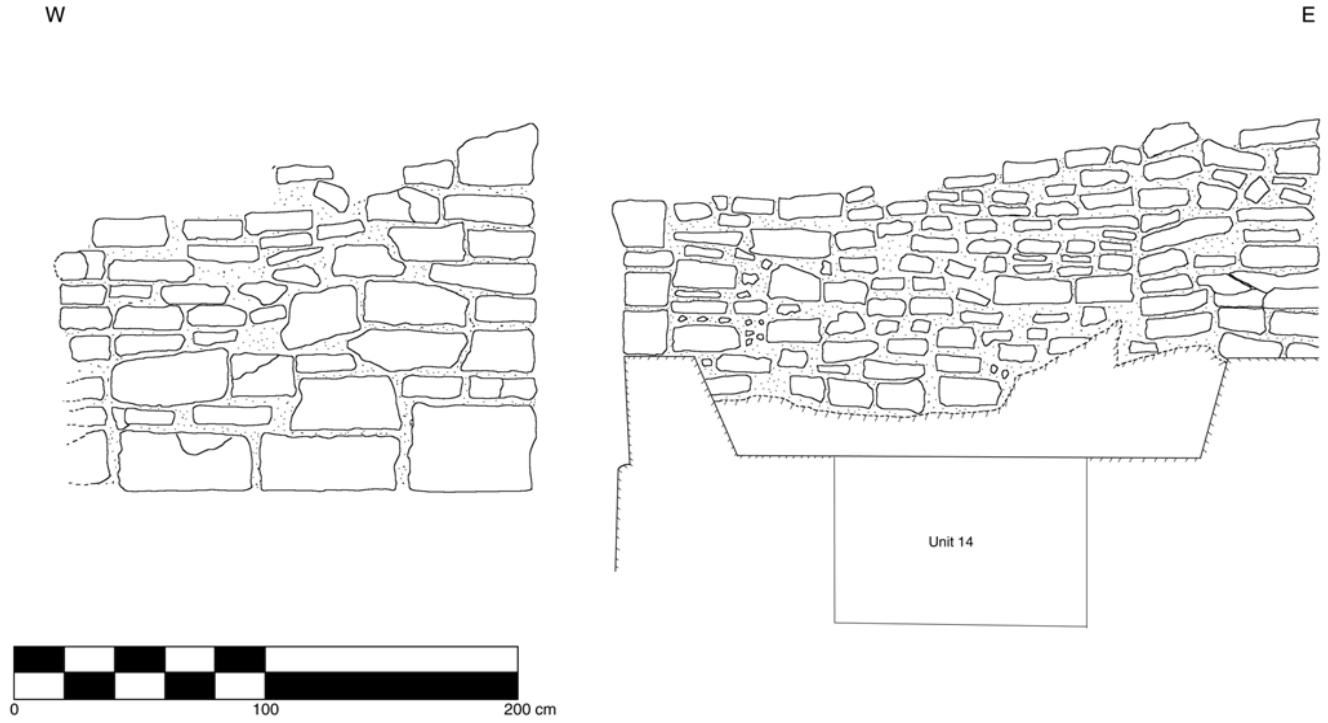
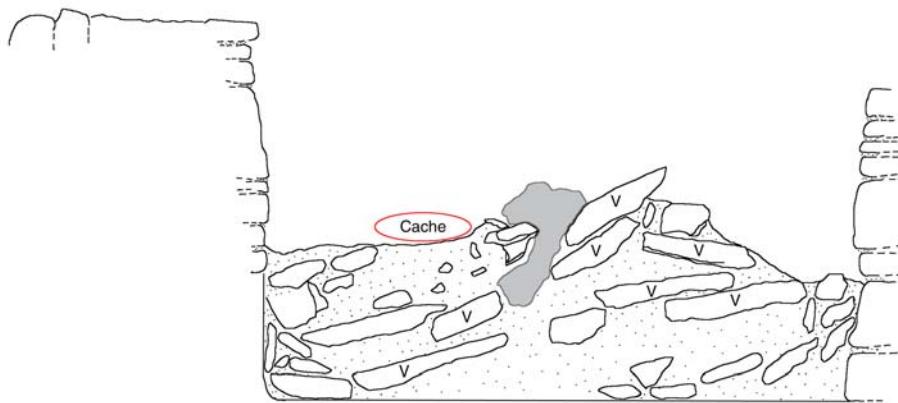


Figure 3
Cahal Pech
Str. D-1
Profile of North wall of structure showing bench and blocked doorway
(the doorway has been set to the left to better show the detail of the masonry)
Drawing by J. Puc
N. Puc
Computer rendering by: D. Lee
July 2000



V - Vault Stones

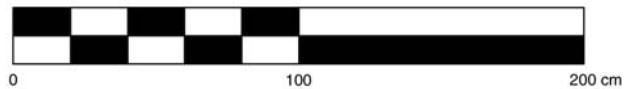


Figure 4:
Cahal Pech Structure D-1
West Interior Profile
Debris from Collapsed Vault
Drawing by: D. Lee
S. Gibbs
V. Renados

with one large central doorway on the north side and three doorways on the south side, the central doorway providing the passageway through this structure and access to Plaza D from Plaza A (Figures 2 and 6).

Excavation units designed to test through the terminal floor of the building found that there were two re-plastering episodes that were likely associated with the terminal phase structure. Below these re-plastering episodes, a previous phase platform retaining wall was found in the western floor unit. The plaster surface topping this wall was also found in the eastern floor unit. The position of this wall running east-west across the unit and the presence of the floor in the east unit approximately 2 metres away suggest that this may have been the edge of a previous plaza floor. Due to the elevated position of Plaza D, it was impossible to take the excavation to bedrock this season. Since the other goal of the excavations was to expose terminal architecture for possible consolidation, excavation that would result in the destruction of the terminal architecture was prohibited. As a result, no further phases of architecture were uncovered.

ARTIFACTS

Ceramics

One of the interesting aspects of the excavation of Structure D-1 was the relatively low frequency of artifacts found during excavations. The terminal phase of the structure was almost devoid of ceramic material with the exception of intentional deposits. While this in itself is not unusual for monumental constructions at Cahal Pech, what is unusual is that few artifacts were found in the fill excavated from the bench and in the floor units.

What is of interest is that a number of the special deposits found were clearly evidence of post-abandonment activity at the structure. This indicates that following the abandonment of Cahal Pech and the dissolution of the site's political power base, local people returned to Structure D-1 for ritual activity. Even with this contribution to the material record of the structure, however, the activity at D-1 following the site's abandonment was very specific and apparently not repeated, resulting in only minimal deposition of artifact material.

The majority of ceramic information on the structure comes from special deposits. Of particular note, was the presence of four post-abandonment caches. Two of these deposits were placed in the building approximately 40 cm above the terminal floor, atop fallen roof stones and accretion, in the southeast and southwest corners of the room. Both were deposited in areas of burning. A detailed analysis of these materials has not yet been conducted, but a cursory examination of these ceramic deposits noted the presence of Terminal Classic ceramic types and large fragments of "pie crust" rimmed censer lids.

A third deposit was found in the doorway on the south side of the building, also approximately 25 cm above the terminal floor. These ceramics have not yet been typed. The fourth deposit was found on top of the spine wall that connects the east side of D-1 to A-1. This consists of a single partial vessel, which is typed as Lucha Incised (Gifford 1976),

placed on the humus on top of the wall. The presence of this Early Classic vessel fragment on top of a Late Classic construction within possible post-abandonment context is particularly interesting since it suggests that the Maya were keeping older vessels, essentially antiques, and then placing them in ritual context in the Terminal Classic. There is similar evidence for this practice at the Zopilote Group in the periphery of Cahal Pech (Cheetham et al. 1994), where a late Preclassic carved stela was entombed in a Late Classic construction phase.

In addition to these deposits, there were several other termination caches found on the terminal architecture. A partial red-slipped vessel was found on the southeast exterior corner of the building and appears to be Late Classic in date. A portion of a red-slipped ceramic drum was found on the north-south axis of the bench on the bench top against the northern structure wall, and fragments of a red-slipped vessel were found, again axially, on the floor in front of and abutting the bench.

Excavations within the bench also located two partial vessel caches on the northeast and northwest corners of the unit. These were oriented in relation to the centreline of the bench, but not in the corners of the bench's masonry. The rim of an olla was found in the northeast, and a partial, red-slipped ashware vase was found in the northwest. These vessel fragments comprised almost the entire ceramic record from within the bench feature.

A cursory analysis of the ceramic record from the terminal phase of Structure D-1 suggests that the building is of Late Classic construction and was abandoned near the end of the Classic period. Evidence from previous excavations suggests that the site was abandoned between A.D. 750 and 800, and the evidence from Structure D-1 is consistent with this assessment. The evidence of post-abandonment activity tentatively dated to the Terminal Classic also seems to support this supposition.

The paucity of ceramic material suggests that the activity at Structure D-1 was not residential, nor was it likely related to feasting activity, since these activities generally result in higher frequencies of ceramic deposition. By the Late Classic, the acropolis of Cahal Pech was an area of dense construction and space was at a premium; it is possible that residential activity may have taken place at D-1, and waste material was fastidiously removed from the structures. The absence of any substantial deposits of residential type material in the fill suggests that the function of Structure D-1, and therefore Plaza D-1, was public in nature. What is also clear is that access to this part of the site was considerably more restricted, and so any civic functions would have been accessible to only a select few.

Lithics

The number of stone tools and the amount ofdebitage from Structure D-1, like the ceramic record, is small. This might be expected since it is safe to say that there was very little in the way of tool production taking place in the building. Additionally, very little obsidian was found in excavation. Only two small fragments of prismatic blades were found. This would seem to counter a domestic argument for the structure. It is also possible that any remains were removed from the building, and that it was essentially abandoned "clean."

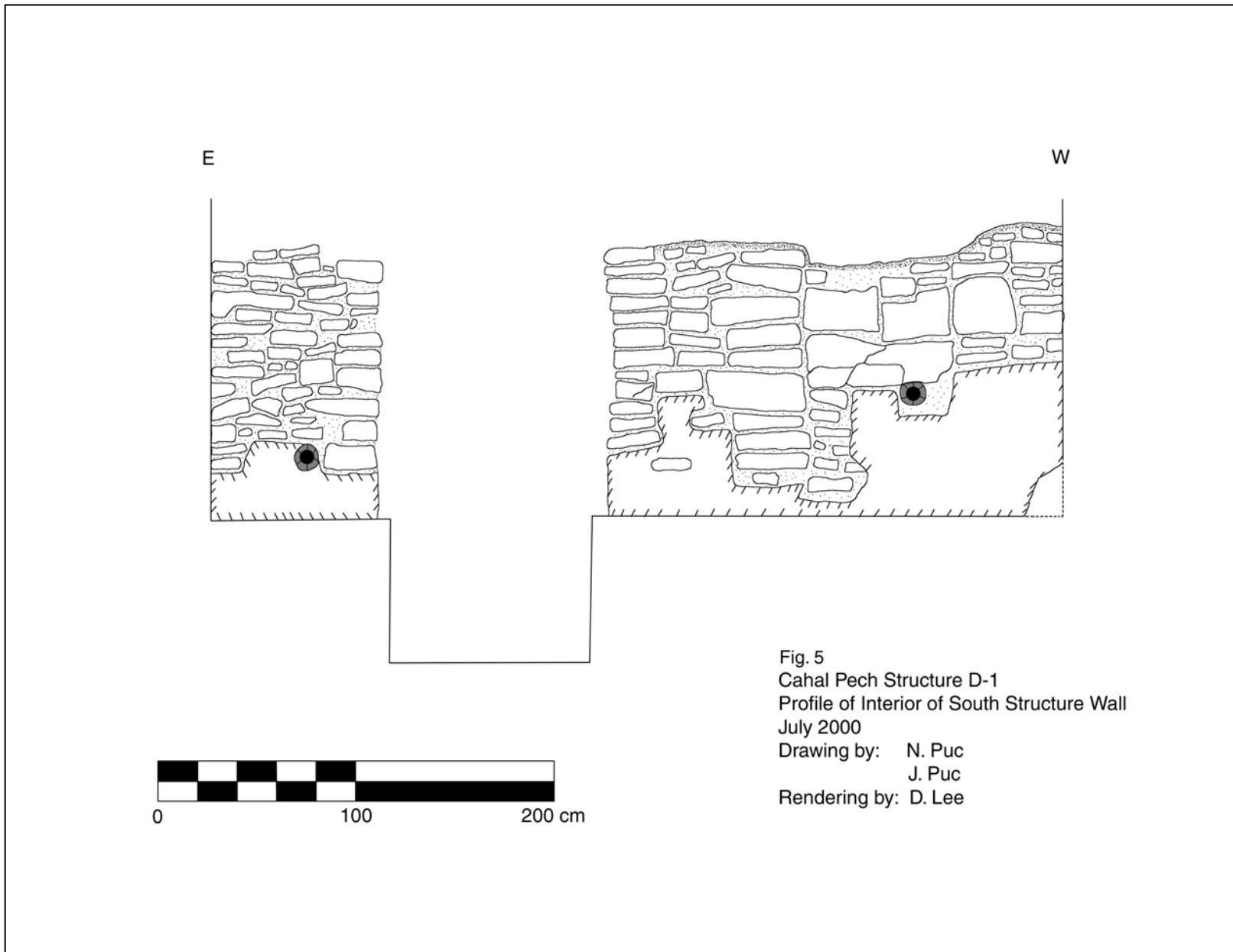


Fig. 5
Cahal Pech Structure D-1
Profile of Interior of South Structure Wall
July 2000
Drawing by: N. Puc
J. Puc
Rendering by: D. Lee

SUMMARY AND CONCLUSIONS

One of the more interesting aspects of the structures at Cahal Pech is the fact that the geographically conscripted hilltop required the Maya to use particularly ingenious designs in their construction programs. Expanding horizontally in programs of renovation and redesign would require the construction of massive support platforms to alter the natural terrain. Such designs would be both labour- and material-intensive.

Whether this was the motivation behind the design programs at Cahal Pech, or whether the final form was simply the result of a particular vision of how the site should look, we cannot know. What is known, however, is that building programs at Cahal Pech chose to conform to the natural topography of the hilltop, and that changes to the architecture took the form of multiple renovations to existing spaces. Structure D-1 is a good example of this approach, changing the living space of the monumental core without greatly expanding the geographical area of the central precinct. The “terminal” phase of construction in Structure D-1 consisted of not less than two major redesigns of the interior space while maintaining the external form and dimensions of the building (Figure 2).

Another interesting aspect of the architecture exposed during this season of excavations was the presence of a narrow double-course wall running from the eastern end of Structure D-1 to the southwestern corner of Structure A-1. The screen wall, when excavated was approximately 2 meters in height. This “screen” wall blocked Plaza D from view of Plaza A and prevented access to Plaza D from the staircase on the southern side of Structure A-1. These appear to have been the primary functions of this wall, though it is possible that the wall may also have served as a partial support for a perishable structure appended onto the eastern end of Structure D-1.

During the 2000 field season, one room, approximately half of Structure D-1, was excavated to the terminal phase, and two shallow test units in the terminal floor were opened. This investigation found that the structure was initially vaulted and was likely quite high. The preserved portions of the wall suggest that the interior ceiling height must have been close to 3 metres. In the initial construction phase, there were four points of access into the eastern room of D-1. Later renovations reduced this to one point of access on the plaza side. A single-phase bench was found in this room, and the plaster surface of the bench is conjoined to the terminal floor. The absence of any floor surfaces found within the bench, however, implies that the bench was part of the original design of the structure.

The bench feature showed aesthetic care in its design, and this suggests that the bench was probably not intended as a sleeping surface. Also, the numerous access ways into the room would make it an unlikely sleeping location. My initial impressions, based on this, and the almost total absence of artifacts that might suggest any domestic activity, are that this structure in Plaza D likely served as an administrative, ritual, or political function. The bevelled surfaces on the two “armrests” may actually have served as back rests, and correspond to depictions of Maya elite sitting facing one another in meeting. It is also possible that this was the function of this room prior to its renovation, and that that function changed once access was closed from Plaza A. If this is the case, it is impossible to suggest

what that later function might have been other than to restate that the absence of artifacts seems to negate the idea that it was residential.

Excavations previously conducted at Cahal Pech by Jaime Awe, David Cheetham, Terry Powis, Gyles Iannone, and Jim Conlon (see reports of the BVAR project 1988-1995) have revealed the history of the site. We know that the hilltop was occupied in the Early Preclassic period, and that by the Late Preclassic it was a thriving and important centre of activity in the Upper Belize Valley. By the Early Classic period, the importance of Cahal Pech in regional politics was waning, and there was an associated decline in construction in the monumental core, as other centres such as Xunantunich and Baking Pot eclipsed Cahal Pech. Excavations in Structure A-1, the largest pyramidal structure at the site, indicate that by the Late Classic, Cahal Pech was once again an important centre, though it probably never regained the status it held in the Late Preclassic, now sharing the political stage with several other large well-established sites in the Valley. This information paints a picture of a politically dynamic and interconnected environment where the success or failure of one site often spelled success or failure for neighbouring sites.

So what does this suggest for Plaza D? The structures in Plaza D form a small, elevated plaza group at the centre of the site. To the west of the plaza, the acropolis drops off steeply, overlooking the small western ball court. Structure A-1, the largest pyramidal structure of the site forms the eastern side of the plaza, and acts as the group's eastern structure. On the north and below is Plaza A, the ceremonial and administrative plaza with restricted accessibility, and on the south is a single direct access to the ruling family's residential complex. The position of the plaza, the presence of the bench, and the efforts taken through renovation to further restrict access to this group of structures suggest that Plaza D was a kind of liminal space between the public and the private areas of the site.

One possibility for future research is to excavate Structure A-1 on the east side. If access to the top of the structure is possible from this side, this might suggest a reason for the private environment created by this plaza. Excavations on the side by Plaza A did not reveal a staircase to the top of the structure. This, of course, remains supposition. What is clear is that the construction of Plaza D was intended to further a pattern of restricted access moving through the site, from Plaza B which is the most public, to Plaza A which is smaller and more restricted, to Plaza D which is smaller still and elevated with access only through the top of Structure A-4, to the residential complex.

Eastern structures have frequently been found to be ancestor shrines. It may be significant, therefore, that Structure A-1 the primary pyramidal structure at the site forms the eastern side of Plaza D. Excavations in Plaza F (Audet, this volume) disproved previous suggestions that Plaza F was a service plaza housing commoners that would have served the royal court. To the contrary, while the construction found in Plaza F was not as grand, (consisting of a platform with low masonry walls topped with a perishable superstructure), there was no evidence of domestic activity.

What seems more probable is that the entire hilltop core of Cahal Pech represents the royal court of the site, occupied by several elite family groups. Over time, power may have

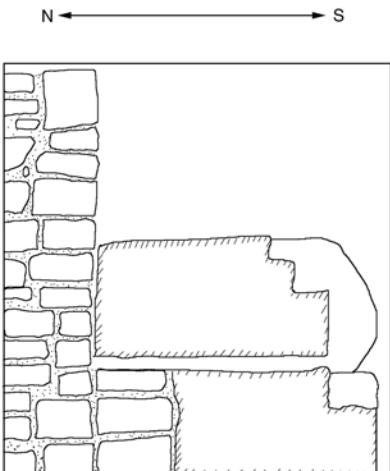
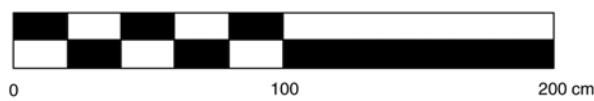
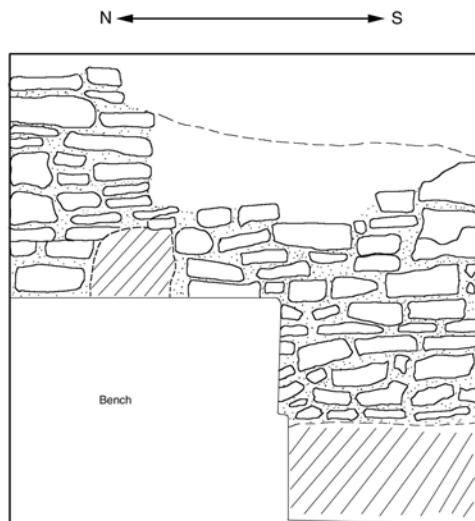
shifted from group to group, resulting in different construction programs. The pyramid in Plaza A represents a late re-emergence of the site in terms of regional power. At least some of the answers to understanding this period in the site's history probably reside in Plaza D and in its relationship to A-1, the largest monumental structure at the site.

At the end of the 2000 season, excavations at Structure D-1 were backfilled. While one of the goals was to excavate the structure to permit consolidation as part of the archaeological park, problems with drainage of the plaza made this effort unfeasible. The terminal plaza floor was found more than a meter below the existing ground surface. The small, restricted space of the plaza resulted in substantial accretion since the abandonment of the site. This meant that in order for consolidation to take place, the entire plaza would need to be cleared so that drainage similar to that employed by the Maya during the occupation of the site, could be reproduced.

Plaza D at the site of Cahal Pech represents a transitional space between the most public parts of the acropolis and the most private parts. The architecture within this plaza, while small, is interesting in terms of its location, form, and modifications that were obviously intended to increase the level of privacy within this group over time. More work is required in Plaza D, and its consolidation in the future would add an interesting dimension to the tourism experience at the site. This plaza illustrates an aspect of the built environment that reflects philosophies of public and private within the ancient Maya world.

Fig. 6
Cahal Pech
Str. D-1

East Interior Profile
Drawn by: J. Puc
N. Puc
July 2000



Profile: West end of Bench
Drawing by: J. Puc
N. Puc
July 2000

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ANCIENT MAYA SETTLEMENT AT BAKING POT, BELIZE: FINAL RESULTS OF THE NORTH CARACOL FARM SURVEY PROGRAM

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INTRODUCTION

Settlement survey at Baking Pot (see Bullard and Ricketson-Bullard 1965; Ricketson 1931; Willey et al. 1965) by the Belize Valley Archaeological Project (BVAR) has been ongoing over the course of nine field seasons (Conlon 1993, 1995, 1997; Conlon and Ehret 2000). The long-term goal of the settlement survey program at Baking Pot is to produce as extensive a perspective as possible of settlement surrounding a single major center of the Belize Valley (Conlon 1995:83, 1997:7). This objective is meant to provide a picture of the settlement morphology distribution of a principal center within the region over the broadest area possible. Survey at Baking Pot is expanding eastward in order to include the previously surveyed sites of Spanish Lookout and Barton Ramie (see Willey et al. 1965) (Figure 1). This past field season we continued the surveying of the North Caracol Farm settlement cluster two kilometers east of Baking Pot (Conlon 1995:97; Golden and Conlon 1996; Ehret and Conlon 2000). This report presents the results of the 2000 field season of survey, and a brief discussion concerning comments in previous reports that updates earlier observations concerning basic settlement analysis at Baking Pot, such as mound and population densities.

SURVEY RESULTS

The 2000 field season survey program was brief (four weeks of June) but fruitful. Survey progressed eastward towards Spanish Lookout from North Caracol Farm (NCF). As we reached the Belize River in the northeast of the limits of survey we established datums for future survey between here and the estimated location of Spanish Lookout. Over the course of survey in the east of NCF several mounds that complete this settlement clusters picture were incorporated into the plan of Baking Pot. This new data necessitates a brief reexamination of previous analysis of settlement at NCF and Baking Pot.

North Caracol Farm

The NCF settlement cluster has been described previously (see Conlon and Ehret 2000), but a brief review is warranted. NCF represents a distinct zone of settlement as defined by the boundaries of Garbutt Creek and the Belize River, and the lack of settlement in the east (Figure 2). Mounds at NCF range in distance 1300 - 1800 m from the center

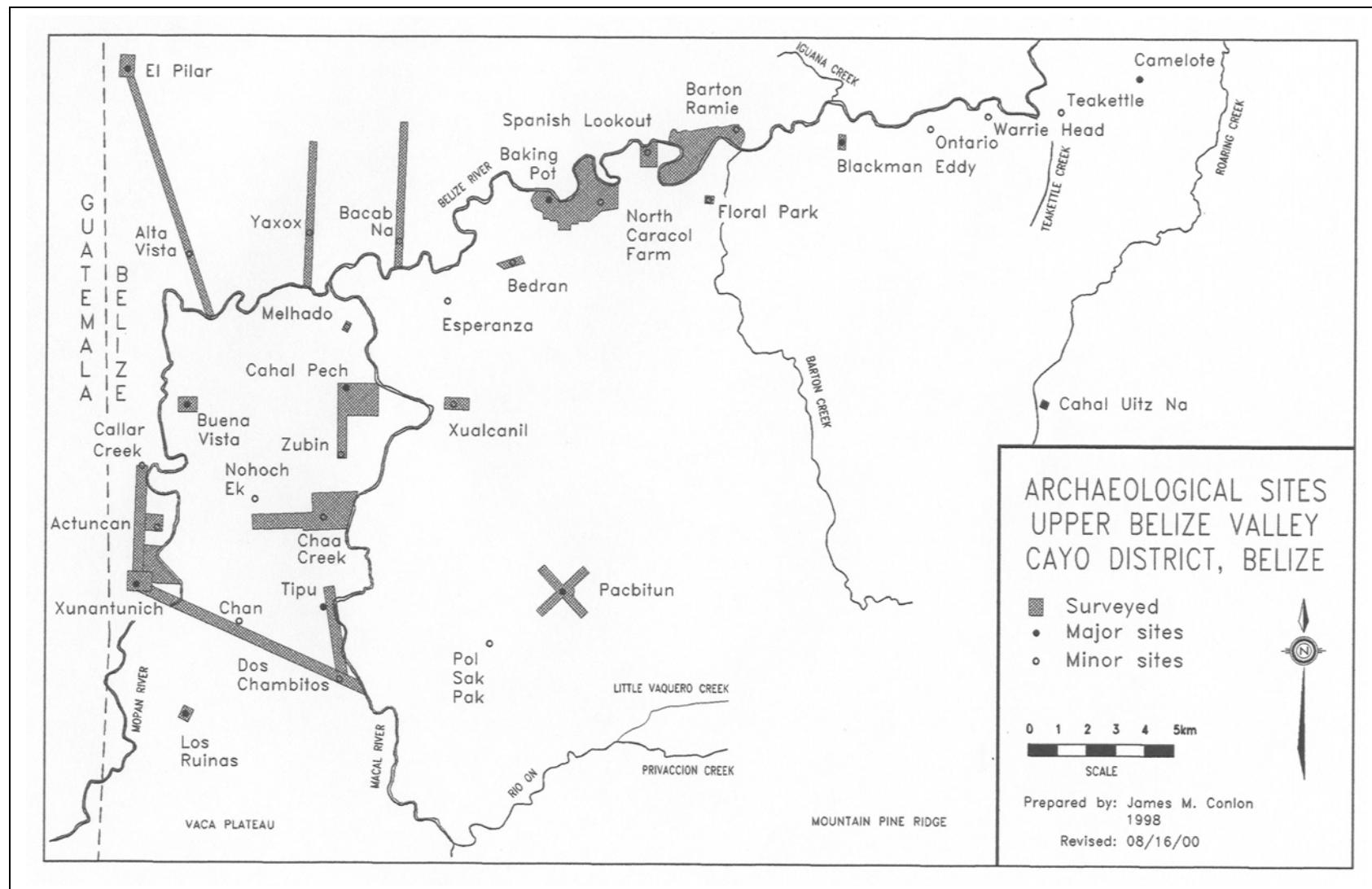


Figure 1: Upper Belize River Valley showing the location of North Caracol Farm.

Baking Pot,
Cayo District,
Belize
2000

Belize Valley
Archaeological Reconnaissance

Plan by:
James M. Conlon (1993-00)
Survey by:
James M. Conlon (1992-00)
Jennifer J. Ehret (1999-00)
Melissa M. Johnson (1996/97)
Cameron A. Griffith (1994/96)
Shawn M. Brisbin (1992/94)

Revised: 06/24/00
Revised: 10/28/99
Revised: 01/15/98
Revised: 02/17/97
Revised: 06/21/96

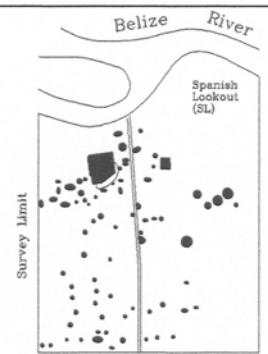


Figure 2: Map of Baking Pot, showing the North Caracol Farm settlement cluster.

of the main sacbe connecting Groups I and II at Baking Pot and range in height from 0.10 to 5.5 m. Occupying presently heavily farmed lands, all the mounds of NCF have been ploughed at least four times a year over the last ten years. Mound 1 is the tallest (5.5 m), and largest single mound at NCF, suggesting its dominance within the group as its main focal point. The dry creek bed in the north of the NCF settlement cluster drains eastward from Garbutt Creek in the west to the Belize River. It is not presently clear whether this was a natural creek or a channel built by the ancient Maya of NCF. In either case, this creek/channel would have enabled the ancient Maya of NCF to take advantage of the perennial flow of water from Garbutt Creek and likely permitted the irrigation of crops in its immediate area over the entirety of the year.

Baking Pot

The survey program conducted this year does not change the basic settlement data drastically owing to the relatively comparable mound density captured in the area surveyed (Table 1). Both Zones E (Northeast Baking Pot) and F (NCF) (see Fig. 1) continue to display the lowest mound densities of settlement at Baking Pot, 0.44 and 0.51 respectively, well below the overall average of 0.93 mounds per hectare.

The 2000 survey does have a slight affect on previous density estimates when considering actual area occupied by mounds. Factoring out unoccupied area (possibly used for more intensive agricultural pursuits rather than garden plots typically found adjacent to mounds) increases NCF's mound density from 0.51 to 1.38 (Table 2). This more closely corresponds to results obtained from Zone C (east-central, 1.47) and overall (1.49) at Baking Pot and suggests the inhabitants of NCF were more likely in an equilibrium mode of agricultural production rather than the previously hypothesized surplus mode of production (Conlon and Ehret 2000). However, as Table 3 demonstrates, the overall area, as well as the observed but unsurveyed empty lands to the east of NCF, places NCF's former inhabitants within an estimated surplus mode of agricultural production.

DISCUSSION

As noted previously, potential sources of other foodstuffs is not accounted for in these agrarian sustenance estimates (Conlon and Ehret 2000). However, these production and consumption estimates do provide a modicum of insight into identifying areas that are comparably more urban or rural in composition, at least on the surface. Ancient Maya site dynamics of urban and rural dwellers gives rise to questions concerning land holdings, the management of agricultural production, the method of collection and distribution of surplus goods, and even the identification of specialists other than managers and farmers (priests, scribes and warriors, for example). Identifying the differential zones of settlement contributes to formulating future research goals and the focus excavations must take in order to examine these site dynamics.

Zone	Area	Mounds	Population	Mound Density	Population Density
<i>A</i>	60.09	105	525	1.75	8.74
<i>B</i>	19.33	35	175	1.81	9.05
<i>C</i>	68.80	77	385	1.12	5.60
<i>D</i>	25.59	20	100	0.78	3.91
<i>E</i>	75.86	33	165	0.44	2.18
<i>F</i>	99.33	51	255	0.51	2.57
<i>Total</i>	345.80	321	1,605	0.93	4.64
<i>SL</i>	56.39	77	385	1.37	6.83
<i>CP</i>	156.15	112	560	0.72	3.59

Table 1: Mound and population densities for Baking Pot, Spanish Lookout, and Cahal Pech.

Zone	Area	Mounds	Population	Mound Density	Population Density
<i>A</i>	57.87	105	525	1.81	9.07
<i>B</i>	17.63	35	175	1.99	9.93
<i>C</i>	52.52	77	385	1.47	7.33
<i>D</i>	18.81	20	100	1.06	5.32
<i>E</i>	30.00	33	165	1.10	5.50
<i>F</i>	37.09	519	255	1.38	6.88
<i>Total</i>	214.92	321	1,605	1.49	7.47
<i>SL</i>	47.50	77	385	1.62	8.11
<i>CP</i>	97.78	112	560	1.15	5.73

Table 2: Mound and population densities, minus unoccupied area, for Baking Pot, Spanish Lookout, and Cahal Pech.

Area = hectares

E = Northeast Baking Pot (NEBP)

Population = Mounds X 5 people

F = North Caracol Farm (NCF)

Mound Density = Mounds/Area

SL = Spanish Lookout

Population Density = Population/Area

CP = Cahal Pech

Zone	Area	Mounds	Yield A	Yield B	Population A	Population B	Population
A	60.09	105	68142	10816 2	310	492	525
B	19.33	35	21920	34794	100	158	175
C	68.80	77	78019	12384 0	355	563	385
D	25.59	20	29019	46062	132	209	100
E	75.86	33	86025	13654 8	391	621	165
F	99.33	51	11264 0	17879 4	512	813	255
Total	345.80	321	39213 7	62244 0	1782	2829	1605
SL	56.39	77	63946	10150 2	291	461	385
CP	156.15	112	17707 4	28107 0	805	1278	560

Table 3: Estimates of Potential Agricultural Yield and Sustainable Population.

Yield A = Area X 1134 kilograms Population B = Yield B/220 kilograms

Yield B = Area X 1800 kilograms Population = Mounds X 5 people

Population A = Yield A/220 kilograms

CONCLUSION

Settlement survey at Baking Pot is by no means complete. Besides not having reached the settlement of Spanish Lookout in the east there is also survey in the west of Baking Pot that needs to be undertaken. The results from these future endeavors will complete the broad settlement perspective of Baking Pot. With these survey components completed we can then begin to consider site intra-relationships at greater Baking Pot. Future excavations will help to establish the chronological development of settlement clusters and further provide vital data for discerning the ebb and flow of social, political and economic intrasite relationships.

Acknowledgments

We wish to extend our gratitude to Archaeological Commissioner Dr. Allan Moore and the members of the Belize Department of Archaeology, for their continued interest in, and support of, our project endeavors. Miriam Silva, our host at the Cahal Pech Village, provided impeccable accommodations and service. A special hello is extended to our friends Scotty and Dora of the Cahal Pech Tavern, and Ramon Silva of International Archaeological Tours. Finally, we must thank Jaime Awe, once again, for allowing us to indulge in our seemingly single-minded research program.

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**RESULTS OF THE SECOND SEASON (2000) SURFACE COLLECTION
PROGRAM AT BAKING POT: THE NORTHEAST BAKING POT AND NORTH
CARACOL FARM SETTLEMENT CLUSTERS**

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INTRODUCTION

The site of North Caracol Farm (NCF) lies approximately two kilometers to the east of the major center of Baking Pot, Cayo District, Belize (Figure 1). The site was originally reconnoitered by Jaime Awe in 1993 in preparation for assessing potential future investigations at the site of Baking Pot. The site of NCF has been subject to intensive modern agriculture since at least 1992 and undergone numerous plowing episodes since. Finally, in 1999, a surface collection program of twelve platforms at NCF was undertaken (Ehret and Conlon 2000), along with a similar program in the adjacent Northeast Baking Pot (NEBP) (see Figure 1) settlement cluster that has also come under recent agricultural intensification. This program was successful in providing a broad base for distinguishing the temporal limits of occupation and potential differentiation of mound functions. In light of the continuing agricultural use of the land, and the ongoing destruction of both sites, the surface collection program was continued here in 2000. Even though surface features have been badly disturbed there appeared to be great potential for further contributions via a more extensive surface collection program.

This surface collection project was continued in the 2000 season with varying degrees of success. NEBP appears to have remained relatively undisturbed since 1999 and our collections there in 2000 were consistent with those of the previous field season. However, NCF has undergone, at minimum, 6 - 7 plows in the intervening 10 months of our two surface collections, and many of the smaller mounds mapped in 1999 are essentially gone (indeterminable soil stains, at best). The section that underwent surface collecting at NCF in 1999 was under 0.5 m of new corn, and the section slated for collection in 2000 had just had one crop of black eyed peas plowed under. This made the process of identifying artifacts on the surface very difficult, and unfortunately the NCF 2000 collection, while useful, is not completely comparable with that of the 1999 season. This situation amplifies not only the extreme importance of opportunistic mapping and surface collection, even at a rudimentary level, in areas threatened by the disturbance of new or continuing agricultural activity, but also the significance of instituting follow up collection programs with each successive plowing episode.

Baking Pot, Cayo District, Belize 2000

Belize Valley
Archaeological Reconnaissance

Plan by:
James M. Conlon (1993–00)
Survey by:
James M. Conlon (1992–00)
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Melissa M. Johnson (1996/97)
Cameron A. Griffith (1994/96)
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Revised: 06/24/00
Revised: 10/28/99
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Revised: 08/21/96

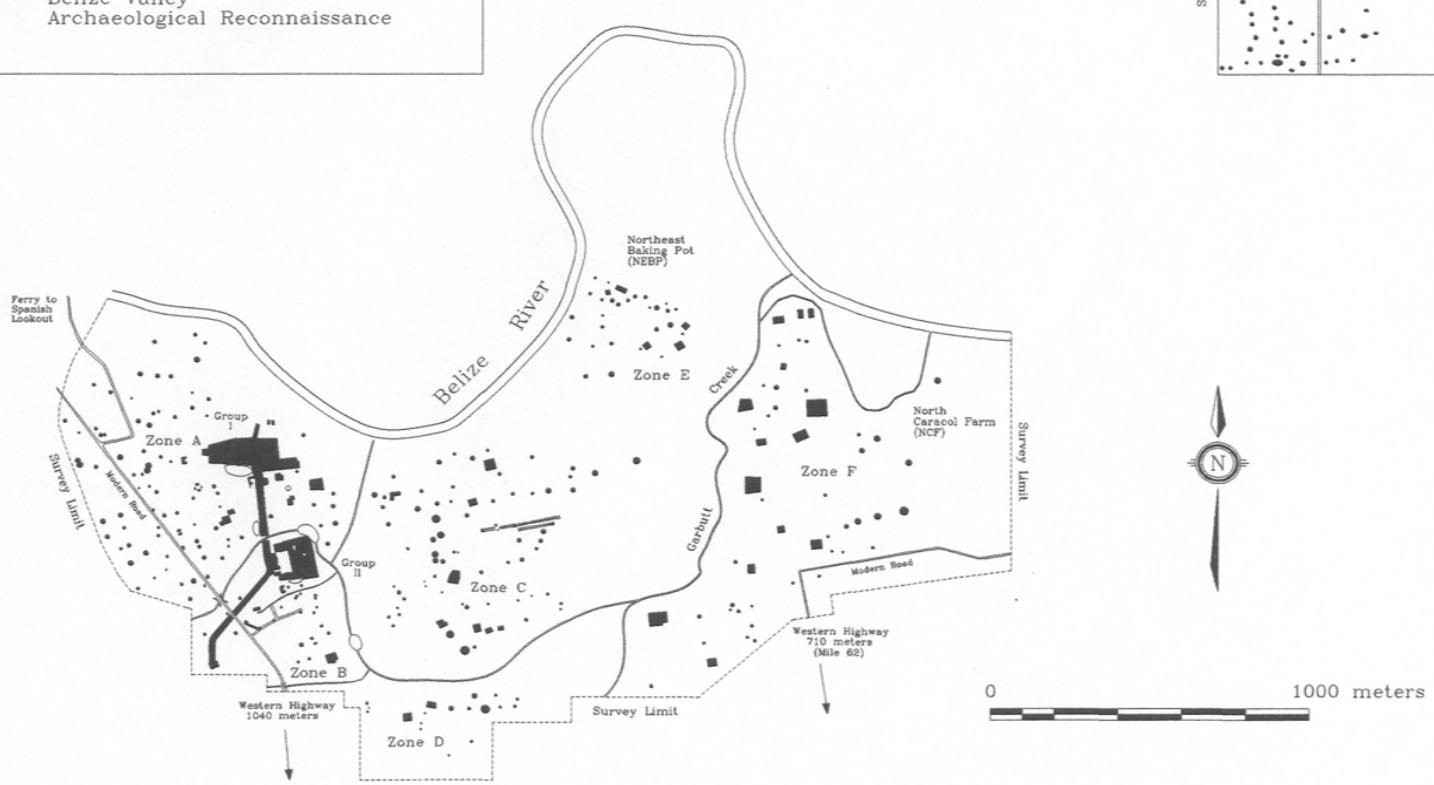
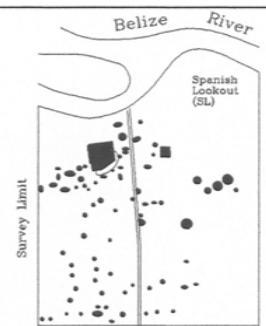


Figure 1: Map of Baking Pot, showing the North Caracol Farm settlement cluster.

METHOD

As in 1999 (see Ehret and Conlon 2000) artifacts lying between mounds were left uncollected as they could not be securely assigned a point of origin. By collecting artifacts found only on the platforms themselves, however, it was possible to acquire a gross knowledge of artifact provenience and mound/structure chronology. This technique established parameters which yielded broad data categories regarding both differential occupation types (i.e. function) and periods of occupation (chronological sequence) at the site.

The field collection was mostly restricted to mound surfaces themselves, but occasionally to the plow dragged scatters at the near base of mounds. The ceramic field collection was restricted to sherds that were readily recognizable as diagnostic (i.e. "classifiable" at least at a typological level), eliminating the collection of weathered or unslipped sherds. At both settlement clusters, other "significant" artifacts (those that stood out as "special" by shape/form, material, etc.), particularly portable ones, were collected and taken to the project lab for analysis and curation. Large, heavy artifacts, and typically common items, such as ground stone manos and metates, were counted but not collected. The presence of more common artifacts such as daub and riverine shell were noted, but not collected. As this was a visual (walking) surface collection program none of the sample was screened.

NORTHEAST BAKING POT (NEBP)

Chronology

At NEBP, 14 more of the 32 mounds (55 %) were surface collected, making the 1999 - 2000 collection 32 of 33 mounds (97 % of settlement cluster) (Figure 2). Indication of earliest occupation was still ephemeral, and only 1 mound had diagnostic ceramics of the Tiger Run phase (Mound 225) (7 % of 2000 sample) (Table 1). The remainder of the sampled mounds contained predominantly Spanish Lookout phase type ceramics (14 of 14 mounds, 100 % of 2000 sample) and early facet New Town phase type ceramics (11 of 14 mounds, 79 % of 2000 sample). By the late facet of the New Town phase occupation decreased to only 6 mounds (43 % of the 2000 sample). These percentages closely approximate the 1999 results (see Ehret and Conlon 2000).

Other Artifacts

As stated above, other artifact types were recorded and/or collected during the ceramic surface collection. Again, this was not an exhaustive effort, and not every artifact was taken back to the project lab. As opposed to the collection in 1999, the quantity of sampled mounds at NEBP (14) was less than NCF (21), however, more non-ceramic artifacts were recorded at NEBP than NCF. This discrepancy is partly based on the more extensive damage NCF has undergone in the past year. The sample discrepancies between 1999 and 2000 may also be affected by locale. In 2000 we collected from the southern limits of NCF, further from the two largest platforms here (Mounds 1 and 18). Also, mounds in the south of

	224	228	237	223	226	247	250	251	220	233	234	241	246	225
<i>New Town</i> (AD1250-1500)														
<i>New Town</i> (AD900-1250)														
<i>Spanish Lookout</i> (AD650-900)														
<i>Tiger Run</i> (AD550-650)														

Table 1: Ceramic phases identified by mound at Northeast Baking Pot, 2000.

NCF were typically small and low lying, subject to greater degradation by the plow and less likely to have had long phase sequences of occupation. The results summarized in Tables 3 and 4 are further described herein.

Daub

Daub was noted, but not collected, on 9 of the 14 mounds we sampled (64 %). Taking into consideration the disturbed nature of the mound surfaces, the presence of daub suggests that the ancient mounds at one time supported a perishable superstructure. The absence of daub on 5 of the mounds does not necessarily imply these mounds did not support perishable superstructures, such as pole and thatch, but we lack the evidence for this conclusion at this time.

Chert tools

The predominate chert tool type was the biface. Chert tools, both whole and fragmented, were found. Bifaces were found on 7 of 14 mounds sampled (50 %), however, no mound produced more than 1 example. Chert biface “choppers” were found on 5 of the 14 mounds sampled (36 %) and these are thought to have been used for agriculture (see Willey et al. 1965:426). One chert stemmed point was found on Mound 220, and 1 scraper was found on Mound 220 as well. All chert tools were taken to the lab for analysis and all received Special Find designations.

Special examples in this category include Special Find (SF) #2, a notched chert biface from Mound 233. SF #7 is a chert micropoint preform from Mound 251. SF #9 is a notched chert micro point from Mound 220, and SF #17 is a chert micro point from Mound 225.

Obsidian

All obsidian was collected and taken to the project lab for analysis. The predominate obsidian artifact was the prismatic blade. Prismatic blades and blade fragments were recovered from 9 of the 14 mounds sampled (64 %). The greatest quantities (5 or more) were recovered from Mounds 220, 233, and 241. SF #1 is a notched micro point from Mound 233.

Ground stone

Manos and metates were the predominant forms of ground stone recorded at NEBP, and 6 of the 14 sampled mounds did not produce any ground stone at all. In most cases the artifacts were fragmented, and the artifacts were not collected but rather quantified and left *in situ*.

Metates were the predominant type of ground stone, and examples were noted at 6 of the 14 sampled mounds. Mound 223 had 4, the largest concentration at NEBP. Manos were recorded at 5 of 14 mounds and Mound 225 had 4 manos, the largest concentration at NEBP. SF #15 is a basaltic bifacial chopper from Mound 223.

Riverine Shell

Riverine shell was recorded at 6 of the 14 sampled mounds at NEBP. The shell was *jute*, and it appeared in both the *Pachychilus indiorum* and *P. glaphyrus* varieties. Interestingly, the mounds closest to the river had both varieties of jute, while the mound further from the river only showed the *P. indiorum* variety.

Marine Shell

No marine shell was recorded in the 2000 season.

Human Remains

Human bone was recovered from Mound 226, and represents 4 long-bone fragments and 1 carpal bone fragment.

Other

Two mounds produced inordinate amounts of a similar type of ceramic. Mound 234 produced 22 fragments of a Benque Viejo Polychrome type vessel, and Mound 233 produced 31 fragments of a Cayo Unslipped type jar.

SF #19 is a sherd of a Belize Red type vessel from Mound 226 with one small drill hole in it. This is most likely a repair mark. SF #14 is a possible figurine fragment from Mound 220. SF #18 is a sherd of historic/modern ceramic from Mound 226 that appears to be from a body of a pitcher. The type is unknown, however the coloring and form are consistent with the modern style of McCoy pottery. SF #22 is a small, black, stone from Mound 234, possibly used for burnishing the surface of ceramics. SF # 3 is a clear quartzite notched micro point from Mound 241.

NORTH CARACOL FARM (NCF)

Chronology

At NCF 21 more of the 51 mapped mounds were collected in 2000 (41 % of the settlement cluster) (Figure 3). This brings the 1999 - 2000 collection to 35 of 51 mounds (69 % of settlement cluster). As previously stated, many of the smaller mounds mapped in 1999 are no longer visible. “Occupation” of mound platforms is more difficult to discuss than at NEBP. As in 1999, only short-lived (1 or 2 phases) mound platforms display continuous phase evidence (e.g., Mounds 27 and 50). In order to discuss settlement development at NCF we have assumed a “continuous occupation” scenario from earliest inception to evidence of final ceramic phase evidence.

The 2000 NCF settlement cluster began with 1 mound (5 % of sample) in the Barton Creek phase (Table 4). Two mounds were added in the Mount Hope phase (10 % of sample), and 2 more mounds appear in the Floral Park phase (10 % of sample). Two more mounds were added in the Hermitage phase and a Floral Park phase mound continued occupation (14% of sample). One new mound was added in the Tiger Run phase and a mound that was occupied in the Mount Hope phase gave evidence of occupation here as well (10 % of sample). The Spanish Lookout phase represents NCF’s height of occupation at 17 mounds (81 % of sample). The New Town phase provides mixed evidence. The early facet was represented at 7 mounds (33 % of sample), however, one mound actually appears during this phase and 2 more reappear after a lull in the Spanish Lookout phase. Four mounds show continuous occupation from the Spanish Lookout. The later facet of the New Town phase was represented at 5 mounds (24 % of sample), and again 1 mound appears during this phase, and 1 shows continuous occupation since the Tiger Run phase. The remaining 3 late facet New Town mounds appear to have experienced a lull during the early facet of that phase.

Other Artifacts

The following summarizes both in tabular and descriptive form the results of the NCF surface collection program in 2000 (Tables 5 and 6). Again, collection was not an exhaustive effort, and not every artifact was taken back to the project lab, though recognizable artifacts were recorded in the field.

Daub

Daub was noted, but not collected, on 14 of the 21 mounds we sampled (67 %). Taking into consideration the disturbed nature of the mound surfaces, the presence of daub suggests that the ancient mounds once supported a perishable superstructure. The absence of daub on 7 of the mounds does not necessarily imply that these mounds did not also support wattle and daub perishable superstructures, but the evidence for such a conclusion remains lacking.

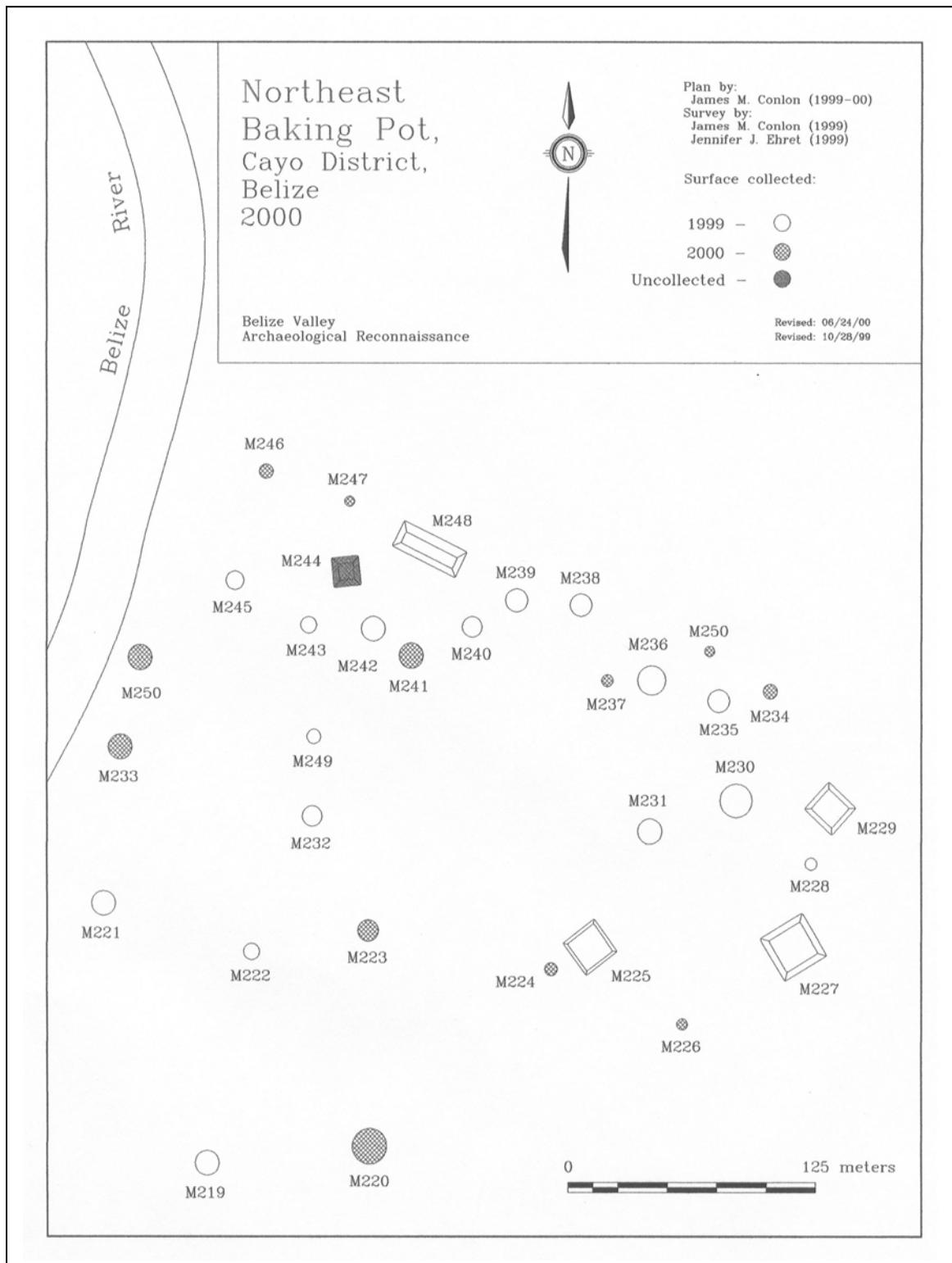


Figure 2: Northeast Baking Pot, mounds tested by surface collection.

	Mano	Metate	Obsidian	Riverine Shell	Human Remains	Daub
220	2	2	12	X		X
223	1	4	2			X
224	1		1	X		X
225	4	2	2	X		X
226	1	3	2		X	X
228						
233			7a,b			
234						X
237						
241			6			
246						
247						
250		1	1	X		X
251		1		X		X
Total	9	13	33	5	1	8

a - one micro point

b - 3 macro blades

Table 3: General artifact summary (X = present/unquantified), Northeast Baking Pot, 2000.

	Unifac e	Biface	Bifacial Choppe r	Stemme d Biface
220		1b	1	1
223	1			
224				
225		1a		
226	1		1	
228				
233		1c		
234				
237			1	
241			1	
246			1	
247	1			
250				
251		1a		
Total				

a - micro point

b - notched micro point

c - notched

Table 4: Summary of modified chert from Northeast Baking Pot, 2000.

Chert tools

Chert tools, both whole and fragmented, were found. The predominate chert tool type was the bifacial “chopper.” Chert bifacial choppers were found on 4 of the 21 mounds sampled (19 %) and again, these are thought to have been used for agriculture (Willey et al. 1965:426). Bifaces were found on 2 of 21 mounds sampled (Mounds 28 and 44). Stemmed uniface and biface points were found on only 2 of the 21 mounds. Other than bifaces, SF #7, a honey-colored chert burin/awl from Mound 27, was the only modified chert recovered.

Obsidian

All obsidian was collected and taken to the project lab for analysis. The predominant obsidian artifact was the prismatic blade. Prismatic blades and blade fragments were recovered from 8 of the 21 mounds sampled (38 %). The greatest quantity (more than 2) was recovered from Mounds 44 and 47. There were no special finds in this category.

Ground stone

Manos and metates were recorded on 11 of 21 mounds at NCF. In most cases the artifacts were fragmented, and, due to the weight of the stone and their commonality, were not collected but quantified and left *in situ*. Metates were the predominate type of ground stone, with 8 of 21 mounds (38 %), producing 9 examples. Manos were recorded at 5 of 21 mounds (24 %), producing 6 examples. Only Mounds 23 and 44 had examples of both artifact type.

SF #4 is a small basaltic celt fragment from Mound 23. SF #5 is a vesicular basalt biface fragment from Mound 25. SF #9 is a granitic celt from Mound 49, and SF #10 is a slate “wrench” fragment from the same mound.

Riverine Shell

Riverine shell was recorded at only 1 of the 21 sampled mounds at NCF and was *jute*.

Marine Shell

No marine shell was recorded at NCF in 2000.

Bone- Human and Faunal

No bone was recorded at NCF in 2000.

Other

SF #8 is a ceramic censer prong from Mound 47.

DISCUSSION

As in 1999, the most obvious distinctions between the two settlement clusters are the discrete variations in surface morphology and chronological development. On the surface, NCF differs morphologically from NEBP, with a number of large platforms supporting patio groups. The mounds at NEBP appear to have been platforms supporting a single superstructure, by no means approaching both the monumental size of several of the NCF platforms and the multiplicity of mounds atop platforms at NCF.

	4 7	4 9	2 3	4 8	4 0	2 8	3 9	2 5	2 9	3 0	3 1	3 4	3 6	4 3	4 4	2 7	5 0	2 6	3 5	4 6	4 2
<i>New Town</i> (AD1250-1500)																					
<i>New Town</i> (AD900-1250)																					
<i>Spanish Lookout</i> (AD650-900)																					
<i>Tiger Run</i> (AD550-650)																					
<i>Hermitage</i> (AD250-550)																					
<i>Floral Park</i> (AD150-350)																					
<i>Mount Hope</i> (50BC-AD250)																					
<i>Barton Creek</i> (400-50BC)																					

Table 4: Ceramic phases identified at North Caracol Farm, 2000.

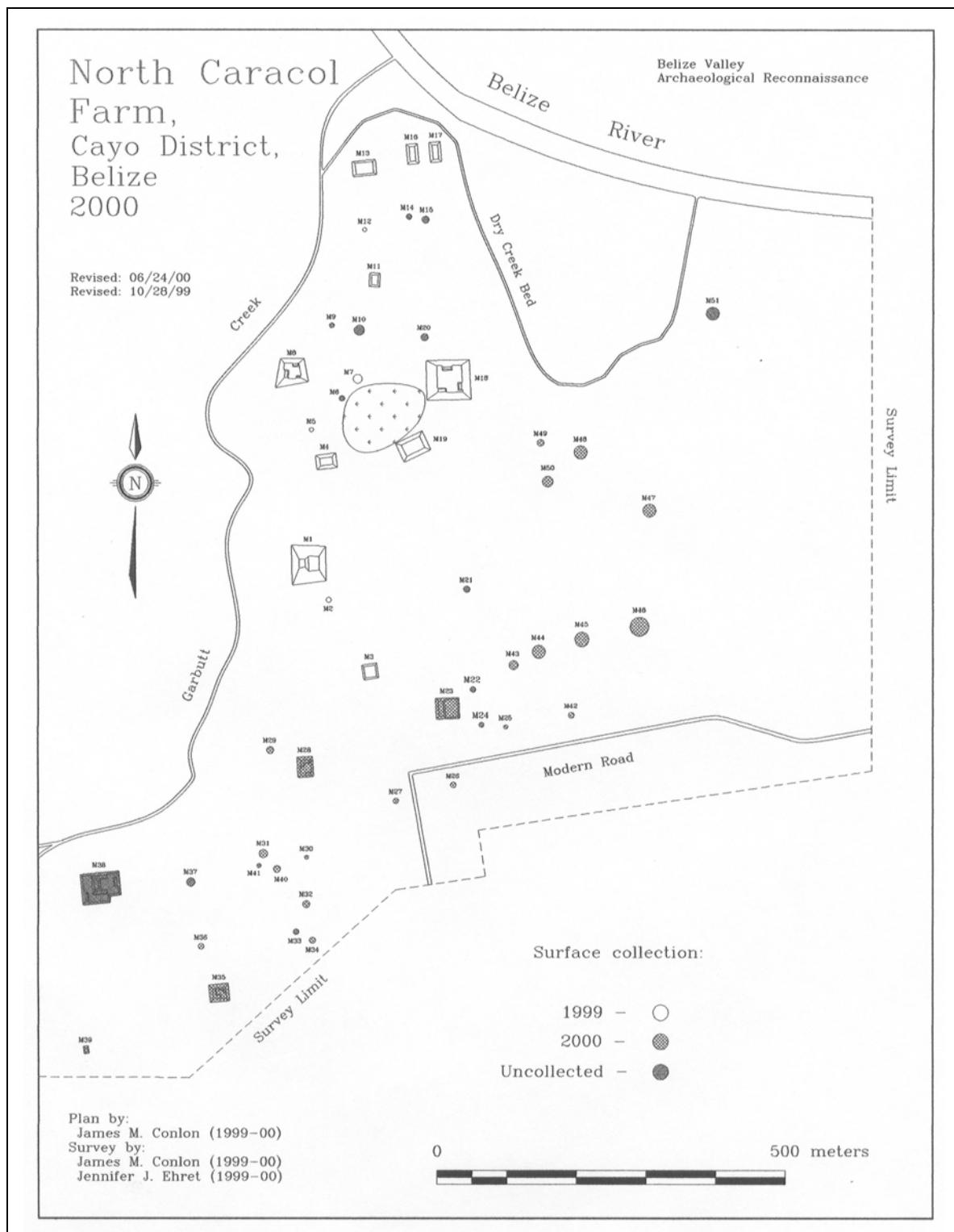


Figure 3: North Caracol Farm (NCF), mounds tested by surface collection.

	Mano	Metate	Obsidian	Riverine Shell	Human Remains	Daub
23	1	1	2			X
25	1					
26						X
27		1				X
28	2					X
29				X		X
30						X
31		1				X
32						
34						X
35						X
36						
39						X
40			1			X
42						
43		1	1			X
44	1	1	3			
45			1			
46		1				
47			3			X
48		2	2			X
49		1				
50	1		1			
Total	6	9	14	1	0	14

Table 5: General artifact summary (X = present/unquantified), North Caracol Farm, 2000.

		Bifacial Chopper	Stemmed Biface
23			
25		1	
26			
27			
28	2		
29			
30			
31			
32			
34			
35			
36		1	
39			
40			
42			
43		1	
44	1		1
45		1	1
46			
47			
48			
49			
50			
Total	3	4	2

Table 6: Summary of modified chert from North Caracol Farm, 2000.

Chronologically, NCF started earlier and broader (geographically) than NEBP, but, in comparison, growth was stymied during the Late Formative and Early Classic periods at NCF. NCF was less able to attract settlers in the Spanish Lookout phase, evidenced by its 71 % occupation rate, than NEBP (100 %), and unable to hold its existing population in the early facet of the New Town phase (NCF 41 % versus 79 % for NEBP), though each seem to have experienced roughly similar losses in the late facet of the New Town phase. Overall, NCF follows a generally more typical (i.e. comparable to other major center development) Belize Valley line of chronological ebb and flow from beginning to end, whereas NEBP, with its sudden appearance and burgeoning, and slow waning, is more anomalous to the region.

The general pattern that emerges at NEBP is one of an agriculturally based Classic period population supplanted or transformed into a resource based, hunter-gatherer society, by Postclassic times. The rise of the “new economy” likely began, or at least had its underpinnings, in the Spanish Lookout phase as evidenced at NEBP (cf. Willey et al. 1965:570). Furthermore, the roughly equivalent frequency distribution of the occurrence of obsidian between NEBP and NCF suggests that elite peoples did not necessarily factor in the importance of its distribution in Postclassic times at either site. As the food supply became unreliable, and the managers became suspect, populations eschewed this system and reverted to individual household means for producing and procuring sustenance (cf. Gifford 1976:288 re: singular household pottery production). This in part, may answer the question of why a migratory population would choose to settle in the relatively vacant land of NEBP, rather than disperse and join an existing and established middle type of settlement, such as NCF represented.

CONCLUSION

As previously stated, the modern history of agricultural plowing may be a significant factor in the chronological distinctions observed between NEBP and NCF. Long-term plowing at NCF would logically have “shaved” more cultural layers from those mounds, thereby disrupting more deposits. The apparent small initial occupation and subsequent rapid expansion of settlement at NEBP is startling. However, some of this perceived burgeoning may be accounted for by less prolonged plowing at NEBP. Analysis of the artifacts collected in 2000 has just been completed and the preliminary results promise to increase our understanding of settlement morphology and history, as well as the Late Classic to Postclassic transition, in the Baking Pot area and the western Belize river valley in general. Our experience in 2000 highlights the necessity to recognize a site in immediate danger of disturbance or destruction and to act, immediately. Our understanding of NCF would have been drastically reduced had the 1999 investigations not taken place.

Acknowledgments

We would like again to thank Archaeological Commissioner Dr. Allan Moore, and all the members of the Belize Department of Archaeology, for enabling our research program at Baking Pot. Within our own BVAR project, we acknowledge contributions to this research by Jenn Piehl for her comments on the human remains. Finally, we would like to thank our Principal Investigator, Dr. Jaime Awe, for his continued support of our specific, special interest, goals within the larger BVAR project.

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**POOK'S HILL 1, OPERATION 4A:
TEST EXCAVATIONS OF THE PLAZA PLATFORM AND EASTERN SHRINE
STRUCTURE 4A, ROARING CREEK VALLEY, CAYO DISTRICT, BELIZE**

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INTRODUCTION

Archaeological investigations at the site of Pook's Hill, Belize, have been carried out as a sub-program of the Western Belize Regional Cave Project (hereafter WBRCP), under the direction of Dr. Jaime J. Awe. The WBRCP has been conducting multidisciplinary research since 1996 with major emphasis on the diachronically variable role of caves in ancient Maya society (Awe 1998a, 1999). Fieldwork at Pook's Hill has provided insight into the ceramic horizon markers of the Roaring Creek Valley, information regarding Terminal Classic activities at the site, and mortuary practices in surface contexts. Through contrast, these advances complement our understanding of the ancient activities conducted in cave settings, as inferred from their material precipitates.

The following report details the excavations of the eastern shrine (Structure 4A) at Pook's Hill, which was the focus of the 2000 season, and serves to summarize the results of the excavations thereof. This report details previous investigations that have been conducted at Pook's Hill both in terms of archaeological research and otherwise. It goes on to discuss the purpose and objectives of Op. 4A of the 2000 field season and provides a narrative of the excavations process including a discussion of the significant features that were discovered. All excavation units tested deposits, which were excavated as a series of discrete stratigraphic units. Subsequently, each discrete context is described, singly or as a combination of stratigraphic units (the latter case referring to instances in which contexts are sub-divided spatially according to the excavation unit of incidence). Following this, detailed descriptions of the special deposits (including burials, caches and problematical deposits) are presented. This report concludes with discussions of the more salient finds made as part of Op. 4A during the 2000 season.

LOCATION AND SETTING

Circumscribed to the south by the Tapir Mountain Nature Reserve and by the Roaring Creek River on to the east, is the 300-acre Pook's Hill Lodge, owned and managed by Ray

and Vicki Snaddon. The facilities of the Lodge are constructed around an ancient Maya *plazuela* group, which takes its name from that of the property and the resort. In archaeological terminology, the ancient site has been designated as PKH1 (i.e. Pook's Hill, Plazuela Group No. 1) as several other *plazuela* groups are located on the Snaddon property. The PKH1 *plazuela* is registered in the files of Belizean Department of Archaeology, in Belmopan, as Site No. 31.189.002.

The Snaddon property and the PKH1 *plazuela* group are located in the Roaring Creek Valley, in the Cayo District of Belize (Figure 1). The site lies approximately 13.5 km southwest of Belmopan, and 7 km south of Teakettle village. The site lies less than 5 km north of a group of caves that were intensively investigated by the Western Belize Regional Cave Project between 1996 and 2000 (Figure 1) (see Awe 1998a, 2000, this volume; Awe and Conlon 1997; Awe 1999). In relation to ancient sites, the *plazuela* lies 4.8 km north of the major center known as Cahal Uitz Na (Figure 1) (Awe and Helmke 1998; Conlon and Ehret 1999; Ehret and Conlon 1999; Ferguson 1999). The PKH1 site is located in the foothills forming the western perimeter of the Roaring Creek Valley at an approximate mean elevation of 78 m above mean sea level (amsl). The Roaring Creek River lies only 600 m SE and 560 m E of the *plazuela*. A small creek runs just over 100 m south of the *plazuela* and merges with the Roaring Creek further to the northeast.

SITE DESCRIPTION

The PKH1 site (Figure 2) is a formal patio group (Ashmore 1981:49-54), which is composed of Type 2 structures in the Copan, Honduras typology (Abrams 1994:14; Freter 1994; see also Willey and Leventhal 1979), or Class 3 structures in the Rio Azul, Guatemala typology (Adams 1999:29). Prior to the inception of formal archaeological investigations, it was posited that PKH1 matches the layout and configuration of *plazuela* groups at Tikal that are referred to as "Plaza Plan 2" configurations (Becker 1971, 1986, 1999; see also Welsh 1988).

The relatively small plaza (ca. 376 m²) of the group is rectangular and on average is oriented 10° west of grid north. The seven structures of the *plazuela* define the outline of the plaza and their transverse axes are aligned perpendicularly to the cardinal directions by the same overall orientation as that of the plaza. Each side of the plaza is bounded by one or two platform structures (suitable for perishable superstructures), with the notable exception of a diminutive pyramidal structure on the eastern side. The structures were numbered from north to east in counter-clockwise fashion, from 1 to 4. In cases where two structures define one of the sides of the plaza, larger structures were given an alpha suffix and smaller ancillary structures a beta suffix. The eastern, southern, and western structures all have small ancillary platforms abutting and extending to their right (when facing onto the plaza) (Figure 2). Together these seven structures define a small plaza or patio that is incorporated into the flank of a hill. The plaza was apparently leveled with core of rocks and *saskab*¹ extracted

¹ The word *saskab*' is the Yucatek Maya term most equivalent of the English "marl" or Spanish "caliche." The term *saskab*' is a composite noun literally meaning "white earth" (i.e. *sak* = white and *kab*' = earth), specifying a predominant component of the ancient masonry recipe as revealed by modern analyses of ancient plasters and well-preserved wet-laid aggregates or backing masonry.

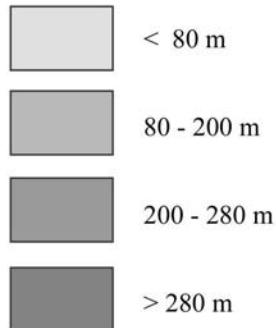
**Upper Roaring Creek Valley:
Map showing
the distribution
of ancient sites.
WBRCP 2000**

Plan: C. Helmke

Legend:

- ▲ surface site
location secure
- △ surface site
location approx.
- cave site
location secure
- cave site
location approx.
-  outline of the site core of Cahal Uitz Na

Elevations



Map aligned to
UTM grid north.

0 0.5 1 KM

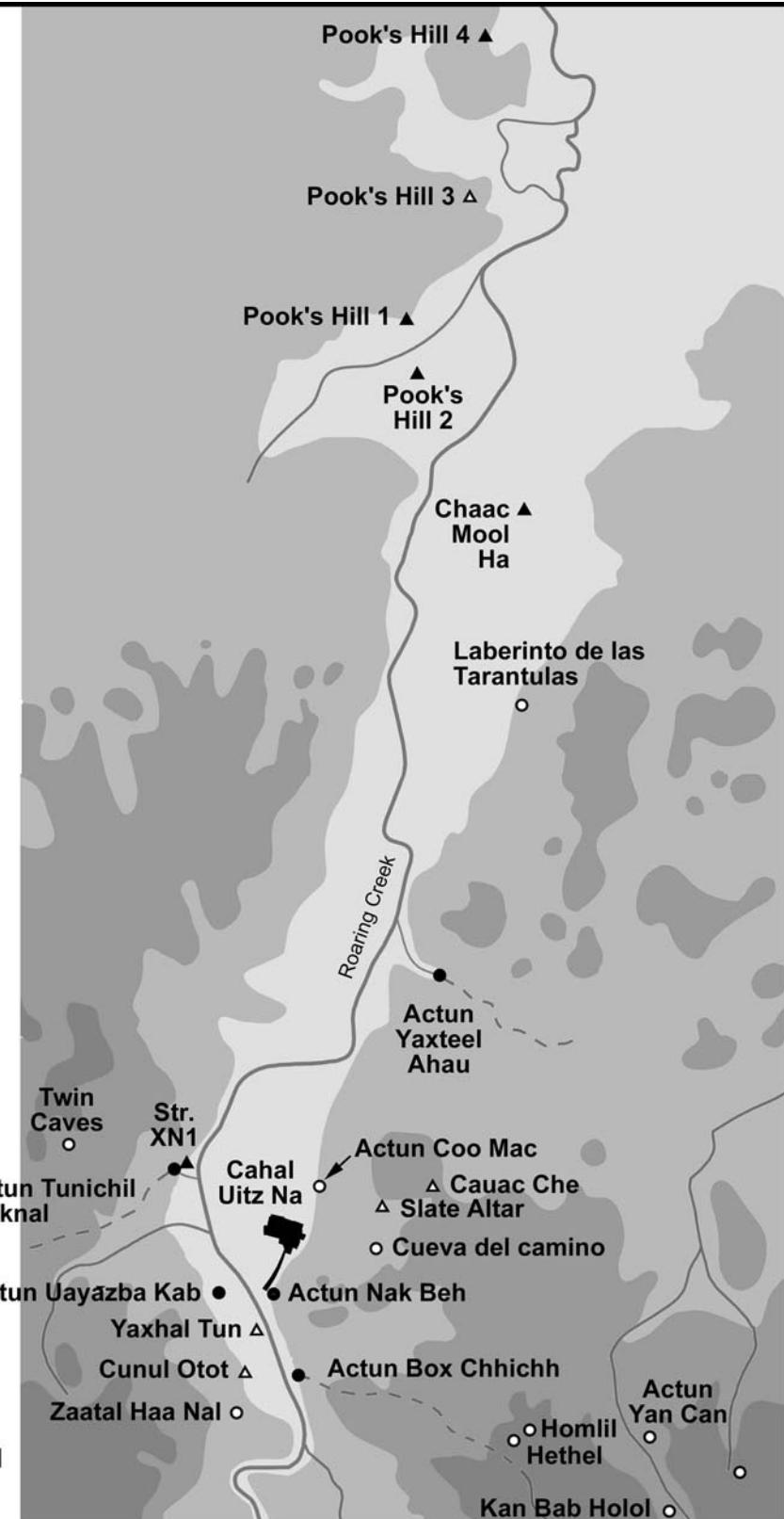


Figure 1: Map of the Upper Roaring Creek Valley, showing location of Pook's Hill 1.

Pook's Hill 1, Belize
Plan of Plazuela Group
Distribution of Operations
WBRCP 2000

Plan: C. Helmke

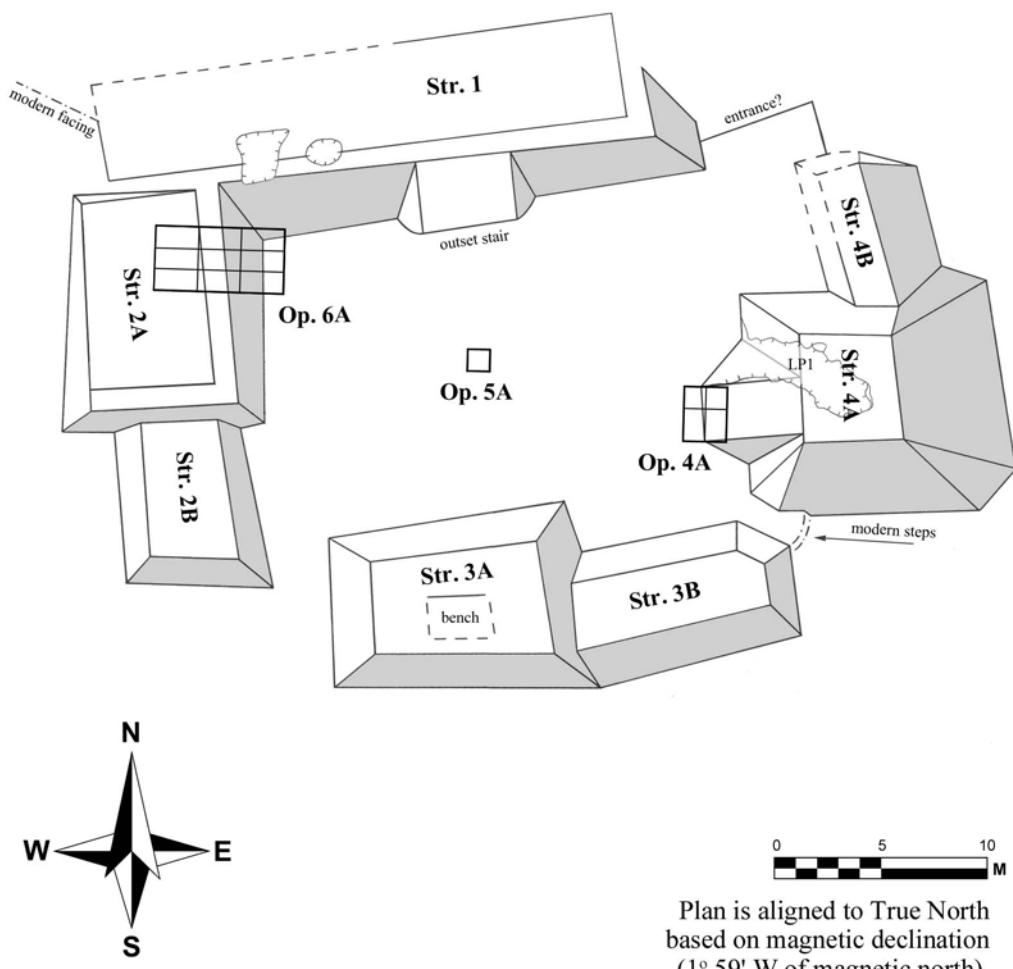


Figure 2: Plan of the Pook's Hill 1 *plazuela* showing the configuration and distribution of the excavation operations of the 2000 Season.

from the hill. As a result, the southern and eastern structures are noticeably elevated as these were constructed upon an artificially raised supporting platform. In contrast, the northern and western structures abut and are built directly into the side of the hill. Looters' disturbances are present in the form of one trench affected the eastern structure (Figure 2). Two smaller depressions associated with Str. 1 were initially thought to be represent looter's efforts. Recent investigations, however, suggest that the trench affecting the eastern structure may in fact represent the only looter's effort at the site. This trench represents the efforts of looters intent on penetrating deeply within, to the center of Str. 4A. Designated as Looter's Pit 1 (LP1) the trench measures approximately 6 m N-S by 2 m E-W. The looters deliberately avoided or accidentally missed the primary axis by trenching along the northern stair side and subsequently cut southeastward, towards the center of the structure.

PREVIOUS INVESTIGATIONS: THE 1999 SEASON

A detailed summary of investigations spanning the year the Snaddons purchased the property (1991) up to the initiation of archaeological excavations (1999) is presented in the report of the previous season (Helmke 2000a). Documentation of research, however informal, preceding the 1990s is still wanting. Undoubtedly, aside from the active looting that affected the eastern shrine (Str. 4A) during the late 1970s (Helmke 2000a), the site had been reconnoitered previously. Knowledge of the nature, purpose, or duration of these visits is, however, faint at present. Nonetheless a rough sketch for the broader Roaring Creek can be constructed from previous investigations in the area. The efforts of Lawrence R. Lisch (1969, 1983) at the nearby site of Big Laugh are apparently the earliest investigations of an archaeological nature in the Roaring Creek. Although geographically a little more distant, Harvard archaeologists under Willey conducted a reconnaissance of housemound groupings at Warrie Head near Teakettle Village in the 1950s (Willey et al. 1965:310, Figs. 2 and 180). The investigations of a cave located to the south of the settlement of Roaring Creek, conducted by Peter J. Schmidt (1968), revealed evidence of Early Classic cave usage, crude architecture and speleothem breakage, all of direct relevance to the chronology of Roaring Creek caves. More informal visits were made by David M. Pendergast into the upper portion of the valley during the 1970s (David Pendergast pers. comm., 2001). In addition, summaries of the investigations undertaken by Jaime J. Awe during the two decades prior to the initiation of the WBRCP are presented elsewhere (Awe 1998a, Awe et al. 1998).

The results of the 1999 investigations are presented in the report of the previous field season (Helmke 2000a). Operations conducted in 1999 focused exclusively on the salvage of the eastern structure of the *plazuela* (Structure 4A). In addition to the emphasis placed on the salvage of this structure, an attribute incidence analysis was also conducted to test the hypothesis that this structure served as the eastern shrine structure of the *plazuela* group (cf. Becker 1999; A. Chase and D. Chase 1994; D. Chase 1994:129; Welsh 1988). Analyses of materials recovered as part of the salvage confirmed that this structure had indeed served as the eastern shrine of the *plazuela* (Helmke 2000a).

The 1999 investigations were initiated by comprehensive mapping in conjunction with surface collections of artifacts encountered during the survey (Op. 1). Although incalculable data has been lost by the depredation of the eastern shrine, investigations

designed to salvage as much data as possible were undertaken, upon completion of the survey. All extant ‘backdirt’ or looters’ spoil (i.e. B-LP1) was re-excavated and screened so as to gain a better understanding of the architectural and artifactual constituents of the structure (Op. 2). A large assemblage of ceramics useful for cross-referencing with the materials recovered by the WBRCP from cave sites was thus recovered. Full advantage was taken of the partial 6 m long profile of Str. 4A exposed within the 2 m wide looter’s trench (i.e. LP1). Clearing of the trench allowed for a detailed recording of architectural components, which ultimately led to the identification of discoveries made by the looters (Op. 3). Finally, the looter’s trench was backfilled so as to prevent further erosion and collapse. With the initiation of WBRCP investigations at the PKH1 *plazuela* in 1999, the site is now the subject of an intensive and continuing program of archaeological investigations.

OPERATION 4A

Purpose and Objectives

With the bulk of the Structure 4A salvage operations completed by the end of the 1999 season (Helmke 2000a), a new series of research objectives were developed for the eastern shrine at the onset of the 2000 field season. Operation 4 was defined to encompass all research excavations focusing on the shrine (Str. 4A), with Operation 4A designating the initial sub-operation. Operation 4A comprised a series of contiguous test excavations, which were designed to assess the incidence of primary special deposits, buried within the plaza platform, at the western base of the shrine. As the looting efforts appeared to have been focused exclusively on the shrine structure itself (in the form of LP1), the adjoining plaza platform at the base of that structure, in alignment to the primary axis, therefore seemed an area likely to yield special deposits unaffected by modern looting. The presumed incidence of special deposits at this locus was deemed highly probable based on a review of burial placements associated with eastern shrine structures in the Maya Lowlands (cf. Becker 1999; A. Chase and D. Chase 1994; D. Chase 1994:129; Welsh 1988). In addition, these test excavations were aimed at defining the architectonic articulation between the structure and plaza platform floor sequences, which in turn could be anchored into relative stratigraphic sequences useful for ceramic cross-dating. The methodology and terminology employed in this report follow the guidelines established elsewhere (Helmke n.d.).

Placement, Layout and Configuration

As the total horizontal breadth required to fully uncover putative primary deposits and architectural features could not be established at the onset, based on examinations of surface features alone, Operation 4A was initially devised as one excavation unit (EU 7), to which extensions could be made so as to extend the horizontal coverage as necessary (following suggestions made by Dr. Jaime J. Awe). Descriptions of the sequence of extensions made to the original excavation unit are presented in the narrative of excavations, below. As the incidence of special deposits is highest along the primary axes of eastern shrine structures in the Maya Lowlands (Becker 1999; D. Chase 1994; Welsh 1988), it was deemed advantageous to establish the initial EU 7 of Op. 4A in alignment to Str. 4A’s primary axis.

Determination of the structure's primary axis was accomplished conjointly by theodolite instrumentation and data derived from the 1:50 site plan drafted on the basis of the 1999 season survey (Operation 1A). As the primary axis is defined as the central node of a structure's architectural symmetry, running perpendicularly to the frontal face (Loten and Pendergast 1984:3), it was necessary to determine the frontal center-point of the structure by halving the distance separating the NW and SW corners of Str. 4A. As neither of these corners were represented by cleared architecture, reliance was placed on the NW and SW corners of the mound of collapse debris shrouding the terminal phase architecture. While it was hoped that patterns of collapse were symmetrical for the northern and southern aspects of the structure, it was recognized from the onset that reliance on mounded features alone could only allow approximation of that structure's primary axis. On the site plan the azimuths of the NW and SW corners of the Str. 4A collapse debris mound were computed in relation to the primary survey datum set within the approximate center of the plaza (i.e. datum PKH1-6), and their mean calculated. This mean azimuth was then foresighted with the theodolite situated at datum PKH1-6, thereby determining the approximate placement of the primary axis. A temporary datum was established at the base of the mound in alignment with this azimuth, which ideally would have defined the center point of the eastern baulk of EU 7 (Figures 3 and 4). Nonetheless, as the trunk and root mass of a Wild Tamarind tree (*Magarum* sp. Barti) occupied part of what would have been the southeastern corner of EU 7, the placement the EU was shifted 50 cm northward of the approximate primary axis, with the temporary datum thereby assuming the position of EU 7's SE corner (Figure 4).

As the purpose of the EU was to trench along the primary axis at the base of the shrine in search of special deposits, a 1 x 1 m EU was deemed to cover too little surface area. In addition, as objectives sighted for Op. 4A focused on the vertical sequence of stratigraphy rather than on horizontal stripping, emphasis was placed on depth, rather than horizontal breadth. Consequently, in order to keep the excavation unit to metric increments and allow a broader lengthwise configuration, a 1 x 2 m EU was chosen as a suitable compromise, set with its long axis parallel to the primary axis, to which limited lateral southward and/or northward extensions could be made as necessary (Figure 3). The outline of Excavation Unit 7 was projected from the SE corner to the north and west in alignment to magnetic cardinal directions using a Brunton pocket transit. Little use was made of line levels and plumb bobs during the setting of the EU strings except for the checking of triangulated corners, as the area was relatively level. The four corners of the EU were subsequently sighted with a theodolite, distance measurements being obtained by the use of the stadia method, thereby allowing plotting of this EU on the site plan. No attempt was made to align this EU to the grids established as part of the 1999 salvage excavations as the placement of EU 7 was conditioned by alignments to Str. 4A's architectural features, rather than secondary features brought about by recent looting (cf. Helmke 2000a).

Narrative of Excavations

Excavation Unit 7

Excavations of EU 7 were initiated with the stripping of humic accumulations. Complete removal of this stratum (Level 1a; SU 21) revealed a N-S alignment of facing stones in the

western portion of the EU and an E-W alignment along the northern baulk, to the east of the former (Figure 4). To the east of the N-S facings and south of the E-W facings a dense concentration of limestone rocks was exposed (SU 30 and 52a), which were interpreted as the backing masonry and core of an architectural component pertaining to Str. 4A-1st. As Op. 4A was designed to test the architectural core of the plaza platform (rather than Str. 4A), attention was shifted to matrices to the west of the alignment of facing stones. Continued removal of humus in the westernmost portion of EU 7 (Level 1a; SU 21), revealed the highly decayed surface of a plaza floor (Floor 1), thereby confirming that the architectural component uncovered to the east was related to Str. 4A rather than the plaza platform. In addition, a concentration of larger limestone rocks and facing stones (SU 56a) occurred along the southern baulk of the EU, to the west of and partly abutting the row of facings, encompassing an area measuring approximately 60 cm N-S by 40 cm E-W. In keeping with the objectives of Op. 4A which were established to test the plaza platform, EU 7 was temporarily down-sized into two adjacent 1 x 1 m EUs, the eastern EU being re-designated 7a, the western 7b, in order to excavate the area to the west of the alignment of facing stones.

Excavation Unit 7b

Excavation Unit 7b was further down-sized to a 1 x 0.6 m EU to focus on the Floor 1 contexts to the west of the alignment of facings (SU 30), in exclusivity. Excavations continued with the penetration of the ballast and core of Floor 1 (Level 2; SU 29), to the north and west of the concentration of limestone rocks (SU 56a). The concentration of rocks was recognized as a distinct feature (SU 56a), although its significance remained unclear at the time. In order to test whether this feature represented a surface scatter or incorporated a vertical dimension, the rocks comprising this concentration were left in situ during the excavation of the core of Floor 1. The core of Floor 1 (Level 2; SU 29) was penetrated to a depth of 36 cm below its surface at which point an increase in artifact frequency was noted, thereby suggesting the occurrence of another feature and halting the excavation of Floor 1's core. Clearing of the core around the concentration of limestone rocks (SU 56a) revealed a distinct and dense mass of rocks, with as many as three stacked rocks noted, thereby confirming that the feature indeed had a vertical dimension (Figure 5). Nonetheless, as the mass of rocks left in situ (SU 56a) afforded only a limited view of the subsequent level, identification of the feature yielding the high frequency of artifacts was hindered. Consequently, the rock mass feature (SU 56a) was dismantled and the end of Level 2 cleared off, revealing the weathered surface of Floor 2.

Floor 2 was found to be considerably better preserved to the north and west of the rock mass feature, similarly to Floor 1. Excavations proceeded with the penetration of the ballast and core of Floor 2 (Level 3; SU 37a), to a depth of 24 cm below its surface. At this juncture a shift in matrix coloration and the occurrence of small, flat, dolostone rocks in the northern portion of EU 7b, prompted the end of Level 3.

The surface of Level 4 was cleared off, and while the level surface defined by the dolostone rocks encountered in the northernmost portion of the EU suggested the presence of Floor 3, few traces of it were found in the remainder of the EU. Notably, the area to the south of the remainder of Floor 3 was represented by variegated matrices with few rock

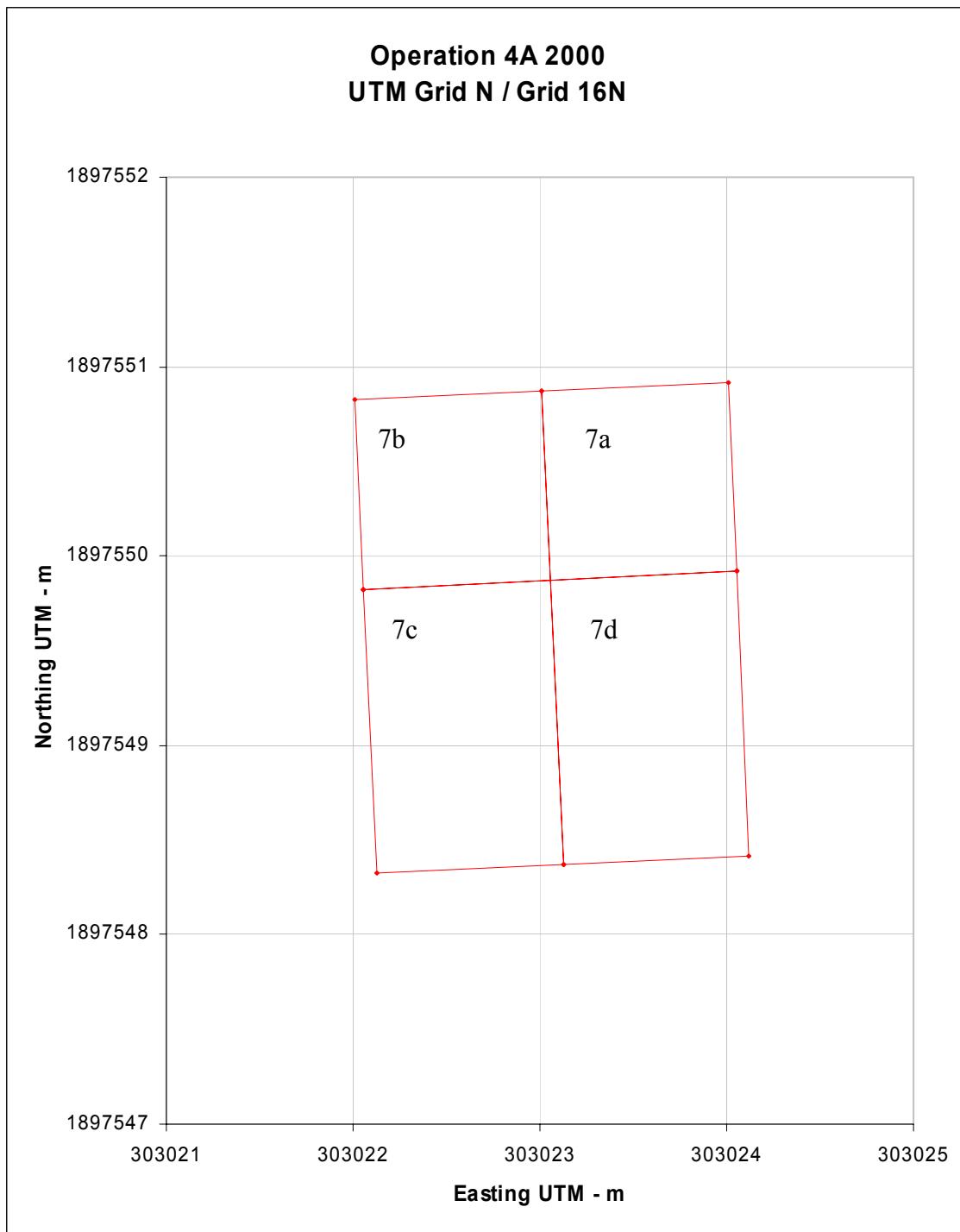
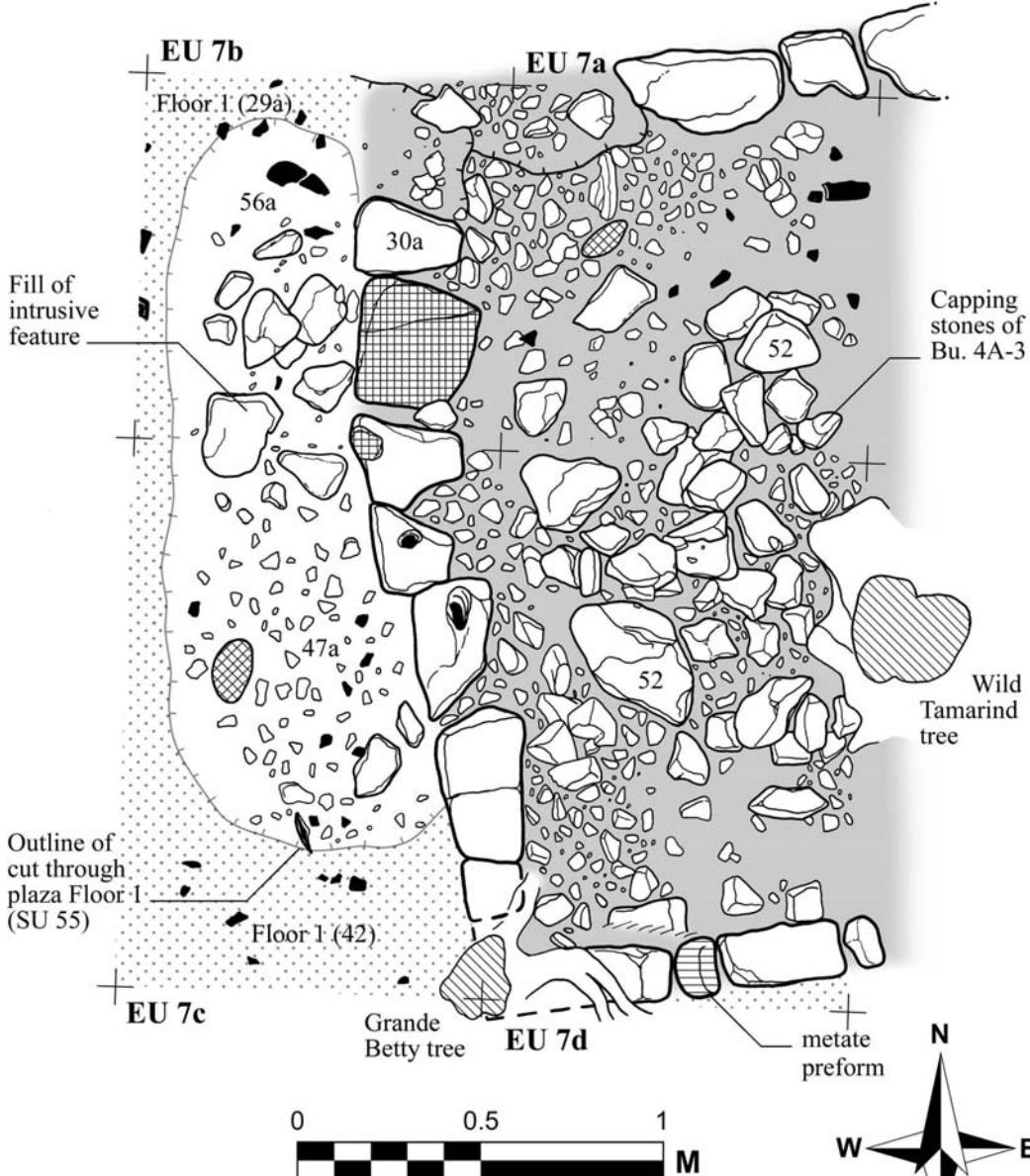
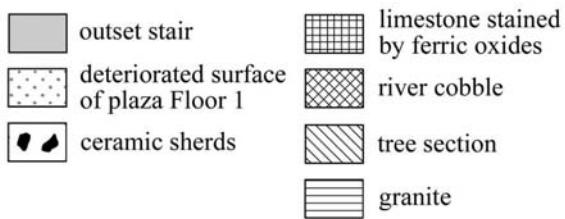


Figure 3: Plan showing the layout and configuration of EU 7 as it appeared by the end of the 2000 field season in relation to absolute UTM coordinates.

Plan is aligned to UTM grid north.

**Pook's Hill 1, Belize
Str. 4A-1st / Plaza, Op. 4A
EU 7, Top of Level 2
Floor 1 & Outset Stair 1
WBRCP 2000**

Plan: C. Helmke



Note that alignments of outset facings are represented as found, *in situ*.
Plan aligned to True North based on magnetic declination (1°59' W of MN).

Figure 4: Plan of the EU 7 excavations with all humic overburden and collapse debris stripped.

inclusions (SU 56c), suggesting some sort of disturbance. The penetration of Floor 3 (Level 4; SU 40a) was initiated in the NW corner, where within a depth of 10 cm the surface of marly, leached bedrock was encountered. Following this bedrock outcrop to the east and south along the baulks of the EU, the outline of a depression filled with light-colored matrix was noted (SU 56c), concentrated to the SW portion of the EU. Examination of the plans of overlying levels revealed that the outline of this bedrock depression corresponded to that of the rock mass feature cleared in Level 2. Removal of matrices from the bedrock depression revealed the presence of human bone, in the form of tibia and femora fragments. These fragments of human bone indicated the presence of Burial 4A-1 (Level 4; SU 41 [41a]). Discovery of Bu. 4A-1 at last clarified the identity of the rock mass feature (SU 56a) and associated disturbances of Floor 1 through 3, suggesting the presence of an intrusive pit (SU 55) penetrating through all floors, which subsequent to the deposition of the human remains was backfilled with soil matrices (SU 56b and 56c) and rocks (SU 56a and 56b) (Figures 4, 5 and 6).

Excavation Unit 7c

Discovery of human remains required the initiation of an extension to EU 7b to allow full exposure of Bu. 4A-1, although selection of its placement and orientation deserves some mention. While the orientation of the skeletal remains was not known, ancient Maya burial practices in the greater Belize Valley favored placement of extended human bodies along a N-S alignment with head to the S (Awe 1992; Song 1995; Welsh 1988; Willey et al. 1965). Thus based on the discovery of leg bones in EU 7b, and the intrusive pit (SU 55) apparently extending to the south, rather than any other direction, it was surmised that the skeletal remains of Bu. 4A-1 extended to the S, at which point the cranium should be located. Consequently, it was decided to set an extension to EU 7b conforming to its E-W width and extending southward for 1.50 m (as the mean stature of Classic Maya males is known to have been ca. 164 cm (Haviland 1967; Marquez and Ángel 1997; Saul 1972).

This 1.5 x 1 m extension, also aligned to magnetic cardinal points, was designated as EU 7c and was initiated with the removal of the humic stratum (Level 1a; SU 34) (Figures 3 and 4). The humic layer was stripped down to terminal phase architecture, thereby revealing the surface of Floor 1, as well as the continuation of the N-S alignment of facing stones, both previously encountered in EU 7b. At this juncture, discovery of the alignment of facings continuing into EU 7c, over a length of ca. 2.5 m suggested that it may represent the basal course of the lowest step of the outset stair of Str. 4A-1st, evidence for which was searched in vain during the 1999 salvage excavations (Operation 2; Helmke 2000a). This interpretation also suggested that the E-W alignment of facings discovered in EU 7a might represent the northern stair side facings of the outset stair. Noteworthy was the discovery of a concentration of small limestone rocks, a river cobble and larger limestone facings (SU 47a), which albeit less dense, appeared to represent the southward continuation of the rock concentration feature noted in EU 7b (SU 56a). Anticipating the sequence of Floors 1-3 associated with known elevations along the northern baulk of EU 7c (i.e. the southern baulk of EU 7b), greatly expedited the excavation of the ballast and core of Floor 1 (Level 2; SU 42) and Floor 2 (Level 3; SU 43). As in the case of EU 7b, both floors were found to be considerably better defined along the western baulks of EU 7c, and by contrast only poorly

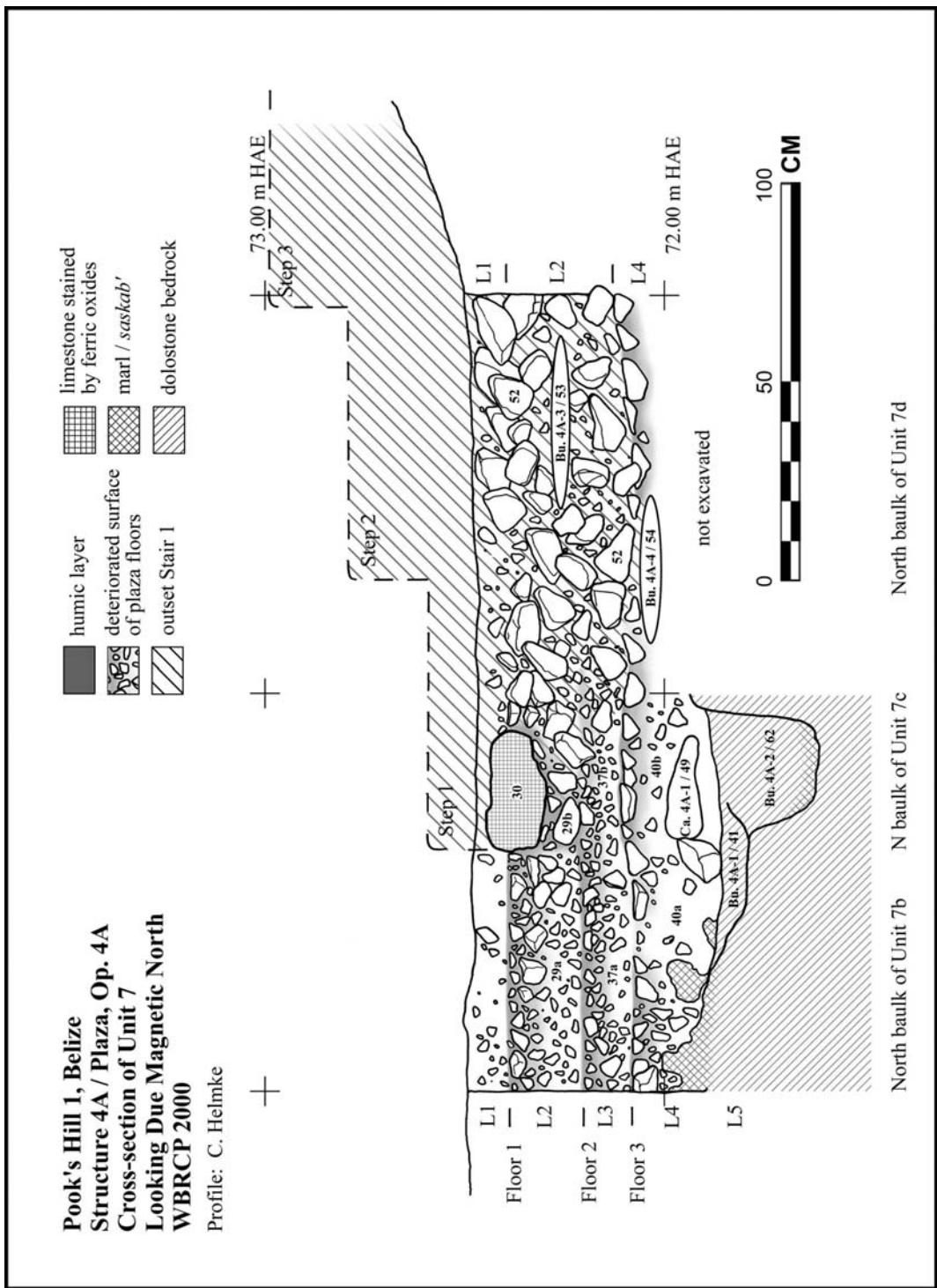


Figure 5: Section through the Op. 4A excavation units, showing vertical disposition of contexts encountered.

Pook's Hill 1, Belize
Structure 4A-1st, Op. 4A
EU 7, SU 55 (Levels 1-5)
Burial 4A-1 & Outset Stair 1
WBRCP 2000
 Plan: C. Helmke

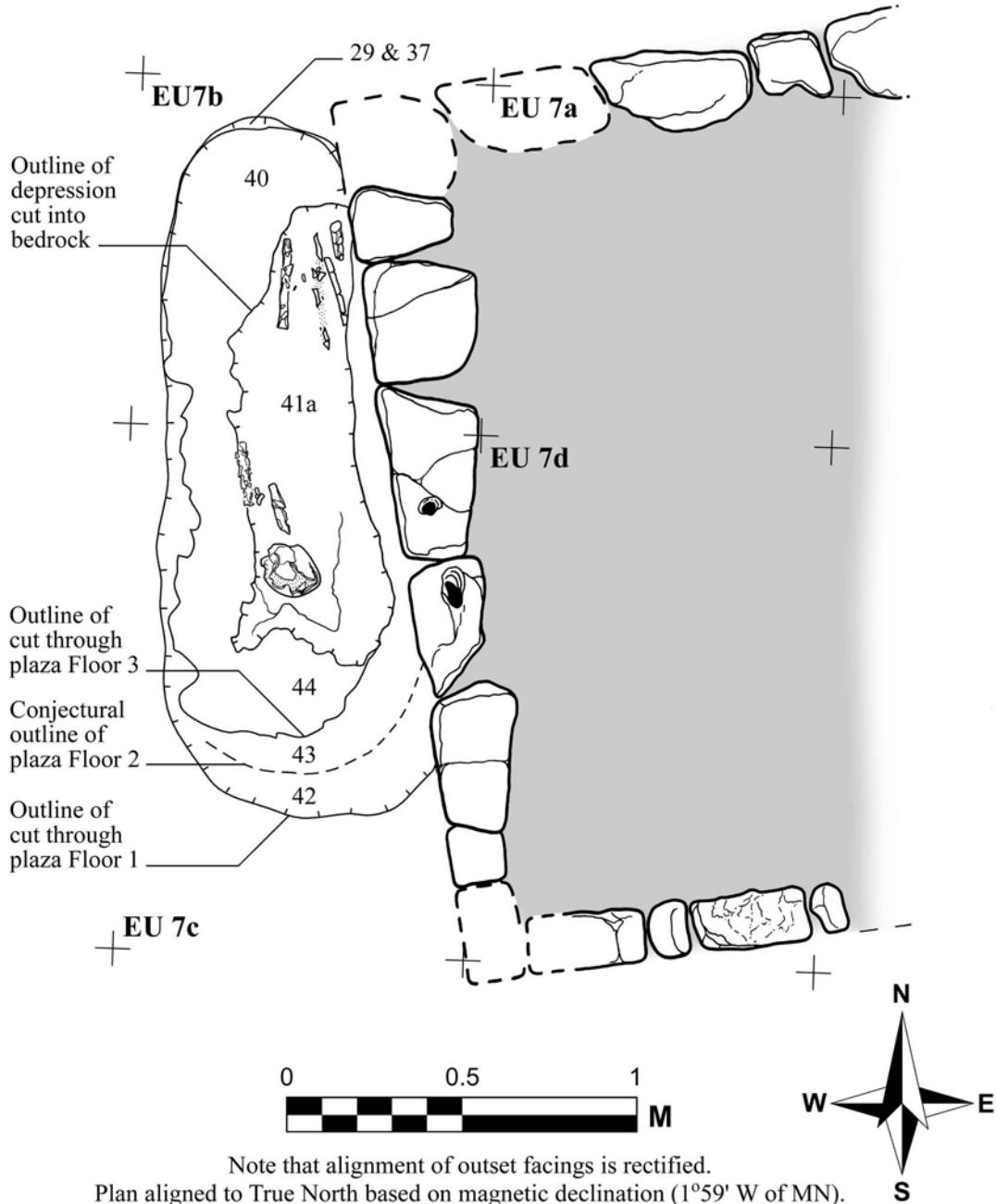


Figure 6: Plan of the intrusive cut through Floors 1-3 and its relation to Burial 4A-1.

defined along the alignment of the outset stair of Str. 4A-1st. While it was suspected that the concentration of rocks noted in EU 7c along the facings of the outset stair (SU 47a) may correlate to the presumed intrusive pit associated with Bu. 4A-1 in EU 7b (SU 55), no clear distinction could be made during the excavation of EU 7c, as both stratigraphic contexts graded into each in terms of coloration and texture (SU 47a and 47b), and the plaster surfaces of Floors 1 and 2 were too poorly preserved to allow delineation of an intrusive feature (SU 55). Consequently, segregation of the artifactual materials contained in what were presumed to be separate contexts, could not be accomplished, on account of the stratigraphic properties referred to above.

The lack of clarity was amended at the end of Level 3, with the exposure of the well-preserved surface of Floor 3, defined by flat limestone rocks in the southern half of EU 7c and along the western baulks thereof. Clearing of the well-preserved surface of Floor 3, allowed concrete identification of the outline of the intrusive pit (SU 55), which had clearly penetrated the northern portion of the floor along the facings of the outset stair. Examination of the plans of overlying levels confirmed that the outline of the intrusive pit (SU 55) encompassed the rock concentrations noted at the end of Level 1a, in both EU 7b (SU 56a) and EU 7c (SU 47a). Consequently, even prior to full clearing of the skeletal remains of Bu. 4A-1 the outline of the pit within which these remains rested was clear, as was the fact that this special deposit must inherently represent a late event in the occupation history of Pook's Hill 1, postdating the construction of terminal architecture encountered at this locus (i.e. Floor 1 and the outset stair of Str. 4A-1st).

The skeletal remains of Bu. 4A-1 were fully cleared once the remainder of the fill (SU 41 [41a] and 47c) of the intrusive pit (SU 55) was removed through excavation, having left the remains of Floor 3 in situ so as to allow clear contextual segregation between the core of Floor 3 (SU 44) and the burial fill (SU 47c, 41, and 47c/41). Following completion of Bu. 4A-1's documentation, the skeletal remains were removed and the bedrock depression within which the burial was deposited was cleared. Subsequently, the core of Floor 3 (SU 44) was excavated to bedrock resulting in the complete exposure of bedrock to the west of the outset stair of Str. 4A-1st, within the confines of EU 7b and 7c.

Excavation Unit 7b (reprise)

Clearing of bedrock, to the north of Bu. 4A-1, in EU 7b, along the base of the eastern baulk, led to the identification of more human remains, which suggested the presence of another skeleton and possibly another burial (SU 62 [41b]; although originally thought to pertain to Bu. 4A-1 and thus initially designated SU 41b). To expose the burial EU 7b was expanded eastward, back to its original 1 x 1 m configuration. As a result, the northernmost portion of the outset stair within the confines of EU 7b was dismantled, its backing masonry (Level 2b; SU 30) artificially sub-divided, vertically along the interstice of Floor 1's surface (SU 30a above, SU 30b below).

Excavations of the outset's backing masonry (SU 30b) revealed that the foundation work had partially chopped (SU 64) through the surface of Floor 2, which was only moderately represented to the east of the alignment of the outset's facings. Encountering the

remains of Floor 2 prompted sub-division of SUs along the surface elevation of the floor, thereby terminating SU 30b. Clearing down revealed that part of Floor 2's core had still been left in situ (SU 37b) despite the effects of the ancient construction efforts of Str. 4A-1st's outset stair (SU 64).

Removal of Floor 2's core revealed the moderately well-preserved surface of Floor 3 throughout the remainder of EU 7b, which although it seemed to have been affected by the mass of later construction, had not been damaged by chopping. Within the core of Floor 3 (SU 40b) at a depth 24 to 30 cm below its surface, a concentration of fragmentary ceramic vessels was encountered (SU 49). This special deposit (SU 49) was recognized as a cache and designated Ca. 4A-1 (Figure 7). The cache was clearly concentrated within the NE confines of EU 7b, and sharply delimited on its western side by the edge of the intrusive pit (SU 55), thereby suggesting that this special deposit had been partly chopped through during the excavation of Bu. 4A-1's burial pit (SU 55) in antiquity.

Removal of the cache, subsequent to its documentation, allowed clearing of the remainder of Floor 3's core (SU 40b) down to the skeletal remains. In removing the core of Floor 3, bedrock outcrops were noted within the NE and SE corners of EU 7b. Exposure of the bedrock from these two starting points allowed definition of a pit which had been excavated into bedrock to a greater depth than that associated with Bu. 4A-1. The different morphology of the burial pit, as well as its occurrence sealed below Floor 3 (thereby predating the construction of the outset stair of Str. 4A-1st), indicated that this special deposit represented another burial, unrelated to the adjacent Bu. 4A-1, and was therefore designated Bu. 4A-2 (SU 62 [41b]). Excavations of Bu. 4A-2 were extended 20-cm northward into the baulk of EU 7b so as to recover the entirety of the skeletal remains. Removal of the skeletal remains resulted in total exposure of bedrock throughout EU 7b, thereby terminating the excavations of this EU.

Excavation Unit 7d

Having successfully completed the objectives sighted for Op. 4A (in testing unlooted areas of the plaza platform associated and aligned to the primary axis of Str. 4A for evidence of special deposits) attention shifted to the architectural configuration of the shrine's terminal phase outset stair (Stair 1). In order to accomplish this, another extension was established to the east of EU 7c and to the south of EU 7a, conforming to the dimensions and orientations of EU 7c (i.e. 1.5 x 1 m, N-S / E-W). Establishment of the EU 7d extension allowed Operation 4A to encompass a series of four contiguous excavation units, forming a quadrangular configuration measuring on the whole 2.5 x 2 m. EU 7d was placed to locate the southern face of Stair 1, in accordance with visible surface features. Features noted on the surface included a large dolostone facing and a partial granite *metate* preform (Shot 306) both of which were found in perpendicular alignment to the facings discovered in EU 7b and 7c, and parallel to the E-W facings discovered in EU 7a. Discovery of facings in EU 7d would allow the outline of the entirety of the outset stair to be exposed within the four EU comprising Op. 4A.

Excavation Unit 7d was initiated with the stripping of the humic layer (Level 1a; SU 50) which once cleared, revealed the core and backing masonry of Stair 1 and led to the discovery of the southern facings of the outset's stair side. The objectives sighted for EU 7d were thus achieved.

Excavation Unit 7e and Unit 7d

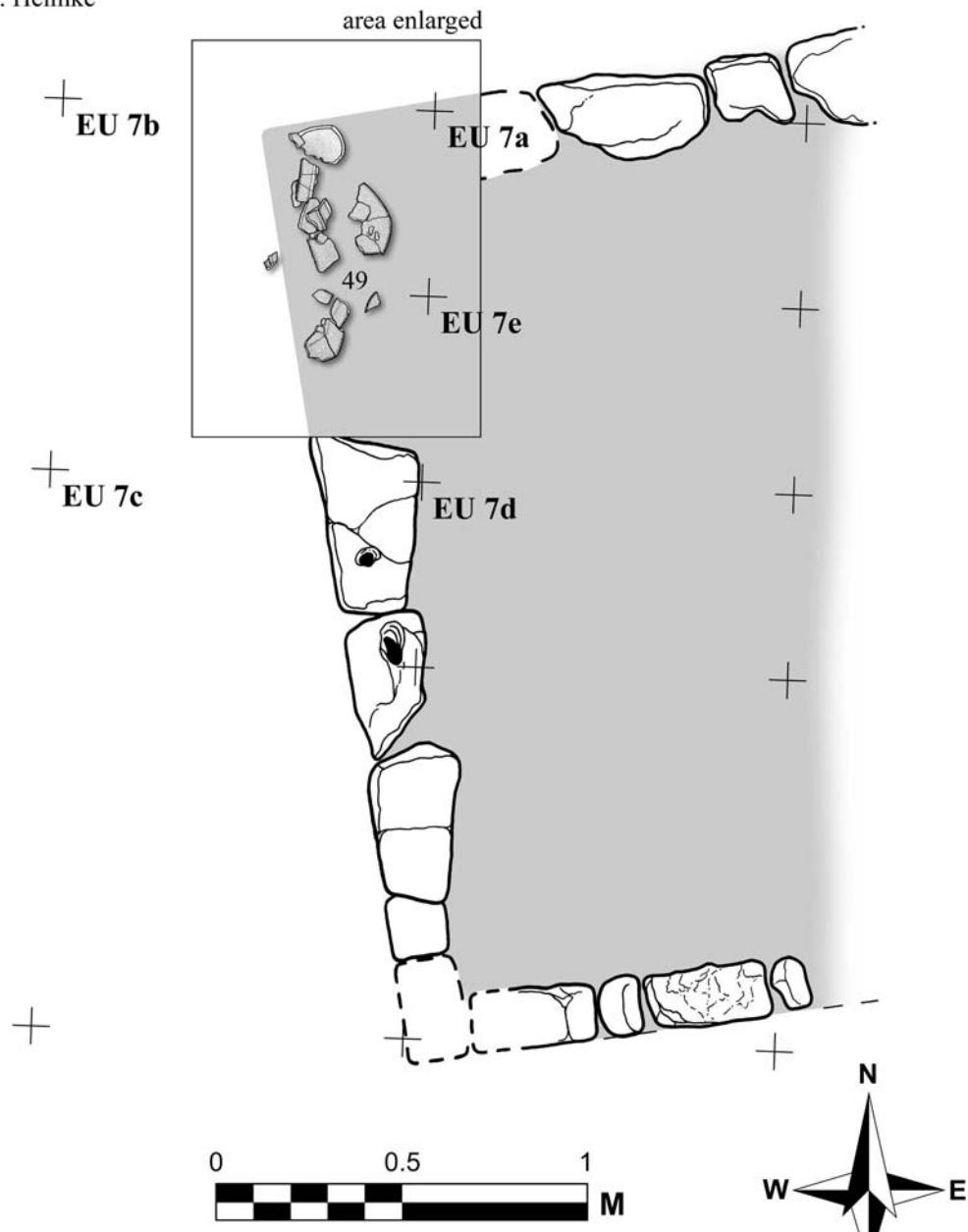
With the end of the season approaching it was deemed unfeasible to penetrate the core of the outset in both EU 7a and 7d in search of additional special deposits. Nonetheless, in the interest of time a small test EU was opened to penetrate the core of Stair 1. The decision was thus made to downsize both EU 7a and EU 7d. The resulting compromise was EU 7e, a 1 x 1 m EU encompassing the primary axis as defined architecturally by the outline of the outset stair (which by now had been fully exposed). In the process of establishing EU 7e it was determined that the actual primary axis as defined by the outset stair lay only 15 cm south of the primary axis approximated on the basis of mounded features at the beginning of the season. The downsized EU 7e comprised the southernmost 0.5 m of EU 7a and the northernmost 0.5 m of EU 7d.

Excavation Unit 7e was initiated with the removal of large core stones associated with little soil matrix (SU 52a; Level 2b). The excavation thus consisted primarily of the removal of rocks within the confines of EU 7e, rather than the excavation of matrices, on account of their paucity. Once the excavations reached a depth of 30 cm below MGS concentrations of soil matrices occurred in the voids between core stones. Excavating these matrices for another 10 cm, to a total depth of 40 cm below MGS, a concentration of human bone and fragmentary ceramic vessels was discovered. The special deposit uncovered represented Bu. 4A-3 (SU 53; between Levels 2b and 2c) (Figure 8). In clearing the cranial fragments along the southern baulk [28], it was clear that EU 7e would have to be extended southward to expose the entirety of the deposit. Consequently the remainder of EU 7d was reinstated, and excavated concurrently to EU 7e. In the process of removing the core in EU 7d (SU 52a) to reach the level of the burial, the fragmentary remains of another individual [36], also associated with Bu. 4A-3 were discovered. Clearing of matrices eventually allowed complete exposure of the Bu. 4A-3 remains contained within the confines of EU 7e/d. Subsequently, the human remains and associated artifacts were removed following documentation, allowing definition of the core hearting of the outset (end of Level 2b) (which at this depth contained a concentration of soil matrix). As the excavation of the burial was completed more rapidly than anticipated, it was decided to continue the excavations of the core, in hopes of reaching bedrock before cessation of the field season.

Excavations of the architectural core (Level 2c; SU 52b) resumed in EU 7e exclusively and continued to a depth of 35 to 45 cm below the elevation of Bu. 4A-3, at which point fragmented but well-preserved human leg bones were encountered in EU 7e. These remains signaled the presence of another burial, designated as Bu. 4A-4 (end Level 4; SU 54) (Figure 9). Initially the human remains were cleared only within the confines of EU 7e, but when it became apparent that the cranium and proximal portions of the humeri lay

Pook's Hill 1, Belize
Structure 4A / Plaza, Op. 4A
EU 7, Level 4, SU 49
Cache 4A-1 & Outset Stair 1
WBRCP 2000

Plan: C. Helmke



Note that alignment of outset outline is represented as rectified.
 Plan aligned to True North based on magnetic declination ($1^{\circ}59' W$ of MN).

Figure 7: Plan of Cache 4A-1 in relation to outset Stair 1.

further to the south, excavations in EU 7d resumed. Core and backing masonry of the outset stair contained within EU 7d (SU 52b) were cleared down to the level of the burial until cranial fragments were encountered. At this juncture, the remainder of the burial was cleared and documented, the end of the season looming imminently. Clearing of the burial revealed that it was deposited intrusively into the ballast of Floor 3 (Level 4), the outline of the cut (SU 59) being clearly discernable to the S and E of the burial.

The removal of the skeletal remains from Bu. 4A-4 was thus intended to mark a propitious –albeit arbitrary–end to the 2000 excavations of Op. 4A. Paradoxically, however, during the removal of the highly fragmentary but still partly articulated cranium of Bu. 4A-4, evidence for yet another cranium was found, lying directly below and abutting the former.

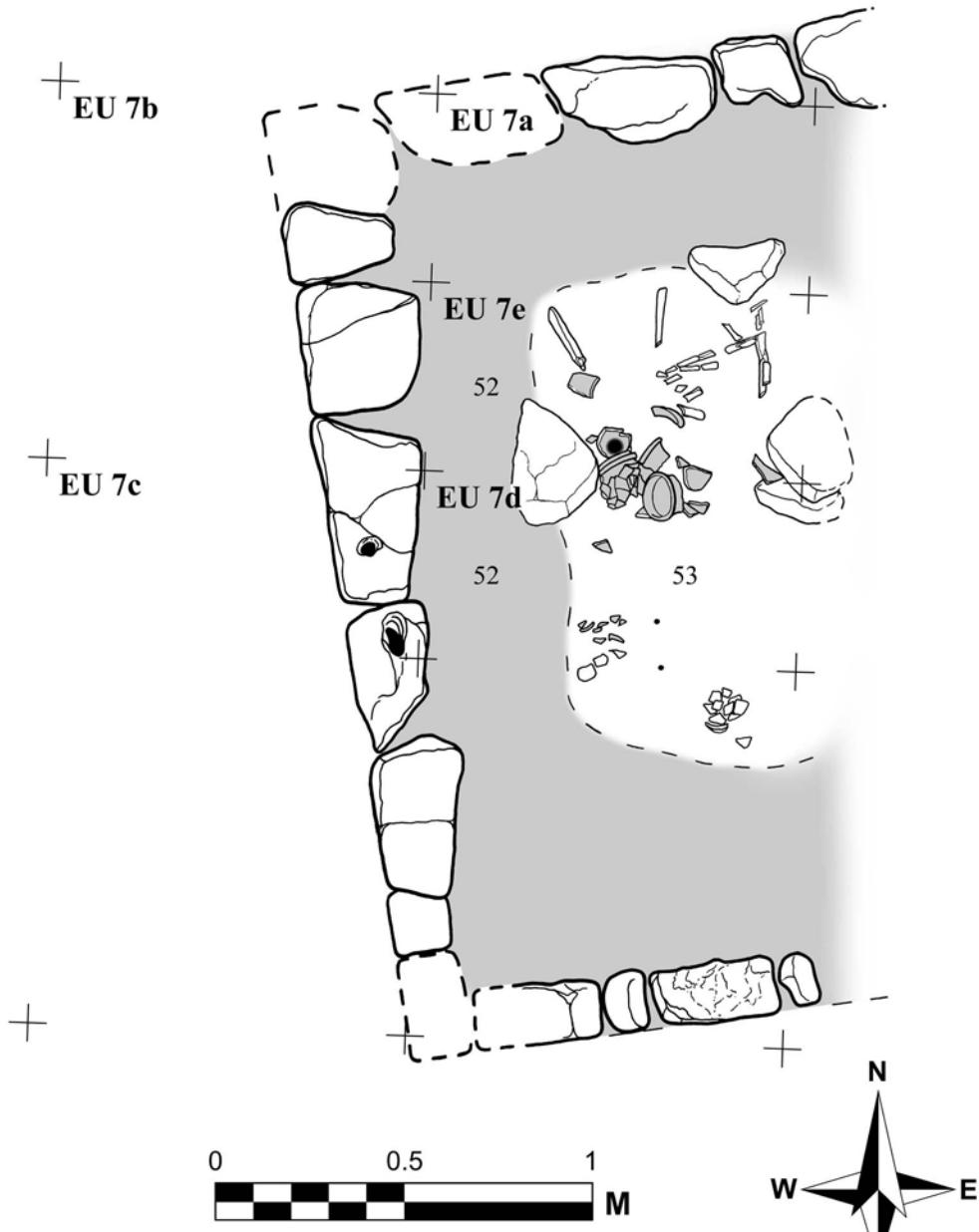
While the discovery of this additional cranium marked the presence of a separate, deeper deposit, designated as Bu. 4A-5, time could not be made to excavate it. Due to inadvertent mixing, however, skeletal remains relating to the individual of Bu. 4A-5 were collected with the cranium of Bu. 4A-4 [37]. The level to which excavations proceeded was marked and careful backfilling ensued, thereby terminating the Op. 4A efforts for the 2000 season. The last minute discovery of Bu. 4A-5, however, made it clear that excavations would have to resume at this locus during the subsequent 2001 season.

Bridging the 1999 and 2000 Seasons

Despite careful clearing, the distinction between collapsed architecture and looter's backdirt (B-LP1) could not be maintained during the 1999 season (Op. 2; cf. Helmke 2000a). This was due in part to excavation strategy adopted in 1999, which was progressing in the salvage excavation of EU 2a, from north to south. Based on the now known orientation and placement of the outset stair in relation to LP1, it is clear that the facings of the northern stair side had been dismantled during the looting efforts. Consequently, the approach chosen did not detect architecture as evidence for it had been affected by the looting. In addition, the highly deteriorated state of the terminal phase architecture coupled with the fact that the backdirt pile (B-LP1) was composed of exactly the same architectural elements as the terminal phase, rendered the core of the outset 'invisible' within the mass of secondary context core re-deposited as B-LP1 (SU 6, 9, 13 and 14). Excavation of the outset stair's core in 1999 (SU 13, 14, 66 and 67) revealed that it had been adversely affected by the growth of roots, which permeated throughout, notably a Wild Tamarind tree (*Magarum* sp. Barti) had grown into the core of the outset to a depth of ca. 70 cm below MGS. However, it was deemed prudent to section the excavation of the backdirt (B-LP1 pile) / collapse so as to ensure added horizontal control. This scheme proved extremely useful as the entirety of the mounded and collapsed outset is now known to have been contained within the limits of EU 2a and 2b (cf. Helmke 2000a). Consequently, materials recovered within these EU's have been re-associated with the architectural feature (e.g. SU 58). It should be pointed out, however, that as a result SUs of EU's 2a and 2b also contain materials from B-LP1.

**Pook's Hill 1, Belize
Structure 4A-1st, Op. 4A
EU 7, Level 2, SU 53
Burial 4A-3 & Outset Stair 1
WBRCP 2000**

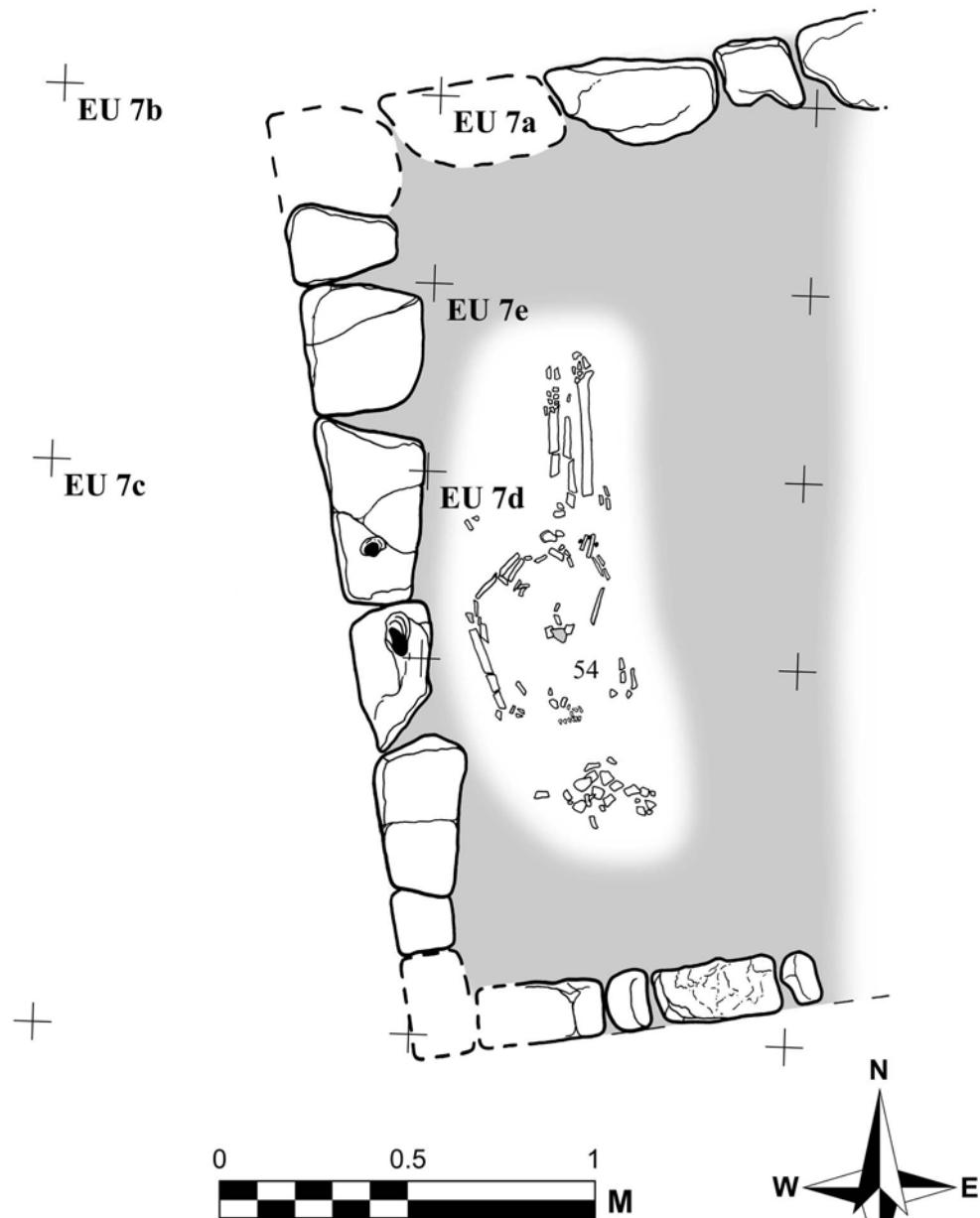
Plan: C. Helmke & L. Jacobs



Note that alignment of outset outline is represented as rectified.
Plan aligned to True North based on magnetic declination ($1^{\circ}59' W$ of MN).

Figure 8: Plan of Burial 4A-3 in relation to outset Stair 1.

Pook's Hill 1, Belize
Structure 4A-1st, Op. 4A
EU 7, Top of Level 3
Burial 4A-4 & Outset Stair 1
WBRCP 2000
Plan: C. Helmke & L. Jacobs



Note that alignment of outset outline is represented as rectified.
Plan aligned to True North based on magnetic declination ($1^{\circ}59'$ W of MN).

Figure 9: Plan of Burial 4A-4 in relation to outset Stair 1.

STRATIGRAPHIC CONTEXTS

Stratigraphic contexts are presented individually below, in the order of their sequential stratigraphic position, from earliest to latest. These groupings are analytical units, the product of the interpretation of stratigraphic sequences recorded as part of the Op. 4A investigations. As interpretations are susceptible to change, with further excavation, the stratigraphic sequence is subject to change as are identifications of the stratigraphic contexts themselves. Each stratigraphic context represents a discrete grouping of stratigraphic units (SU), the emphasis being placed on culturally significant features as a whole, rather than arbitrary subdivisions brought about by the spatial delineations of modern excavation units. Consequently, descriptions of the contexts are not restricted to the individual excavation units or levels in which these were discovered as it is felt that the descriptions presented below, if used in conjunction with the narrative of excavations provided above, supply sufficient data to interested readers. Nonetheless, spatial distributions of stratigraphic contexts are summarized in the ‘provenience’ sections, in part for those readers more accustomed to reading level by level descriptions of specific excavation units.

Bedrock

Provenience: Bedrock was exposed throughout EU 7b and within EU 7c to the west of Str. 4A-1st’s outset stair, as the top of Level 5. Mean elevation of natural (unmodified) bedrock surface in EU 7b: 71.86 m HAE, in EU 7c: 71.88 m HAE. Despite attempts made, bedrock was not reached in EU 7e or 7d during the 2000 season. As bedrock was not penetrated by excavations this context has not been assigned an SU designation.

Description: Natural bedrock is characterized by a medium-hard (unleached) to soft and friable (leached) and relatively smooth undulating limestone surface. Following the topography of the natural terrain, exposed bedrock, slopes slightly to the south. The surface in EU 7b has been highly affected by leaching and thus has a marly texture. To the south in EU 7c, the harder limestone only appears affected by minor exfoliation possibly brought about by root growth. Transition between cultural layers and bedrock is abrupt and original humus at this location appears to have been stripped prior to the construction of Floor 3. Color of bedrock is variegated but a yellowish color (10YR 7/6) predominates.

Cultural Modification: As discovered in 2000, bedrock exposed has been modified in two areas, both for the deposition of human interments. The first forms part of the intrusive pit (SU 55) cut through the Floor 1-3 sequence. The deepest aspect of this intrusion is a relatively shallow (7 cm deep) depression cut into bedrock, conforming to the dimensions of the skeleton of Bu. 4A-1 (1.21 x 0.45 m N-S by E-W, respectively). The second area of modification (SU 65) is represented by the deeper depression cut into bedrock to afford the deposition of Bu. 4A-2. This deeper pit is on average 25 cm deep, and measures 30 cm wide (E-W), and in excess of 0.92 m long (N-S) (as the outline was difficult to trace within the northern reaches of EU 7b).

Relationship to Adjacent Stratigraphy: As Floor 3 overlies unmodified bedrock at all points reached by excavations in EU 7b and 7c, the flooring episode may represent the earliest attested phase of construction of the plaza platform. Consequently, it is surmised that the humic layer, which would have been present originally, was stripped off bedrock at a time coeval to the construction of Floor 3. The intrusive pit (SU 65) cut into bedrock to accommodate Bu. 4A-2 may have been cut during the construction of Floor 3, as this burial underlay Floor 3. The other intrusive pit (SU 55) affecting the bedrock surface exposed, is intrusive through Floors 1, 2 and 3 and thus represents a late event, postdating the construction of terminal architecture (i.e. Str. 4A-1st).

Floor 3 (SU 40 and 44)

Provenience: Floor 3 was documented as Level 4 in all EUs. Mean elevation of Floor 3 as documented in EU 7c: 72.11 m HAE. The surface of the floor was uncovered in the northern and eastern extremities of EU 7b (top of SU 40), but uncovered solely in the southern half of EU 7c and to the west of the intrusive cut (top of SU 44). In addition, parts of Floor 3 were uncovered during the clearing of Bu. 4A-4, which appears intrusive into the ballast layer. Core of Floor 3 was excavated to bedrock in the entirety of EU 7b (SU 40). In EU 7c excavations were also carried to bedrock but only west of the outset stair (SU 44). In the other EUs where portions of the flooring surface were uncovered, it was not excavated and thus was not assigned SU numbers.

Surface: Aside from the pits cut through the floor in antiquity (i.e. SU 55 and 59), the surface of the floor is well preserved (Figure 10). This surface is quite level except for those portions underlying the outset stair of Str. 4A-1st, which were apparently affected by the weight of the outset, or by the construction thereof. No evidence of a plaster coating was discovered; the roughly cut dolostone rocks defining the surface of the floor (\varnothing ca. 10 to 15 cm) were laid down with their broadest surfaces exposed, their adjoining edges set so as to be tightly fitting (Figure 10). These attributes suggest that Floor 3 may have never been intended to receive a plaster coating.

Ballast: Composed of smaller than fist-sized rocks, lying directly below flooring surface (cf. above). Ballast layer is ca. 5 cm thick and composed of small limestone rocks and a mixture of humus and minority of alluvial matrix. This layer can be readily distinguished from the underlying core, which is composed predominantly of alluvium with very few rocks.

Core: The core consists primarily of alluvium, with equal quantity of *saskab'* and a minority of dark soil, apparently derived from humic matrix in antiquity. Very few rocks were mixed in with the well-packed and homogenous core matrix. The only exceptions to this are the few and small river pebbles (ca. 1 to 3 cm), suggesting a fluvial origin for some of the alluvium contained in the core (refer to discussion for Floor 1 of EU 8 in Helmke et al., this volume).

Associated Material: Although ceramic sherds, jute shells, and chert lithics were recovered, specific absolute frequencies are not yet available. The matrix sample recovered

from this context only revealed evidence of pine charcoal (*Pinus* sp.) (Morehart, this volume).

Relationship to Adjacent Stratigraphy: Floor 3 was found to run under the outset stair of Str. 4A-1st, which indicates that construction of the floor is associated with an earlier phase. At present the architectonic articulation between this floor and an earlier phase of Str. 4A has not been uncovered. Based on an examination of the structure's extant section, it seems clear that future excavations searching for such an articulation will have to penetrate deep into the core of the terraced platform. As Floor 3 is the earliest attested flooring episode of the plaza platform, it is possible that it is contemporaneous with the earliest phase of the shrine. Test-pit excavations penetrating the core of the earliest phase of Str. 4A in 1999 (EU 6), failed to reach the elevation of Floor 3, which apparently lies only 38 cm below the deepest point reached in the excavations (cf. Helmke 2000a). These excavations were halted to due time constraints as well as to avoid debilitating the structural stability of Str. 4A's core.

At least two pits have been cut through Floor 3 in antiquity: one (SU 55) is associated with the deposition of Bu. 4A-1 (SU 41), the other (SU 59) is associated with Burial 4A-4 (SU 54). The floor thus predates both of these interments. Burial 4A-2, as well as Cache 4A-1 (the latter lain over the former),

are not represented on the surface of Floor 3 by the outline of an intrusive cut. This evidence suggests This evidence suggests that these special deposits were placed into the core of Floor 3 during to the construction of the plaza platform of which Floor 3 is a part. The construction of Floor 3 is thus contemporaneous with Bu. 4A-2 and Ca. 4A-1.

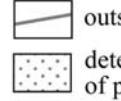
Discussion: Nearly identical floor surfaces have been discovered at Barton Ramie (Str. BR-1: Floor A; Str. BR-123: Floor B) as well as at Baking Pot (Str. BP-198) (Willey et al. 1965: 74-78, Fig. 16d; 108-111, 46c,d,f; Audet 2000). The former instances have been dated to the Spanish Lookout complex (ca. AD 700-900) (Willey et al. 1965: 76, 111), while the latter is assigned to the Late Preclassic (Audet 2000). Thus the architectural characteristics of Floor 3 are thought to be well in keeping with practices documented in the greater Belize Valley.

Floor 2 (SU 37, 43)

Provenience: Evidence for Floor 2 was uncovered in EUs 7b and c and excavated as Level 3. Mean elevation of Floor 2 in EU 7b: 72.20 m HAE, in EU 7c: 72.27 m HAE. As part of the floor was chopped (SU 64) to accommodate the deposition of the dry-laid core of the outset (Str. 4A-1st; i.e. SU 52), remnants of this floor have thus far only been found to the west thereof. Outside the perimeter of the outset the integrity of the floor is unaffected, although small stumps project partly underneath the row of facings and backing masonry of the outset stair (Figure 5). Differentiation between well-preserved floorings vs. stumps is represented in the respective distinction between SU 37a and b in EU 7b.

**Pook's Hill 1, Belize
Str. 4A / Plaza, Op. 4A
EU 7, Top of Level 4
Surface of Floor 3
WBRCP 2000**

Plan: C. Helmke


Note: the surface of Floor 3 in EUs 7d/e is schematic.

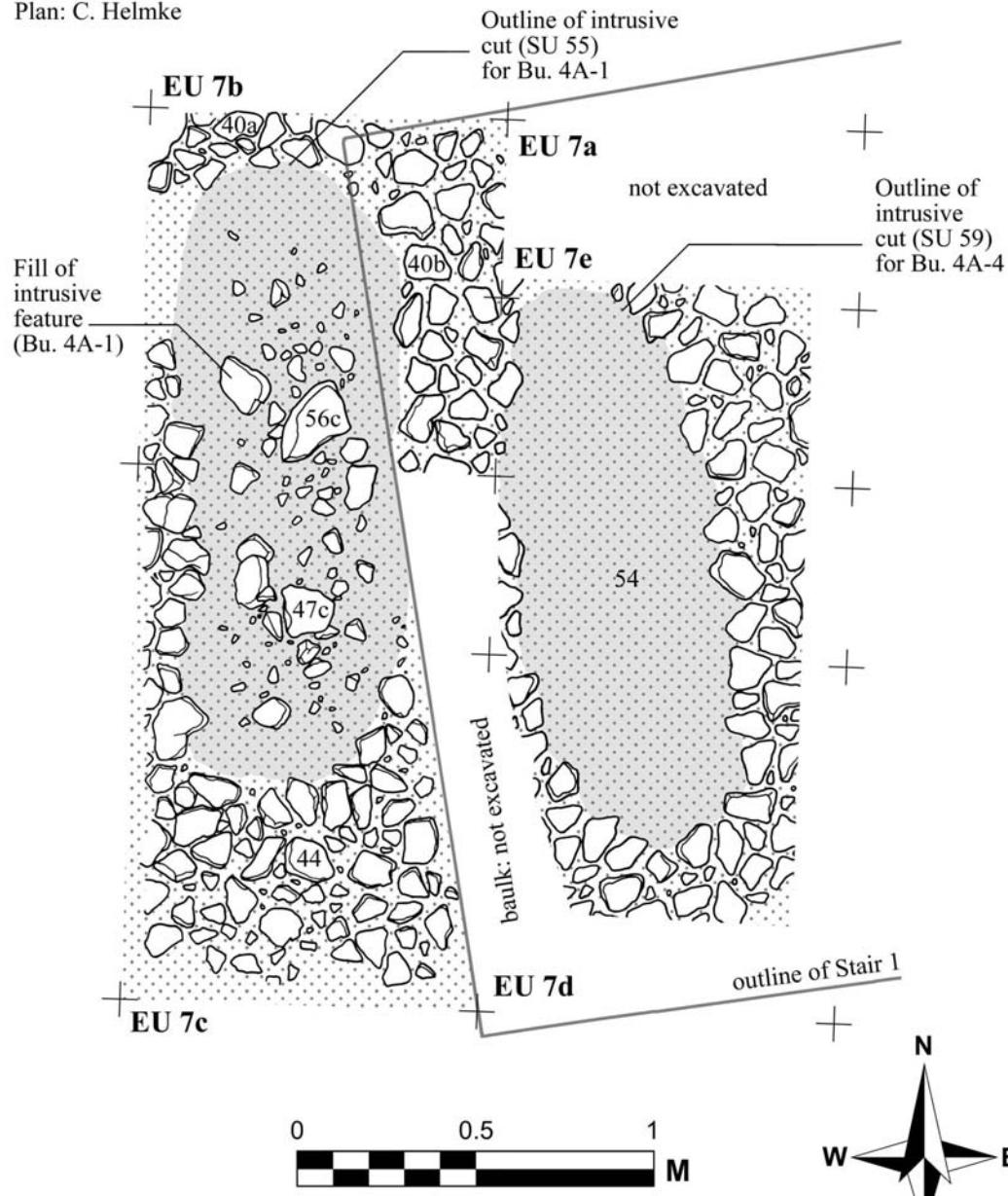


Figure 10: The extent of Floor 3 exposed in EU 7. Note the intrusive cuts.

Surface: Overall the surface of the flooring is poorly preserved. Unlike the preceding floor the surface of Floor 2 appears to have been plastered in antiquity although no well-preserved patches of plaster were discovered. A few nodules of plaster were however exposed, but these were not retained. The surface of Floor 2 is thus represented by a dense concentration of limestone gravel, signaling the ballast layer. Disturbance is represented by the intrusive pit cut (SU 55) for the deposition of Bu. 4A-1 (SU 41), and the chopping (SU 64) preceding the construction of the outset stair. The surface is more compact than core of overlying Floor 1.

Ballast: The ballast of the floor is predominantly composed of densely packed limestone gravel (\varnothing ca. 2 to 5 cm) with a minor soil constituent. Ballast is defined by dense concentration of gravel, although both the ballast and core are composed of the same elements, differing proportions allow rough segregation between the two.

Core: The core is composed of rocks (\varnothing ca. 10 cm) and smaller gravel, with a dark brown soil constituent. The core is relatively compact and composed of more limestone rocks than soil.

Associated Material: Although ceramic sherds, jute shells, and chert lithics were recovered, specific absolute frequencies are not yet available.

Relationship to Adjacent Stratigraphy: Floor 2 was constructed atop Floor 3 (therefore postdating it) and below Floor 1 (therefore predating it). As Floor 1 is apparently contemporaneous to the construction of the terminal phase outset of Str. 4A-1st, the chop line (SU 64) affecting Floor 2 therefore likely represents the earliest aspect of terminal construction efforts at this locus. The intrusive pit (SU 55) penetrating Floors 1-3, in postdating the terminal phase architecture, also postdates the construction of Floor 2.

Discussion: The layer of ballast is very similar to that of Floor 1 in EU 8, as well as Floor 1 in U7b and c, and Floor 1 along the base of Str. 2A (cf. Helmke et al., this volume).

Stair 1 – Outset Stair (SU 13, 14, 30, 52, 66 and 67)

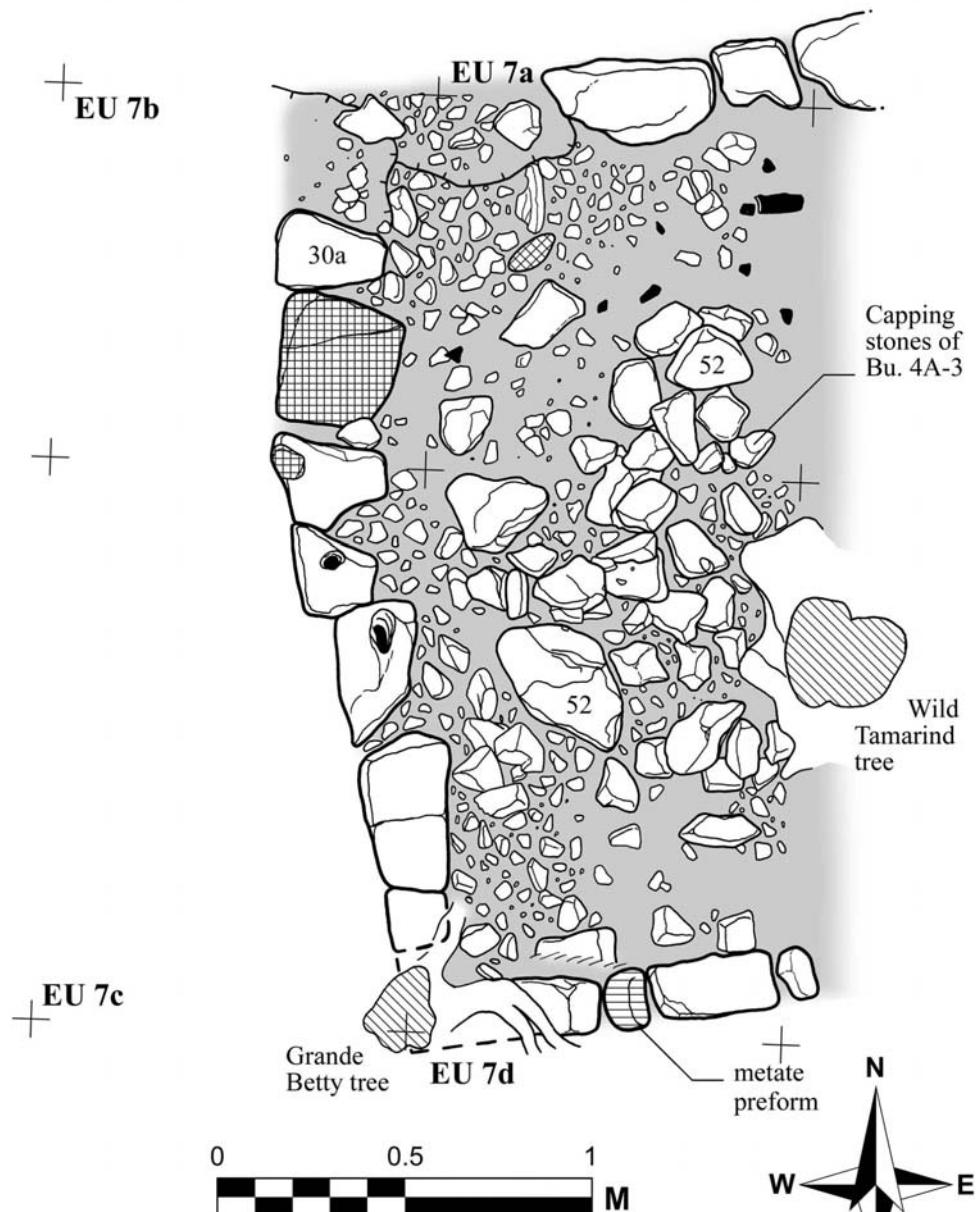
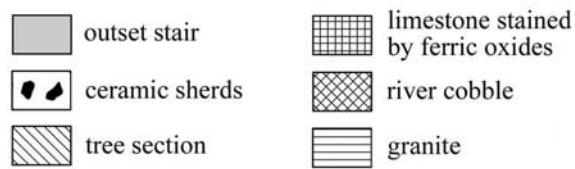
Provenience: Search for an outset stair was initiated in 1999 but decisive evidence for such an architectural feature was only uncovered in 2000. Mean elevation of the basal course at the point of interstice of Floor 1 in EU 7b and 7c: 72.36 m HAE. The basal course of the outset forms a quadrangular outline that was followed during the Op. 4A excavations of the 2000 season (Figure 11). Since all extensions to the original EU 7 (i.e. EU 7a and b) were initiated to encompass the outset, all EUs of Op. 4A incorporate part of the basal course (i.e. EU 7a through 7d). SU 30 defines the segment of facing stones and backing masonry incorporated in EU 7b (Level 2). Otherwise the core and backing masonry were excavated as SU 52 within the southern half of EU 7a and the northern two-thirds of EU 7d (both as EU 7e). At present, only the western portion of the outset has been excavated. The remaining eastern portion will be subjected to excavation in coming seasons. The core of the outset stair was first sampled in EU 2a (SU 66 and 67) and EU 2b (SU 13 and 14) as Level 2a

(1999) (Helmke 2000a). Excavations continuing the sample took place in EU 7e and 7d, as Level 2b (SU 52a) and Level 2c (SU 52b).

Facing: During the 2000 season the basal course of the outset stair of Str. 4A-1st was uncovered. This course was set using sub-rectangular stretcher facing stones, although two might better be termed headers (cf. Figure 11). The width of the cut stones ranges between 16 and 49 cm (mean is 32 cm, n=12), while the depth ranges between 16 and 33 cm (mean is 23 cm, n=12). These cut stones are predominantly made of hard dolostone. Rather than being truly cut, the naturally occurring cleavages characterizing limestone bedding planes were exploited (cf. White n.d.). Note should be made of the carbonic dissolution holes affecting two facing stones. One cut stone is made of softer limestone that is evenly tinted by ferric oxides (SU 30a). Finally, a facing stone incorporated into the foot of the southern stair side is in fact a broken preform for a small granite turtleback *metate* (Shot 306). At present the rise is estimated at 1.60 m and the run at slightly in excess of 3.00 m depending on the articulation of the uppermost step. Based on that these special deposits were placed into the core of Floor 3 during to the construction of the plaza platform of which Floor 3 is a part. The construction of Floor 3 is thus contemporaneous with Bu. 4A-2 and Ca. 4A-1. As well-preserved steps of the outset were not discovered it cannot be stated at present whether PD 4A-2 and Bu. 4A-3 are intrusive into the core of the stair or sealed within it. Nonetheless, the context in which PD 4A-2 was found may suggest that it represents a dedicatory votive offering, thereby suggesting that it is coeval to the construction of Str. 4A-1st's outset stair. Since Bu. 4A-3 lies buried deeper, below PD 4A-2, this hypothesized reconstruction would argue in favor of this deposit also being coeval to the construction efforts. Future investigations at this locus may clarify the stratigraphic relationships.

In addition to the comments on the stratigraphic relationships of the outset stair, ceramic materials recovered from the core in 1999 (SU 13) have been subjected to a preliminary analysis, which suggests a temporal placement for the terminal construction effort. Preliminary analysis of the diagnostic ceramics recovered as part of a sample of the core of the outset stair (SU 13) reveals the presence of the following Late Classic 2 (ca. AD 700-800) types: Dolphin Head Red, Garbutt Creek Red, Rubber Camp Brown, Cayo Unslipped (cf. Gifford 1976); Late Classic 3 (i.e. Terminal Classic; ca. AD 800-900) types: Roaring Creek Red, Vaca Falls Red, McRae Impressed, Alexanders Unslipped and Tinaja Red (cf. Smith and Gifford 1966; Adams 1971; Gifford 1976; Sabloff 1975). The approximate breakdown of diagnostic ceramics from SU 13 is as follows: 2 EC (9 %), 5 LC1 (23 %), 8 LC2 (36 %), and 7 LC3 (32 %). Temporal distributions of these ceramic materials suggest a Late Classic 3 (Terminal Classic placement) for the construction of the outset stair of Str. 4A-1st.

Pook's Hill 1, Belize
Str. 4A-1st, Op. 4A
EU 7, Level 2, SU 30 & 52
Outset Stair 1
WBRCP 2000
 Plan: C. Helmke



Note that alignments of outset facings are represented as found, *in situ*.
 Plan aligned to True North based on magnetic declination (1°59' W of MN).

Figure 11: Plan of outset Stair 1 of Structure 4A-1st.

Floor 1 (SU 29, 42)

Provenience: Floor 1 was discovered to the west of the basal course of the outset stair in EU 7b and EU 7c as Level 2. Mean elevation of Floor 1 in EU 7b: ca. 72.35 m HAE, in EU 7c: 72.36 m HAE. Probing in the SE corner of EU 7d (along the southern stair side of the outset stair of Str. 4A-1st) also revealed the presence of Floor 1, directly below the humus layer. In the EU 7d context, the surface of the floor was not fully stripped or excavated and thus was not assigned an SU designation. Based on this horizontal distribution it is clear that Floor 1 only occurs around the perimeter of the outset stair. The portion of the floor abutting the outset was excavated as SU 29a in EU 7b and as SU 42 in EU 7c. Below this basal course, the backing masonry of the outset stair and the core of the floor graded into each other, but these were segregated and excavated as SU 29b and SU 29a, respectively (in EU 7b).

Surface: The surface of the floor was highly deteriorated and bore a great deal of similarity to that of Floor 1 in EU 8. That both of these floors were subject to similar taphonomic processes is suggested by their comparable stratigraphic contexts (i.e. directly below a thin humic layer). Aside from small ($\varnothing < 2$ cm), highly brittle, plaster fragments no evidence of plastering was found. Nonetheless, the fragments are taken as an indication that the floor was once plastered over the entirety of its surface. The surface is otherwise defined by a dense concentration of limestone gravel (\varnothing ca. 2 to 5 cm), which was cut through in antiquity (SU 55) (Figures 4 and 12). In the southern portion of EU 7c the surface was partly disturbed by Grande Betty roots (*Cupania belizensis* Standl.; cf. Figure 4), while in the center of EU 7c the floor was affected by roots of the Wild Tamarind tree (*Magarum* sp. Barti) which was growing atop the backdirt pile or spoil heap of Looter Pit 1 (i.e. B-LP1), but felled in 1999 (cf. Helmke 2000a).

Ballast: The layer of ballast is very similar to that of Floor 2 in EU 7b and c, as well as Floor 1 in EU 8 and Floor 1 along the base of Str. 2A-1st (Helmke et al., this volume). The ballast is characterized by a dense accumulation of limestone gravel (\varnothing ca. < 5 cm) with a mixture of humus and alluvium interspersed throughout. This layer is more densely packed than the underlying core.

Core: The core had been noticeably affected by root activity and thus subject to humic intrusion. Limestone rocks (smaller than fist-sized) and dark earth comprise the core of the floor. The composition is homogeneous and portions unaffected by root activity are relatively compact.

Associated Material: Specific absolute frequencies of artifacts in the core are not yet available. Minor concentrations of terminal occupation debris were noted and documented during the clearing of the floor's surface. In all, 15 ceramic sherds were documented resting on the surface of Floor 1 in EU 7b, and 19 more within the confines of EU 7c (Figure 4). These materials appear to represent a sparse accumulation of clutter refuse, the peripheral product of activities conducted in the vicinity.

Relationship to Adjacent Stratigraphy: The eastern edge of Floor 1 abuts the facings of the outset stair. It thus is interpreted as being contemporaneous, though the surfacing of the floor likely ensued completion of the outset stair. In addition, there is little distinction to be made between the core of the floor and the backing masonry below the basal course (cf. SU 29 vs. SU 30b). As it is presumed that the floor was once plastered, it is thought that it would have turned up or lipped up to the facings. Floor 1 is thus considered an integral part of the Str. 4A-1st construction effort. The similarities of physical properties shared by Floor 1 in Op. 4A, Op. 5A and Op. 6A, suggest that these all represent part of the same, coeval, terminal construction phase of the plaza platform. The position of Floor 1 above Floor 2 indicates the former postdates the latter. The intrusive pit being cut through Floor 1 to bedrock (SU 55) (to accommodate the deposition of Burial 4A-1, SU 41), indicates that this latter event must have taken place once Floor 1 and the outset stair had been completed. The presence of minor quantities of terminal occupation debris resting on the surface of Floor 1 and the surface of the fill (SU 47 and 56) of the intrusive pit (SU 55) likely represent activities at this locus postdating the intrusive cut.

Intrusive Feature (SU 55, 47, and 56)

Provenience: This feature is an intrusive pit (SU 55) and its secondary fill (SUs 47 and 56). The intrusion was excavated in antiquity to accommodate the deposition of Burial 4A-1 (SU 41). The outline of the intrusive feature is restricted to EUs 7b and 7c, and occurs exclusively to the west of and in alignment to the basal course of the lowest step of the outset stair (see above) (Figure 6). The three-dimensional outline of the pit (SU 55) when represented in section is a deeply concave ‘chop line’ (Figure 6). The intrusion was cut through the surface of Floor 1, through Floors 2 and 3, down to bedrock, thereby encompassing Levels 2-5.

Fill contained within the pit is segregated horizontally based upon the EU within which it occurs. Thus the fill of the trench within EU 7b is designated as SU 56, while fill in EU 7c is referred to as SU 47. The fill (SUs 47 and 56) is also subdivided vertically by the addition of ‘-a,’ ‘-b,’ and ‘-c’ suffixes, to follow their vertical distribution along the lines of Levels 2, 3, and 4, respectively. Thus, for example, “SU 47b” refers to the fill of SU 55 of Level 3, in EU 7c. Any fill deposited directly over Burial 4A-1 (Level 4) was excavated as part of SU 41 (although the burial fill is analogous to and thus contemporaneous with SU 47c and 56c).

Pit Description: The pit (SU 55) measures 2 m in length (N-S), maximum width ranges between 0.60 and 0.70 m (E-W), and at its deepest is 1.20 m. The eastern perimeter of the pit edges along the lowest step of the outset stair of Str. 4A-1st. This attribute suggests that the pit was excavated along an already established architectural feature. The baulk of the pit’s southern extremity is characterized by a slope, while in contrast the northern extremity is markedly steep, almost vertical (Figure 6). The morphology of the trench suggests that the intrusion was initiated at the southern extremity, where it was brought down to bedrock and then carried northward.

Pook's Hill 1, Belize
Str. 4A-1st / Plaza, Op. 4A
EU 7, Top of Level 2
Floor 1 & Outset Stair 1
WBRCP 2000

Plan: C. Helmke

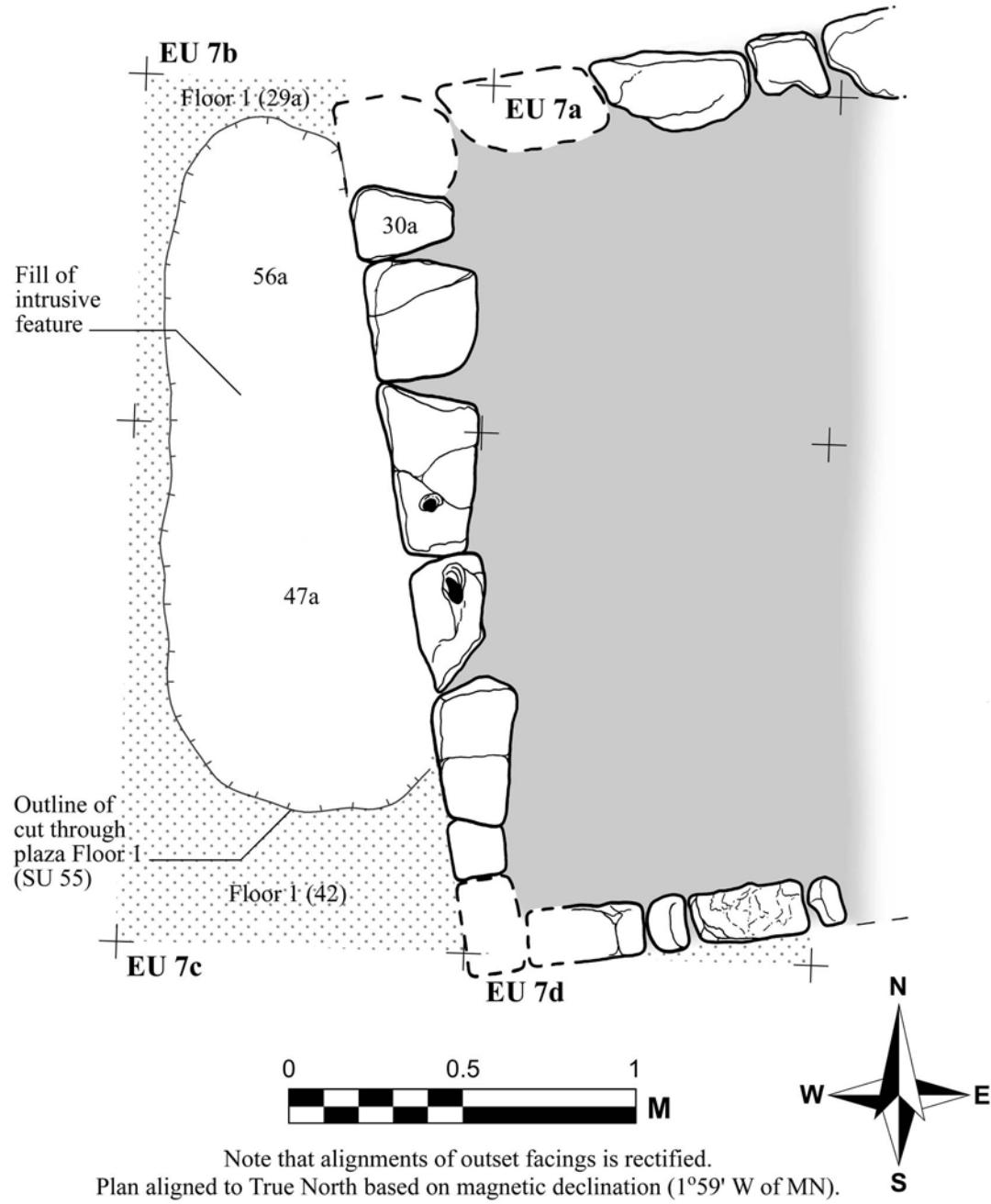
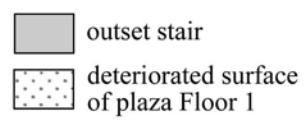


Figure 12: Extent of Floor 1 cleared in EU 7a and EU 7b. Note the prominent intrusive cut.

Fill Description: The majority of the fill is composed of a mixture of core and ballast extracted during the ancient excavations penetrating Floors 1 through 3. This bulk was secondarily backfilled into the pit as a nearly homogeneous mass, although it should be noted that the lower level contained a majority of soil matrices, while the upper levels contained a predominance of rocks. For specific descriptions of the ballast and core of these particular floorings refer to the individual contexts, above. In addition, the fill also contained inclusions of fist-sized limestone rocks, roughly-hewn boulder-sized limestone rocks (SU 56b, 47b and c), as well as a minority of small, slab facing stones (ca. 20 to 35 cm in length; SU 56a and b), and metamorphic river cobbles ($\varnothing < 20$ cm; SU 47a). While concentrated in the northern portion of the pit, the larger rock constituent remained somewhat homogeneous throughout the pit from the top of Level 2 down into the upper part of Level 4 (SU 47 and SU 56 subdivisions a through part of c). Other prominent inclusions include midden material as part of the upper strata, and part of Cache 4A-1 (SU 49) mixed throughout the secondary fill (the western portion of the cache (SU 49) was apparently affected by the intrusion). The midden materials may have been deposited in order to compensate for the compaction and slumping of the fill.

Associated Material: The identification of midden material in the fill is based on comparison to the cores of floors at Pook's Hill that were not affected by cultural intrusions. In contrast, these contexts contain relatively low frequencies of ceramic, lithic and vertebrate faunal remains (e.g. Floor 1 in EU 8 and portions of Floor 3 in EU 7c not affected by the intrusion). Contemporaneous midden deposits were found piled on the plaza floor along the base of Str. 2A (cf. Clusters 4 through 6; cf. Helmke et al., this volume). These deposits exhibit some of the highest concentrations of ceramic, chert, obsidian, groundstone, faunal and macrofloral remains thus far identified at Pook's Hill (Morehart, this volume; Stanchly n.d.). In addition to high absolute frequencies, midden deposits at Pook's Hill exhibit the largest diversity of economically significant vertebrate and vegetal species (Morehart, this volume; Stanchly n.d.). These attributes are shared by the fill of the intrusive pit, thereby supporting the identification of midden materials in SUs 47a and 56a.

Specific absolute frequencies of ceramic materials contained within the fill are not available at present. Nonetheless, comments can be made on other artifact classes, although none of the frequencies presented here are final. The fill contained fragments of prismatic obsidian blades. Faunal remains included in SU 47a [SU 42] are represented by parrotfish skull elements, and a specimen from a large rodent (*agouti* or *paca*) (Stanchly n.d.). In addition, SU 47a [SU 42] contained pine charcoal (*Pinus* sp.) and carbonized rind fragments of calabash (*Crescentia cujete*) (Morehart, this volume). Stratigraphic Unit 47b [SU 43] solely contained pine charcoal (*Pinus* sp.) (Morehart, this volume). Stratigraphic Unit 47c, and the fill associated with Bu. 4A-1 [SU 41/47] contained pine charcoal, *Poaceae* disseminules, *Acrocomia aculeata* endocarp fragments, as well as evidence of an unknown residue; possibly pine rosin (Morehart, this volume).

Aside from the midden materials two sherds of a Mountain Pine Red dish (Gifford 1976:193-195) were also recovered as part of the intrusive pits fill. These were apparently extracted from Ca. 4A-1 (SU 49), whose western edge was affected by the cutting of the intrusive pit (SU 55). One of these sherds was recovered from SU 41 (Level 4 in EU 7b), the other within SU 47c (Level 4 in the N extremity of EU 7c). This distribution suggests that

the backfilling of SU 55 effectively mixed the backdirt extracted during the excavation process.

Relationship to Adjacent Stratigraphy: That the eastern perimeter of SU 55 is defined by the lowest step of the outset staircase indicates that the latter feature was already present at the time the individual of Burial 4A-1 was laid to rest. In addition, the pit was cut through Floors 1, 2 and 3 indicating that SU 55 maintains a posterior stratigraphic relationship with the floors. Presence of two sherds of Ca. 4A-1 (SU 49) within the secondary fill of SU 55 indicates that Ca. 4A-1 as well as Bu. 4A-2 (SU 62 [41b]) also precede the intrusion. The midden material contained within the fill of the pit (SUs 47 and 56) shares a great deal of typological, quantitative and qualitative attributes with the midden material associated with Str. 2A (Helmke et al. this volume), suggesting possible contemporaneity. Artifactual materials found deposited directly upon the surface of Floor 1 are thought to represent terminal occupation debris, postdating both the completion of the terminal architecture as well as the intrusive Bu. 4A-1 event. Based on these data it is suggested that the Bu. 4A-1 event took place late in the chronology of Pook's Hill 1, apparently during the *process* of abandonment². Due to the absence of preserved plaster flooring it could not be determined if the intrusion into Floor 1 was re-patched. This aspect may have been informative with regard to the specific placement of the Bu. 4A-1 event within the chronology of Pook's Hill 1's abandonment process.

Humus (SU 21, 34, 50)

Provenience: The humus layer was found throughout EU 7 of Op. 4A and excavated as Level 1a. The mean elevation of the MGS prior to excavation in EU 7a and b is: 72.51 HAE, in EU 7c is: 72.50 m HAE, and in EU 7d is: 72.52 m.

Description: The MGS defined by the humic layer sloped gently to the south within the confines of EU 7, thereby conforming to the slightly graded surface of the underlying terminal Floor 1. This stratum was found to range in thickness from 6 (EU 7b) to 22 cm (EU 7a). The humus was a compact, black to dark brown matrix (10YR 2/2), with a large percentage of root inclusions, and minor constituent of small limestone rocks ($\varnothing < 5$ cm). Larger roots of a Grande Betty tree (*Cupania belizensis* Standl.) and a Wild Tamarind tree (*Magarum* sp. Barti) were also encountered. Aside from considerable bioturbation the majority of the humic deposits appear to represent the accretive total of the Oa / A Horizon formation processes, a point supported by the thickness of the deposit, which corresponds to that covering natural, unmodified terrain in the vicinity.

Associated Material: Although ceramic sherds, chert debitage, human remains and faunal materials were recovered as part of the humic stratum, specific absolute frequencies are not yet available. Nonetheless, comments can be made on the incidence of faunal and

² Here the 'process of abandonment' is understood in its stratigraphic manifestation as 1) the phase, 2) the activities taking place during that time, and 3) the resulting artifactual fingerprint of these activities. Since this interval is defined on the basis of stratigraphy the process of abandonment is conceived as a protracted event spanning from the date of terminal construction to the partial collapse of structures and the formation of collapse debris mounds.

human remains as these have already been the subjects of preliminary analyses (SUs 21, 34, and 50). The human remains are represented by a single mandibular RP₃ tooth and two fragments of metatarsal shafts (EU 7; Level 1a; SU 21). Fish remains are represented by parrotfish, reptile bone is represented by one fragment of a medium sized turtle, while mammal bones include specimens of a nine-banded armadillo and one mandibular portion of a medium to large sized animal (possibly peccary) (Stanchly n.d.). Although these remains were recovered within the humic stratum these may have been deposited as part of the midden materials included in the fill of SU 55 (i.e. SU 56a) which subsequently may have been disassociated from their context due to bioturbation. Conversely, it is possible that these faunal materials form part of the minor deposits of terminal occupation debris detected by the presence of ceramic sherds occurring on the surface of Floor 1.

Relationship to Adjacent Stratigraphy: As the humic horizon covers all terminal construction phase architecture, it seems clear that this stratum formed subsequently, from the time of abandonment onwards until excavations penetrated these deposits. Thus while artifacts included in the humic horizon include materials that can be termed terminal occupation debris, some materials are probably the result of structural collapse followed by bioturbation in the form of animal activity and root growth. Thus while the matrices forming part of the humus are the result of natural processes, the cultural materials contained therein may have any number of original contexts.

SPECIAL DEPOSITS

Burials and other special deposits are presented here in the sequential order of their discovery (thus in the numerical sequence of their designations). Although stratigraphic contexts are presented in the order of their temporal placement (from earliest to latest), the special deposits in the present report do not follow that order because the exact relationships between all of them cannot be ascertained until EU 7 is completed, an undertaking scheduled for the 2001 field season. In all five burials, a cache, two problematical deposits, and a looted crypt have been identified in association with Str. 4A thus far. Each special deposit is presented, in the order of their discovery in the following order: burials, caches, and problematical deposits. As problematical deposits and the crypt were discovered during the 1999 season, these are presented as part of Op. 1A-3A report (Helmke 2000a), as are descriptions of the secondary context human remains recovered from the looters' 'backdirt pile' or spoil heap of LP1 (i.e. B-LP1).

Burial 4A-1 (SU 41)

<i>Provenience:</i>	Recovered in EU 7b and 7c, in Level 4, SU 41 [41a]. Mean elevation of top of burial: ca. 71.90 m HAE. Mean elevation of base of burial pit: 71.83 m HAE. Figure 13. To distinguish Bu. 4A-1, from Bu. 4A-2, the latter originally thought to pertain to Bu. 4A-1, SU 41 was initially subdivided in SU 41a and 41b.
<i>Grave type:</i>	In a depression cut into bedrock. Burial is intrusive through Floors 1, 2 and 3, down into bedrock. Burial fill is a mixture of core and ballast of Floors 1 through 3 with a minor component of midden material in

the upper portions (SU 47, 55, 56). Larger rocks deposited directly above Burial 4A-1 appear to serve as capping stones to the interment (in keeping with mortuary practices documented in the Roaring Creek Valley; cf. Ferguson and Gibbs 1999; Helmke, Cruz, Mirro and Jacobs 1999). The burial fill (SU 47c and 56c [41/47]) was more loosely packed than overlying fill (SU 47a, 47b, 56a, and 56b) and consisted of variegated light brown (10YR 5/4) to yellowish (10YR 7/6) soil with fist-sized and smaller limestone rocks.

<i>Grave dimensions:</i>	Grave: Length: 121 cm; Width: ca. 45 cm; Depth: 7 cm. Skeleton: Length: 109 cm; Width: ca. 20 cm; Depth: 5 cm.
<i>Burial Type:</i>	Primary.
<i>Orientation:</i>	Head to the south. Facing west and down.
<i>Position:</i>	Flexed at the knees, on the left side. Body prone, but may have been deposited resting on its left side. Right arm extended along the side of the body, left arm apparently crossed under the torso.
<i>Condition:</i>	The burial was moderately well preserved, with most deterioration occurring in the postcranial axial skeleton and the arms and hands. The cranium and legs are fragmentary but well represented.
<i>Individual:</i>	Field determination: Probable adult male (JCP). Laboratory determination: This burial contained the remains of a probable male adult. On the basis of dental attrition and cranial suture closure, it is estimated that this individual was 30-40 years of age (JCP).
<i>Cultural Modification:</i>	The individual's anterior teeth had been modified by filing. The maxillary incisors and canines were filed into the pattern designated as C-3 in Romero's system of classification (Romero 1970:Fig. 1). The mandibular incisors and canines were filed in the B-7 pattern. The overall effect of the dental filing is the interdigitation of the upper and lower filed teeth.
<i>Skeletal Material:</i>	Evidence of nonspecific infection can be seen in a sclerotic reaction on the superolateral shaft of the left tibia and on the left metatarsals. Both healed and active areas of the tibial infection are present. The infection on the metatarsals is active, with sclerotic involvement, and a combination of porosity and irregular reshaping. Healed porosity on the orbital roofs (cribra orbitalia) possibly indicates anemia in childhood resulting from some combination of inadequate nutrition, infectious disease, and/or parasitism (Stuart-Macadam 1985). The relationship between cribral orbitalia and anemia is questionable in the absence of porotic hyperostosis. The maxillary left premolars, mandibular right fourth premolar, and right first molar have carious lesions.

Pook's Hill 1, Belize
Structure 4A / Plaza, Op. 4A
EUs 7b & 7c, Level 4
Bu. 4A-1, SU 41 &
Bu. 4A-2, SU 62
WBRCP 2000
 Plan: C. Helmke



Burial 4A-2:

- 9: L Fibula
- 10: L Tibia
- 11: L Femur
- 12: R Tibia
- 13: Phalanges
- 14: Probable Radius
- 15: R Radius
- 16: R Humerus
- 17: L Arm
- 18: Cranial frags.

+ EU 7c NW

Bu. 4A-1
SU 41

+ EU 7a NW
Bu. 4A-2
SU 62

Burial 4A-1:

- 1: L Tibia
- 2: L Fibula
- 3: R Tibia & fibula
- 4: R Femur
- 5: L Femur
- 6: L Humerus
- 7: R Ulna and Humerus
- 8: Cranium



Plan aligned to True
North based on a 1°59'
Azimuth West of Magnetic.

Figure 13: Plans of Burials 4A-1 and 4A-2. Outlines represent depressions cut into bedrock.

Associated Material: No burial furnishings were found with the burial. Artifactual materials contained in the burial fill may, however, represent deliberate inclusions rather than haphazard incidences. The exclusive occurrence of chert debitage (SU 47c) and *jute* shells (SU 47c) within the fill of Bu. 4A-1 for instance, may be material by-products of the funerary activities conducted at this locus. These observations are noteworthy considering the frequent associations between lithic debitage and tombs (Eberl 2001:315, 2002; Hall 1984; Taschek and Ball 1992) as well as the predominance of *jute* in burial fills of Actun Uayazba Kab (Ferguson and Gibbs 1999; cf. also Halperin 2000).

Relationship to Adjacent Stratigraphy: As Bu. 4A-1 was deposited at the base of the intrusive pit (SU 55) cut through the Floor 1-3 sequence, the burial clearly postdates the construction events embodied by these architectural components. As Floor 1 is contemporaneous with the construction of Str. 4A-1st's Stair 1, the burial postdates the terminal construction efforts documented in Op. 4A. As the fill of Bu. 4A-1 (SU 47 and 56) is overlain by sparse deposits of terminal occupation debris, it is suggested that Bu. 4A-1 was deposited during the phase of site abandonment.

Burial 4A-2 (SU 62)

<i>Provenience:</i>	Recovered in EU 7b, Level 4, SU 62 [41b]. Mean elevation of top of burial: ca. 71.72 m HAE. Mean elevation of base of burial pit: 71.66 m HAE. Figure 13.
<i>Grave type:</i>	In a depression cut into bedrock, sealed below Floor 3. As the skeletal material of this burial was originally thought to be associated with Bu. 4A-1, it was designated SU 41b, a designation which has since been revised to SU 62.
<i>Grave dimensions:</i>	Grave: Length: > 92 cm; Width: 28-30 cm; Depth: 24 cm. Skeleton: Length: > 79 cm; Width: 29 cm; Depth: 6 cm.
<i>Burial Type:</i>	Primary.
<i>Orientation:</i>	Head to the south. Cranium too fragmentary to comment on direction that the individual faced.
<i>Position:</i>	Possibly extended, prone. Arms extended along side of body.
<i>Condition:</i>	The skeletal remains are poorly preserved, with little cortex remaining, and though the deposit was a primary interment, only a few fragments of the cranium and right arm were recovered. The legs are fragmentary and moderately well preserved. All teeth are present.
<i>Individual:</i>	Field determination: n.a. Laboratory determination: Based on dental attrition, the individual was a young adult, probably between 20 and 25 years of age (JCP).
<i>Cultural Modification:</i>	None.

Skeletal Material: The only observed pathology is evidence of a healed nonspecific infection on the left tibia. Poor preservation of the skeletal elements prevents more detailed observations of pathologies.

Associated Material: No associated burial furniture was found in Bu. 4A-2. Cache 4A-1 was, however, discovered in the core above Bu. 4A-2 and in alignment to it. Consequently, based on spatial and stratigraphic relationships this cache may represent part of the coeval funerary activities at this locus.

Relationship to Adjacent Stratigraphy: Burial 4A-2 was found sealed in the core of Floor 3 and thus dates to around the time of the floor's construction. Also contained in the core of Floor 3 was Ca. 4A-1, which was aligned to Bu. 4A-2. This implies that the deposition of Ca. 4A-1 is contemporaneous to the deposition of the burial. The intrusive pit affecting Floors 1-3 (SU 55) partially cut through the SW portion of Ca. 4A-1, thereby indicating that the deposition of Bu. 4A-1 postdates that of Bu. 4A-2.

Burial 4A-3 (SU 53)

Provenience: In EU 7e and 7d (i.e. southern half of EU 7a and northern half of EU 7d, respectively), Level 2, SU 53a. Mean elevation of top of burial: 72.27 m HAE. Mean elevation of base of burial: 72.22 m HAE. Figure 14. Only a portion of the portion of the burial was exposed in 2000. Data presented are thus provisional.

Grave type: In core of the outset stair of Str. 4A-1st. Large roughly hewn limestone blocks were placed on top of the area to cap the burial, but also functioned as part of Stair 1's core (Figure 14).

Grave dimensions: Grave: Length: > 120 cm; Width: > 70 cm; Depth: n.d.
Skeleton: Length: 120 cm; Width: 70 cm; Depth: 5 cm.

Burial Type: Primary.

Orientation: Heads to the south. Crania too fragmentary to comment on direction(s) that the individuals faced.

Position: Possibly flexed at knees with arms extended along sides? Position otherwise indeterminate due to fragmentary condition of the remains.

Condition: Preservation of the human remains is poor to moderate, with each individual represented mostly by the bones of the cranium and legs, and to a lesser extent the arms. Postcranial axial elements of both individuals are almost completely absent.

Individuals: **Field determination:** n.a.

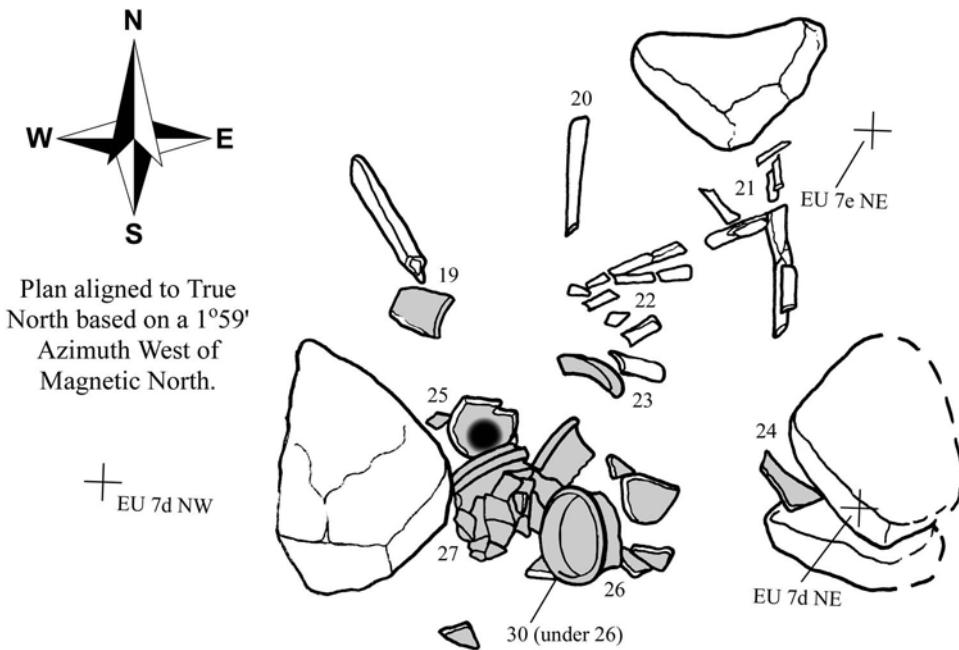
Laboratory determination: This burial contains the commingled remains of a minimum of 2 adult individuals. The right mastoid process of the temporal of each individual was recovered, and is the only criterion for sex estimation available. On this basis, one individual is a probable female and the other is a probable male (JCP).

Cultural Modification: None.

Skeletal Material: The legs of both individuals show extensive evidence of infection. The right femur, tibia, and fibula [19] of one individual show active

Pook's Hill 1, Belize
Structure 4A-1st, Op. 4A
EUs 7d & 7e, Level 2
Burial 4A-3, SU 53
WBRCP 2000
 Plan: L. Jacobs & C. Helmke

EU 7a NE



Burial 4A-3:

19: R Tibia, R Fibula & R Femur

Bu. 4A-3, SU 53

20: Unidentified



- concentration of jute

21: Femur and patella

- censer fragment

22: Femur, L Humerus



23: Femur?

24: Pedestal base sherd (53/1)



25: Neck of pyriform vase (53/3)

26: Pedestal base of pyriform vase (53/3)

27: Pedestal base sherds (53/1)

28: Sherds

29: Cranial fragments (Indv. A)

Spike applique censer (53/4)

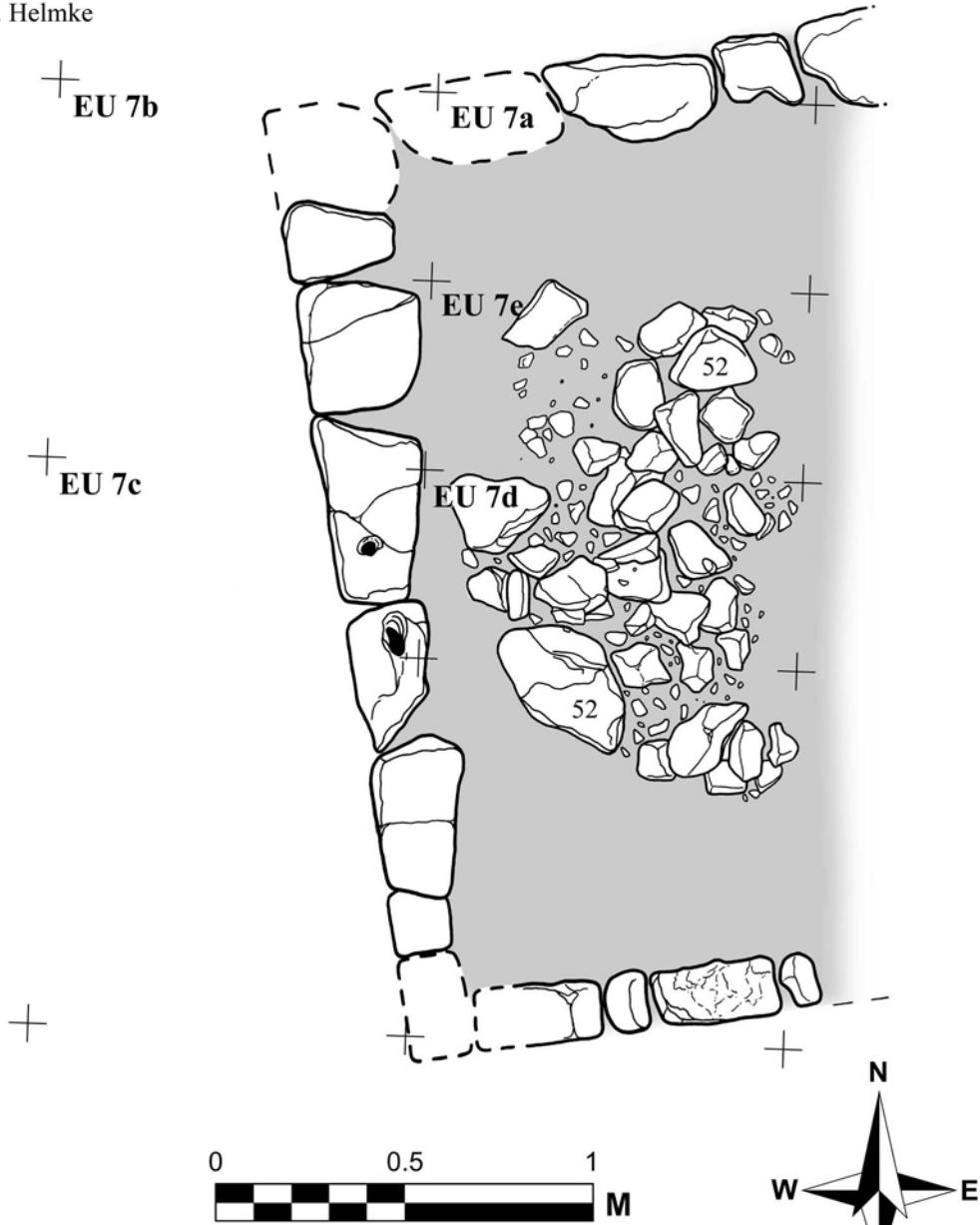
30: Molded-carved sherd (53/2)

36: Cranium (Indv. B)

Figure 14: Plan of Burial 4A-3.

**Pook's Hill 1, Belize
Structure 4A-1st, Op. 4A
EU 7, Top of Level 2b
Rocks Capping Bu. 4A-3
& Outset Stair 1
WBRCP 2000**

Plan: C. Helmke



Note that alignment of outset outline is represented as rectified.
Plan aligned to True North based on magnetic declination ($1^{\circ}59'$ W of MN).

Figure 15: Plan of the capping stones of Burial 4A-3 in relation to outset Stair 1.

and healing woven bone reaction on the anterior diaphyses. Similarly, the right tibia and fibula of the other individual show active and healing woven bone formation on the bone, almost obliterating the linea aspera. A fragment of fibular shaft shows an active woven bone reaction with a cloaca. An active woven bone reaction is also present on a right humeral shaft fragment, and left and right radial shaft fragments; these are some of the few preserved arm bones. It is possible that a more extensive infection manifest also in the upper appendages is absent due to factors of preservation. The female individual shows healing and active porosity on the cranial vault, supraorbital margins, and mandibular body. It is clear that both of these individuals were affected by a systemic infection. Minor marginal lipping, a degenerative change, is present on the proximal articular facet of a navicular and the base of a first metatarsal.

Associated Material: Over the thoracic areas of the burial was a concentration of partial ceramic vessels, with conjoining sherds strewn over the remainder of the burial. Although specific absolute frequencies are not yet available the most noteworthy ceramic specimens merit reference.

53/1 [19, 23 to 25, 27, 28] Reconstructible orange ware censer. Ceramic vessel with a high, flaring pedestal base with folded-out lip. The exterior body above pedestal has a pronounced basal molding, a diagnostic element of the Terminal Classic vases. Rim is pointed and beveled inwards. The body exhibits a pronounced shoulder break, with four short, evenly spaced, vertical grooves running downwards from a shallow pre-slip groove running below the rim. The vessel is nearly identical in terms of form to Lamanai-style Buk phase censers (Graham 1987: 81-87), but differs in the surface treatment and paste. Most notably it is not embellished by complex post-slip incised decorations along the shoulder and base, nor does the orange slip exhibit the luster typical of Buk vessels (see Awe and Helmke 2000 for similar form). Specimen may be related to Daylight Orange: Daylight Variety (Grooved) (Gifford 1976: 300-301, Fig. 200c). Largest grouping found across the thoracic-pelvic area of Individual A with specimen 53/3.

53/2 [27] Fragment of orange ware vase. Three conjoining body sherds of a relatively thick-walled molded-carved vase, of the provisional Belize Molded-carved type, exhibiting part of the so-called 'Caves Branch' iconographic scenes (see Helmke and Halperin, this volume). Found below specimen 53/1.

53/3 [25 to 28] Reconstructible red and brown ware vase. Large pyriform vase, with narrow orifice [25], concave base and relatively short, outflaring pedestal base [26]. Interior and pedestal base are unslipped, exterior slipped base is streaky and matte brown, exterior body from basal break to rim is slipped dark red. Three, thin, nearly parallel, pre-slip incisions along neck, and two comparable arc-shaped incisions along the pronounced basal break embellish the vase. Based

on identifying attributes the vase is of the Duck Run Incised: Duck Run Variety (Gifford 1976: 240). Found clustered predominantly in the thoracic-pelvic area of Individual A, but with some sherds occurring in association with the cranium [28].

53/4 [29] Fragmentary ceramic censer. Sherds of an unslipped, apparently globular censer with appliquéd spikes. Apparently related to Miseria Applique (Sabloff 1975: 174-177) and more peripherally with Alexanders Unslipped: Beaverdam Variety (Gifford 1976: 284-286, Fig. 186q) and More Force Unslipped (Gifford 1976: 305-307). Although only one sherd was found in direct association with the burial (along the southern baulk of EU 7e), 10 cm to the east of the cranium of Individual A, the remaining sherds were found in the core directly overlying the burial (SU 52a).

Although *jute* was noted during the clearing of the burial and recorded on the plan, these shells appear to be fortuitous inclusions on account of low frequency.

Matrix samples of the burial fill indicate the presence of charcoal remains dominated by pine charcoal (*Pinus* sp.) with minor incidence of unidentified hardwood charcoal (Morehart, this volume). In addition, evidence of unknown residue was recovered, which although possibly representing the remains of incense (e.g. *copal*), the identification as pine rosin cannot be excluded (Morehart, this volume).

Relationship to Adjacent Stratigraphy: Burial 4A-3 was deposited in the core of Str. 4A-1st's outset stair (i.e. Stair 1). As the steps of Stair 1 were too poorly preserved it could not be determined whether the burial was included in the core during terminal phase construction efforts (coeval to construction), or whether this special deposit was intrusive into the outset stair (postdating terminal construction). Future excavations of Op. 4A coupled with analyses of ceramic materials contained in the core vs. the burial, may clarify the stratigraphic position of Bu. 4A-3. The ceramic vessels contained in Bu. 4A-3 indicate a Terminal Classic dating (ca. AD 830-950) based on forms and ceramic types documented. This assessment will need to be considered during future ceramic analyses of the ceramic materials contained in the associated core (SU 52a).

Discussion: The association between the ceramic censers, pine charcoal and the unidentified carbonized residue (interpreted as either pine or copal incense), suggests that the burning of incense was a major component of the funerary activities surrounding the deposition of Bu. 4A-3.

Burial 4A-4 (SU 54)

Provenience: Deposit recovered in EU 7e and 7d, Level 4, SU 54a. Directly below surface of Floor 3. Mean elevation of top of burial: 72.08 m HAE; Mean elevation of base of burial: ca. 72.04 m HAE. Figure 16.

<i>Grave type:</i>	In ballast of Floor 3. Small limestone rocks (ca. Ø 15 cm) serving to cap the burial were encountered.
<i>Grave dimensions:</i>	Grave: n.d. Skeleton: Length: 146 cm; Width: ca. 40 cm; Depth: 4 cm.
<i>Burial Type:</i>	Primary.
<i>Orientation:</i>	Head to the south, facing down.
<i>Position:</i>	Flexed at the knees, prone. Left arm extended along the body, right arm partially flexed.
<i>Condition:</i>	Preservation is moderate, with deterioration of the bones being most pronounced in the postcranial axial skeleton.
<i>Individual:</i>	Field determination: n.a. Laboratory determination: The primary individual is a young adult, of an estimated 16-20 years of age based on dental eruption and attrition as well as cranial suture closure. Right leg not recovered in excavations (JCP).
<i>Cultural Modification:</i>	None.
<i>Skeletal Material:</i>	Healed porotic hyperostosis is present on the parietals and occipital of the cranial vault. There is evidence of a healed nonspecific infection on the left fibula and an active infection on the left humerus. The dentition of this individual shows severe linear enamel hypoplasia and hypoplastic pits on the anterior teeth and the mandibular left first molar. The most severe episode, resulting in a deeply grooved linear hypoplasia, took place when the individual was between 3 and 4 years of age, and may be related to time of weaning. This age is associated with the time of greatest susceptibility to linear enamel hypoplasia in ancient Maya populations. The primary factors causing this susceptibility are increased stress due to nutritional inadequacy and infectious diseases following the time of weaning (Whittington 1992:201). At least 2 earlier episodes of childhood stress are represented by lesser linear hypoplasias and/or series of pits on the maxillary and mandibular incisors and canines. The mandibular left first molar has a large carious pit on the center of the occlusal surface.
<i>Associated Material:</i>	54/1 [n.a.] Two marine shells modified into tinklers. Material: tentatively identified as olive shell, <i>Olivella</i> sp. L. Association with the distal end of the left radius and ulna suggest that these formed part of a bracelet. Matrix samples of the burial fill revealed the presence of pine charcoal (<i>Pinus</i> sp.) and burned grass disseminules (<i>Poaceae</i>) (Morehart, this volume).
<i>Relationship to Adjacent Stratigraphy:</i>	Stratigraphically, the deposit is sealed between the core of the outset stair of Str. 4A-1 st (SU 52a and 52b) and Bu. 4A-5 (SU 144), which lies directly below. Cutting of the Bu. 4A-4 pit is intrusive into Floor 3 (SU 59). Contextual attributes therefore suggest that the deposition of Bu. 4A-4 postdates Bu. 4A-5 as well as the construction of Floor 3 and predates construction of the outset stair.

**Pook's Hill 1, Belize
Structure 4A-1st, Op. 4A
EUs 7d & 7e, Level 4
Burial 4A-4, SU 54
WBRCP 2000**

Plan: L. Jacobs & C. Helmke

+
EU 7e NE

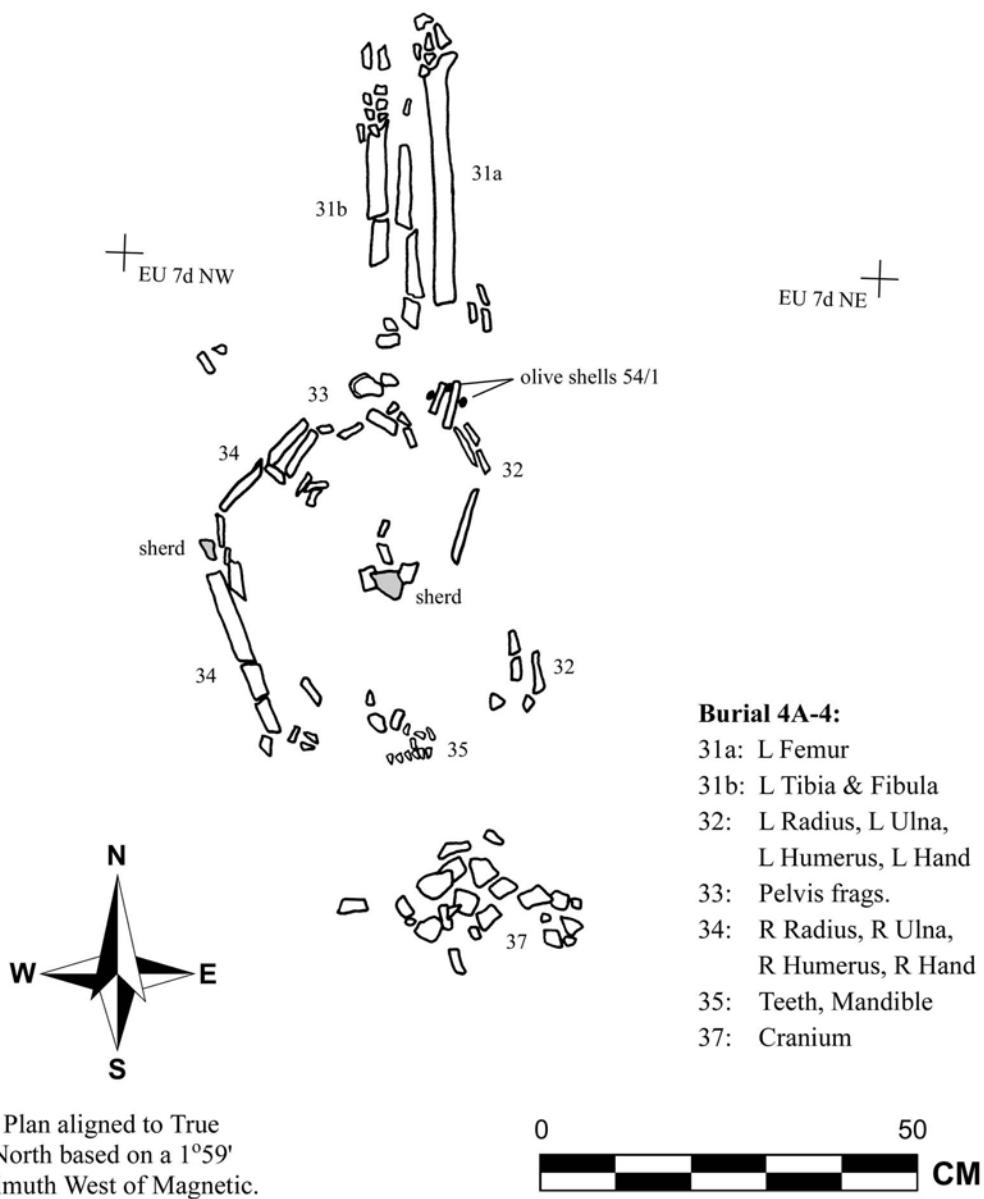


Figure 16: Plan of Burial 4A-4.

Burial 4A-5

For this interment, only entries for which data are available are presented.

- Provenience:* Evidence for this burial was first noted in the northern half of EU 7d, during the removal of the cranium of Bu. 4A-4 (SU 54), top of Level 4. Elevation of top of cranium: ca. 72.05 m HAE. As this burial was not excavated during the 2000 season, no SU number has been assigned to this context.
- Grave type:* Apparently in core of Floor 3.
- Orientation:* Possibly head to the south.
- Individual:* **Field determination:** n.a.
Laboratory determination: The individual of this burial is thus far only represented by the internal auditory meatus of the temporal and by a mandibular left first molar (i.e. LM₁) (JCP). Although these elements were recovered as part of SU 54 in the field [37], these are not part of the individual of Burial 4A-4, and are represented due to partial mixing during excavations. An objective has been set to excavate this interment during the 2001 season.

Relationship to Adjacent Stratigraphy: Evidence for this burial was found directly below Bu. 4A-4, thereby suggesting that Bu. 4A-5 represents an antecedent interment. As Bu. 4A-4 was intruded into the ballast of Floor 3, it seems likely that Bu. 4A-5 was deposited into the core of Floor 3. This would argue in favor of Bu. 4A-5 postdating the construction of Floor 3, but predating the construction of the outset stair of Str. 4A-1st. Clearing of the burial during the subsequent field season as well as testing of the architectural component within which it rests may clarify the stratigraphic position of this interment.

Cache 4A-1 (SU 49)

- Provenience:* This deposit was recovered in EU 7b, within Level 4, as SU 49. It is located within the core of Floor 3 (SU 40b), centrally aligned to Bu. 4A-2 (SU 62) as well as the NW corner of Str. 4A-1st's Stair 1. Mean elevation of the top of the deposit: 71.99 m HAE; mean elevation of the base of the deposit: 71.93 m HAE.
- Content and Arrangement:* The deposit comprises three fragmentary ceramic vessels (Figure 17). The three vessels are arranged around a cluster of two large limestone rocks, with the approximate central point of this configuration marked by a concentration of charcoal. Note should be made of the intrusive cut (SU 55) associated with Bu. 4A-1 (SU 41), which has affected the western portion of the deposit, thereby partly obscuring the original configuration of the cache. Sherds of the western portion of the deposit were recovered as part of the burial fill of Bu. 4A-1 (EU 7b; Level 4; SU 41; EU 7c; Level 4; SU 47c),

indicating the degree of ancient disruption. Also part of the deposit were two stones (ca. Ø 15 cm), one a water-worn hard dolostone (to the south), the other a roughly hewn and softer limestone (to the north). As sherds and fragmentary vessels of the deposit were found above, below and adjacent to these, it seems that the rocks were deliberate inclusions. Carbon was found between these two stones and contained within the vessel occupying the eastern position (Vessel 2), as were charred *jute* shells amidst the charcoal.

Associated Material: **49/1** [1] Fragmentary bichrome vessel. High degree of fragmentation and absence of rim or discernable base disables secure identification of form. Nonetheless the vessel appeared globular and thus bowl-shaped in situ. Surfaces while heavily eroded exhibit red slip on the interior and exterior, with the latter embellished with faded brown-black designs. Paste exhibits a large, dark gray and unoxidized core.

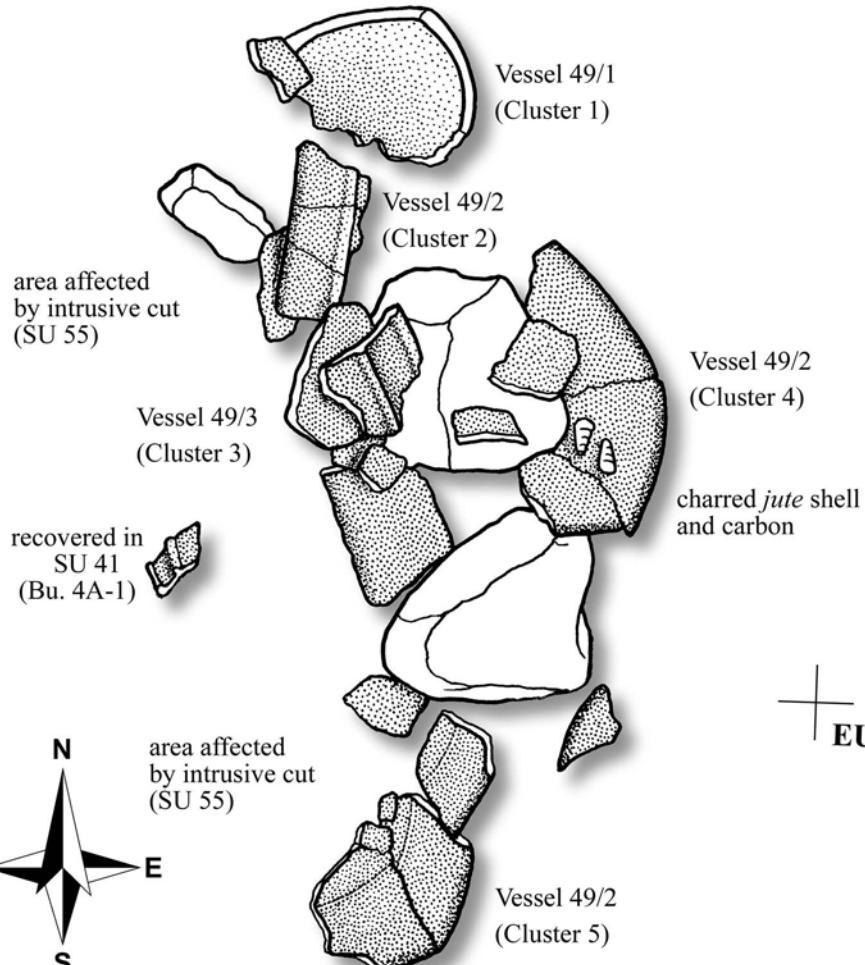
49/2 [2, 4, 5] Fragmentary red ware dish. Shallow dish form with truncated triangular medial ridge and low annular base. Interior though highly weathered is slipped red up to the rounded rim. Interior undercutting gives appearance of thickened walls above the ridge. Dish identified as Mountain Pine Red: Mountain Pine Variety (Gifford 1976:193, Fig. 194b). The remains of charcoal were contained within this vessel, as were partly charred *jute* shells (*P. indorum*), exhibiting broken spires.

49/3 [3] Fragmentary orange ware dish. Weathered basal flange bowl with pointed and flattened rim. Basal flange is small, rounded and triangular. Thickening of the walls above the flange is produced by excised exterior below the flange, rather than the typical interior treatment. Exterior is unslipped, while faint traces of soft, streaky, bright orange slip adhere to the vessels' interior. Vessel exhibits attributes of Aguila Orange (Gifford 1976: 182-183) with the exception of the thick, dark gray and unoxidized core. Additional sherds of this vessel were recovered as part of the fill of Bu. 4A-1 (SU 41).

Relationship to Adjacent Stratigraphy: Cache 4A-1 was found sealed within the core of Floor 3, above Bu. 4A-2. This suggests that while the deposit may have formed part of the funerary activities associated with Bu. 4A-2, the cache is necessarily a later aspect and therefore its deposition postdates the burial, however slightly. As no evidence of an intrusive pit was found penetrating the surface of Floor 3, both the cache and the burial are presumed to represent integral parts of the construction effort represented by Floor 3. Consequently, dating of the cache allows temporal placement of the burial and Floor 3. The intrusive cut (SU 55) associated with Bu. 4A-1 (SU 41) thus clearly postdates the deposition of Ca. 4A-1. Examinations of the vessels forming part of the cache suggest that three types are represented: Mountain Pine Red (Gifford 1976:193-195), Aguila Orange (Gifford 1976:182-183) and an unidentified bichrome type. This suggests that the cache includes

Pook's Hill 1, Belize
Structure 4A / Plaza, Op. 4A
EU 7b, Level 4
Cache 4A-1 (SU 49)
WBRCP 2000
 Plan: C. Helmke

 EU 7b NE EU 7a NW



Plan aligned to True North based on magnetic declination ($1^{\circ}59' W$ of MN).

Figure 17: Plan of Cache 4A-1.

types from a time transitional between Early Classic 3 (ca. AD 375-550) and Late Classic 1 (ca. AD 550-650), thereby rendering AD 400-600 a likely temporal placement for the cache.

Discussion:

Note should be made of the two stones recovered as part of the deposit. Had these stones formed a triangular configuration with a third stone, the latter probably would have occurred to the west of the two recovered. This reconstruction would place the third stone within the area affected by the ancient intrusive cut (SU 55), which could account for the absence of this putative stone (Figures 6 and 17). Had such a triangular stone configuration been uncovered, the cache may have been designed to form a miniature ‘cosmogram’, an interpretation attributed to several cache deposits of other Lowland Maya sites (cf. Freidel et al. 1993:59-69; Moyes 2000; Taschek and Ball 1999; Taube 1998). As such the three stones may have represented the so-called ‘primordial hearth of creation’ (Freidel et al. 1993:59-69), while the vessels may have served to reinforce define this hearth’s orientation or boundaries in relation to the cardinal directions. Delineation of sacred space in relation to the cardinal directions, through the plotting of corners is a metaphor of creation documented in colonial and modern Maya ritual tropes (Freidel et al. 1993; Schele and Mathews 1998:34-36; Tedlock 1996). Prompting the interpretation of the ‘hearthstones’ was the presence of charcoal between the stones and in the adjacent vessel (Vessel 2).

Problematical Deposit 4A-1 (SU 57)

Provenience:

This deposit was discovered within the core of the earliest phase of Str. 4A (tentatively designated as 4A-3rd-A). Mean elevation of the deposit: ca. 72.35 m HAE. Although it seems most probable that PD 4A-1 is part of a primary interment that was bisected by test-pit excavations (EU 6), it remains possible that these elements may represent part of a votive deposit. This ambiguity is due to the emphasis that was placed during the excavation on vertical penetration, thereby compromising horizontal control. As the identity of this deposit has not been clarified, the designation of problematical deposit is employed.

Content and Arrangement: This deposit consists of the feet and some lower leg bone fragments of an individual of above-average size. No artifacts or votive offerings were found in association. If this deposit represents a burial, the remainder of the skeleton would extend to the S of EU 6 as would be typical.

Condition:

Highly fragmentary. Found as loose fragments amidst dry-laid boulder core.

Individual:

Field determination: n.a.

Laboratory determination: Probable older adult (JCP).

Cultural Modification: None.

Skeletal Material: Evidence of extensive infection can be seen on fragments of fibula, and on metatarsal shafts and one proximal foot phalanx. Both active and healed areas of infection are evident. The infection includes sclerotic involvement. Both the left and right foot also show degenerative changes associated with arthritis, including increased porosity and marginal lipping on the proximal articular facet of the left navicular and the right lateral cuneiform. The distal articular facet of the left navicular has undergone changes associated with arthritis, including a redefinition of the joint margin and a marginal exostosis. Based on this evidence, it is suggested that these human remains may be those of an older adult.

Relationship to Adjacent Stratigraphy: The entirety of the deposit was found inclusively within the core of the earliest phase of Str. 4A construction (as documented within the section exposed within LP1). Thus at present this deposit appears to be the earliest special deposit discovered at Pook's Hill 1. However, no data are available to relate this first phase of construction to other stratigraphic contexts documented to date (hence its absence in the Harris Matrix, Appendix B).

Problematical Deposit 4A-2 (SU 58)

Provenience: These materials were recovered predominantly as part of the test-pit excavations in southern portion of EU 2a. Again bisection of the deposit left some materials to be assigned as part of EU 2b. Mean elevation of the deposit: ca. 72.81 m HAE. As it could not be determined whether this cluster represented a looter stack such as SU 18, this cluster was left without designated in 1999. Excavations of the outset stair in 2000 determined that this cluster was in fact originally contained within the core of the badly deteriorated outset Stair 1, in close proximity to the primary axis. All these elements urge the reconstruction of this deposit and its designation as a problematical deposit. Human remains recovered as part of SU 21a (EU 7a) in 2000, may derive from this deposit also.

Content and Arrangement: This deposit was found as a cluster of 5 fragments of human bone, 1 fragmentary prismatic obsidian blade and 1 elongated cobble [SU 13] (cf. Helmke 2000a). In addition, materials from adjoining SUs bisected by the test-pit may have originally formed part of PD 4A-2: SU 21 Unit 7: Lower RPM₃ and 2 Metatarsal shafts. SU 6 and 13 and SU 9 and 14: Material recovered from these SUs includes 10 fragments of cranial vault (9 in SU 9, 1 in SU 6) and several fragments of tibia. Based on skeletal portions represented, this deposit may have formed a secondary bundle burial (cf. Tikal Altar 5). In this instance, the skeletal portions represented might indicate that this deposit functioned more as a cache than as a burial (hence the problematical deposit designation) (cf. Becker 1992, 1993).

Relationship to Adjacent Stratigraphy: This reconstructed deposit was found in the core of Stair 1. However, due to the poor preservation of this component and the means by which it was tested in excavations it cannot be determined if this deposit was inclusive or intrusive into the stair. In the former case it would make Bu. 4A-3 inclusive and PD 4A-2 would postdate that interment. In the latter case, the deposit would appear to be quite late in the history of Pook's Hill 1, and may coeval Bu. 4A-1.

DISCUSSION

The Operation 4A excavations led to the discovery of four and parts of a fifth primary human interment as well as an associated cache deposit. These were found within the core of the terminal outset stair of Structure 4A-1st as well as within the core of earlier plaza floors. The discovery of burials in direct association with the eastern structure of the PKH1 *plazuela* confirms that its primary function was that of an ‘eastern ancestor shrine’ or ‘mausoleum’ – the conclusion reached by the end of the 1999 salvage excavations (Helmke 2000)–but requiring further corroborative data. Thus the objectives sighted for the sub-operation could be realized, as it was demonstrated that the looting efforts were indeed just concentrated to a trench (LP1) penetrating the core of Str. 4A and did not affect the plaza platform, nor the axial area of the primary axis. This trench, while wholly destructive, was established off the primary axis of the building thereby missing the areas most likely to yield primary context special deposits. In part, the objectives of Op. 4A were also aimed at identifying the primary axis of Str. 4A as well as to test to for the incidence of special deposits in the plaza area, which appeared unaffected by the depredations of modern looting. To date, these excavations allowed identification and documentation of the primary axis, associated special deposits, and architectural components in which each of these deposits occurred and their stratigraphic relations. Thus while the sub-operation could not be completed during the 2000 season, all of the research questions formulated at the onset were addressed and objectives sighted were achieved. It is hoped to complete the efforts in future seasons.

Primary Axis

A significant part of the Op. 4A investigations were devoted to the identification of the primary axis of Str. 4A. Noteworthy discoveries made, include special deposits that are not aligned precisely to the geometric primary axis and thus appear ‘off axis.’ This is true both of the cache deposit as well as certain burials. In the former case, however, it seems likely that this deposit was set in alignment to an earlier phase of Structure 4A (perhaps Str. 4A-2nd or 3rd) and thus may only appear ‘offset’ from the primary axis of the terminal phase architecture. Burials occurring in the core of plaza floors have their center points offset from the actual point of interstice with the primary axis of Str. 4A-1st (as inferred geometrically from the alignment of outset Stair 1).

One illuminating example is Burial 4A-1, which is clearly intrusive into the plaza floors and postdates the construction of the terminal architecture (Figure 18). Consequently, placement of the burial could rely on the extant configuration of the outset stair as a means of inferring the primary axis. The placement of Bu. 4A-1’s intrusive pit in relation to the outset

stair may thus shed some insight into its affinity to the primary axis of Str. 4A-1st. More insightful than the mere presence of a votive deposit, are the cognitive processes that operated behind considerations of layout and placement with regard to the primary axis. If the abdominal area of the individual of Burial 4A-1 was meant to be aligned with the primary axis, so that the body may form a proportionate and perpendicular alignment, then the trench and indeed the skeleton itself may be considered offset from the axis. Multiple explanations can be offered to account for such displacement including the following:

It has been remarked that votive deposits are not precisely aligned with the expected geometric configuration predicated by architectural symmetry. It has thus been inferred that the axis established for the deposition of votive offerings was perceived rather than measured (cf. Loten and Pendergast 1984: 3). Consequently, one might invoke the spontaneity and idiosyncrasy of the votive activity surrounding the deposition of caches and burials.

Functional considerations might also have affected deliberations of placement. In this specific instance the bedrock encountered in the southern end of the pit was too hard to cut into. As a result it was not possible to excavate a depression wherein the deceased individual could be laid to rest. Thus it can be suggested that the pit was extended northward over softer bedrock, wherein a depression was indeed cut and the body deposited. Had the body of the deceased been offset southward within the existing limits of the trench, the abdominal area would have coincided with the primary axis.

Outside Renaissance-inspired Western considerations of the aesthetics of architectural symmetry, are the emic appreciations thereof. One need to look no further than the etymology of the word “symmetry” itself (i.e. from Greek for ‘sun’ + ‘measure’) to understand that the principle of ‘exact correspondence which is correct or of pleasing proportions’ (Pearsall 1999: 1450) is an etic semantic domain secondarily attributed to the word. In this instance it should be noted that the northward offset of the trench allows for the cranium to be aligned almost perfectly with the geometric primary axis, although on the whole the deposit might be considered partly off-axis. Thus the cranium or ‘head’ of the deceased might have been the focal point of the alignment, along the lines of a *pars pro toto* principle (Figure 18). Indeed the cranium enjoys a prominent position among ancient Maya caches (e.g. as the contents of lip-to-lip deposits) and burials (e.g. where dishes may be inverted to conceal or house the skull, or substitute for it in apparent cases of decapitation). Verification of such a trend may illuminate the meshing of ancient geomantic and geometric precepts, thereby offering a model against which so-called off-axis deposits can be considered.

Skeletal Material and Paleopathology

The burial sample from Pook’s Hill 1, (Str. 4A) generated by the 2000 field investigations is relatively small and the skeletal material from some of the burials remains commingled and fragmentary. There are however, several conclusions that can be drawn from the preliminary analysis of this skeletal assemblage. A minimum of 6 individuals were excavated as part of Op. 4A and of these individuals, 2 are probable males and 1 individual is a probable female. It was not possible to determine the sex of 3 of the individuals due to a

Pook's Hill 1, Belize
Structure 4A-1st, Op. 4A
Burial 4A-1 & Primary Axis
WBRCP 2000
Plan: C. Helmke

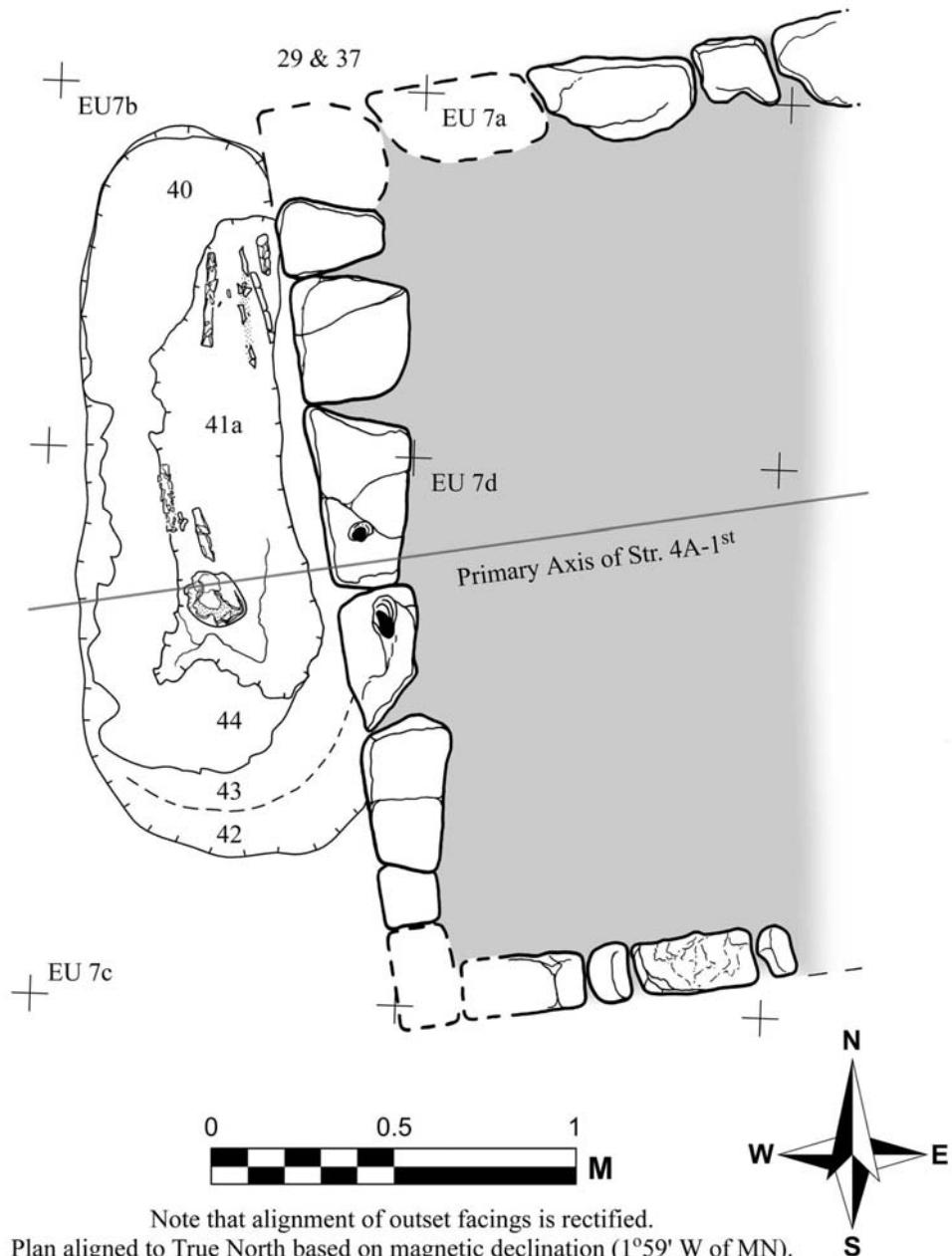


Figure 18: Plan of Bu. 4A-1 in relation to the primary axis of Stair 1 of Str. 4A-1st.

lack of diagnostic attributes. Both of the males, as well as the female individuals are adults while 2 of the individuals of undetermined sex are young adults. It was not possible to determine the age of the remaining individual that was represented only by a mastoid process. All burials excavated during the 2000 season were discovered and documented in primary context, in contrast to all human remains recovered in 1999. In addition, following the standard burial practices for the Belize River Valley generally, all individuals were buried aligned to a N-S axis with their heads to the south, either in an extended position or with lower limbs flexed. Despite the poor preservation of some of the remains, it seems as though all individuals were interred in a prone position.

Due to the small, commingled and fragmentary state of the skeletal remains recovered to date at PKH1, a formal paleopathological analysis of the material is not possible at this time. However, some general statements regarding the health status of the residents of PKH1 can nevertheless be made. There is a high incidence of nonspecific stress indicators of both childhood and adult affliction, evidence of an interaction of nutritional and disease factors that raised the susceptibility of these individuals to a variety of health stresses (Goodman et al. 1988).

Porotic hyperostosis and developmental enamel defects are indicators of stress during childhood that, though the etiology is complex, have a strong underlying nutritional component (Goodman et al. 1992; Stuart-Macadam 1985). Porotic hyperostosis is considered present when any degree of porosity in the characteristic areas of the parietal, occipital, and orbit is observed (Ortner and Putschar 1985:258). In this sample, all but one individual for which porotic hyperostosis could be scored show that it is present (Bu. 4A-1, Bu. 4A-4, SU 18a, SU 18c). The female individual in Burial 4A-3 has porosity on the cranial vault, face, and mandible related to a systemic infection, and so was not scored for porotic hyperostosis. The individual in Burial 4A-2 shows no evidence of porotic hyperostosis. This condition is active in the subadult individual of SU 18c, and healed on the adult individuals, a pattern consistent with iron deficiency anemia in childhood.

Developmental enamel defects include here linear enamel hypoplasias, hypoplastic arrays of pits, and hypocalcification. All of these defects are taken to indicate nonspecific metabolic stress that includes nutritional deficiencies and infectious disease episodes. Four individuals in this sample could be scored for enamel defects (Bu. 4A-1, Bu. 4A-2, Bu. 4A-4, SU 18a). Of these, enamel defects are present in 50%, or two individuals. The individual in Burial 4A-4 shows severe linear enamel hypoplasia indicating a pronounced stress episode between 3 and 4 years of age, probably associated with weaning. This individual also shows 2 earlier episodes indicated by linear hypoplasias and hypoplastic pits that occurred in earlier years. The young adult female of SU 18a has 2 episodes of linear enamel hypoplasia on the mandibular right canine, and one hypoplastic band on the maxillary central incisors. These episodes also occur between the ages of 3 and 5, reflecting the same increased physiological stress around the time of weaning. An opaque band of hypocalcification is also present on this individual's mandibular second molar.

At least one of these markers of childhood stress is present in 4 of 5 individuals that could be scored. Although this sample size is small and frequencies cannot be compared to the results of other studies in the Maya area, in general the occupants of PKH1 fit a pattern of pronounced childhood stress observed in the Late and Terminal Classic periods at other sites (Storey 1992, 1997; Wright 1994). Most of the PKH1 individuals were affected by more than one episode of physiological stress in childhood, suggesting that nutritional stress was common for the occupants of this *plazuela* group. This evidence of childhood stress does not necessarily, however, indicate a general decline in the adequacy of the diet or the availability of foodstuffs in the Late and Terminal Classic. Rather, it represents the typically increased susceptibility of weaned children in maize-based agricultural societies to anemia and episodes of infectious disease when making the transition from breastmilk to maize gruel. Many samples in the Maya lowlands that include individuals from the Protoclassic and Early Classic show similar frequencies of childhood stresses. While the sociopolitical history of each site in the Late and/or Terminal Classic must be taken into account, there are many sites at which the Early to Late to Terminal Classic transitions were not accompanied by skeletal evidence of markedly increased stress.

Nonspecific infections are manifest in all adult individuals for which adequate skeletal material was recovered, primarily in the long bones of the legs (Bu. 4A-1, Bu. 4A-2, Bu. 4A-3a, Bu. 4A-3b, Bu. 4A-4, SU 18a, SU 20). The severity of the infections ranges from a mild periosteal reaction to pronounced infection including sclerotic involvement and significant irregular reshaping of the bone surface. The tibia is most frequently afflicted, with infection present in all individuals for which this bone could be scored (Bu. 4A-1, Bu. 4A-2, Bu. 4A-3 Individuals A and B). Infection in the femur and/or fibula occurs with the next highest frequency, present in 50% of individuals for which these bones could be scored. Other skeletal elements with evidence of infection include the humerus (Bu. 4A-3, Bu. 4A-4), radius (Bu. 4A-3), ribs (SU 18a), metatarsals (Bu. 4A-1, SU 20), and metacarpals (SU 18a). Such a pattern of periosteal infection, including the frequency with which the leg bones are affected and the appearance of the infection in the metatarsals and metacarpals, may indicate the presence of endemic treponematosis (Aufderheide and Rodriguez-Martin 1998; Hackett 1976). These infections were healed at time of death in 2 individuals, and active in 5 individuals. The two individuals in Burial 3 appear to have suffered from systemic infection, active at time of death, including both periosteal reaction and sclerotic involvement and affecting most long bones. The young adult female of SU 18a appears to have suffered a pronounced sinus infection involving the maxilla and zygomatic bones. This infection was healed at time of death.

The incidence of possibly treponemal and nonspecific infections indicating morbidity in adulthood, and porotic hyperostosis and enamel defects indicating morbidity in childhood, makes it clear that physiological stress was a ubiquitous factor throughout the lives of the residents of Pook's Hill 1. This pattern has been observed in the populations of Copan, the Peten, and other areas of the Maya lowlands in the Late Classic, and is related to the interaction of nutritional stress, infectious disease, and parasitism.

CONCLUSION

The data generated by the 2000 season of investigations of the eastern shrine have contributed greatly to an understanding of the chronology, the burial practices, paleopathology, and architectural construction practices of the Roaring Creek Valley. As the surface site against which data from cave sites will be compared, it is hoped that Pook's Hill 1 is representative both in terms of diachronic as well as typological variables. The site was selected for excavation precisely because it stands in the middle of the settlement continuum, a means, however, offering no guarantees. It has thus been a surprise to find that so many of the artifactual elements occurring in cave contexts are also represented at Pook's Hill 1. The search for definite evidence linking the ancient inhabitants of Pook's Hill with the neighboring cave sites is still underway. Despite the absence of a proverbial 'smoking gun' it is felt that much of the evidence amassed thus far will shed light on the history of votive practices in the Roaring Creek Valley as seen through the window afforded by Structure 4A.

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Appendix A:

Pook's Hill 1, Operation 4A, Index of Stratigraphic Units (2000 Field Season).

SU	Op.	Str.	EU	Lvl.	Description
13	2A	4A / Plaza	2b	1a / b	Collapse debris of backing masonry and core of Stair 1 and overlying humus layer.
14	2A	4A / Plaza	2b	1b	Collapse debris of backing masonry and core of Stair 1.
18c	2A	4A	n.a.	0	Cluster of human remains. Materials placed in a discrete stack by looters. Recovered from backdirt of Looters Pit 1.
21	4A	4A / Plaza	7a / b	1a	Humic horizon.
27	1B	4A	SC 4	Surf.	Surface collection of artifacts encountered during clearing of vegetation off Str. 4A in the interim between 1999 and 2000 seasons.
29	4A	4A / Plaza	7b	2	Floor 1. Ballast and core thereof.
30a	4A	4A	7b	2a	Backing masonry of Stair 1. SU was split arbitrarily, vertically above surface of Floor 1.
30b	4A	4A	7b	2b	Backing masonry of Stair 1. SU was split arbitrarily, vertically below surface of Floor 1.
34	4A	4A / Plaza	7c	1a	Humic horizon.
37a	4A	4A / Plaza	7b	3	Floor 2. Ballast and core thereof. SU was split arbitrarily, horizontally along facings of Stair 1 (to the west thereof).
37b	4A	4A / Plaza	7b	3	Floor 2. Ballast and core thereof. SU was split arbitrarily, horizontally along facings of Stair 1 (to the east thereof).
40a	4A	4A / Plaza	7b	4	Floor 3. Ballast and core thereof.
40b	4A	4A / Plaza	7b	4	Floor 3. Ballast and core thereof.
41	4A	4A / Plaza	7b / c	4	Burial 4A-1. Human remains and associated artifacts.
42	4A	4A / Plaza	7c	2	Floor 1. Ballast and core thereof.
43	4A	4A / Plaza	7c	3	Floor 2. Ballast and core thereof.
44	4A	4A / Plaza	7c	4	Floor 3. Ballast and core thereof.
47a*	4A	4A /	7c	2	Fill of intrusive cut SU 55. SU corresponds to surface and

		Plaza			bottom elevations of Floor 1.
47b*	4A	4A / Plaza	7c	3	Fill of intrusive cut SU 55. SU corresponds to surface and bottom elevations of Floor 2.
47c	4A	4A / Plaza	7c	4	Fill of intrusive cut SU 55. SU corresponds to surface and bottom elevations of Floor 3. Corresponds to burial fill of Bu. 4A-1.
49	4A	4A / Plaza	7b	4	Cache 4A-1.
50	4A	4A / Plaza	7d	1a	Humic horizon.
52a	4A	4A	7d / e	2b	Core and backing masonry of Stair 1. SU split arbitrarily, vertically above elevation of Bu. 4A-3.
52b	4A	4A	7d / e	2c	Core and backing masonry of Stair 1. SU split arbitrarily, vertically below elevation of Bu. 4A-3.
53	4A	4A	7d / e	2	Burial 4A-3. Human remains and associated artifacts.
54	4A	4A / Plaza	7d / e	4	Burial 4A-4. Human remains and associated artifacts.

Legend: * = reconstructed stratigraphic unit.

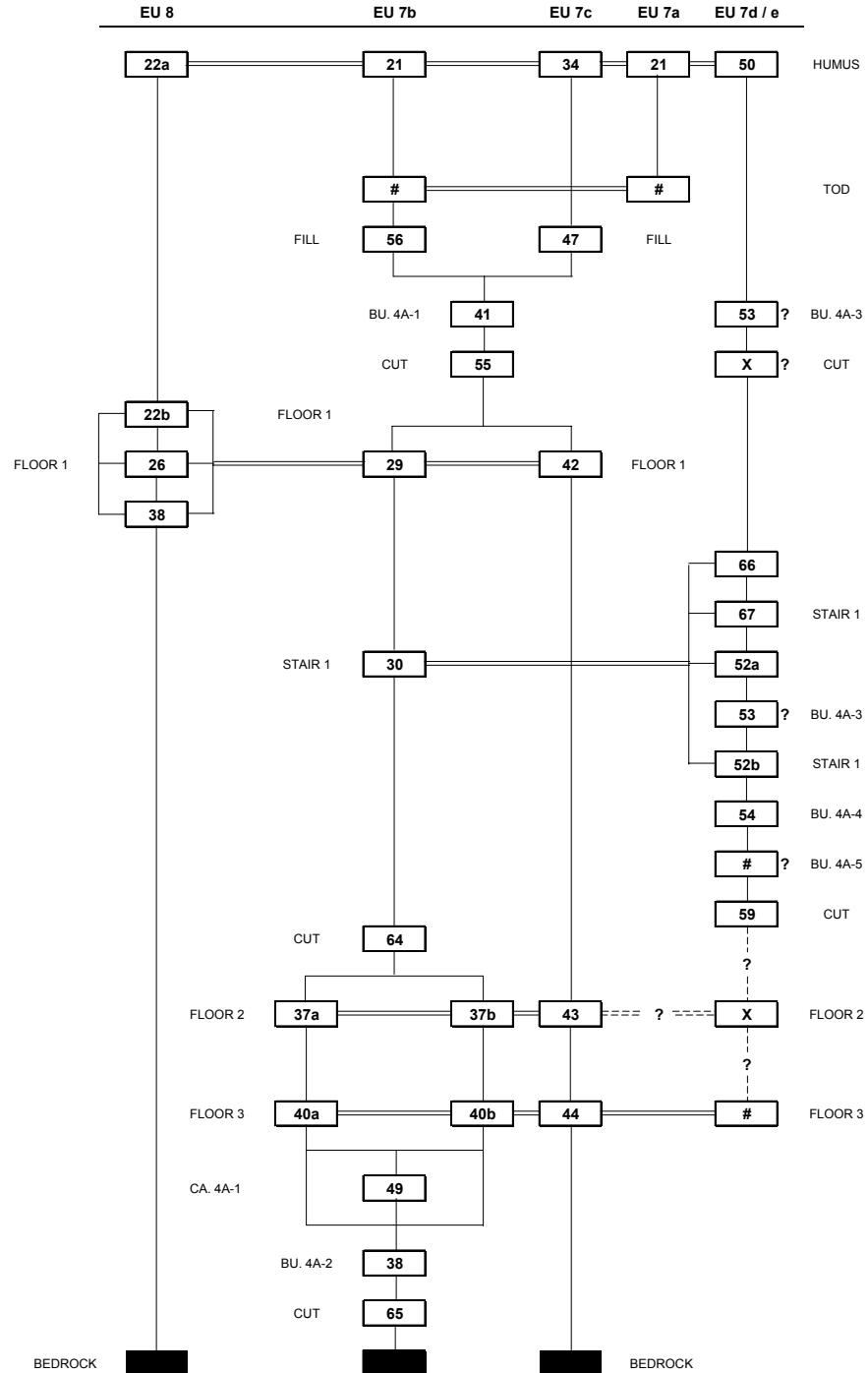
Appendix A –continued:

SU	Op.	Str.	EU	Lvl.	Description
55	4A	4A / Plaza	7b / c	2-4	Intrusive cut through Floors 1, 2 and 3. Cut made to accommodate the deposition of Bu. 4A-1.
56a*	4A	4A / Plaza	7b	2	Fill of intrusive cut SU 55. SU corresponds to surface and bottom elevations of Floor 1.
56b*	4A	4A / Plaza	7b	3	Fill of intrusive cut SU 55. SU corresponds to surface and bottom elevations of Floor 2.
56c*	4A	4A / Plaza	7b	4	Fill of intrusive cut SU 55. SU corresponds to surface and bottom elevations of Floor 1. Corresponds to burial fill of Bu. 4A-1.
57	3	4A	6	4?	PD 4A-1. In the core of the earliest construction of Str. 4A.
58*	2	4A / Plaza	2b	2a	PD 4A-2. In the core of Stair 1.
59	4A	4A / Plaza	7d / e	3	Intrusive cut through Floor 3. Cut made to accommodate the deposition of Bu. 4A-4.
62	4A	4A / Plaza	7b	4	Burial 4A-2. Human remains and associated artifacts.
64	4A	4A / Plaza	7b / c	4	Chop line affecting Floor 2. Cut made to accommodate the foundations / core of Stair 1.
65	4A	4A / Plaza	7b	4	Pit cut into bedrock. Cut made to accommodate the deposition of Bu. 4A-2.
66*	2A	4A	2a	2a	Core of Stair 1. SU reconstructed based on data recovered during salvage operations in 1999 (SU 13).
67*	2A	4A	2b	2a	Core of Stair 1. SU reconstructed based on data recovered during salvage operations in 1999 (SU 14).

Legend: * = reconstructed stratigraphic unit.

Appendix B:

Pook's Hill 1, Operation 4A, Preliminary Harris Matrix of Stratigraphic Units



Nb: SUs 13, 14, and 58 are all integral parts of Stair 1 and are thus equated to SUs 30 and 52.

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**POOK'S HILL 1, OPERATIONS 5A AND 6A:
TEST EXCAVATIONS OF THE PLAZA PLATFORM AND STRUCTURE 2A,
ROARING CREEK VALLEY, CAYO DISTRICT, BELIZE**

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INTRODUCTION

The following report serves to summarize the results of the Operation 5A test excavations of the plaza platform and Operation 6A test excavations of the western structure (Structure 2A) at the *Plazuela* Group 1 site of Pook's Hill (i.e. PKH1), Belize. The site setting, location and site description are omitted as these are presented in the foregoing Op. 4A report (Helmke, Piehl and Bassendale, this volume) and since both are designed to be read in conjunction. In keeping with the format of the foregoing report, the purpose and objectives of each operation are presented first, followed by a brief discussion of the placement, layout and configuration of the excavation units forming a part of each operation. Following this, a narrative of the process of excavations is provided. As two sub-operations are reported on, these are presented separately and in order numerical ascendancy, with 5A first and 6A second. Completion of the narrative section is followed by detailed descriptions of the stratigraphic contexts discovered in both 5A and 6A, which again are presented separately and in sequence. The stratigraphic contexts are presented in the order of their sequential position from earliest to latest. Finally, discussions of the excavations for Op. 5A and 6A are concluded with preliminary interpretations of the types of activities conducted in association with Structure 2A in antiquity and inferentially, the function that building served in its last phase of utilization.

OPERATION 5A

Purpose and Objectives

Operation 5 was initiated to account for all research excavations of the Plaza Platform. Sub-operation 5A was defined to encompass all excavation units focusing on the center of the platform, exhibiting no visible relation to adjacent structures. Consequently,

Operation 5 comprises excavations of the plaza platform withdrawn from the mounds of collapse debris of adjacent structures. The interface between structures and the plaza, while also pertaining to the plaza platform, is individually apportioned to operations relating to particular structures (since the mounds of collapse debris define the aerial extent of operations relating to specific structures). Excavation Unit 8, the first test excavation of Op. 5A, was initiated in order to document the sequence of construction episodes shaping the terminal appearance of the platform, as manifested by superimposed flooring components. The presumed incidence of a sequence of plaza floors was based on the results of similar excavations conducted previously in the Belize Valley and Maya lowlands generally (e.g. Awe 1992; Loten and Pendergast 1984; Pendergast 1979:37-39, 1982:5-7; Willey et al. 1965). These foregoing investigations have revealed sequences of flooring episodes providing essential data on the frequency of construction episodes of plaza platforms. Excavations of EU 8 were designed to reveal the number of flooring components and to recover artifactual materials associated with discrete flooring episodes so as to assist in the temporal placement of these construction events.

Placement, Layout and Configuration

Excavation Unit 8 was aligned to magnetic cardinal points by projecting a due west bearing from the datum located in the approximate center of the plaza (i.e. datum PKH1-6) (Figure 1). The placement of the test excavation was conditioned by the configuration of the surrounding mounded structures, as an attempt was made to place the EU as close to the point of interstice of the primary axes of principal structures (i.e. Strs. 1, 2A, 3A, and 4A) as possible. With the assistance of theodolite instrumentation, the westward bearing allowed the delineation of the northern baulk of the EU, the NW corner of EU 8 being set at a 2 m distance from the survey datum (i.e. datum PKH1-6). Keeping the alignment and configuration of EU 8 to full meter increments in relation to the position of the survey datum was deemed advantageous so as to align EUs of Op. 5 to a grid centered on this datum. Consequently, were extensions to this initial EU to be deemed necessary, these could be made expediently through projections from this reference point. Once the northern baulk and NW corner of EU 8 were established, the remaining corners were projected by triangulation so as to form a 1 x 1 m test EU. This small size was considered suitable to uncover data on various flooring components, although it was recognized that extensions could be made as necessary. In addition, the EU was designed to test the nature of a small drop in the elevation of the plaza flooring, which was encompassed by the EU. This drop in flooring separates the higher elevation of the MGS of the NW portion of plaza platform from the SE portion, which was found to be at a slightly lower elevation. The drop in flooring could be seen to run diagonally across the entire surface of the MGS of the plaza from the SE corner of the mounded Str. 1 to the SE corner of the mounded Str. 2A, suggesting that it may represent a structural feature (Figure 2).

Narrative of Excavations

Since EU 8 was designed as a test excavation of architectural components for which no data existed prior to the initiation of the 2000 season, it was deemed prudent to employ a combination of cultural stratigraphy and arbitrary 10 cm level excavation methods.

Pook's Hill 1, Belize
Plan of Plazuela Group
Distribution of Operations
WBRCP 2000

Plan: C. Helmke

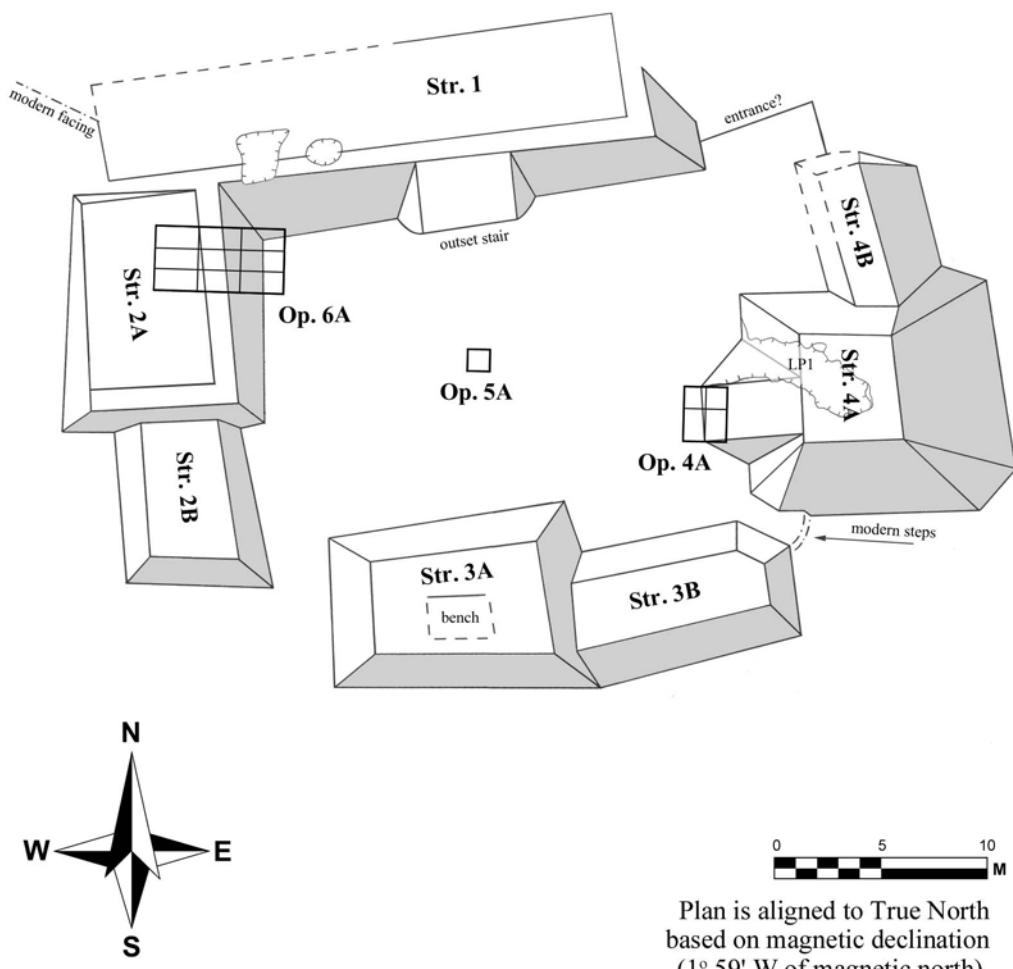


Figure 1: Plan of the Pook's Hill 1 *plazuela* showing the configuration and distribution of the excavation operations of the 2000 Season.

Pook's Hill 1, Belize
Plan of *Plazuela* Group
Plaza Topographic Feature
WBRCP 2000

Plan: C. Helmke

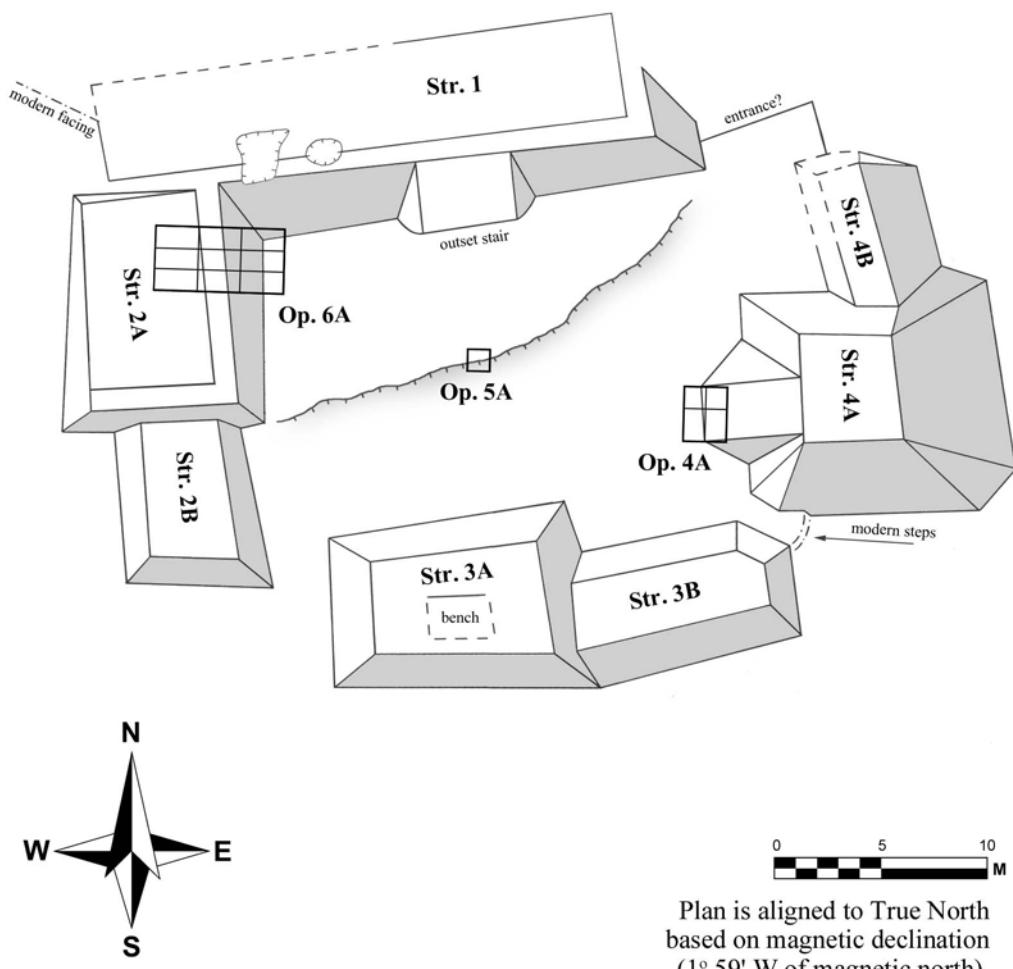


Figure 2: Plan of the Pook's Hill 1 *plazuela* showing the slight drop in elevation of the modern ground surface of the plaza and its point of interface in EU 8 (note that the drop is rendered schematically).

Were well-preserved plaster flooring surfaces to be encountered these would be used to mark stratigraphic interstices. Conversely, were an architectural component to encompass a depth in excess of 10 cm, this would be subdivided into arbitrary levels so as to allow vertical control (in a circumstance in which the sequence of flooring episodes was unknown at the onset of excavations). This approach was deemed particularly prudent considering the discovery of Floor 1 made in Op. 4A, which was found to be poorly preserved, represented solely by the ballast layer (cf. Helmke, Piehl and Bassendale, this volume). It was thus surmised that arbitrary subdivisions should be employed, particularly if the matrices exposed during excavation could not be sufficiently discerned on the basis of coloration and texture, while any such arbitrary subdivisions could be amalgamated later if these were found to be unnecessary.

Excavations of EU 8 were initiated with the stripping of grasses and the associated humus layer, which was found to be atypically thin at this locus, amounting to no more than a few centimeters (ca. 2-3 cm). Contained within this humic layer was a dense concentration of limestone gravel, identical in all respects to those defining the weathered surface of the ballast layer of Floor 1 in Op. 4A. It was thus surmised that this gravel represented the ballast of Floor 1 that had been partly loosened and displaced by extensive bioturbation. Continued excavation revealed that the density of limestone gravel increased with depth, thereby supporting the interpretation of this layer as ballast. Based on this discovery and the inability to segregate the humus from the ballast layer, the first level (SU 22) was assigned to a mixture of Levels 1a (humus) and ballast (Level 2a). Once excavations had proceeded to a depth of 10 cm, the level was ended.

A new level was initiated (Level 2b; SU 26), which was not associated with any noticeable shift in matrix coloration although it was found to incorporate a limestone rock constituent that was slightly larger, suggesting that the core of Floor 1 had been penetrated. Before reaching the end elevation of the arbitrary level (i.e. MGS -20 cm) a nearly level bedrock surface was exposed throughout the northern half of the EU. Contrary to expectations, the surface was not smooth as is typical of natural bedrock, but characterized by a crackled and damaged surface (SU 63). Interestingly, the southern limit of this bedrock surface corresponded closely to the drop in floor noted during inspection of the MGS. This suggested that the entire NW portion of Floor 1 rests upon modified bedrock (e.g. SU 63), which may in essence represent the quarry scar cut into the side of the hill into which Strs. 1 and 2 were partly set. Encountering this feature prompted the closing of Level 2b.

The subsequent level (Level 2c; SU 38) was initiated so as to excavate the core of Floor 1, to the south of the modified bedrock ‘shelf.’ It was anticipated that this level would be closed along the arbitrary lines dictated by another 10 cm increment in depth (i.e. MGS -30 cm) or along the surface of another earlier floor surface. Clearing of Level 2c revealed that it was of identical composition to Level 2b, suggesting that it still comprised part of the core of Floor 1. In clearing the core, the smooth natural bedrock surface was exposed which was found to slope downwards to the south, thereby conforming to the slope of the surrounding, unmodified, natural terrain. Before reaching the bottom elevation of a third arbitrary level, the entire natural bedrock surface had been exposed in the southern half of EU 8, thereby terminating both Level 2c (SU 38) as well as EU 8.

Having discovered that the articulation between modified and unmodified bedrock corresponds closely to the drop in elevation documented on the surface, it is surmised that the SE portion of the plaza platform was built upon unmodified bedrock (Figure 2), possibly using core material extracted from the quarry cut into the side of the hill. In sum, the excavations of EU 8 countered expectation in the discovery of a single floor component, associated with Floor 1, rather than a sequence of floors. Based on the results of EU 8, only a terminal construction effort has been associated with the Plaza Platform at this locus. This discovery is divergent of those made in Op. 4A where three flooring episodes have been documented (cf. Helmke, Piehl and Bassendale, this volume). Consequently, it is surmised that the majority of the plaza was not plastered until the terminal construction of Floor 1, thereby leading to the inference that for a portion of the site's history, the NW portion of the plaza was defined solely by the bedrock surface.

OPERATION 6A

Purpose and Objectives

Operation 6A was defined to account for all 2000 season excavations focusing on the exposure of terminal phase architecture of Str. 2A-1st. In terms of research objectives, the purpose of clearing Str. 2A-1st was to define the architectural configuration of this structure. Complete exposure of this structure and documentation of its architectural configuration were designed to assess the function that this building served within the spectrum of activities that were conducted in antiquity in the *plazuela* group. Assisting in the identification of structure function, it was hoped that artifactual remains associated with the activities conducted at Str. 2A-1st would be encountered as part of the Op. 6A excavations. In addition, the quality of architectural construction would be assessed by these excavations so as to gauge the possibility of future consolidation efforts. Consolidation efforts in turn were considered as part of the objectives for development of the site for tourism.

Placement, Layout and Configuration

Operation 6A initially encompassed an E-W trench that was designed to recover data on architectural configuration on the eastern face of Str. 2A-1st while encompassing the entirety of the collapse debris mound associated with this structure at this locus. A trench running perpendicularly to the conjectured face of terminal architecture was deemed an appropriate means of tackling the exposure of Str. 2A-1st as it would allow identification of structural components and stratigraphic succession encompassing the base of the collapse debris mound to the east and the summit of the structure to the west. Thus the interstice between Str. 2A-1st and the Plaza Platform could be uncovered, as well as the stratigraphic interstice between terminal phase architecture and strata deposited subsequent to terminal construction efforts.

So as to encompass the summit, the base of the collapse debris mound, and to keep to trench to regular meter increments, the trench was set to a length of 6 m (E-W). The width (N-S) of this trench was set to 1 m to conform to the smallest meter increment (Figure 3).

This width was deemed suitable since this initial trench was designed as a test penetrating into matrices of unknown composition and spatial distribution. All strata uncovered as part of this trench could thus not only be documented, but would also allow distribution of these to be projected into extensions made to this trench, thereby assisting in expedient stripping. So as to control for the horizontal distribution of artifacts uncovered in this 6-m long trench, it was subdivided into three 1 x 2 m EUs (designated EU 10, 11 and 12 from E to W). Subsequent to the initiation of this initial trench, the excavations of Op. 6A were broadened by southward extension. These extensions comprised two additional trenches set parallel to the first and encompassing six more EUs. The second trench set adjacent to the initial trench comprised EUs 13, 14 and 15 (designated from E-W) while the third trench encompassed EUs 16, 17 and 18 (designated from E-W). Thus by the end of the 2000 season, Op. 6A comprised nine 1 x 2 m EUs, covering an area of 18 m² (Figure 3).

The placement of the initial trench was conditioned by the configuration of the mounded features exhibited by Str. 2A-1st since the trench was designed to encompass part of the summit as well as the entirety of the collapse debris mound (as stated above). A portion of terrace facings exposed at the surface of the northern end of the collapse debris mound was deemed an appropriate place to set the trench as it would apparently allow exposure of better-preserved architecture. From this point, symmetries could subsequently be drawn, thereby guiding the efforts of other stripping excavations. In addition, placement of this trench at this location was deemed doubly advantageous. First, the trench would thus be set to the north of the conjectured location of the outset stair, thereby avoiding clearing an architectural component of greater complexity. Second, the easternmost portion of the trench would thus be set in the corner formed by the collapse debris mounds associated with Str. 2A-1st and Str. 1-1st. Consequently, the collapse debris mound associated with Str. 2A-1st would thus be included as part of the trench, while excluding part of the collapse debris mound associated with Str. 1-1st. This second aspect was deemed of importance if artifacts associated with specific structures were to be segregated spatially in the field, as part of the process of excavations.

The placement of the Op. 6A trench was thus established on the basis of the criteria outlined above. The alignment of strings defining the EUs and the placement of respective back stakes were set using tape measures, line levels, plumb bobs, and a Brunton compass (i.e. ‘Pocket Transit’). Quadrangular configurations were maintained by the use of triangulation and all EUs were set to magnetic cardinal directions. Projecting the alignments of the Op. 6A trench to the south allowed establishment of a grid covering the entire frontal (eastern face) of Str. 2A. This grid thus formed three 2 m wide (E-W) columns and nine 1 m wide (N-S) rows, covering an area measuring 54 m². While only a third of the excavation units forming part of this grid were excavated in 2000, resumption of stripping excavations in future seasons would only require string to be drawn to redefine the boundaries of EUs as semi-permanent back stakes were set in establishing the grid. The configuration of this grid was plotted on the base map by surveying corners with the aid of theodolite instrumentation.

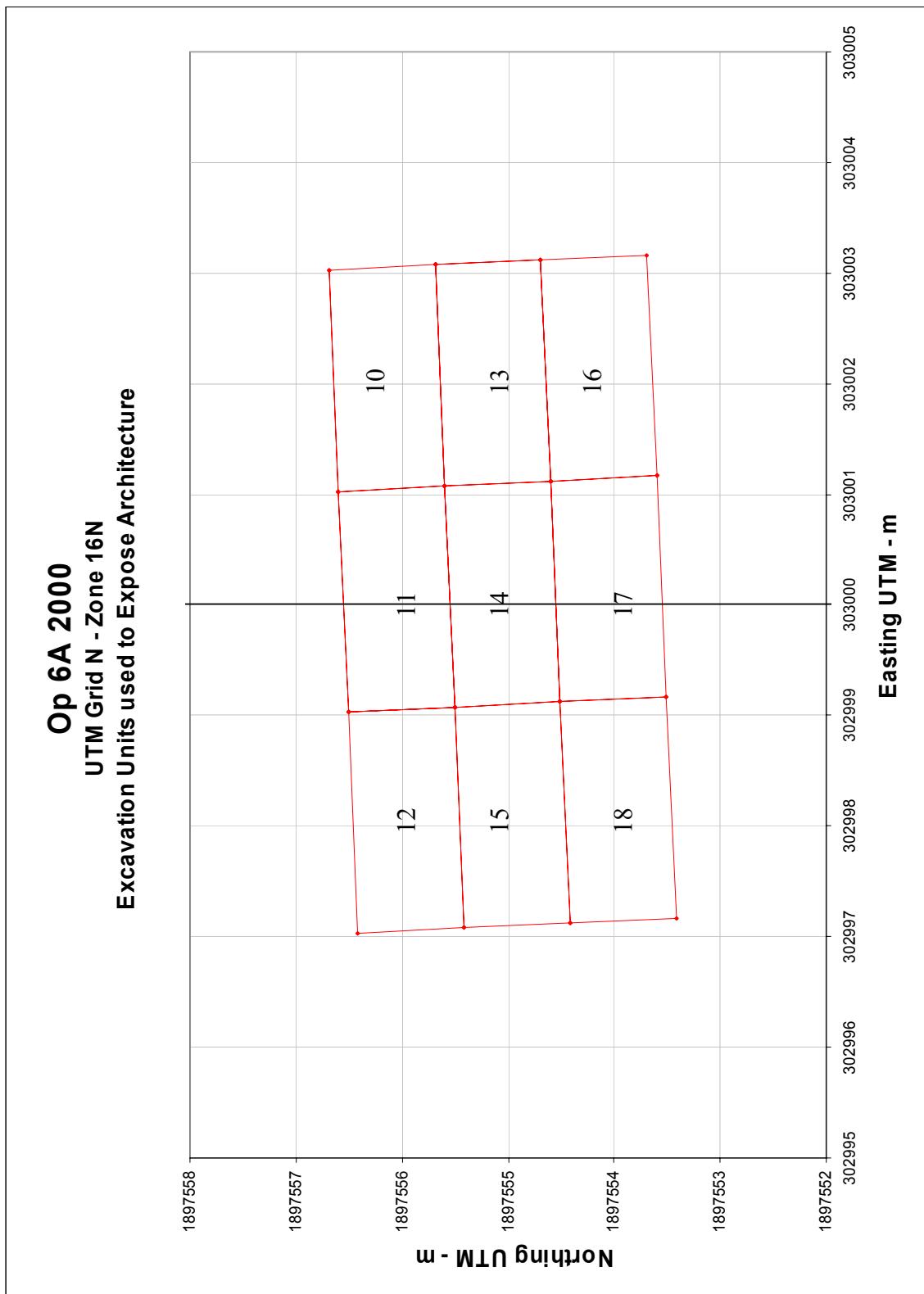


Figure 3: Plan showing the layout and configuration of the Op. 6A excavation units, as they appeared at the end of the 2000 season. Coordinates are absolute UTM. Plan is aligned to UTM grid north.

Narrative of Excavations

The narrative of excavations is designed to relate the sequence of excavation processes forming part of a sub-operation, determined by the succession in which EU_s were excavated. Nonetheless, in the case of Operation 6A the numerical EU designations refer to the order in which these were set up at the beginning of the season, prior to the onslaught of excavations proper. The EU_s were all laid out according to a coherent sequencing with numbers increasing within rows from eastern to western columns and between rows from north to south (Figure 3). The numbers therefore do not specifically refer to the sequence in which these were excavated. Unlike some operations, several of these excavations units were being excavated concurrently, and with greatly fluctuating numbers of personnel available during the course of the season, the number of EU_s that could be excavated at any one time, varied proportionately as well. Thus, the narrative presented below, is organized according to groupings of EU_s, which share similar objectives and/or uncovered similar architectural features, these groupings in turn being presented sequentially according to the first EU that was initiated in the group. The absolute sequence in which excavation units were excavated may be approximated as follows: 10, 11W, 12, 15, 14W, 18, 17W, 13, 16, 17E, 14E, and 11E where E and W refer to the eastern and western portions of EU_s (Figures 3 and 4). The boundary segregating contexts in EU_s 11, 14 and 17 was defined by the remains of the face of Terrace 1, which was visible from the onset of excavations at the surface, and thus served as a means of subdividing contexts according to a culturally significant feature. Nonetheless, despite the sequential linearity that the above listing might suggest, several EU_s were excavated concurrently, and depending on the type, composition and volume of stratigraphic deposits, some EU_s initiated earlier were completed towards the end of the season.

Excavation Unit 10

Excavation Unit 10 was the first EU initiated as part of Op. 6A. This EU was selected on the basis of its location at the base of the mound of collapse debris. This location was deemed advantageous as it was surmised that a lesser amount of collapse debris –relative to other EU_s– would be encountered thereby allowing rapid clearing of Floor 1 at this locus. Clearing of Floor 1 in turn would allow excavations to be extended westwards along this architectural feature until these encountered the face of Terrace 1.

Excavation of EU 10 were begun with a predominate focus on the eastern 1 x 1 m of the EU. Humic concentrations were stripped and collapse debris exposed (SU 23). At this juncture Floor 1 had already been exposed in both Ops. 4A and 5A. Consequently, the elevation of the putative Floor 1 associated with Str. 2A could be projected thereby allowing the depth of the collapse debris stratum at this locus to be gauged in advance. This projection in turn allowed rapid progression through the collapse debris stratum (SU 23) without fear of penetrating architecture, until a dense concentration of ceramic sherds and faunal remains (including *jute* shells and parrotfish bones) was encountered in the northern portion of the EU

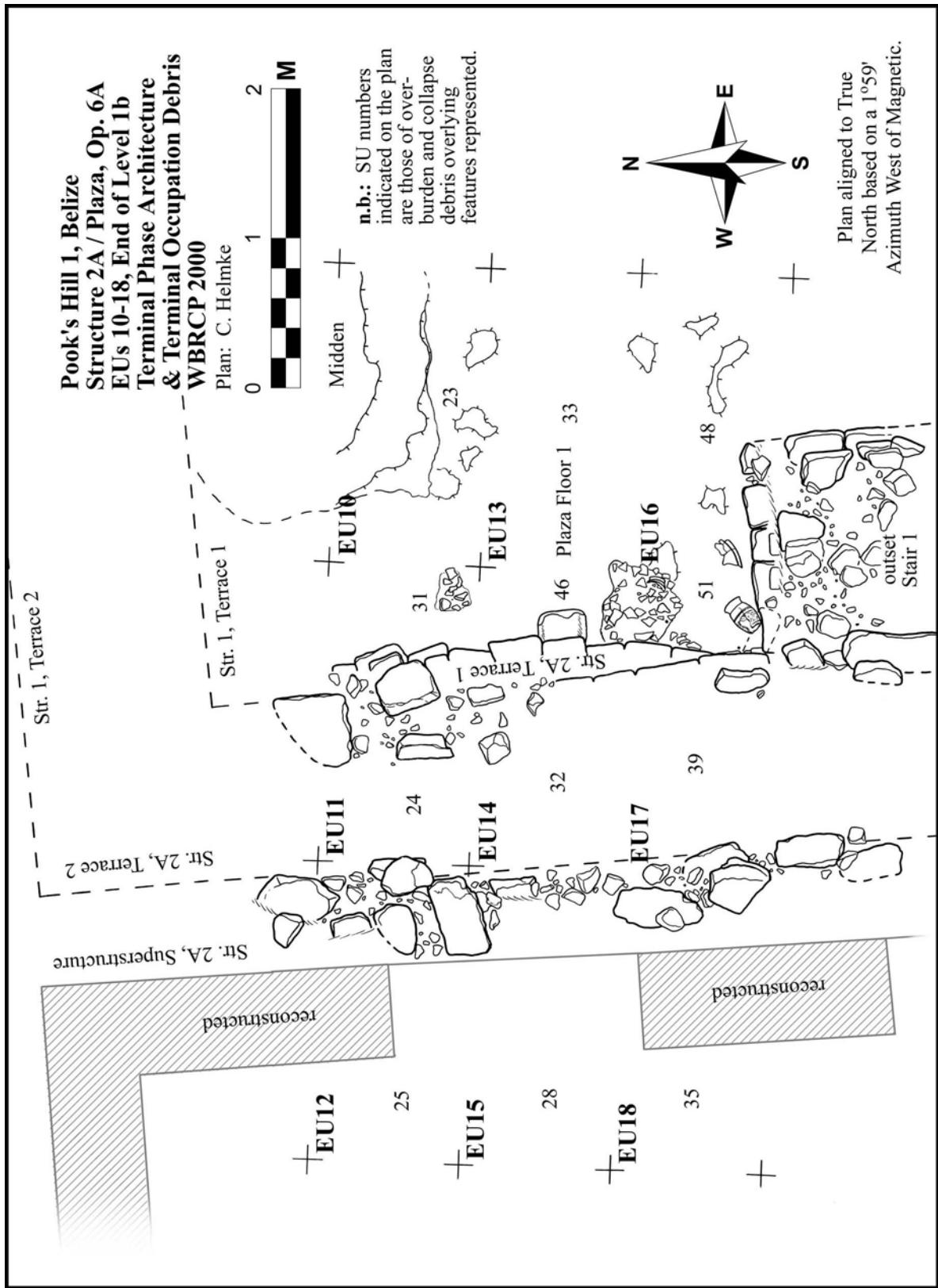


Figure 4: Plan showing the layout and configuration of terminal phase architecture and associated terminal occupation debris once stripped of all overlying humic overburden and collapse debris.

(SU 36) (Figure 4). Realizing that this feature lay in the way of Floor 1 and may in fact shroud its entirety, the objectives for EU 10 shifted to the identification and full exposure of this feature, with the objective of clearing Floor 1 befalling the adjacent EU 13.

Detailed clearing of this feature revealed that it was a midden representing a heaped deposit of clutter refuse (SU 36), which indeed occupied most of the surface of Floor 1 contained within the boundaries of EU 10. Once the midden had been documented photographically as well as in plan, 10 N-S cross-sections were recorded (at 20 cm intervals) to determine the volume encompassed by the midden. Upon completion of this feature's documentation, the horizontal breath of this pile was subdivided into five 1 x 0.4 m sections.

Based on the horizontal configuration it was clear that the midden deposit contained within the boundaries of EU 10 represented only the southernmost extent of a deposit extending to the north and possibly to the east. Thus without extending EU 10, only a sample of the midden could be excavated. This approach was taken leaving the remainder of this feature to be tested in future seasons. The central subdivision of the midden was excavated first as a probe in order to test for the incidence of internal micro-stratigraphy (SU 36c). The probe revealed that the midden did not exhibit discrete internal stratification, thereby suggesting that this feature had been deposited either rapidly and / or as a secondary mixed mass. These points of taphonomy are discussed in more detail, below. Each subsection was subsequently excavated down to the surface of Floor 1 as spatially discrete sub-contexts (i.e. SUs 36a-36e).

In the process the poorly preserved and slumped remains of an architectural component apparently associated with Str. 1-1st were uncovered along the N baulk of the EU. Since this component, represented by an E-W row of facings, did not form part of the architecture related to Str. 2A-1st nor was of appreciably clear configuration, it was not cleared beyond the extent of EU 10 nor penetrated by excavations.

In clearing Floor 1 throughout EU 10 small well-preserved patches of plaster surfacing were encountered. In order to test the make-up of this plaster, samples were recovered for future analyses (SU 45). With the complete exposure of Floor 1 EU 10 was closed, its secondary (and eventually its primary) objectives having been accomplished.

Excavation Units 11, 14 and 17 (Western Portions)

Initiated simultaneously and excavated concurrently to EU 10, was the western portion of Excavation Unit 11. Visible surface features included the remains of the verge of Terrace 1, which was used to define the eastern edge of the western portion of the EU, and possibly the eastern wall of the superstructure or the face of Terrace 2 to the west in EU 12. Despite notice of these western architectural features, EU 11's western baulk was defined by EU string, as the architectural features appeared to occur outside of EU limits to the west. Otherwise unit strings also defined the N and S baulks. The purpose of EU 11W as well as its affiliates EUs 14W and 17W was to define the flooring of T1 and if possible clear the base of the architectural features pertaining either to the superstructure or T2.

In EU 11, the humic accumulations (Level 1a) were found to be thin (no more than 5 cm) and collapse debris (Level 1b) of little volume so that the two were excavated as a single conglomerated SU. In addition, the humus did not yield artifacts, thereby rendering contextual distinction between the two strata unnecessary. Following completion of EU 11 the same method was applied to the adjacent EUs 14W and 17W. Thus while SU 24 of EU 11 represents a mixture of humus and collapse all artifacts recovered stem in fact from collapse and from loosely defined deposits resting atop the flooring of Terrace 1, but mixed irremediably with collapse, thus disabling clear contextual segregation in the field. Once humus was stripped, the collapse was stripped in the E portion of the EU and a large horizontally placed slab of limestone was exposed near the verge of T1, which may mark the flooring of T1.

Following the slab westwards defined a roughly level surface represented by the ballast of the poorly preserved flooring of T1. No traces of plaster were found to verify this identification beyond a doubt. This completed the removal of collapse debris from the W half of EU 11 (SU 24), with the stratigraphic section exposed in the W baulk representing solely collapse debris capped by a thin layer of humus. Thus by the time EU 11 was closed successful definition of the foot of T2 or a superstructure wall was not forthcoming, although it could be confirmed that this architectural feature occurred outside of the EU 11 limits to the west in EU 12.

Subsequent to these efforts excavations aimed at clearing more and hopefully better preserved terrace flooring were initiated in the adjacent EU 14, to the south. Again as with EU 11, only the portion to the west of the Terrace 1 remains was cleared of humus and collapse as a single SU. As with EU 11 the majority of artifacts were recovered from the collapse debris stratum, but unlike its predecessor, larger sherds were identified resting directly on the poorly preserved flooring in EU 14. These artifactual materials were suggestive of TOD, but these were too few and mixed into the lower reaches of the collapse debris to segregate and thus were collected as part of the singular SU 32. During excavations qualitative assessments suggested also that more artifacts had been recovered from EU 11 than were being recovered from EU 14. This assessment suggested that a thin 'sheet midden' or terminal occupation debris cluster may indeed have been present on T1 flooring in EUs 11 and 14, but due to intensive bioturbation were mixed irremediably with the overlying collapse debris layer. In addition, the fluctuation in artifact frequency observed during the excavations, suggested that this putative TOD cluster may have had its node to the N of EU 11 in the postulated corner formed by Strs. 1 and 2A at the level of T1 flooring. EU 14 and its associated SU 24 were closed once the majority of collapse debris had been removed, exposing the poorly preserved terrace flooring, still without successful definition of the T2 base or superstructure wall as it also occurred outside the EU boundaries, to the W within EU 15.

EU 17 was initiated shortly after EU 14 was begun and excavated concurrently. The excavation of EU 17 entailed the same processes as those employed in the foregoing EUs 14 and 11, with the E edge defined by architecture and remaining baulks by EU boundaries. The mixture of collapse debris (Level 1b) and humus (Level 1a) contained within this EU

(SU 39) was stripped off expediently, still without the discovery of a well-preserved section of flooring, since only ballast was exposed. Based on knowledge gained in the process of excavating EUs 11 and 14, the stripping in EU 17 was expedient, rapidly completed and discovered no indication of TOD. This absence suggests that within the confines of EU 17 the presumed deposit of TOD had petered off completely. With the completion of EU 17, the entirety of the poorly preserved T1 flooring had been cleared over an area of 3.63 m² (cumulatively in EUs 11, 14 and 17) thereby having reached the goals set for this group of EUs.

Excavation Units 12, 15 and 18

Once EU 11 was initiated, so too was EU 12, immediately in sequence. The purpose of EU 12 and its associated EUs to the S was to expose part of the structure's summit to clarify the configuration of the Str. 2A-1st building, in hopes that these data may shed light on the structure's original function. Excavations were started with the stripping of humus (Level 1a; SU 25) in EU 12 from E to W, exposing collapse debris. With the surface of the collapse debris layer exposed, it was scrutinized for linear arrangements of facing stones suggestive of terrace or wall components. Examinations did indicate two rough, apparently slumped lines of facing stones running N-S in the western portion of EU 12. These rows were interpreted either as representing the front (eastern) face of a bench feature and the face of a T2 component, or the interior (western) and exterior (eastern) faces of the eastern wall of the superstructure. All other rocks exposed represent collapse debris.

Clearing of the humic layer also revealed a granite *metate* fragment and a possible *mano* in the eastern portion of the EU. In addition, a fragmentary turtle back *metate* was recovered nearby during surface collection as artifact 4/1, on what is now known to have been the T1 flooring. The two *metate* specimens may represent conjoining elements, although this has not yet been verified. These implements are suggestive of the types activities carried-out at that building and in turn may shed light on the structure's original function. Based on the context in which these artifacts were found it is thought that these may have originally been placed and/or used on the presumed bench surface.

Once fully cleared of humus, the provenience of all artifacts encountered at the end of Level 1a was secured by theodolite readings and photographs. As these three excavation units were designed to uncover and expose parts of the structure's summit, and since secure architectural components to follow were lacking, it was decided to first strip humus off collapse debris in all the EUs, and the remove collapse off terminal architecture subsequently. Consequently, SU 25 was closed once all Level 1a humus overburden was stripped off collapse debris within the confines of EU 12.

Subsequent to the closure of SU 25, EUs 15 and 18 were initiated concurrently. Again these were started with the stripping of humus as Level 1a (SU 28 and 35, respectively) taking place throughout the limits of the EUs, in hopes of defining the southern continuation of the rough alignments of facing stones noted in EU 12. As humic concentrations were thinnest in EU 18, excavations rapidly exposed the collapse and found that the alignments noted in EU 12 apparently did extend southward through both EUs 15

and 18. During the clearing of the humic layer more granite *metate* fragments were found within EU 18, an apparent link to the artifacts recovered during clearing in EU 12. Humus (Level 1a) had been stripped off collapse within all three EUs when personnel had to be shifted to the excavation of plaza level EUs containing considerably larger concentrations of collapse debris. Due to time constraints none of the collapse debris contexts exposed in the summit EUs could be penetrated. Thus despite the discovery of the rough lines of stone at the surface of Level 1b, the identity of this or these feature(s) could not be determined with certainty by the end of the 2000 season. Consequently, the objectives sighted for the summit EUs were not achieved in 2000, but it is hoped that resumption of excavation on these in future seasons may allow clarification of these points.

Excavation Units 13 and 16

The purpose of EU 13 was to expose the surface of Floor 1, since it had been found that EU 10 did not adequately befit this task. As such, the prime objective of EU 13 was to clear the surface of Floor 1, since this feature could in turn be followed to the base of Terrace 1. EU 13 focused on the clearing of humus (SU 33a; Level 1a) off collapse debris (SU 33b; Level 1b). Once this was accomplished smaller fist-sized stones were removed in an effort to determine if underlying architectural features were represented. Small clusters of ceramics were found at the interstice between humus and collapse, but these seemed to be fortuitous inclusions derived from the collapse of Str. 2A-1st architectural components. At this juncture Floor 1 had still not been cleared in Op. 6A and no clear architectural features were available to follow. As collapse was being removed within the temporarily down-sized E 1 x 1 m section of EU 13, two large dolomitic facing stones (size 60 x 46 cm and 46 x 30 cm) aligned roughly N-S were exposed. These initially suggested presence of a deteriorated architectural component. As Floor 1 would have occurred to the E of this putative alignment, additional collapse was removed in hope of exposing the floor and the facing stones to ascertain their function and articulation with the plaza floor. Continued excavation of collapse (Level 1b) to the E of these stones did eventually reveal the surface of Floor 1. The large facing stones were found to be resting directly atop a thin layer of humus covering this portion of the floor thus indicating that these did not form part of an architectural feature. Instead it seemed likely that these stones formed part of an architectural component, which had collapsed *en bloc*, remaining somewhat articulated despite the fall. The size and alignment of these stones suggested that these may have formed part of the crowning course of T1, which in this section would have collapsed as much as 2 m forward to the E onto the already partially humus-littered Floor 1. This interpretation was supported by the absence of the uppermost course of T1 in EUs 14 and 17, as well as the near identical size of facing stones exposed in situ, to those exposed in secondary context in EU 13. Identification of these rocks as forming part of collapse debris allowed full exposure of the surface of Floor 1 within the E half (1 x 1 m) of EU 13.

Once the eastern half of EU 13 was completed, attention shifted to the western half. Concurrent to this, EU 16 was initiated. Examination of the exposed stratigraphic profiles in EU 13 indicated that collapse debris occurred exclusively to the W and S of the E 1 x 1 m portion of EU 13. Consequently, excavations continued with the removal of collapse westward in EU 13 and southward within the E half of EU 16, while still working cautiously

to expose any architectural features that might be contained within the confines of EUs 13 and 16. In the process of removing collapse debris from the eastern portion of EU 16, a still partly articulated section of facing, running roughly E-W along the southern baulk was exposed. As excavations proceeded, this component was identified as the northern stair side of the principal outset stair of Str. 2A-1st (i.e. Stair 1). With Floor 1 and the outset stair as reference points the clearing of collapse debris continued expediently.

The more rapid pace afforded by the discovery of secure architectural features was attenuated once various unarticulated human remains were encountered in both EUs 13 and 16. These remains were found either resting directly atop the surface of Floor 1 or within the lowest reaches of the collapse debris, separated from the floor's surface by no more than 5-7 cm of humic soil. Examinations of the stratigraphy suggest that this humus was deposited during the gradual abandonment of the site, or subsequent thereof, until it was sealed by the collapse of Structure 2A-1st. The human remains were found sparsely distributed with teeth occurring seemingly at random in the soil matrices. Consequently, these remains appear to occur outside of a formal burial context as part of terminal occupation debris deposits. Based on this incidence, the human remains are apparently on equal standing with the artifacts recovered from these types of deposits, thereby suggesting that similar activities may be responsible for their deposition. These clusters of human remains were documented by a combination of measures, including scaled plans, theodolite survey and photography. The removal of the collapse debris in EUs 13 and 16 thus entailed carrying the excavations down to ca. 15-20 cm above the expected flooring surface at which point more detailed troweling allowed exposure of any human bone clusters contained in the matrices. Once these had been documented remaining matrices were excavated down to the surface of Floor 1. Complete exposure of Floor 1 and the face of the northern stair side of outset Stair 1, in EUs 13 and 16, brought SUs 33b and 46 (respectively) to a close.

Excavation Units 11, 14 and 17 (Eastern Portions)

Of this grouping EU 11 was started first with the clearing of humus off the collapse debris layer. At the time it was initiated few architectural features had been discovered in Op. 6A, which could guide the direction of excavations. In addition, to avoid clearing strata along a known point of vertical interstice such as a face of T1, which was known to occur within EU 11 (cf. Harris 1989: 48, Fig. 15b), efforts in the E portion of this EU were temporarily suspended with efforts shifted to EUs 13 and 16. The exposure of Floor 1 marked completion of the objectives sighted for both of these latter EUs, and efforts were thus shifted to the adjoining EUs 14 (SU 46) and 17 (SU 51). Excavation Unit 11 was not reinstated at that time, since it was felt that the clearing of rocks forming part of the collapse debris might adversely affect the now fully cleared SU 36 midden, which was currently undergoing documentation by means of sections, plans, photos and theodolite survey.

Clearing of collapse debris in EU 17 rapidly lead to the exposure of the face of T1 and the remains of the northern stair side facings of Stair 1. These discoveries thus allowed clear definition of the well-preserved corner formed by the stair and the terrace, which also indicated that T1 had slumped forward to the N of this corner. Overall preservation of the terrace facings was good, however, despite the slumping noted. With three architectural

features to follow, it was anticipated that the collapse debris of EU 17 could be cleared down to Floor 1 rapidly, suggesting that it could be the first of the three eastern portions to allow full exposure of terminal phase architecture.

With the experience garnered in EUs 13 and 16, however, it was deemed prudent to conduct detailed troweling in the lowest reaches to test for the incidence of TOD clusters. In this process, two ocarinas (Shots 435 and 436) were exposed in the thin humic layer covering Floor 1, along the foot of T1 in the corner formed with the outset stair. The clustering of these two ocarinas indeed suggested that a TOD deposit might have been found. Careful clearing besides and to the east of these revealed a nearly complete molded-carved vase (61/1), lying on its side directly atop the surface of Floor 1. This additional discovery confirmed that a well-preserved TOD deposit had been encountered, thereby closing the excavations of collapse debris and initiating the clearing of Level 1c (SU 61) in EU 17. Clearing in EU 14 also revealed a large partial turtle back granite *metate*, partially propped up against the face of T1 and forming part of this same deposit. Clearing around this *metate* to the south coupled with continued clearing in EU 17 to the north, the base of a fragmentary pyriform vase (61/2) was found. This latter specimen was found standing in a tilted position on the surface of Floor 1 and partially engulfed by a midden-like heap. This pile was formed by ceramic sherds, faunal remains, deteriorated organic material (as indicated by dark soil) and other artifact classes (SU 61), which in turn was partly stacked up against the face of T1. During the clearing of collapse debris in EU 11 another smaller midden-like heap was exposed, which was resting directly upon the surface of Floor 1 (SU 60). With the nearly simultaneous discovery of these deposits in EUs 11, 14 and 17, these were all left in situ, carefully exposed and found to be in the same stratigraphic position designated Level 1c (by resting upon and/or abutting terminal architecture and being sealed entirely under collapse debris). Consequently, it was determined that the midden deposit exposed earlier in EU 10 (SU 36) formed the northernmost continuation of these terminal occupation debris clusters encountered in Op. 6A. Once all of these deposits were cleared and documented in plans, photographs and a theodolite survey, these were recovered as part of each EU in which they occurred and the foot of T1 and the remainder of Floor 1 were cleared. Complete recovery of the TOD deposits and complete exposure of the terminal phase architecture closed EUs 11, 14 and 17, as well as Op. 6A as a whole since the end of the timetable of the 2000 season had been reached.

In light of the architectural components, stratigraphic features and artifactual deposits exposed and documented as part of Op. 6A, the objectives sighted for this sub-operation at the onset of the 2000 season are deemed successfully accomplished. More specifically all objectives outlined for groupings of EUs were achieved, with the exception of the summit EUs 12, 15 and 18, which were not completed due to time constraints. The major objective for Op. 6A was centered on identifying the original function of Str. 2A-1st and was delineated along two lines of evidence. The first concerned the exposure of the terminal phase architecture in order to assess structure form, which could reveal the function that the building was designed to serve. The second concerned the documentation and recovery of artifactual remains and deposits, which could shed light on the activities conducted at this locus and the activities responsible for the formation of deposits, thereby allowing assessment of the function(s) to which the building was put. Exposures of all terminal phase

architectural components (with the exception of the summit) allowed realization of the first objective. Related to this objective was an assessment of the quality and preservation of architecture. Excavations revealed that the architecture was preserved sufficiently to allow considerations of architectural consolidation to take place. Excavations of Op. 6A, however, ran against expectations in the number of important terminal occupation debris clusters discovered in association with the last phase of occupation. The unexpected discovery of numerous terminal occupation debris / midden deposits contained within the spatial delineation of Op. 6A, underscore the success of this sub-operation and the potential of these materials to allow assessments of Str. 2A's ancient function.

PLAZA PLATFORM: STRATIGRAPHIC CONTEXTS

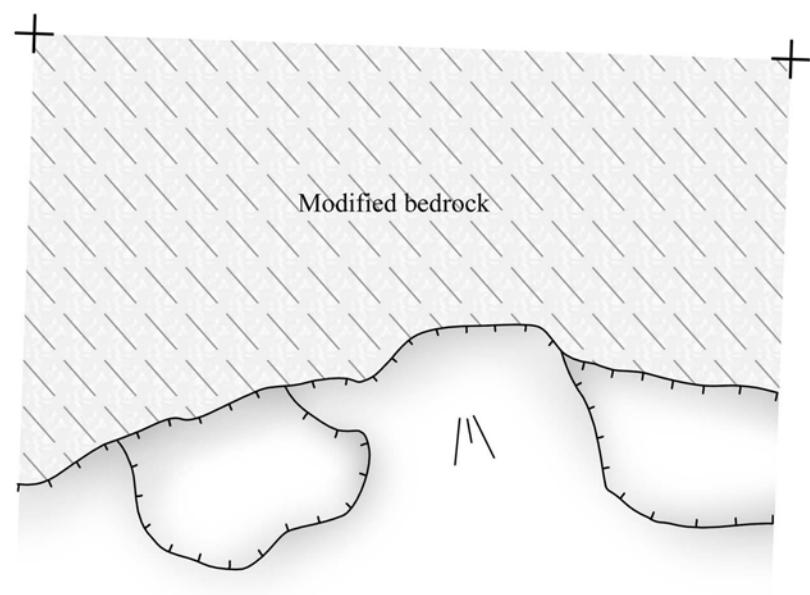
Stratigraphic contexts are individually presented below, in the order of their sequential stratigraphic position, from earliest to latest. Operation 5A contexts are presented first in the present section, followed by a section detailing the Op. 6A contexts. These groupings are analytical units, the product of the interpretation of stratigraphic sequences recorded as part of the Op. 5A and 6A investigations. As interpretations are susceptible to change, with new discoveries that might be made over the course of future field seasons, the stratigraphic sequence is subject to change as are identifications of the stratigraphic contexts themselves. Each stratigraphic context represents a discrete and coeval grouping of stratigraphic units (SU), the emphasis being placed on culturally significant features as a whole, rather than arbitrary subdivision brought about by the spatial delineations of modern excavation units. Consequently, descriptions of the contexts are not restricted to individual excavation units or levels in which these were discovered as it is felt that the descriptions presented below, if used in conjunction with the narrative of excavations provided above, supply sufficient data to interested readers wishing to glean at the process of excavation. Nonetheless, spatial distributions of stratigraphic contexts are summarized in the 'provenience' sections, in part for those readers more accustomed to reading level-by-level descriptions of specific excavation units. For ease of reference two appendices are included at the end of this report that provide an index of all SUs presented herein (Appendix A) as well as a preliminary Harris Matrix of all SUs uncovered as part of Ops. 5A and 6A (Appendix B).

Bedrock

Provenience: Bedrock was encountered throughout EU 8 as the top of Level 3. Mean elevation of unmodified bedrock: 72.33 m HAE; mean elevation of modified (i.e. leveled) bedrock: 72.45 m HAE. As excavations did not penetrate this context, it has not been assigned an SU designation.

Description: Bedrock is a hard limestone with a smooth and undulating surface. The unmodified surface exhibits minute fissures and small patches of exfoliation. Color of the bedrock is a relatively uniform yellowish (10YR 7/6) with patches of light brown (10YR 5/4) mottling the surface. Bedrock slopes downward to the south (ca. -24 %), thereby conforming to the topography of the unmodified, surrounding natural terrain.

Pook's Hill 1, Belize
Plaza Platform, Op. 5A
EU 8, Level 3, SU 63
Modified Bedrock
WBRCP 2000
Plan: M. Kalch, J. Guerra
& C. Helmke



Natural bedrock

Plan aligned to true north based on a
1°59' azimuth west of magnetic north.



Figure 5: Plan showing the extent of modified bedrock. Note the marl solution pits along the northern edge of natural bedrock.

Cultural Modification: The original humus layer that is surmised to have occurred at the EU 8 locus appears to have been stripped in antiquity as no trace of this stratum was encountered in the Op. 5A excavations. Bedrock exposed in EU 8 exhibits one area of modification (SU 63) (Figure 5). This modification consists of a leveled, quarried surface in the northern half of the EU, which has a fractured appearance, comparable in all respects to the bedrock surface encountered in the excavations conducted in Entrance 2 of Actun Uayazba Kab (cf. EUs 10 and 13 in Ferguson and Gibbs 1999). The transition between the leveled modified surface to the N and the smooth sloping surface of unmodified bedrock to the S is characterized by a sharply defined break of slope running approximately E-W through the middle of the EU.

Relationship to Adjacent Stratigraphy: The entirety of the bedrock encountered in EU 8 is overlain by the core of Floor 1. Absence of ancient humus below the flooring and overlying the bedrock indicates that this layer was stripped prior to the construction of Floor 1, while the opposite apparently holds true for EU 23a. Removal and modification of the ancient land surface thus seems roughly coeval to the construction of Floor 1. Association of the intrusive cuts affecting the bedrock (i.e. SU 193) with Bu. 2A-3 indicates that these are coeval to the deposition of the burial. Temporal placement of the burial and the modifications of the bedrock are discussed in the section describing Bu. 2A-3.

Discussion: Apparently the boundary of modified bedrock (SU 63) encountered in EU 8, represents the southern extent of the cut which was made in antiquity into the side of the hill, so as quarry limestone building materials, accommodate the foundations of the western and northern structures, and provide core material for the S and E portions of the plaza platform. The area of the plaza platform at the base of Strs. 1 and 2 thus appears to represent a leveled surface, cut into bedrock, upon which the foundations of Floor 1 were subsequently constructed. Discovery of this modification thus explains the diminutive, but perceptible drop in elevation between the NW and the SE portions of the plaza platform floor, noted during examinations of the MGS of the plaza (Figure 2).

Floor 1 (SU 22, 26)

Provenience: Floor 1 was cleared and excavated throughout EU 8 and excavated as Level 2. The mean elevation of the surface of Floor 1 in EU 8 (which corresponds closely to that of the MGS): 72.59 m HAE. The ballast and core of Floor 1 were excavated as Level 2 in a series of three arbitrary 10 cm levels (Levels 2a, 2b and 2c). The ballast layer is roughly contained within the boundaries of Level 2a (SU 22), while subsequent Levels 2b and 2c to bedrock represent the core of this terminal flooring episode (SU 26a and 26b). However, as the humic layer was fund to be practically non-existent at this locus, the first arbitrary level comprises both the humus (Level 1a) and the floor's ballast (Level 2a). The surface of the terminal plaza platform flooring was uncovered at the base of Strs. 2A (see below), and 4A (cf. Helmke, Piehl and Bassendale, this volume). The center of the plaza was solely tested in 2000 by EU 8 wherein Floor 1 was uncovered throughout and carried to bedrock. All contextual segregations established on the basis of arbitrary levels represent vertical subdivisions of a unitary construction effort.

Surface: The surface of Floor 1 was found to be highly deteriorated, represented only by a dense accumulation of gravel-sized limestone ballast. No evidence of any plaster was discovered. Complete deterioration of the plaster flooring is thought to result from low humic accumulations since abandonment, leaching of the soluble elements of lime-based plaster, in conjunction with bioturbation in the form of intensive root activity. The overall poor quality of Late Classic plaster floors is well attested throughout the Maya Lowlands (David Pendergast pers. comm. 2001), an attribute apparently shared by the Pook's Hill example.

Ballast: The layer of ballast is very similar to that of Floors 1 and 2 in EUs 7b and c, and Floor 1 along the base of Str. 2A (see below). The nearly level surface uncovered once modern grass was stripped is surmised to have been the surface of the platform, based on the dense ca. 10 cm thick accumulation of limestone gravel (SU 22) deposited as a well sorted mass. The latter is interpreted as representing the ballast of the terminal flooring. Thus the surface of the ancient floor is thought to have been immediately below the MGS. All modern humus recovered was found interspersed throughout the uppermost 5 to 10 cm of the ballast, where bioturbation (e.g. prolonged root activity) accounts for the loosening of the ballast. Ballast is comprised of densely packed limestone gravel (\varnothing 2 to 5 cm), a minority of river pebbles, with little soil constituent. The little matrix recovered is a mixture of humus, marl or *saskab'* (a.k.a. marl or *caliche*), and alluvial sand (from most to least).

Core: The maximum depth of the core layer (SU 26a and 26b) was 18 cm in the southern portion of the excavation unit, and ranges between 5 and 10 cm in the northern section. Generally the matrix constituent of the core shares a great deal of similarity with that of the ballast. The sand and silt-sized matrix constituent was lighter colored towards the underlying bedrock suggesting higher alluvium content and/or leaching of bedrock. Unlike the ballast layer (SU 22), the core was very compact, containing a predominance of larger than gravel-sized limestone rocks ($> \varnothing$ 5 cm). Few rocks above fist-sized (\varnothing 10 cm) were recovered, the whole exhibiting a moderately sorted section. Small granitic rocks, ferric oxide-tinted limestone rocks, as well as one granitic, water-worn river cobble represent a minority of inclusions.

Associated Material: While jute shells and ceramic sherds were recovered, few were retrieved overall. Specific absolute frequencies are not yet available. A notable faunal specimen was, however, recorded: the pharyngeal plate of a parrotfish (SU 22) (Stanchly n.d.).

Relationship to Adjacent Stratigraphy: As Floor 1 was found to be constructed entirely atop partly modified bedrock, the construction episode represented by this floor appears to represent the earliest documented construction effort at this locus, subsequent to the quarrying of bedrock. Shared characteristics with the other stratigraphic contexts designated as Floor 1 in Op. 4A (Helmke, Piehl and Bassendale, this volume) and 6A (see below), suggest that the Floor 1 encountered in EU 8 forms part of the same flooring episode, which appears to have affected the entirety of the plaza. Occurrence of earlier flooring episodes documented at the foot of Str. 4A (Helmke, Piehl and Bassendale, this volume) indicate that Floor 1 is not the earliest plaza platform floor. Based on the morphology of the

underlying bedrock, it is consequently assumed that prior to Floor 1, the plaza area at the foot of Strs. 1 and 2 was represented by leveled bedrock.

Discussion: It seems likely that the river pebbles of the ballast layer (SU 22) were extracted during the mining of alluvial matrices and conjunctively deposited and mixed as part of the ballast. As a small creek lies less than 100 m S of the *plazuela* it seems the most convenient source of such alluvium. The water-worn granite cobble recovered in the core (SU 26a) is assumed to have been recovered from the banks of the Roaring Creek. The latter fluvial system accounts for the erosion and transport of igneous and metamorphic material derived from the Mountain Pine Ridge Batholith, and their subsequent deposition throughout the alluvial valley bottom (White n.d.). Thus the alluvial matrices used as part of the core material of the plaza platform, may also have been mined along the shores of the Roaring Creek. Adding weight to this interpretation is the fact that the Roaring Creek lies less than 500 m east of the *plazuela*, thereby offering an effective source of clayey, alluvial, metamorphic and igneous resources to the ancient inhabitants (cf. Lisch 1969, 1983).

STRUCTURE 2A: STRATIGRAPHIC CONTEXTS

Terrace 1

Provenience: Terrace 1 of Str. 2A-1st has been exposed throughout Op. 6A as the top of Level 2. Mean reconstructed elevation of T1 was not determined. Mean elevation of foot of T1 ranges between 73.08 and 73.13 m HAE (based on Floor 1 elevations in EU 17 and 11, respectively). Terrace 1 has not been sampled in excavations and thus has not been assigned an SU designation.

Dimensions: Height: ca. 1.50 m above terminal plaza Floor 1. Height based on well-preserved sections in EU 17. Width: n.d. Length: ca. 3 m N-S (exposed as part of Op. 6A). Facings may have been in plumb.

Facing: The Terrace 1 face was constructed of a nearly equitable mixture of hard dolostone and limestone rocks. Few of the dolostone facings were dressed, natural cleavage planes being exploited advantageously. Conversely, limestone facings each had at least one well-dressed face. The courses were comprised mostly of slab facings set as stretchers with partly dressed faces (ca. h: 8-23 cm; w: 13-36; d: n.d.) (Figure 6). The number of preserved, still-articulated courses of facings was found to range between 5 and 7, yielding a mean height of facings ranging between 18.6 and 19.2 cm. Facings were laid down in regular partial courses, with stretchers predominating in the bond pattern. Use of small (ca. Ø 5-10 cm) dolostone and limestone chinks was noted.

Masonry and Core: As Terrace 1 was not physically tested by excavations, no data are currently available on the masonry and core thereof. However, as the uppermost courses have collapsed onto the plaza floor cleared along the foot of this architectural component, descriptions of the collapse may prove insightful in this regard (see below).

Flooring: Although the flooring of T1 was searched for in EUs 11, 14 and 17 no evidence for it was uncovered. Either the excavations did not penetrate sufficiently into the collapse, or the entire surface of this flooring may have decayed. Future investigations, planned for the 2001 season may clarify this situation.

Associated Material: As Terrace 1 was not penetrated by excavations, no data are available on the artifactual content of its backing masonry and core.

Relationship to Adjacent Stratigraphy: Floor 1 was found to run up directly to the foot of the terrace. Due to the poor preservation of the floor it could not be ascertained whether it turned up to the foot of the terrace. As terminal occupation debris was found piled at the foot of the terrace, it can be securely stated that these artifact deposits came into being subsequent to the construction of the terrace, thereby postdating it. As the terrace and terminal occupation debris are covered by considerable deposits collapse debris it is clear that this architectural component represents part of the terminal phase architecture of Str. 2A-1st.

Comment: Terrace 1 was found to slumped forward considerably in the northern portion of Op. 6A. This attribute suggests that if the slumping is proportionate to architectural symmetry, the central point of this bulge may represent the center of the portion of Terrace 1's face, located to the N of Stair 1. Consequently, if Strs. 2 and 1 formed a corner in the NW part of the *plazuela*, its location may be approximated in reference to the distance separating the bulge from the SW corner formed by that terrace and Stair 1, and projecting this measurement north from the bulge. It is hoped that future excavations may test this hypothesis.

Superstructure

Provenience: Tentative evidence for a masonry wall forming a part of the superstructure of Str. 2A-1st was uncovered in EUs 12, 15 and 18. As only the humus was stripped in these EUs, only the rough alignments conjectured to be the remains of walls were noted, and considered to represent the top of Level 2. Due to the ambiguity of the findings at present, no elevations are presented.

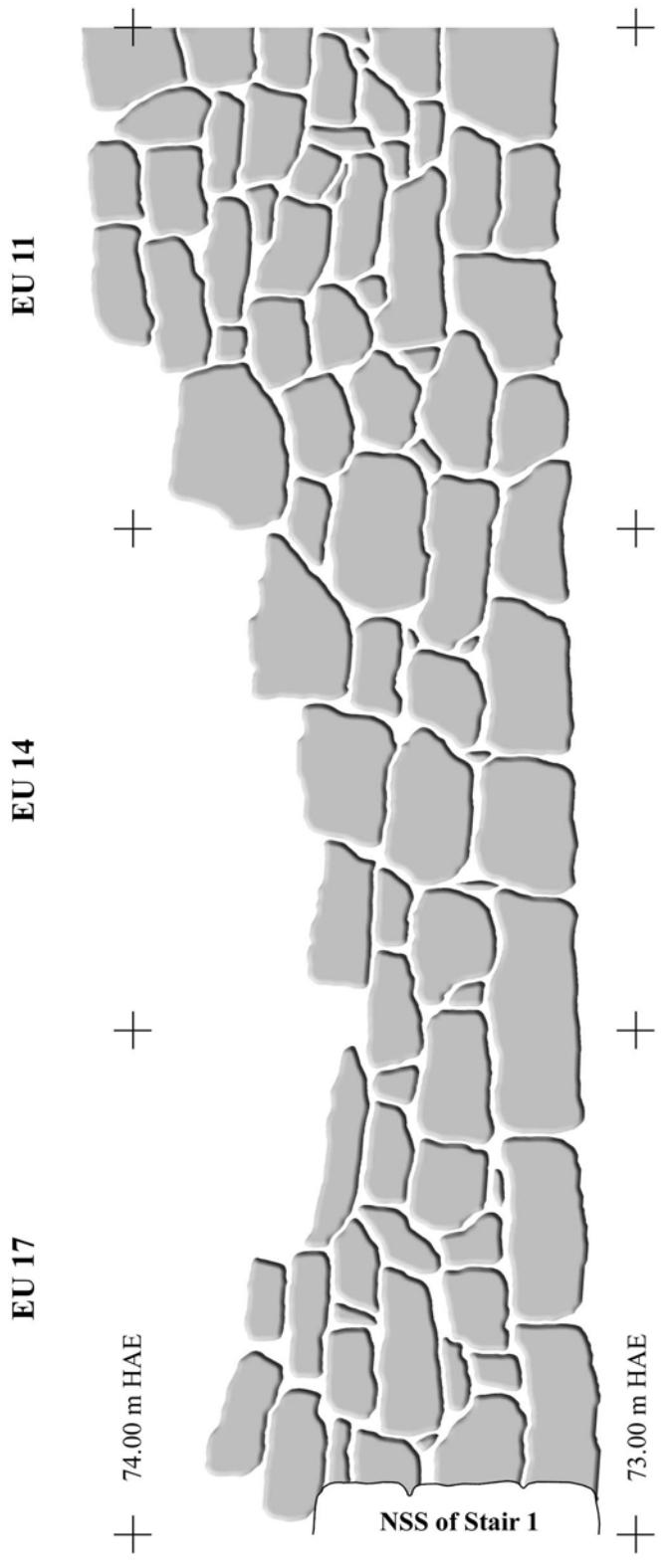
Dimensions: Height: n.d.. Width: possibly ca. 60 cm. Length: ca. 3 m of possible wall were exposed in Op. 6A (Figure 4).

Facing: Descriptions of the facings are based on examinations of the superior outlines of what is deemed to be the uppermost preserved course of facings of the wall stumps. Both faces the presumed superstructure's wall appears to have been constructed predominantly of hard dolostone rocks. Few of the facings were dressed, natural cleavage planes being utilized. Consistently a single type of facing appears to have been employed: small regular-shaped, slabs, set as headers with either dressed or partly dressed faces. No additional observations were made.

Pook's Hill 1, Belize
Structure 2A-1st, Op. 6A
EUs 11, 14 & 17, Top of Level 2
Elevation of Terrace 1
Looking Due Magnetic West
WBRCP 2000
Elevation: C. Helmke



Scale 1:15



Note that the elevation is schematic and
rendered from photographic records.

Figure 6: Schematic elevation of the face of Terrace 1 exposed as part of the Op. 6A excavations.
Note that the surface of Floor 1 defines the line below the basal course.

Masonry, Core and Associated Material: As the presumed wall was not penetrated by excavations, no specific data are available on the artifactual content of its backing masonry and core. However, based on observations of the exposed walls stumps, the backing masonry and core conjointly may have measured as little as 20 cm across, being composed of small fist-sized (ca. Ø 10 cm) limestone rocks and smaller ones (ca. Ø 5 cm), set as a moderately to poorly sorted mass.

Relationship to Adjacent Stratigraphy: As this tentatively identified component appears to be related to Str. 2A-1st, it is presumed to represent part of the terminal phase construction efforts. The component is partly shrouded in collapse debris, whole overlain by the humic layer. Thus it can only be asserted that this construction effort predates the collapse of the structure at the time of abandonment or thereafter. Once future excavations have cleared this component, the particular architectonic articulation of with other components may be discerned.

Discussion: In 2000, a search for the facings of Terrace 2 was undertaken. Despite the morphology of the surface of the mounded debris suggesting the existence of such a component, no clear evidence was found in EUs 12, 15 and 18. It is thus deemed probable that T2 had collapsed to such an extent that no clear alignments could be discovered. The discovery of the possible wall of the superstructure may thus represent part of T2. Consequently, what has been termed T2 may in fact represent the exterior facings of the superstructure's walls. This hypothesis would then attribute the westernmost row of facings (here deemed part of the interior facings of the superstructure's walls) to another component, such as the frontal face of a bench. These hypotheses need to be tested in future seasons, by more extensive clearing of the summit.

Stair 1 – Outset Stair

Provenience: Evidence for the facings of the northern stair side and NE corner of Str. 2A-1st's outset stair was exposed in EUs 16 and 17, as the top of Level 2 (Figures 4 and 7). Mean elevation of the foot of the northern stair side facings as measured along the surface of Floor 1: 73.05 m HAE. As excavations did not penetrate the stair, no SU number has been assigned to this context.

Dimensions: Rise: in excess of 0.55 m above terminal plaza Floor 1. Rise based on elevation of highest well-preserved course of the N stair side (EU 17). Run: approximately between 1.12 and 1.40 m. Run determined by measuring along the basal course of the N stair side, perpendicularly to the face of T1. As the surface of the outset stair was not cleared, the number of steps and associated tread and riser heights were not uncovered. Based on patterns of collapse visible on the surface it could only be determined that the width of Stair 1 exceeds 1.40 m.

Facing: Facings employed in the northern stair side were predominantly of hard dolostone with a minority of soft limestone. The plane sides of most dolostone facing stones were left unmodified, while most limestone facings were dressed with at least one and as many as three faces. The majority of facings utilized may be classed as sub-rectangular,

**Pook's Hill 1, Belize
Structure 2A / Plaza, Op. 6A
Cross-section of EU's 16-18
Looking Due Magnetic South**

WBRCP 2000
Profile: C. Helmke, R. Guerra & N. Puc

Elevation data: W. Poe, S. Hayes & C. Helmke

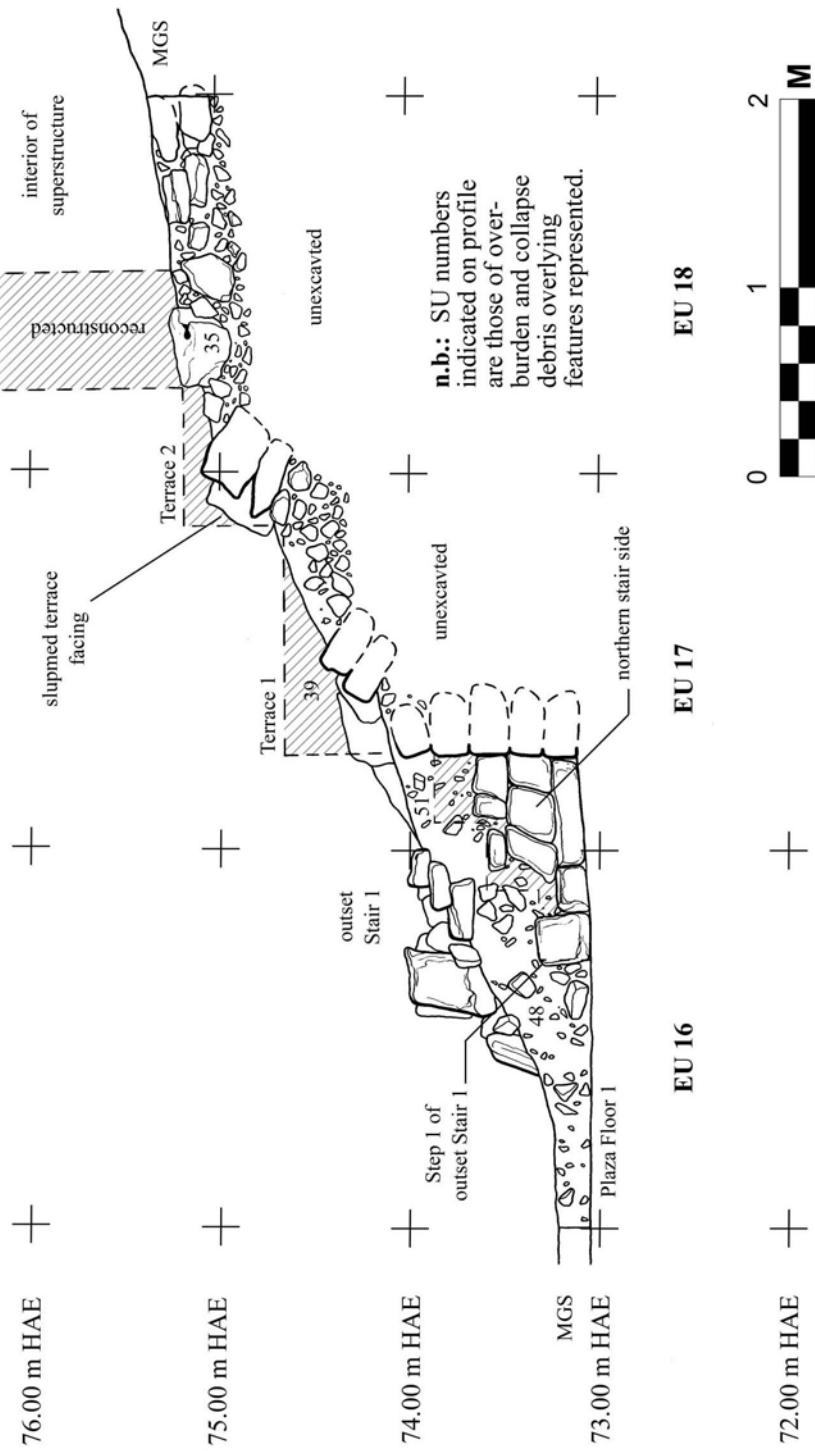


Figure 7: Section of the southern baulk of Op. 6A showing the layout and configuration of terminal phase architecture once stripped of all overlying humic overburden and collapse debris. Note the northern stair side facings.

slabs set as headers (h: 10-23; w: 20-58; d: 20-33) with a minority of smaller, sub-rectangular, block facings (h: 21-23; w: 17; d: 10-20). The northern stair side was constructed of 3 courses, thereby yielding a mean height of facings of 18.3 cm. The basal course was set with the largest facings as a continuous course, with the slightly less continuous second and third courses being set atop. The ratio of stretcher to header facing stones of the N stair side was determined to be 4:1. Use of small (ca. Ø 5-10 cm) dolostone and limestone chinks was noted. Facings of the N stair side were set in plumb.

Masonry, Core and Associated Material: As Stair 1 was not penetrated by excavations no data are available on the masonry, core and artifactual inclusions thereof.

Relationship to Adjacent Stratigraphy: Stair 1 is undoubtedly the outset stair of Str. 2A-1st, based on its relation to the terminal phase Terrace 1, extending northwards at a right angle from it. The specific stratigraphic relationship held between the stair and the terminal floor (Floor 1) is, however, less clear. The foot of the stair's facings was cleared in search of a plaster turn-up, which was not found. While it is possible that the floor extends below the outset, this hypothesis was not tested and cannot be supported at present on account of Floor 1's poor preservation.

Floor 1 (SU 45)

Provenience: The remains of Floor 1 were cleared within EU 10, 11, 13, 14, 16 and 17, as the top of Level 2. Mean elevation of Floor 1 in Op. 6A is: 73.08 m HAE. Excavations did not penetrate the floor, but a well-preserved patch of the plastered surface was sampled for future analyses (EU 10; Level 2; SU 45).

Surface: On the whole just under 7 m² of Floor 1 associated with Str. 2A were exposed as part of Op. 6A (Figure 8). The plaster surface of the floor was found to be moderately to poorly preserved. Nonetheless, the ballast surface of the floor was well represented throughout, allowing clear definition of this architectural feature. Based on the exposed ballast surface it could be ascertained that Floor 1 was slightly graded to the S (ca. -3.1 %). Areas of the floor overlain by greater quantities of collapse debris or considerable artifact concentrations displayed patches of moderately well preserved plaster surfaces, measuring between 2 and 3 cm thick (EUs 10, 13, 16 and 17). Preserved plaster patches represent only 8 % (approx. 0.6 m²) of the plaster surfacing that would have been uncovered were preservation excellent (approx. 6.8 m²). The surface of Floor 1 is otherwise characterized by small patches of discolored beige (2.5YR 8/1) or yellowish sediment (10YR 7/6), apparently the decayed remains of ancient plaster. A 5 x 5 cm sample of well-preserved plaster was collected in EU 10 for future analyses (SU 45).

Ballast: Description of the ballast is based on the surface features exposed in Op. 6A, as the floor was not actually tested by excavations. The ballast is signaled by a densely packed layer of small limestone (or *saskab'*) nodules and dolostone gravel (Ø 2-6 cm), deposited as a moderately sorted mass.

Core and Associated Material: As the floor was not penetrated by excavations, no data are currently available on the core or the artifactual content thereof.

Relationship to Adjacent Stratigraphy: Floor 1 was found to be overlain by deposits of Terminal Occupation Debris, which in turn were covered by collapse debris. This relationship indicates that Floor 1 forms part of the terminal construction effort documented in Op. 6A, thereby associating it with Str. 2A-1st. Clearing the base of T1 as well as that of the N SS of Stair 1, however, did not reveal plaster turn-ups as would be expected. Nonetheless, the overall poor preservation of the plaster floor prevents secure identification. In addition, it seems possible that Floor 1 runs partly underneath T1 and Stair 1, although as this was not tested by excavations. Consequently, support for this hypothesis is lacking at present. As Floor 1 was not tested by excavations, no additional stratigraphic relationships could be drawn.

Terminal Occupation Debris – Cluster 4 (SU 36)

Provenience: Terminal occupation debris identified as a midden deposit was cleared and excavated in EU 10 (SU 36) as Cluster 4, assigned to Level 1c. Mean elevation of Floor 1 underlying the deposit is: 73.10 m HAE. The micro-topography of this pile of amorphous shape was recorded through section drawings tied into absolute elevations by theodolite instrumentation (Figure 9). This feature was excavated in five 1 x 0.4 m sections. Sub-division of the feature during excavation allowed the designation of five sub-contexts for SU 36, distinguished on the basis of alphabetic suffixes -a through -e (assigned from west to east). Thus, for example, SU 36e represents the easternmost 40 cm section of Cluster 4 (Figure 10). Based on horizontal configuration it is clear that the midden deposit contained within the boundaries of EU 10 represents the southernmost extent of a deposit extending to the north and somewhat to the east. It is hoped that future excavations may clear the remainder of this deposit, so as to obtain a complete inventory, rather than a sample thereof. Despite the segregation between Cluster 4, 5 and 6 on the basis of spatial distribution, all are interpreted as forming part of a broad, coeval deposit of terminal occupation debris.

Identification: Cluster 4 was identified on the basis of a high density of faunal remains, partial ceramic vessels, conjoining sherd material and other special finds, as a discrete midden deposit underlying collapse debris and directly overlying the terminal plaza Floor 1 in the northern portion of EU 10.

Description: Based on the micro-topography data (Figure 8), the variable maximum thickness of the midden deposit was found to range between 36 and 39 cm. On average the deposit is between 60 and 70 cm wide (N-S) over a length of approximately 1.55 m (E-W). The southern perimeter of Cluster 4 was delineated by a somewhat indefinite feathered outline (Figure 11), indicating that this deposit represents an ancient deposit unaffected by cultural or natural disruptive agents (through the adherence to the Law of Original Continuity; Harris 1989: 32-33). The matrix constituent was represented by a loose, variegated dark brown (10YR 5/6) matrix of homogeneous texture. Composition was otherwise heterogeneous consisting of artifacts (terminal occupation clutter refuse) (ca. 40 % of volume), soil matrix (ca. 35 %) and a relatively low proportion (ca. 25 %) of limestone

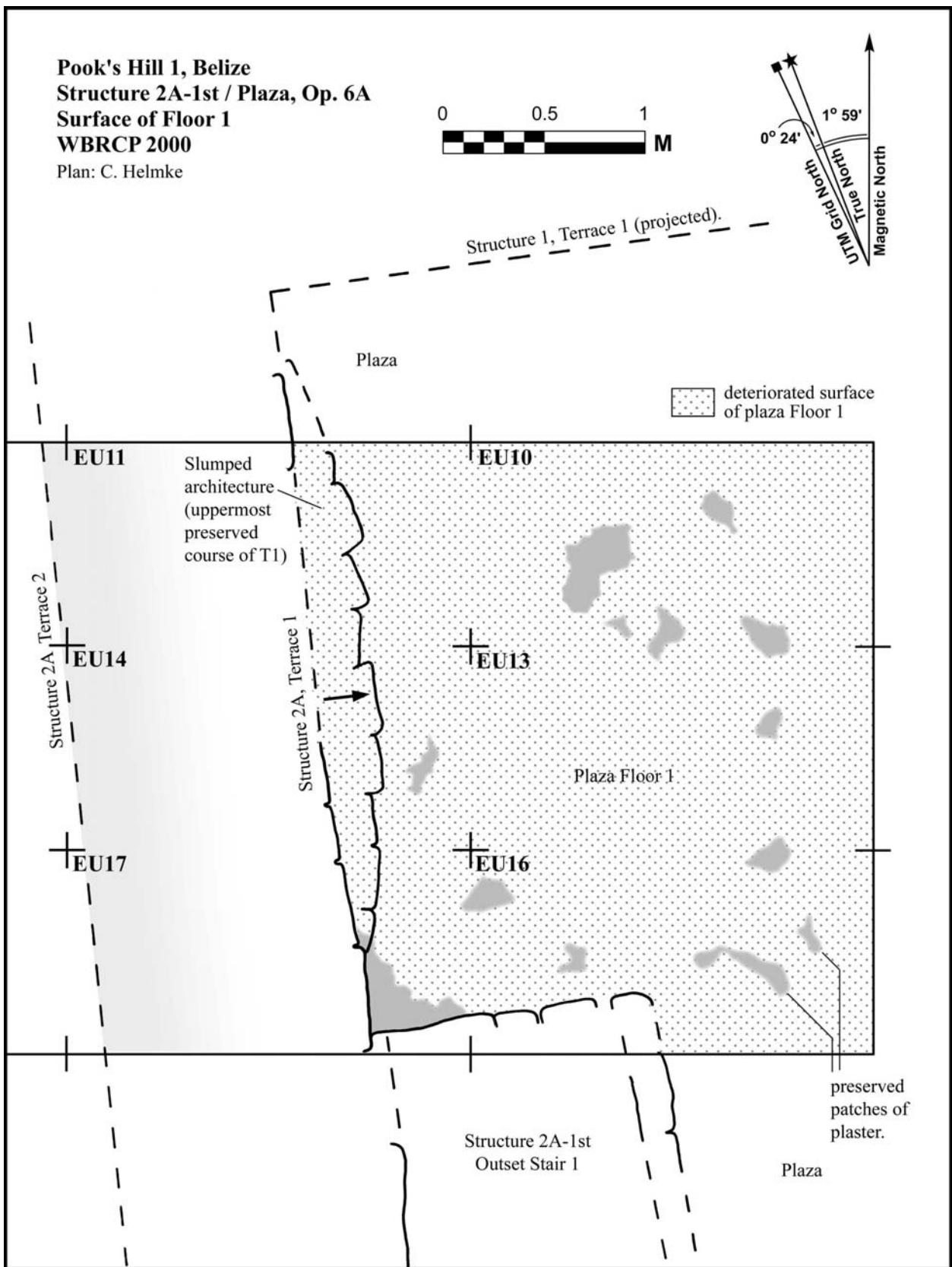


Figure 8: Plan showing the extent and preservation of Floor 1 exposed in Op. 6A.

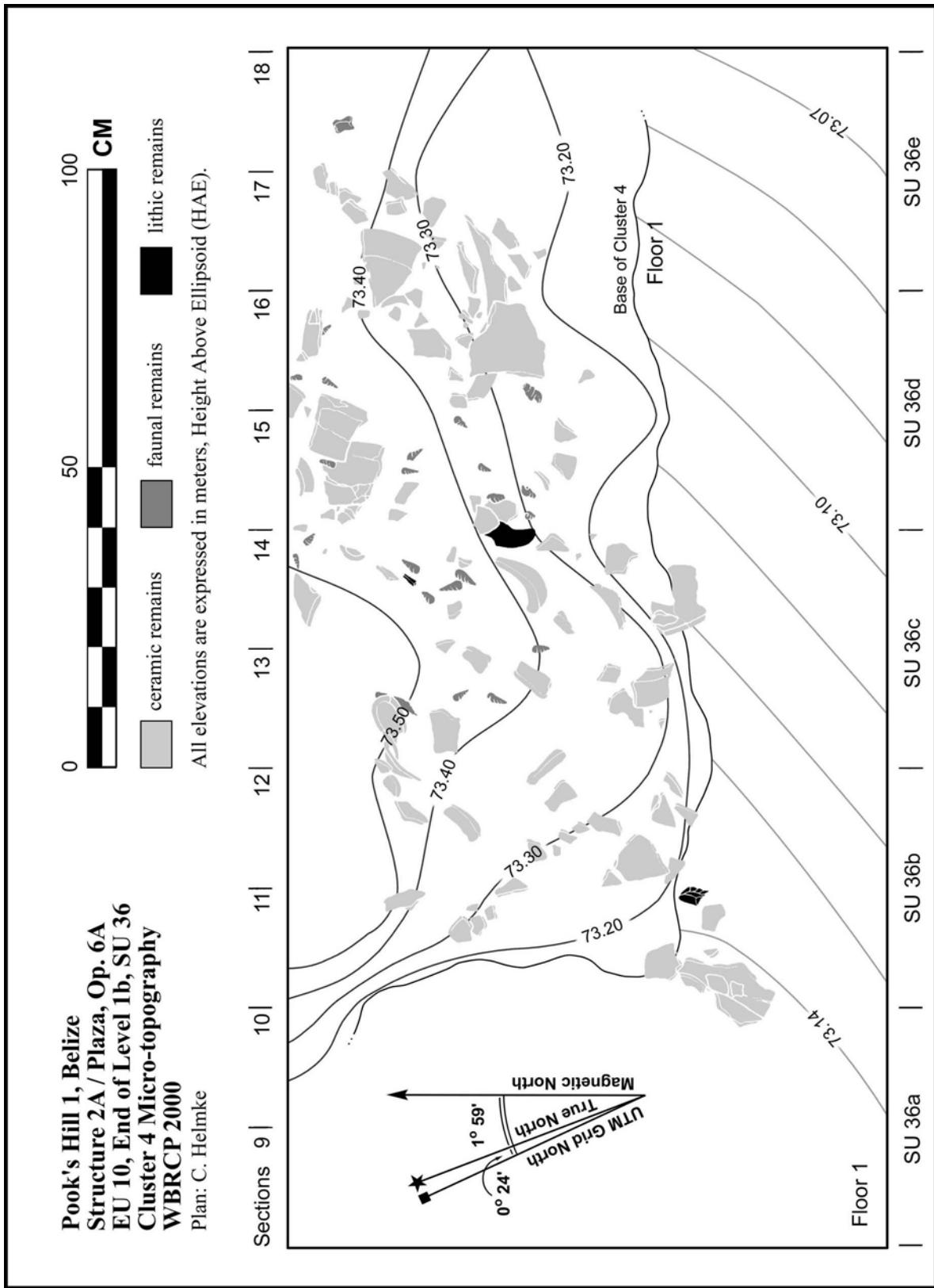


Figure 9: Plan of the micro-topography of the surface of the midden deposit and the associated surface of Floor 1.

and dolostone rocks. The latter are interpreted as intrusive aspects as well as inclusions of initial structural collapse, dating to the phases of terminal occupation / abandonment. While some soil matrices may be intrusive through leaching, bioturbation and compaction, the majority is interpreted as the remains of decayed organic matter originally deposited as part of the midden, an interpretation supported by carbonized macrofloral remains (see below).

Taphonomy: Stratigraphic positioning of this feature (SU 36) directly atop the terminal Floor 1 (SU 45) and sealed below the layer of collapse debris (SU 23), as well as the feathered southern edges indicate that the deposit is in primary context, unaffected by subsequent cultural disruption. Consequently, it may be stipulated that the feature was deposited in the context of its discovery in antiquity and subsequently sealed by the debris of collapsing structures. A small 50 x 40 cm section excavated into the feature as a probe (SU 36c) revealed in cross-section that the deposit did not exhibit internal stratification (Figure 11). Lack of internal stratification suggests that the feature was deposited as a unified mass. This attribute in turn suggests rapid and / or mixed deposition of materials in secondary context. The formation of the midden feature is thus thought to represent a singular event, rather than representing the accretive total of minor deposits laid down intermittently. Inclusions of moderate-sized limestone and dolostone rocks (ca. Ø 15-20 cm) embedded into the surface of the feature are likely intrusions brought about by the collapse of surrounding structures. Inclusions of smaller rocks (ca. Ø 5-10 cm) occurring throughout the midden, on the other hand, are thought to represent integral constituents, which were deposited concurrently with the remainder of the feature. These smaller rocks, if derived from collapsing architecture may be revealing as to the dating of the deposit within the ‘abandonment phase’ sequence.

Based on the context, lack of internal stratification and typological constituents, the deposit is interpreted as representing a primary deposit of secondary clutter refuse (Hayden and Cannon 1983: 131-138). Presumably the midden comprises an accumulation of discarded artifacts which were swept off flooring surfaces and subsequently dumped into a pile. The designation of this deposit as a midden of secondary clutter refuse is also based on the low potential for artifact recycling and the high content of organic materials (Hayden and Cannon 1983: 131; cf. Helmke 2001). *Associated Artifactual Material:* The ceramic constituent is represented by conjoining sherds of Roaring Creek Red dishes (both red and orange-slipped) (Gifford 1976: 240-243), large rim and body sherds of Cayo Unslipped and Alexanders Unslipped *ollas* (Gifford 1976: 276-287), sherds of large incurving bowls attributable to Garbutt Creek Red (Gifford 1976: 230-233) and other local unslipped or excised incurving bowls of unnamed type, fragmentary vase forms of unidentified type, and sherds of Belizean molded-carved vases (cf. Helmke 2001). Fragmentary and whole effigy ocarinas were also uncovered, as were fragmentary limestone spindle whorls, chert debitage, fragmentary formal chert tools, fragmentary prismatic obsidian blades, and a miniature groundstone adze (SU 36e). In addition a rasp-like musical instrument made of faunal bone was found during the clearing of collapse debris off the midden (SU 23/36) (cf. Hammond 1975:364, Fig. 143a and c; Morton 1987:107; Willey et al. 1965:496, Fig. 305j-k). Specific absolute frequencies are not yet available.

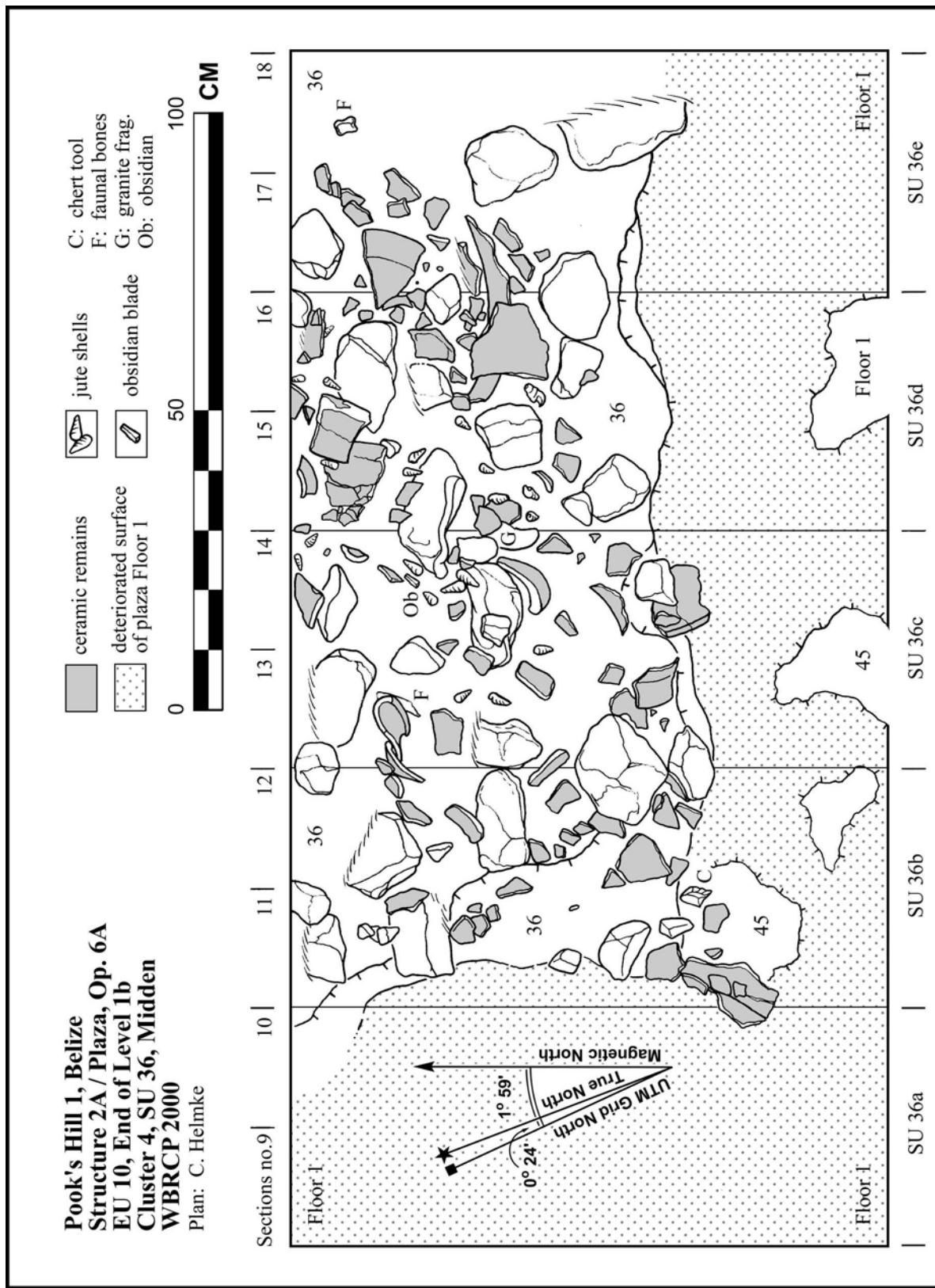
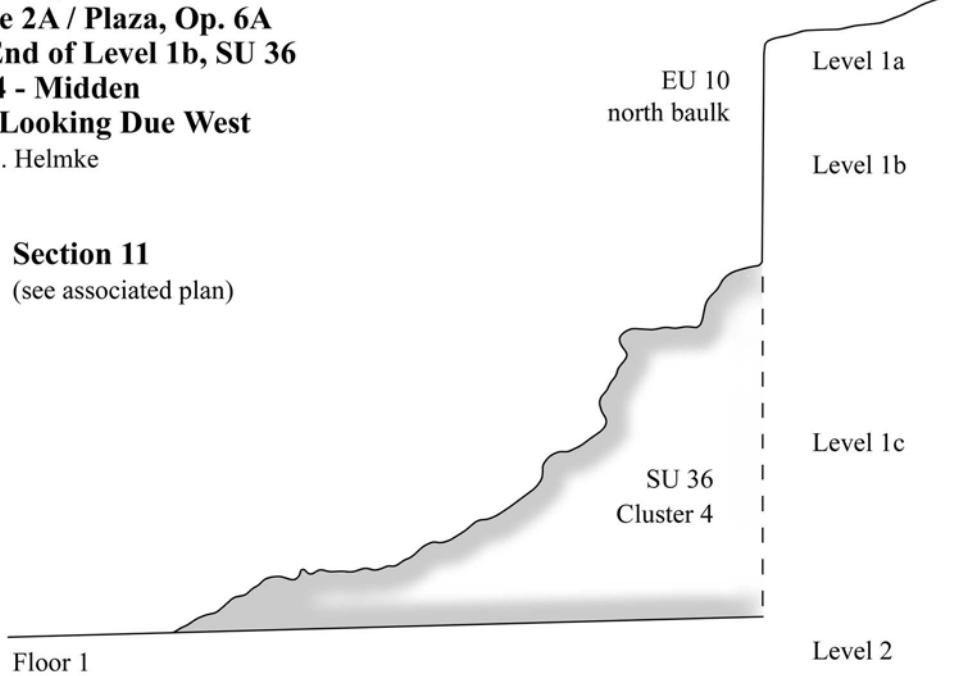


Figure 10: Plan of the midden deposit (Cluster 4) exposed in Excavation Unit 10.

Pook's Hill 1, Belize
Structure 2A / Plaza, Op. 6A
EU 10, End of Level 1b, SU 36
Cluster 4 - Midden
Section, Looking Due West
Section: C. Helmke

Section 11
(see associated plan)



Section 14
(see associated plan)

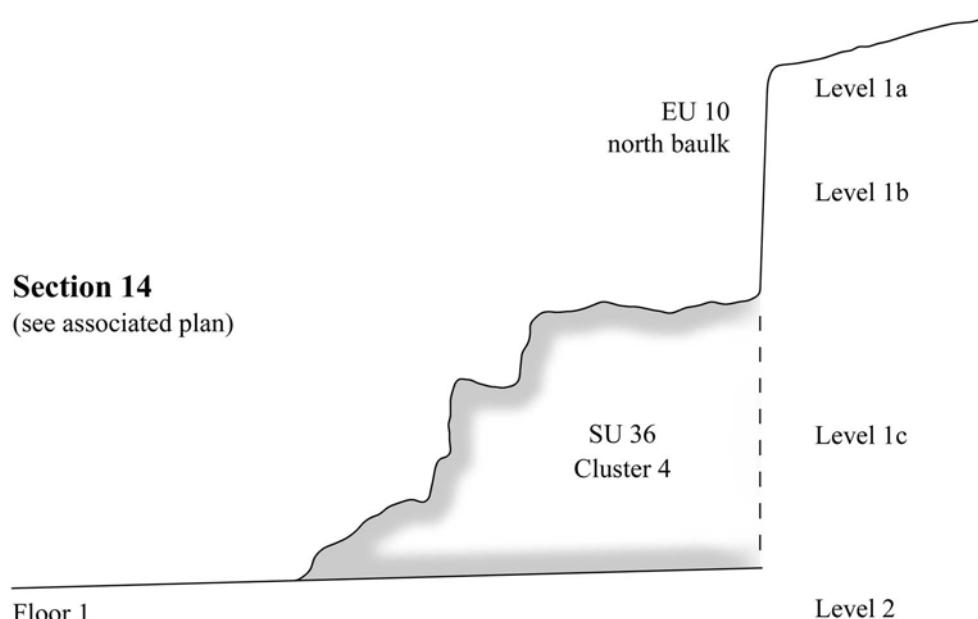


Figure 11: Representative cross-sections through the midden deposit.
See associated plan views for configuration and orientation of specific sections.

Associated Faunal Material: The midden deposit yielded a total of 63 vertebrate faunal bone fragments, 1 *pomacea* shell and approximately 168 *jute* shells (*Pachychilus indiorum*, and *P. glaphyrus*). The majority of *jute* shells had their spires broken off, indicating that these are byproducts of food-consumption. Mammalia are represented by armadillo (*Dasyurus novemcinctus*), carnivore (*Canis* sp.) and deer species (white-tailed deer *Odocoileus virginianus*, or red brocket deer, *Mazama Americana*). In addition, tapir (*Tapirus bairdii*) and agouti or paca (Order *Rodentia*) may also be represented, although these identifications are tentative at present. Avia are represented by bones of a large bird, presumably turkey (*Agriocharis ocellata*) or great curassow (*Crax rubra*). Fish remains are represented in exclusivity by parrotfish species (Family *Scaridae* sp.). The majority of these specimens exhibit charring or discoloration brought about by contact with open flames. Whether this attribute is a result of food preparation practices or a product of the midden deposit being ignited (to reduce noxious odors) remains undetermined at present.

Associated Human Skeletal Material: In addition, the midden also contained the fragmentary remains of humans (*Homo sapiens*). In total 8 fragments were recovered, representing the remains of at least 2 individuals (i.e. adolescent and adult). Fragments recovered include the unfused medial half of humeral head (adolescent) (SU 36); half of the shaft and a third of the distal end of a left femur (SU 36b) (late adolescent); third-thirds of a left femur shaft, and a quarter of the neck thereof (adult) (SU 36c); a right radius shaft and half of a right ulna proximal diaphysis (SU 23/36), as well as a possible fibula fragment (SU 36). Pathologies represented include active woven bone affecting the linea aspera and healed lateral sclerotic thickening and porosity on the proximal shaft (late adolescent possible) (SU 36b); active woven bone on proximal shaft fragment (late adolescent) (SU 36b); and active woven bone on tip of interosseous crest of the right radius, which is also present on pronator teres insertion (SU 23/36). The incidence of human skeletal remains within middens and / or terminal occupation deposits is a coeval attribute noted at other Lowland sites including Tikal (Harrison 1970, 1999: 193, 195, 197), Caracol (A. Chase and D. Chase 1987:56, 2000, 2001; D. Chase 1994:129), and Altun Ha (Pendergast 1990).

Associated Macrofloral Material: The 2 soil samples recovered from the midden (SU 36 and 36e) yielded evidence of pine charcoal (*Pinus* sp.) as well as unidentified hardwood charcoal, in comparable proportions. Four carbonized maize kernels (*Zea mays*), carbonized remains of calabash rinds (*Crescentia cujete*) (presumably used as bowls made of a halved, dried gourds), a hog plum pit (*Spondias* sp.), and chile pepper seeds (*Capsicum annuum*) were also recovered. A third soil sample recovered during the clearing of the surface of the midden (i.e. interstice of SUs 23 and 36) yielded additional calabash rind fragments, pine and palm charcoal (Arecaceae).

Relationship to Adjacent Stratigraphy: Cluster 4 was found lying directly atop the terminal Floor 1. This indicates that the deposition of this midden deposit occurred subsequent to the terminal construction efforts affecting the plaza platform. The midden was also found to abut a poorly preserved and extensively slumped architectural component, apparently related to Str. 1. This relationship suggests that the deposition of the midden also post-dates the construction of Str. 1-1st. Occurrence of the midden sealed below collapse

debris as well as the morphology of the deposit itself (as revealed in cross-section) indicate that the midden occurs in the original context of its deposition, although the constituents thereof are recognized to be in secondary context in relation to their presumed, initial contexts of discard. Incidence of small limestone and dolostone rocks throughout the midden suggests that this deposit includes structural remains of partly collapsed buildings. This attribute suggests that the deposition of the midden corresponds to a phase coinciding with the initial phases of the structural collapse; thereby placing the deposition of the midden within the earlier facet of the sequence of events of the terminal occupation / abandonment phase.

Discussion: Based on the processes thought to be responsible for the formation of the deposit (i.e. sweeping and secondary dumping), the activities inferred from the materials recovered within the midden, may shed light on the functions and activities conducted of adjacent structures (particularly Str. 2A). These interpretations are also applicable to Clusters 5 and 6, described individually, below.

Terminal Occupation Debris – Cluster 5 (SU 60)

Provenience: Terminal occupation debris was identified and excavated in EU 11 (SU 60 [31]) as Cluster 5, assigned to Level 1c. Mean elevation of Floor 1 underlying the deposit is: 73.13 m HAE. The deposit represents a small conical pile of artifacts (Figure 12). Owing to its small size, this feature was excavated as a single context. Based on horizontal configuration it is clear that the deposit contained within the boundaries of EU 11 represents the entirety of a small refuse deposit. Despite the segregation between Cluster 4, 5 and 6 on the basis of spatial distribution, all are interpreted as forming part of a broad, coeval deposit of terminal occupation debris.

Identification: Cluster 5 was identified on the basis of a high density of sherd material and faunal remains, as a discrete refuse deposit underlying collapse debris and directly overlying the terminal plaza Floor 1 in the southeastern portion of EU 11.

Description: Cluster 5 represents a small conical pile of terminal occupation debris. The base of the deposit measures 23 cm (N-S) by 29 cm (E-W) and stood at most ca. 20 cm above the surface of Floor 1 (ca. 73.33 m HAE). Although rather steep-sided, the outline of Cluster 5 was delineated by a somewhat feathered outline. The matrix constituent was represented by a loose, variegated dark brown (10YR 5/6) matrix of homogeneous texture. Composition was otherwise consists nearly equitably of artifacts (terminal occupation debris) (ca. 50 % of volume) and soil matrix with small limestone rocks (ca. Ø 1-3 cm) (ca. 50 %). While matrices may be intrusive through leaching, root activity and compaction, the majority is interpreted as the remains of decayed organic matter originally deposited as part of the pile.

Taphonomy: Stratigraphic context of this feature (SU 60) directly atop the terminal Floor 1 and sealed below the layer of collapse debris (SU 31), as well as the feathered edges indicate that the deposit is in primary context. Consequently, it is stipulated that the feature was deposited in the context of its discovery in antiquity and subsequently sealed by the

collapse debris of Strs. 2A-1st and 1-1st. As SU 60 was excavated subsequently to SU 36, it was presumed that it would not exhibit internal stratification, a hypothesis confirmed during the excavation of this feature. In keeping with the interpretations of SU 36, it is believed that the formation of Cluster 5 represents a singular event, interpreted as a primary deposit of secondary clutter refuse (Hayden and Cannon 1983: 131-138; cf. Helmke 2001). As with SU 36, Cluster 5 is thought to comprise an accumulation of artifacts that were swept off flooring surfaces.

Associated Artifactual Material: The refuse pile contained numerous ceramic sherds. Specific absolute frequencies are not yet available, however.

Associated Faunal Material: A total of 8 faunal bone fragments and 51 jute shells (*Pachychilus indiorum*, and *P. glaphyrus*) were recovered from Cluster 5. Of the bones, 3 represent the remains of parrotfish skull elements (Family Scaridae). In addition, 1 deer calcaneum fragment (white-tailed deer *Odocoileus virginianus*, or red brocket deer *Mazama americana*), 1 proximal femur fragment of an indeterminate rodent (Order Rodentia), 2 charred long bone fragments of an unidentified medium to large mammal, and 1 unidentified bone specimen (possibly attributable to a large mammal) were also recovered.

Associated Human Skeletal Material: Included amongst the small refuse pile were 6 human bone long bone fragments (possibly derived from one bone). No additional data are available on these specimens at present.

Associated Macrofloral Material: No matrix samples were retained for analysis.

Relationship to Adjacent Stratigraphy: Refer to the heading describing the stratigraphic relationships of Cluster 6 (see below).

Discussion: Refer to the heading discussing Cluster 4 (see above).

Terminal Occupation Debris – Cluster 6 (SU 61)

Provenience: Evidence for a pile of terminal occupation debris was found at the interstice of EUs 13, 14, 16 and 17, designated Cluster 6 (SU 61) and excavated as Level 1c. Mean elevation of Floor 1 underlying this deposit is: 73.10 m HAE. The deposit represents a refuse pile and fragmentary artifacts placed at the foot of Terrace 1, to the north of the outset stair of Str. 2A-1st (Figure 12). Owing to its relatively small size, this feature was excavated as a single, culturally defined context (SU 61), rather than sub-dividing it according to the four EUs within which it occurred. Based on horizontal configuration it is clear that the deposit contained within the boundaries of EUs 13, 14, 16 and 17 represents the entirety of a small refuse deposit. Despite the segregation between Cluster 4, 5 and 6 on the basis of spatial distribution, all are interpreted as forming part of a broad, coeval deposit of terminal occupation debris.

Identification: Cluster 6 was identified on the basis of a high density of faunal remains, sherd material, partial ceramic vessels, a fragmentary *metate* and other special finds

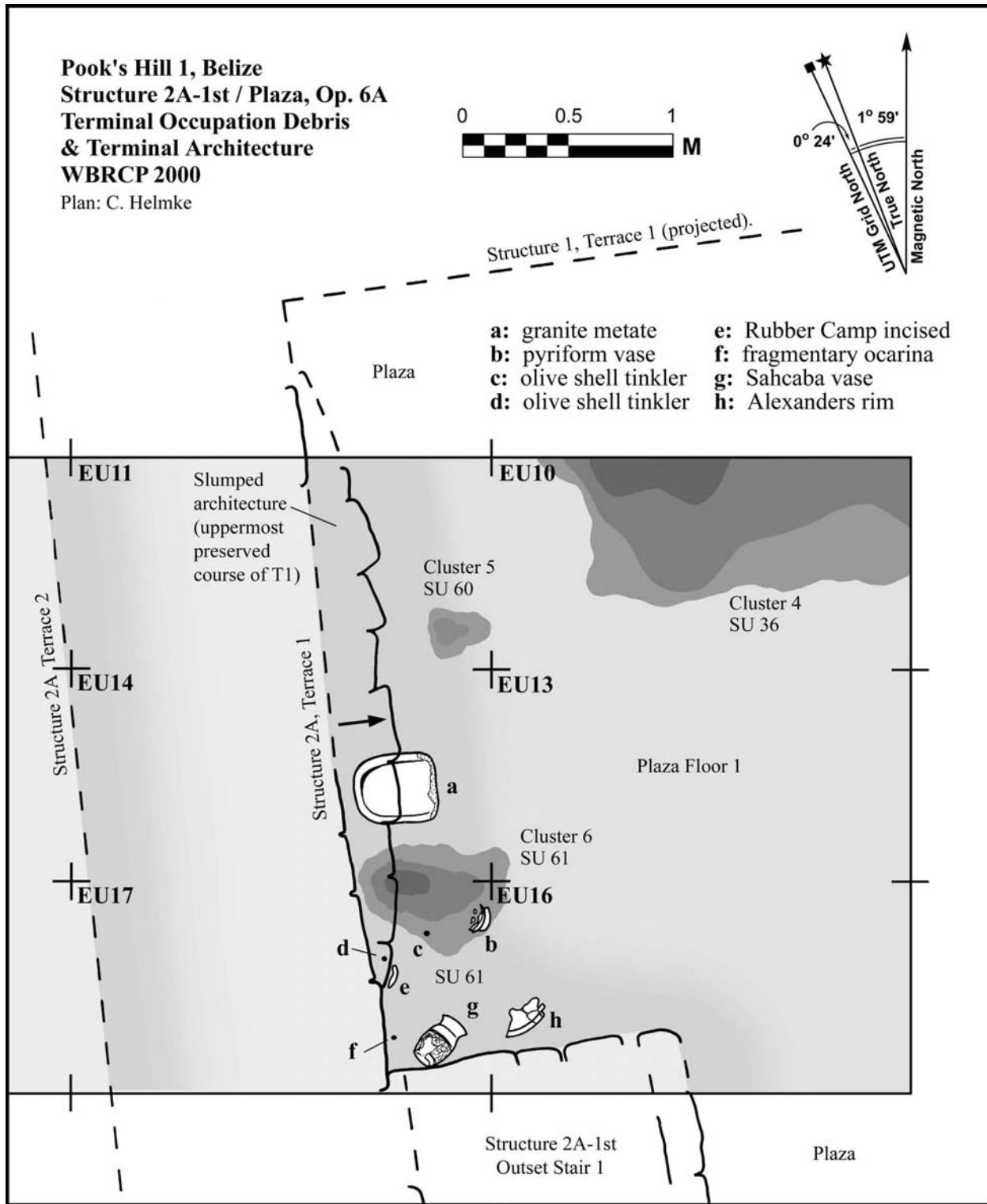


Figure 12: Plan showing the distribution of terminal occupation debris clusters.

as a discrete refuse deposit underlying collapse debris and directly overlying the terminal plaza Floor 1.

Description: The central aspect of this cluster is represented by a relatively small heap of refuse, measuring 52 cm (N-S) by 70 cm (E-W), partly abutting the foot of Terrace 1. This pile measured at most between 30 and 35 cm high (towards its center), sloping down and away from the face of T1 to a feathered outline. The matrix constituent was represented by a loose, predominantly dark brown (10YR 5/6) matrix of homogeneous texture. Composition otherwise consists nearly equitably of artifacts (terminal occupation debris) (ca. 70 % of volume) and soil matrix with small limestone rocks (ca. Ø 1 - 5 cm) (ca. 30 %). While matrices may be intrusive through leaching, bioturbation and compaction, the majority is interpreted as the remains of decayed organic matter originally deposited as part of the refuse pile. In addition, Cluster 6 also encompasses partial ceramic vessels placed along the northern base of the outset stair (immediately to the south) and a partial *metate* adjacent to the northern side of the refuse pile, at the foot of Terrace 1. On the whole Cluster 6 thus has the appearance of a deposit tucked away in the corner formed by Terrace 1 and the northern stair side of Stair 1.

Taphonomy: The stratigraphic relationships of Cluster 6 (SU 61) with other strata are particularly revealing as to the degree of disturbance affecting the deposit. In resting directly atop the terminal Floor 1 and being sealed below the layer of collapse debris (SUs 33, 46, 48 and 51), as well as the feathered edges of the refuse pile indicate that Cluster 6 is in primary context. The recovery of a nearly complete, but fragmentary molded-carved vase resting on its side atop dish sherds, suggests that it may have been placed in an upright position in antiquity, but subsequently tipped or was tipped over on its side, prior to being sealed by collapse debris. Recovery of a pyriform vase (61/2), found preserved in an upright position, indicates that Cluster 6 was deposited in the context of its discovery in antiquity and subsequently sealed by the debris of collapsing structures. As this cluster was excavated subsequently to Clusters 4 and 5, it was anticipated that this feature would not comprise internal stratification. Absence of internal stratification was confirmed during excavation, suggesting (as in the case of Clusters 4 and 5) that the refuse pile of Cluster 6 was deposited as a unified mass. This attribute in turn suggests that a singular event accounts for the rapid and / or mixed deposition of materials in secondary context.

Based on the context, lack of internal stratification and typological constituents, the heap of Cluster 6 is interpreted as representing a primary deposit of secondary clutter refuse (Hayden and Cannon 1983:131-138). Presumably the refuse deposit comprises an accumulation of artifacts that were swept off flooring surfaces and were dumped or swept into a pile, at the base of Terrace 1. The designation of this deposit as secondary clutter refuse is also based on the low potential for artifact recycling and the high content of organic materials (Hayden and Cannon 1983: 131; cf. Helmke 2001). The artifacts of the refuse pile thus stand in contrast to the fragmentary ceramic vessels and *metate*, which line the foot of Structure 2A's Terrace 1 and Stair 1, suggestive of provisional discard (Hayden and Cannon 1983: 131-138). The presence of artifacts along the foot of Terrace 1 finds parallels with provisional discard patterns observed among the modern Highland Maya, where objects having re-use or hindrance potential are placed along the foot of walls (Hayden and Cannon 1983:131-138, Figs. 5, 8). The concentration of Cluster 6 in the corner formed by the outset

stair and the terrace suggests that the refuse was deliberately relocated to a partly concealed area. The relocation of refuse to partly concealed areas such as corners is a prevalent bias among the modern Highland Maya (Hayden and Cannon 1983: 131), suggesting that the patterns of refuse disposal documented at Pook's Hill are well in keeping with modern analogs (Helmke 2001).

Associated Artifactual Material: Ceramic remains were represented by partial vessels and sherds. Sherd material included Roaring Creek Red (Gifford 1976:240-243), Daylight Orange Darknight variety (Gifford 1976: 301-303), Garbutt Creek Red (Gifford 1976:230-233), and Cayo Unslipped (Gifford 1976:276-283) ceramic type: varieties. Notable ceramic specimens include a complete molded-carved vase related to the Sahcaba type (61/1 resting directly atop rim sherds of a Roaring Creek dish) (Coggins 1975; Helmke 2001; Smith and Gifford 1965:162), the base of a pyriform vase (61/2 a.k.a. 'brandy snifter' form) exhibiting thumb impressions on the basal break as well as pre-slip incisions and punctuations, related to Vaca Falls ceramic group (cf. Gifford 1976:235-243) (partly tilted upon the refuse pile and a fragmentary human tibia), rim sherds of a large Alexanders Unslipped olla (Gifford 1976:283-287), and sherds of a brown-slipped incurving bowl, with excised exterior decorations representing a local unnamed type, related to the Garbutt ceramic group (Gifford 1976:230-235). Other finds include two spire-lopped olive shell (*Olivella* sp.) tinklers, 1 nearly complete (61/3) and 1 fragmentary ceramic effigy ocarina (61/4), and 1 fragmentary sub-rectangular, turtleback, granite *metate*, resting directly on the facings of Terrace 1. Specific absolute frequencies are not yet available.

Associated Faunal Material: Although faunal materials have been the subjects of preliminary analyses, specific absolute frequencies are not yet available. The sample contained in Cluster 6 is dominated by jute shells (*Pachychilus indiorum*, and *P. glaphyrus*). Fish remains are represented by parrotfish (Family *Scaridae* sp.), while vertebral fish bone may also belong to parrotfishes, although this association is tentative. Mammalia are represented by deer, possible deer and possible tapir bones. As in the case of Cluster 4, the majority of bones exhibit charring (refer comments made above).

Associated Human Skeletal Material: Contained within the refuse pile, but lying directly upon the surface of the plaza Floor 1 were the fragmentary remains of a left human tibia (SU 61 [46]). The specimen was found in association with the fragmentary pyriform vase, which was partly tilted, thereby resting directly upon the bone shaft. The tibia exhibited healed woven bone with striae and porosity, most pronounced around the midshaft. In addition, slight expression of new woven bone posterior shaft was also noted.

Associated Macrofloral Material: A sample of matrix from inside the molded-carved vase (SU 61 [51]) yielded a predominance of pine (*Pinus* sp.) and a minority of unidentified hardwood charcoal. Soil samples of matrices associated with Cluster 6, but not directly forming a part of the deposit yielded pine (*Pinus* sp.) (SU 33 and 46), avocado (*Persea* sp.) (SU 46) and chico sapote (*Manilkara* sp.) charcoal (SU 46). In addition, carbonized squash seed and rind fragments (*Cucurbita* sp.) (SU 46), carbonized calabash rind fragments (*Crescentia cujete*) (SU 33), and carbonized maize kernels (SU 33 and 46) were also recovered. No matrix sample was recovered from SU 48.

Relationship to Adjacent Stratigraphy: The refuse pile of Cluster 6 was found lying directly upon the terminal plaza floor (Floor 1) and partly abutting the foot of Str. 2A-1st's Terrace 1. These relationships indicate that the refuse pile of Cluster 6 postdates the terminal construction efforts of Str. 2A and the plaza platform. The position of the fragmentary *metate* indicates that that artifact holds the same temporal relationship. Spatial distribution of the molded-carved vase and the fragmentary Alexanders Unslipped *olla* indicate that this component of Cluster 6 postdates the construction of the outset stair of Str. 2A-1st. These attributes indicate that the deposition of the entire cluster represents an event within the sequence of terminal occupation / abandonment. Since Cluster 6 is entirely sealed by collapse debris, the refuse deposit was thus placed in the context of its discovery prior to the phase of structural collapse. As the artifactual materials seem to have suffered little weathering it is presumed that Cluster 6 was deposited shortly before the phase of structural collapse. If structural collapse is equated with total abandonment, the deposition of Cluster 6 may thus represent one of the latest events of the terminal occupation / abandonment phase associated with Str. 2A.

Discussion: Refer to the heading discussing Cluster 4 (see above).

Collapse Debris (SU 23, 24, 31, 32, 33, 39, 46, 48 and 51)

Provenience: Collapse debris was exposed throughout Op. 6A as the top of Level 1b. Mean elevation of collapse debris in EUs 10, 13 and 16: ca. 73.45 m HAE; in EUs 11, 14, and 17: ca. 74.30 m HAE; in EUs 12, 15 and 18: ca. 75.13 m HAE. In EUs 12, 15 and 18, humus was stripped off, exposing the collapse (top of Level 1b), although this context was not penetrated. In EUs 10 (SU 23), 11 (SU 24 and 31), 13 (SU 33), 14 (32 and 46), 16 (SU 48) and 17 (SU 39 and 51) collapse debris was excavated conjointly with the humic layer as Level 1 a/b, down to terminal phase architecture and / or concentrations of terminal occupation debris. In EUs 11, 14 and 17, collapse debris was segregated horizontally along the face of T1. Collapse debris to the west of this alignment (SU 24, 32 and 39) rested upon the flooring of T1 and was considered to predominantly represent the collapsed remains of the presumed T2 and the superstructure of Str. 2A-1st. To the east of this alignment (SU 31, 46 and 51) collapse debris rested upon Floor 1, abutting the face of T1 and was considered to represent the collapsed remains of T1, T2 and the putative masonry superstructure of Str. 2A-1st (thereby representing the westernmost continuations of the collapse debris contexts of EUs 10, 13 and 16 (i.e. SU 23, 33 and 48 respectively)).

Description: Collapse to the E of T1 was composed of large dolostone facings (up to Ø 30-60 cm) and smaller limestone facings (mean Ø 15-25 cm) predominantly, with fist-sized (Ø 10 cm) and smaller limestone rocks (ca. Ø 5 cm). The range of sizes of the rocks made for a very poorly sorted collapse debris stratigraphic profile. Collapse to the W of T1's face upon to flooring of that terrace was composed predominantly of smaller limestone and dolostone rocks (ca. Ø 10-30 cm), account for a poorly sorted profile. In the upper reaches of the collapse debris intrusions of dark brown (10YR 5/6) to black (10YR 2/1-2/2) humic soil prevailed. Deeper into the collapse, dark brown to light brown (10YR 5/6-5/4) and dark gray (10YR 3/1) loamy matrices were interspersed throughout. Closest to the terminal floor

(Floor 1), the coloration of the collapse debris matrices were variegated beige to dark brown, with mottled light brown (10YR 5/4) to yellowish (10YR 7/6) predominating.

Associated Material: Collapse debris included ceramic sherds, fragmentary prismatic obsidian blades, exhausted obsidian cores (SU 33), chertdebitage, fragmentary formal chert tools, groundstone adzes (SU 33), groundstone *mano* and *metate* fragments, groundstone spindle whorl fragments (SU 23), ceramic disks, perforated ceramic disks, whole and fragmentary ceramic effigy ocarinas, a cylindrical groundstone bead (SU 48), *jute* shells, vertebrate faunal bone fragments, and human bone fragments. Specific absolute frequencies are, however, not available at present. Vertebrate faunal remains occurring within the collapse included evidence of deer (SU 23, 25, 33, 46, 48, and 51), rodents (SU 23), parrotfish (SU 23, 33, 46), tapir (SU 33), and agouti or paca (SU 33). Note that no vertebrate faunal remains were recovered from the collapse debris resting on the flooring of Terrace 1 (SUs 24, 32, and 39). Human remains were predominantly found upon the surface of Floor 1 and are discussed in a separate section below.

Relationship to Adjacent Stratigraphy: Collapse debris was found to overlie all terminal phase architecture and all primary deposits of terminal occupation debris encountered in Op. 6A. This stratigraphic position indicates that the collapse debris postdates the terminal construction efforts as well as the latest evidence for the use of Str. 2A (i.e. Clusters 4-6). Consequently, it is stipulated that the collapse of Str. 2A documented in Op. 6A postdates the phase of terminal occupation. The collapse may thus mark the terminal event in the phase of abandonment. As the artifacts and heaps of clutter refuse of Clusters 4-6 were apparently sealed by collapse shortly after their deposition, it is presumed that collapse and thus abandonment (at least of Str. 2A) followed shortly after Clusters 4-6. The humic horizon was found to overlie the entirety of the collapse debris stratum. This relation indicates that the formation of the humic horizon formed, uninterrupted from the time of abandonment/collapse to the time of Op. 6A was initiated.

Humus (SU 23, 24, 25, 28, 31, 32, 33, 35, 39, 46, 48, and 51)

Provenience: The humus layer was found throughout Op. 6A and excavated as Level 1a in EUs 12 (SU 25), 15 (SU 28) and 18 (SU 35). In EUs 10 (SU 23), 11 (SU 24 and 31), 13 (SU 33), 14 (32 and 46), 16 (SU 48) and 17 (39 and 51) the humus (Level 1a) was excavated conjointly with collapse debris (Level 1b) as a single unitary Level 1a/b. In EUs 11, 14 and 17 the humus and collapse strata were subdivided horizontally along the face of T1; SUs to the west thereof (SUs 24, 32 and 39) represent the humus and collapse debris resting on the supposed flooring surface of T1 and SUs to the east thereof (SU 31, 46 and 51) representing humus and collapse debris piled onto Floor 1 and abutting to the face of T1 (thereby representing the westernmost continuations of SUs 23, 33 and 46). The mean elevation of the MGS prior to excavation in EUs 10, 13 and 15 is: 73.60 m HAE, in EUs 11, 14 and 17 is: 74.45 m HAE, and in EUs 12, 15 and 18 is: 75.28 m.

Description: The MGS defined by the humic layer sloped gradually from west to east (mean is ca. -28 %), thereby conforming to the surface of the mound of collapse debris shrouding the terminal phase architecture of Str. 2A-1st. The humic layer was found to

range in thickness from 5 to 20 cm. The humus was compact in the lower EUs (EU 10, 11, 13, 14, 16 and 17) to loose in the upper EU (EU 12, 15 and 18). The majority of the humus was a black to dark brown (10YR 5/6) to black (10YR 2/1-2/2) matrix, with concentrations of dark gray (10YR 3/1) soil being encountered in EU 12 (SU 25) (possibly the remains of ash). The humus was represented by loamy matrices with a large percentage of root inclusions (notably large roots of strangler fig, *Ficus* sp.) and decayed organic matter (including cohune nuts, *Attalea cohune*), with a minor constituent of small limestone rocks ($\varnothing < 5$ cm). Aside from considerable bioturbation the majority of the humic deposits appear to represent the accretive total of the Oa / A Horizon formation processes, a point supported by the thickness of the deposit, which corresponds to that covering natural, unmodified terrain in the vicinity. Based on the prevalence of root activity affecting this stratum many artifacts included in the upper reaches of the collapse debris stratum may be intrusive, an interpretation supported by associated finds (see below).

Associated Material: Although ceramic sherds, chert lithic debitage, groundstone artifacts and faunal materials were recovered as part of the humic stratum, specific absolute are not yet available. Notable incidences include a granite *metate* fragment and fragmentary *mano* which were recovered from EU 12 (SU 25). In addition, comments can be made on the incidence of faunal and macrofloral remains as these have already been the subjects of preliminary analyses (SUs 25, 28, and 35), although these are restricted to EU 12, 15 and 18 as it is only within the confines of these that Level 1a was segregated from the underlying Level 1b. Stratigraphic Unit 25 yielded 4 *jute* and 6 mammalian bone fragments (possibly deer); SU 28 yielded 4 *jute* and 1 possible *pomacea* shell fragment; and SU 35 included only 1 *jute* shell. From the deeper probes in EU 18 (SU 35) a soil sample was collected which yielded evidence (subsequent to flotation) of pine charcoal (*Pinus* sp.) and carbonized rind fragments of calabash (*Crescentia cujete*) (Morehart, this volume), the latter possibly the remains of a bowl made of a halved, dried gourd. Last but not least a Belizean dollar coin (bearing the date 1990) was recovered at the interstice between collapse and humus in EU 16 (SU 48), clearly indicative of the extent of bioturbation and its effects on artifact displacement.

Relationship to Adjacent Stratigraphy: As the humic horizon covers the entirety of the collapse debris stratum, it seems clear that the humic layer formed subsequently to the collapse of Str. 2A-1st, following the time of abandonment onwards until excavations of Op. 6A penetrated these deposits. Thus while artifacts included in the humic horizon include materials that can be termed terminal occupation debris, most must be considered secondary contexts, as many materials recovered are probably the result of bioturbation (animal activity and root growth) drawing artifacts from the underlying collapse debris closer to the surface. The modern coin found within SU 48 was apparently deposited accidentally during the clearing of vegetation in the *plazuela* between 1992 and 1993 (Ray and Vicki Snaddon pers. comm. 2000), with continued root activity and the settling of matrices resulting in the inclusion of this coin more than 10 cm below MGS. Thus while the matrices forming part of the humus are the result of natural processes, the cultural materials contained therein may have any number of original contexts.

STRUCTURE 2A: HUMAN REMAINS

<i>Provenience:</i>	Human remains were found scattered in EUs 10 (SU 23/36, SU 36), 11 (SU 31), 13 (SU 33), 14 (SU 61) and 16 (SU 61). The majority of materials derive from Level 1c contexts, notably Cluster 4 (SU 36) and 6 (SU 61), although some were found at the interstice of Level 1b and 1c as part of collapse debris. Elevations of these specimens are variable, but cf. Figure 13.
<i>Grave type:</i>	Skeletal remains were found in a variety of contexts including: resting atop the surface of the terminal plaza Floor 1, mixed into terminal occupation debris clusters (SUs 60 and 61), occurring within midden deposit (SU 36), within the lowest reaches of collapse debris associated with abandonment phase.
<i>Grave dimensions:</i>	Due to the wide dispersal of the human remains, a plan showing the distribution of these materials is provided (Figure 13) rather than more limited, but typical measures of length and width for primary interments.
<i>Burial Type:</i>	Secondary or primary for materials occurring within the midden and terminal occupation debris clusters (depending on the social processes invoked to account for their deposition). Materials occurring on the plaza floor and other non-sealed contexts may be in a secondary or tertiary context. Presence of articulated remains resting on the plaza floor, suggests secondary context, however, unless the remains were still fleshy at the time of displacement / deposition.
<i>Orientation:</i>	n.a.
<i>Position:</i>	n.a.
<i>Condition:</i>	The human remains were found to be fragmentary, represented mostly by teeth and the more durable portions of long bone shafts. The left femur of Individual B has been sliced by a metal tool, probably as a result of negligent excavation.
<i>Individuals:</i>	Field determination: n.a. Laboratory determination: The human remains represent a minimum of two individuals, one a late adolescent and the other an adult. Material from each individual was found in Cluster 4 (SU 36) and in Cluster 6 (SU 61). This depositional context and the skeletal elements recovered, which include primarily the durable shaft fragments of the arms and legs, indicate that parts of these two individuals were included in each deposit. Individual A: The late adolescent is represented by the medial half of the right proximal humeral epiphysis, fragments of the right humeral diaphysis, and the left femoral diaphysis. Individual B: The adult is represented at least by a fragment of the mandibular right first molar and the left second molar, and the left femoral diaphysis. Commingled remains: The late adolescent individual and the adult are very similar in size, and many of the human remains consist of

small midshaft fragments of long bone, so some of the skeletal elements remain commingled. Included among the commingled remains are a right ulna shaft fragment, one thoracic vertebral fragment, one sacral articular facet, one ilium fragment, a fibular shaft fragment. (JCP).

Cultural Modification: No cultural modifications were noted on these remains.

Skeletal Material: **Individual A:** The left femur shows evidence of infection in active woven bone along the linea aspera, and healed sclerotic thickening and porosity on the proximal shaft.

Individual B: A healed infection is present on the femur of this individual, characterized by both sclerotic and woven bone.

Commingled remains: Included among the commingled remains that exhibit signs of pathology are a tibial shaft with a healing woven bone infection, a left tibia with woven bone infection, and a right radial shaft with active woven bone infection.

Associated Material: No artifactual materials were directly associated with the remains in manner consistent or suggestive of burial furnishings. However, all skeletal remains occurring within the midden and TOD clusters were obviously in direct association with all other artifact classes forming part of these deposits. For details see the sections on Clusters 4 (SU 36), 5 (SU 60) and 6 (SU 61), above.

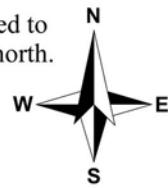
Relationship to Adjacent Stratigraphy: The specifics pertaining to the stratigraphic position of the midden and the terminal occupation debris clusters are presented above, in their respective sections. For the remainder of the skeletal material, it is clear that all were deposited subsequent to the completion of the terminal phase architecture and prior to the collapse of Str. 2A-1st which sealed all these materials. Consequently, it seems clear that the human remains were deposited as part of the terminal phase occupation of the site, a phase dated to the Terminal Classic (ca. AD 830-950).

Discussion: The human remains recovered from Operation 6A represent a minimum of two individuals. The human remains were apparently deposited concurrently with the terminal occupation debris. However, due to taphonomic processes operating on these deposits prior to their being sealed by the collapse debris, coupled with intensive bioturbation (predominantly intensive root activity), some of the human remains were also recovered as part of the collapse debris stratum. The identification of the cultural processes responsible for the deposition and spatial distribution of these materials remains problematical, as a detailed analysis of this assemblage has not been completed to date. Nonetheless, it should be pointed out that the

Pook's Hill 1, Belize
Structure 2A-1st / Plaza, Op. 6A
Human Skeletal Remains
WBRCP 2000

Plan: C. Helmke

Plan aligned to
magnetic north.



- | | |
|----------------------------|--|
| 1: long bone fragments | 8: mandibular LM ₂ (adult) |
| 2: unfused humeral head | 9: tibial diaphysis |
| 3: left femur (adult) | 10: unidentified bone [458] |
| 4: left femur (adolescent) | 11: left tibia |
| 5: right radius [392] | 12: left femur (adult) & fibula frag. |
| 6: right ulna [392] | 13: sacrum, illium & vertebra frags. |
| 7: right humerus [393] | 14: mandibular RM ₁ (adult) [406] |

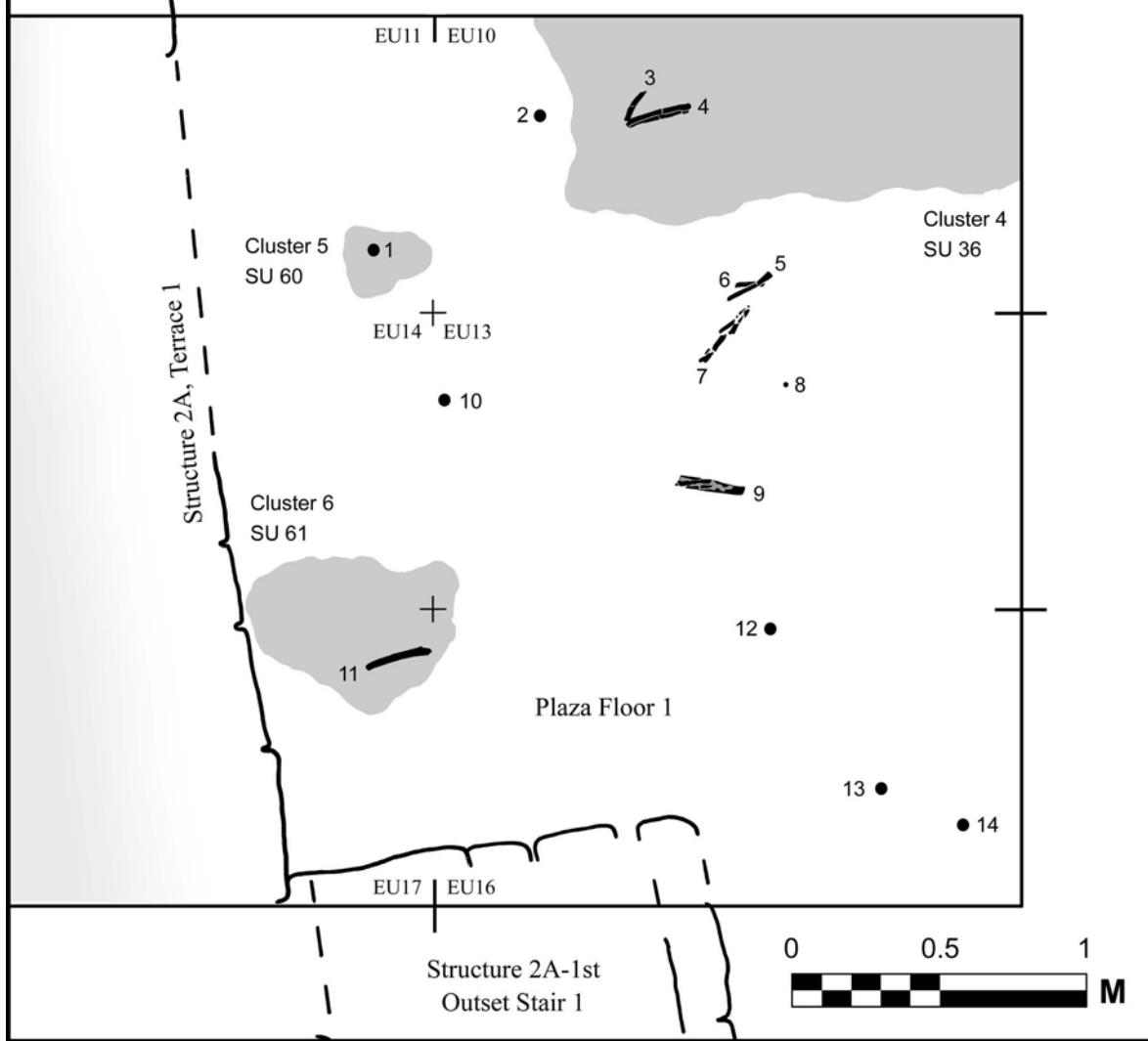


Figure 13: Plan showing the distribution of human skeletal remains.

of human teeth in collapse debris or loose human bone in terminal classic debris has been documented at several contemporaneous lowland Maya sites including Tikal (Harrison 1970, 1999: 193, 195, 197), Caracol (A. Chase and D. Chase 1987:56, 2000, 2001; D. Chase 1994:129), and Altun Ha (Pendergast 1982, 1990). These patterns suggest that a distinct type of activity may be responsible for the irreverent disposal of human remains within residential groups, in the Terminal Classic.

DISCUSSION AND CONCLUSION

The excavations succeeded in clearing and identifying terminal phase architecture contained within the boundaries set for Operations 5A and 6A. Both operations identified the terminal flooring of the plaza platform and identified Structure 2A-1st as a terraced platform (with at least one and maybe two terraces), apparently with a partial masonry and perishable superstructure (possibly with multiple doorways), and a principal, axial outset stair. In addition, scatters of human remains and several artifactual deposits were uncovered, all the product of the terminal phase occupation of the site. The importance of these deposits lies in that these were all sealed in situ by collapse debris. Consequently, the constituents, their associations, their spatial distribution and stratigraphic position all have the potential to shed light not only on the processes responsible for their deposition, but also the activities in which the specimens of these deposits played a part.

Taphonomy

A detailed analysis of the taphonomic processes affecting these deposits and their stratigraphic configuration are therefore imperative to a coherent assessment of the ancient human activities, which took place at the Structure 2A-1st locus. To these ends, the natural and cultural processes responsible for the formation of these deposits and affecting these subsequent to deposition, were assessed above, respectively in the sections detailing each discrete terminal occupation debris / midden cluster.

To reiterate, the absence of micro-stratification within the midden deposit and the clusters of terminal occupation debris, signals that these represent secondary context clutter refuse deposits, the product either of mixing and/or rapid deposition. The former would imply that the mixing is a result of extensive sweeping with subsequent consolidation into nucleated heaps or piles. The latter implies that these deposits are the product of few activities, taking place over a very short period of time, with refuse deposited at or very close to their points of recovery. Naturally, the deposits may be the product of a combination of processes mentioned.

The feathered edges of all the clusters indicate that these have not been displaced significantly from their context of deposition, although bioturbation in the form of root growth and animal burrowing was observed at various points. Substantiating this assessment is the presence of partial vessels, which have maintained their integrity and apparently stood directly atop the surface of Floor 1, prior to being sealed by collapse debris.

Although complete analyses of the artifactual constituents are still underway, their recurrence and similarity in the various clusters, suggest that the same types of activities are represented by each. Similarly, the distribution of similar ceramic modes and forms throughout each deposit indicates that these are all the product of a single phase, at present dated to the Terminal Classic (ca. AD 830-950).

While some human and animal activities probably affected these deposits prior to being sealed by collapse debris, at present there is little evidence of these. Exceptions are apparent attempts to ignite the midden (as suggested by charred artifacts and some charcoal at the surface of the deposit) and rodent gnaw marks on human and animal bones. Despite these, the minor humic accumulations present on Floor 1 as well as the spatial and structural congruence maintained by the clusters suggests that these were sealed relatively rapidly after their deposition. It is unclear at present if the partial collapse of Str. 2A-1st that sealed off these deposits took place subsequent to the abandonment of the structure and/or site, or whether the site was still inhabited by a diminished group of people. This point may never be aptly resolved, although detailed comparisons of stratigraphic profiles between various structures may allow partial resolution of this point in the future. Regardless, it is clear that at present these deposits are the latest in situ evidence of Str. 2A-1st usage.

Structure Function

Having reviewed all basic interpretations of these terminal occupation and midden clusters, we return to the original research question stated at the beginning of this report: What function did Structure 2A serve within the PKH1 *plazuela*? The prevalence of animal remains, carbonized plant remains, serving vessels, bowls and vases forming a part of the terminal occupation debris clusters suggests that meals are the primary activity represented artifactually. In addition, musical instruments, in particular ceramic ocarinas (clay whistles) and a faunal bone rasp are noteworthy since these are the same type of instruments represented in the Main Chamber of Actun Tunichil Muknal, located further up the valley, to the south. Together, these data sets suggest that the meals consumed at the Str. 2A-1st locus may have been somehow accompanied by the playing of music, thereby possibly setting these apart from daily fare. The remains of ceramic vessels provide support for this interpretation. Vases, for example are known to have been used as the container of specialty beverages, such as *kakaw* (a cacao based beverage) based on current epigraphic evidence (MacLeod 1990; MacLeod and Reents-Budet 1994). Incurving bowls, on the other hand, are known to have been used for serving and drinking *ul* (maize gruel otherwise known as *atole*), as inferred from epigraphic data and ethnographic analogs (Deal 1998; MacLeod 1990; MacLeod and Reents-Budet 1994). Both of these vessel forms and their association with specialty beverages, often referred to as “festival foods” (LeCount 1996), further suggest that the meals taking place at Str. 2A-1st (as represented artifactually) were somehow specialized activities. This conclusion is also supported by the frequency of parrotfish (*Scaridae*) remains, a Caribbean species that obviously would have had to have been imported to the site, suggesting that it too figures as specialty fare. Based on these attributes it is suggested that the terminal occupation debris clusters are the remains of feasts and indicate that the

primary function of Str. 2A-1st in the Terminal Classic, prior to the abandonment of the site, was that of a ‘feasting hall’ in the loosest sense.

This interpretation brings to mind the function of a type of building known in the ethnohistoric literature as a *pohpol nah*¹ (i.e. “mat house” in Yucatek Maya) or ‘council house’ (Fash et al. 1992). The *pohpol nah* is “the name by which were known municipal buildings in colonial times, of which was in charge the *aj jol pohp* (i.e. “the one at the head of the mat”); where they assembled to discuss public affairs and learn to dance for the town festivals” (Barrera Vasquez 1991:666; trans. by C. Helmke; see also Tozzer 1941). In addition *aj jol pohp* is glossed as: “head of the banquet, steward of the house called *pohpol nah* [...]” (Barrera Vasquez 1991:228; see also Roys 1939:44). These entries make mention of feasting in their reference to ‘banquets’ and thus form a line of analogy with the structure identified at Pook’s Hill. In addition, the reference to ‘dancing’ may be supported by the presence of musical instruments in the Pook’s Hill assemblage, while the plaza area upon which Str. 2A fronts would be entirely amenable to the performance of pageants of various sorts, including dances. Thus while, it is not stipulated that the PKH1 plaza is a seat of government, it seems as though some of the attributes of the larger administrative centers were replicated on a more diminutive scale within the *plazuela* groups in the Terminal Classic. It is possible that such ‘council houses’ may have only catered to the extended lineage residing there and to neighboring settlements, but the emulation of the central order is suggested. Whether this emulation was intended to raise the prestige of the local inhabitants by signaling affiliation or dissent to the central administration of a polity remains speculative at present.

The last pieces of evidence directly related to an assessment of the structure’s function are the sherds of Belize Molded-carved vases (tentatively assigned to a new type named Ak’utu’ Molded-carved). Sherds of these vessels have been recovered in the midden as well as the terminal occupation debris clusters and in the collapse debris associated with Str. 2A. Thus based on their incidence alone, it is clear that these were used as part of the feasts that are stipulated to have taken place at Str. 2A-1st. The hieroglyphic caption (known as the Primary Standard Sequence or PSS) that decorates the rim of these vases includes one glyphic collocation that refers to the ‘vessel type’ of the vases themselves. The term is read as *ahk’utu’*,² which is a composite noun literally meaning “give-thing” (Boot n.d.: 16; Helmke 2001) and was the gloss by which the ancient Maya referred to these vases. The recurrent and exclusive association of this term with Terminal Classic molded-carved vases

¹ Here some of the spellings have been updated to conform to the new orthography of Maya words. Thus here the glottal spirant /h/ of *nah* (“house”) and *pohp* (“mat”) has been reconstructed and the glottal fricative /j/ of *jol* (“head”) has been updated from their more traditional but erroneous Colonial spellings. These changes are based on recent comparative historical linguistic analyses and advances epigraphic decipherment.

² The vessel type glyphic collocation of these molded-carved vases is written entirely syllabically as **ya-k’u-tu-u**, yielding a full reading of *yak’utu’* where the final /u/ yields a glottal stop. The term can be segmented morphologically as *y-ak’u-tu’* and analyzed as 3SA-give-INST. Here the initial consonant is the prevocalic third person singular absolute / possessive (“his / her / its”), followed by the root *ahk’(u)*, where the glottal spirant must be reconstructed from comparative historical linguistics, meaning “to give” (tv) (Boot n.d.: 16; David Stuart pers. comm. 1998), the term being completed by a suffix identified as a rare instrumental (Erik Boot pers. comm. 2000; Marc Zender pers. comm. 2000). The whole thus reads: “his/her ‘give-thing’” or in looser prose: “it is the gift of so and so.” In the continuation of the glyphic text the name of the patron / owner of the vase follows.

indicates that the vessels were designed to be bestowed upon as a present. Interestingly, the gifting of vessels and other objects at banquets and feasts is well documented in the ethnohistorical literature (LeCount 1996; Tozzer 1941). Consequently, based on the culmination of all lines of evidence it seems that the identification of Structure 2A-1st's terminal function as a 'feasting hall' or '*pohpol nah*' seems well supported.

Appendix A:

Pook's Hill 1, Operations 5A and 6A, Index of Stratigraphic Units (2000 Field Season)

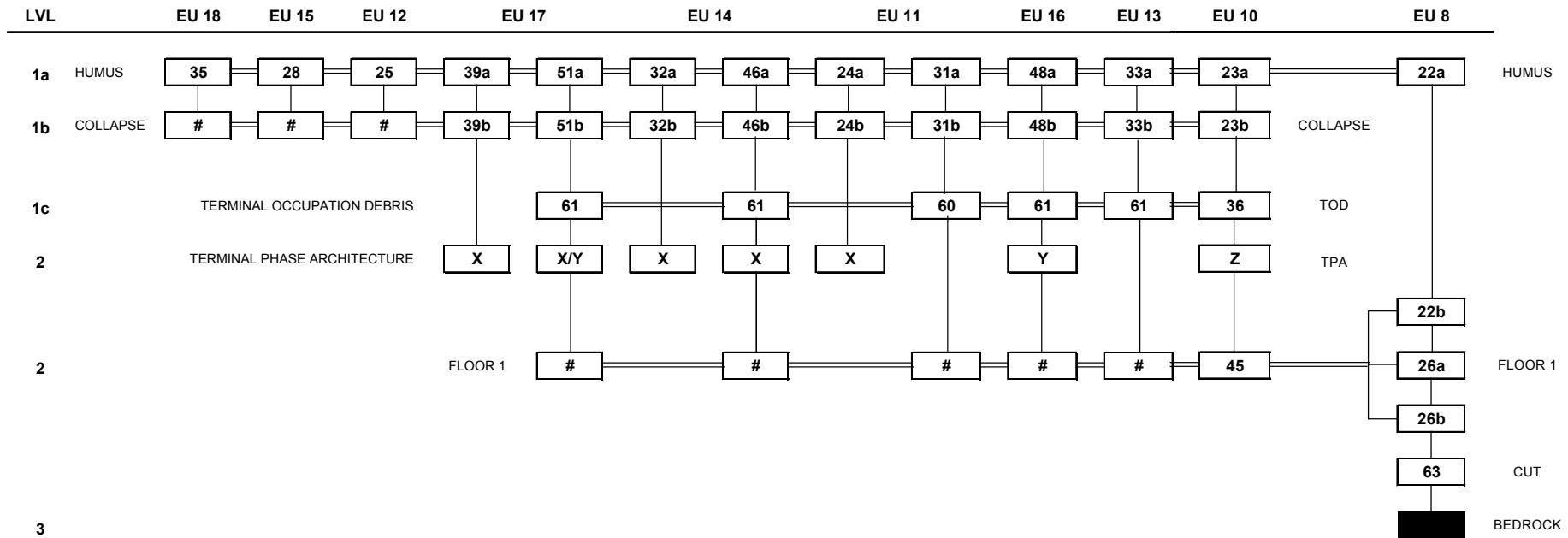
SU	Op.	Str.	EU	Lvl.	Description
22	5A	Plaza	8	1a-2a	Humic horizon and ballast of Floor 1. Arbitrary level corresponding to 0-10 cm depth below MGS.
23	6A	2A / Plaza	10	1a / b	Humic horizon and collapse debris overlying terminal Floor 1 and midden deposit (Cluster 4).
24	6A	2A	11	1a / b	Humic horizon and collapse debris overlying terminal flooring of Terrace 1. SU defined to the west of T1 facings within the confines of EU 11.
25	6A	2A	12	1a	Humic horizon overlying collapse debris.
26a	5A	Plaza	8	2b	Core of terminal Floor 1. Arbitrary level corresponding to 10-20 cm depth below MGS, down to surface of quarried / modified bedrock.
26b	5A	Plaza	8	2c	Core of terminal Floor 1. Arbitrary level corresponding to >20 cm depth below MGS, down to sloping unmodified bedrock surface.
28	6A	2A	15	1a	Humic horizon overlying collapse debris.
31	6A	2A / Plaza	11	1a / b	Humic horizon and collapse debris overlying terminal Floor 1 and Terminal occupation debris deposit (Cluster 5) as well as abutting the face of terminal T1. SU defined to the east of T1 facings within the confines of EU 11.
32	6A	2A	14	1a / b	Humic horizon and collapse debris overlying terminal flooring of Terrace 1. SU defined to the west of T1 facings within the confines of EU 14.
33	6A	2A / Plaza	13	1a / b	Humic horizon and collapse debris overlying terminal Floor 1 and minor quantities of terminal occupation debris resting directly on Floor 1.
35	6A	2A	18	1a	Humic horizon overlying collapse debris.
36	6A	2A / Plaza	10	1c	Cluster 4. Midden deposited directly upon terminal Floor 1 and partly abutting poorly preserved architectural component of Str. 1. Cluster 4 is sealed by collapse debris.
39	6A	2A	17	1a / b	Humic horizon and collapse debris overlying terminal flooring of Terrace 1. SU defined to the west of T1 facings within the confines of EU 17.
45	6A	Plaza	10	2	Floor 1. SU instated so as to account for well-preserved plaster surfacing sampled for analysis.
46	6A	2A / Plaza	14	1a / b	Humic horizon and collapse debris overlying terminal Floor 1 and Terminal occupation debris deposit (Cluster 6) as well as abutting the face of terminal T1. SU defined to the east of T1 facings within the confines of EU 14.
48	6A	2A / Plaza	16	1a / b	Humic horizon and collapse debris overlying terminal Floor 1, terminal occupation debris deposit (Cluster 6), as well as minor quantities of terminal occupation debris resting directly on Floor 1.

Appendix A –continued:

SU	Op.	Str.	EU	Lvl.	Description
51	6A	2A / Plaza	17	1a / b	Humic horizon and collapse debris overlying terminal Floor 1 and Terminal occupation debris deposit (Cluster 6) as well as abutting the face of terminal T1 and northern face of Stair 1. SU defined to the east of T1 facings and to the north of Stair 1 facings, within the confines of EU 17.
60	6A	Plaza	11	1c	Cluster 5. Clutter refuse heap deposited directly upon terminal Floor 1. Cluster 5 is sealed by collapse debris.
61	6A	2A / Plaza	14, 16, 17	1c	Cluster 6. Clutter refuse heap deposited directly upon terminal Floor 1 and partly abutting the foot of T1. Associated with this deposit are fragmentary artifacts representing provisional discard. Cluster 6 is sealed by collapse debris.
63	5A	Plaza	8	2c / 3	Modification of bedrock surface by chopping. This feature apparently represents an old quarry scar, the whole being overlain by the core of Floor 1.

Appendix B:

Pook's Hill 1, Operations 5A and 6A, Preliminary Harris Matrix of Stratigraphic Units (2000 Field Season)



Legend:
 X=Pertains to the Terrace 1 component of Str. 2A-1st.
 Y=Pertains to the Stair 1 component of Str. 2A-1st.
 Z=Pertains to the slumped component of Str. 1-1st.

Acknowledgements

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PRELIMINARY ANALYSIS OF PALEOETHNOBOTANICAL SAMPLES FROM POOK'S HILL 1, CAYO DISTRICT, BELIZE

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INTRODUCTION

The following report discusses some initial observations and interpretations of botanical remains recovered during the 2000 season of archaeological investigations of Pook's Hill 1 (PKH1), a *plazuela* group located in the Roaring Creek Valley of western Belize. First, the field and laboratory methods will be outlined. Second, identifications will be presented. Lastly, these data will be briefly discussed in light of what is already known about ancient Maya plant-human interactions.

FIELD METHODS

One-liter soil samples recovered from archaeological deposits were processed using a manual flotation system. A small, five-gallon bucket was modified by removing the bottom and attaching 1/16-inch nylon window screen with marine sealant. A 55-gallon steel drum was used as the water reservoir. In order to prevent contamination, water in the drum was changed every one to three samples depending on the composition of samples. The small bucket was immersed in the water source and agitated in a clockwise/counter-clockwise rotation. Soil was poured in slowly until the entire sample was processed. The light fraction was removed with a fine mesh sieve and placed on a small, water-permeable, square cloth. The heavy fraction was gently poured into a larger cloth square. Both light and heavy fractions were tied on a line and allowed to air dry.

LABORATORY METHODS

Light fractions were rough sorted at low magnification using a stereomicroscope. Carbonized wood was initially separated into monocots, hardwoods, and soft woods (gymnosperms). Specimens were then cross-referenced with modern wood material for determinations of taxonomic affiliation. Other remains, such as seeds, fruits, etc, were segregated into groups defined by anatomical similarities and also identified through comparisons with reference collections. All charcoal was weighed and seeds were counted. Results are presented in Table 1.

CHARCOAL

The charcoal assemblage from Pook's Hill 1 is not diverse. Pine (*Pinus* sp.) is the dominant wood charcoal recovered (Figure 1). Every flotation sample contained pine charcoal (100 %). Pine was found in a number of contexts, including burials, middens,

beneath floors, and in architectural collapse. Charcoal from hardwoods is limited compared to pine. Only 31 % of flotation samples yielded hardwood charcoal. Chico sapote (*Manilkara* sp.) and avocado (*Persea* sp.) are the only two hardwood genera identified. Chico sapote and avocado were recovered from one sample each. Poor preservation prevented the identification of other hardwood specimens. Finally, one specimen of palm charcoal (Arecaceae) was retrieved.

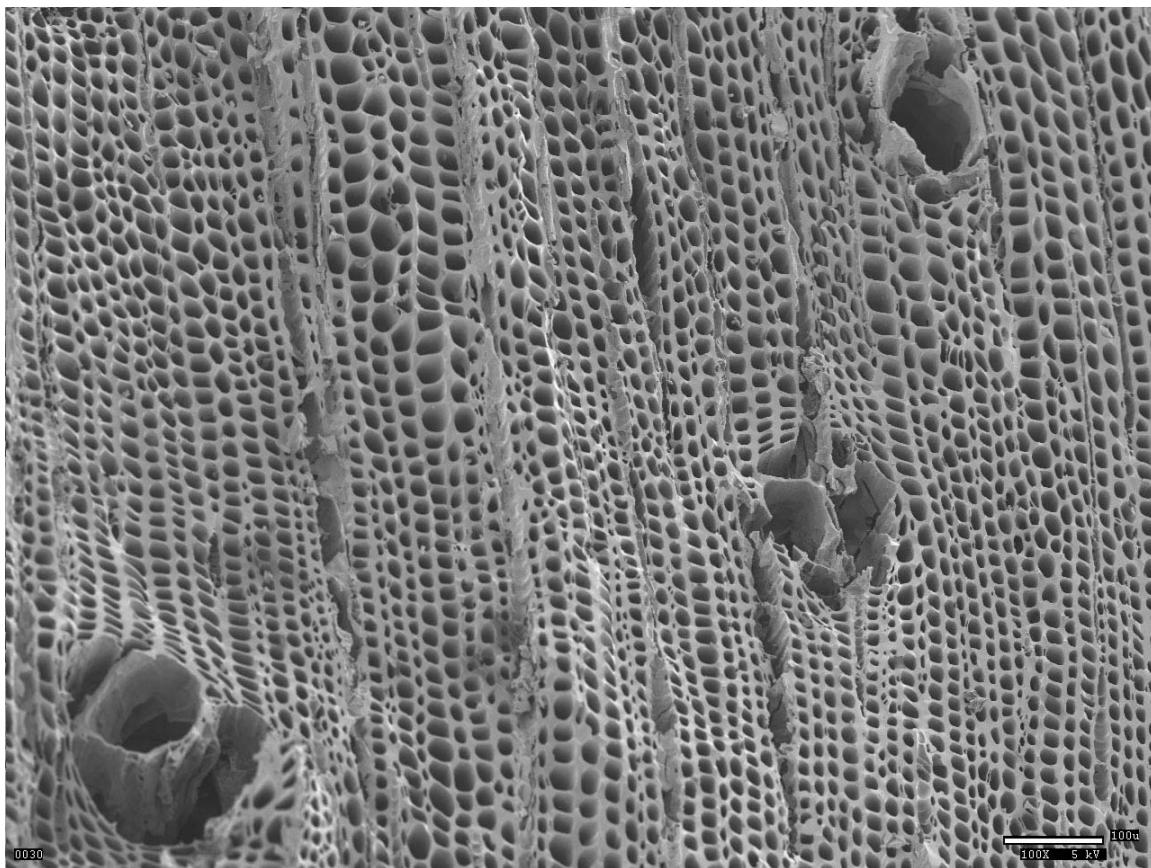


Figure 1: Scanning electron micrograph of carbonized *Pinus* sp. (100X magnification).

DOMESTICATES

Archaeobotanical remains from a number of domesticated cultigens were recovered from Pook's Hill. Five samples yielded maize (*Zea mays*) kernels and cupules (31 %) (Figure 2). Morphological attributes of maize can be quantified in order to compare archaeological specimens with prehistoric and extant maize types. Due to the small, fragmentary sample of maize, however, conclusions based on morphological comparisons would likely be tentative and, possibly, misleading. Thus, no measurements were made of the Pook's Hill maize.

Other domesticates are represented in the archaeobotanical assemblage as well. Two chile pepper seeds (*Capsicum annuum*) were recovered from a midden deposit (Figure 3).

One seed fragment and rind fragments of squash (*Cucurbita* sp.) were found as well. It was not possible, however, to determine the species of *Cucurbita*.

TREE FRUITS

The carbonized remains of economically useful tree fruits were recovered from many contexts at Pook's Hill 1. Calabash rind (*Crescentia cujete*) is the dominant charred fruit item. 37 % of samples contained calabash rind fragments. One flotation sample yielded an endocarp specimen from the coyol palm (*Acrocomia aculeata*). Lastly, the fragments of no less than one hog plum (*Spondias* sp.) (Fig. 4) pit were recovered from a midden deposit.



Figure 2: Carbonized *Zea mays* kernels (Marks indicate 1 mm).

OTHER REMAINS

A number of other remains were found in archaeobotanical samples. Carbonized residues from an unknown taxon were found in Burials 1 and 3. While these may be the remains of incense, they could also be carbonized pine resin. Pine is a very resinous wood that was found in abundance at Pook's Hill 1. Eight burned grass (Poaceae) disseminules were recovered from Burials 1 and 4. The remaining archaeobotanical materials consist of trumpet tree (*Cecropia* sp.) and nightshade (*Solanum* sp.) seeds. These seeds are uncarbonized, and are likely intrusive.

DISCUSSION

The content of Pook's Hill's botanical assemblage is similar to data recovered from other sites in the Maya lowlands. Data on woods, domesticates, and fruit trees are not divergent from observations made at many Maya sites, suggesting broadly shared trends in ancient Maya plant-use strategies.

The dominance of pine (*Pinus* sp.) charcoal is a testament to its importance for the prehistoric inhabitants of Pook's Hill. Pine is commonly found in abundance at Maya sites. For instance, at Copán, Honduras, pine was the dominant wood charcoal recovered from contexts that span the site's entire occupation (Lentz 1991). The intense exploitation of pine at Copán may have contributed to deforestation and environmental degradation (Abrams and Rue 1988; Abrams et al. 1996). Pine was also abundant in charcoal assemblages from Cuello, (Miksicek et al. 1991), Cahal Pech, (Wiesen and Lentz 1999), Pulltrouser Swamp (Miksicek 1983), Dos Pilas (Lentz 1994), Aguateca (Dickau and Lentz 2001), Cihuatán (Miksicek 1988), Cerén (Lentz et al. 1996), and Yarumela (Lentz et al. 1997).



Figure 3: Carbonized *Capsicum annuum* seeds (Marks indicate 1 mm).

Pine is not a locally available resource in much of the Maya lowlands. Thus, pine may have been an important trade good in Classic period exchange systems (Lentz 1999: 14). The role of pine as an exchange item was observed by J.E.S. Thompson (1970: 146), who stated that "Ocote (pitch pine)...is more plentiful in the highlands than in parts of the lowlands, notably much of the Usumacinta drainage, to which sticks may have been shipped, but the central Petén probably drew on supplies from the Pine Ridge land of British Honduras..."



Figure 4: Carbonized *Spondias* sp. pit (Marks indicate 1mm).

Sites located in the Roaring Creek valley are much closer to pine sources than other large sites in the greater Upper Belize Valley, such as Cahal Pech, Xunantunich, Buena Vista del Cayo, and El Pilar (Fig. 5). Pook's Hill 1 is less than a day's walk to the Mountain Pine Ridge, the largest modern source of pine. In addition, if modern distributions of pine are any indication, another smaller pine ridge nowadays occurs only 1 km south of Pook's Hill 1 (Fig. 5). The proximity of the Roaring Creek sites to such widely valued wood resources was likely economically advantageous. Pine products extracted from the Mountain Pine Ridge possibly included bundles of splints for torches, planks and trunks for construction materials, resin for fuel and incense, and pre-prepared charcoal for domestic fuel use- the latter a practice of the contemporary Chorti Maya of Guatemala (Wisdom 1940: 180-181; Rice 1999: 26). By preparing pine wood into charcoal prior to transport the product would have been more impervious to decomposition in the hot, humid, seasonally wet, tropical environment, a factor that has led some scholars to rule out certain organic materials in models of lowland Maya trade (e.g., Voorhies 1982).

The residents of Pook's Hill 1 may have also burned pine during rituals, a practice that would explain the abundance of pine charcoal in burial contexts. Elsewhere, Morehart (2001) has argued that the ceremonial burning of pine was a standard aspect of ancient rituals conducted in the many caves of the Roaring Creek Valley. Thus, it is not surprising that the same practice was common during ceremonies at nearby habitation sites.

Table 1: Archaeobotanical Remains from Pook's Hill 1 (PKH1). *= uncarbonized

<i>ID No.</i>	<i>Plant</i>	<i>Part</i>	<i>Weight</i>	<i>Freq.</i>	<i>Op.</i>	<i>Str.</i>	<i>EU</i>	<i>Lvl</i>	<i>SU</i>	<i>Context</i>
30001-001	Pinus sp.	Charcoal	1.11	—	4A	4A	7e/d	2	53	Bu. 4A-3
30001-002	Unknown	Residue	0.06	—	4A	4A	7e/d	2	53	Bu. 4A-3
30001-003	Hardwood	Charcoal	0.03	—	4A	4A	7e/d	2	53	Bu. 4A-3
30002-001	Pinus sp.	Charcoal	0.38	—	4A	4A/Plaza	7c	3	47b[43]	Core of Floor 2
30003-001	Manilkara sp.	Charcoal	0.55	—	6A	2A/Plaza	14	1b	46	Collapse debris
30003-002	Pinus sp.	Charcoal	0.15	—	6A	2A/Plaza	14	1b	46	Collapse debris
30003-003	Zea mays	Kernels	0.05	2	6A	2A/Plaza	14	1b	46	Collapse debris
30003-004	Cucurbita sp.	Rind	0.03	—	6A	2A/Plaza	14	1b	46	Collapse debris
30004-001	Pinus sp.	Charcoal	0.12	—	4A	4A/Plaza	7b/c	4	41 [41a]	Bu. 4A-1
30004-002	Poaceae	Disseminules	< 0.01	5	4A	4A/Plaza	7b/c	4	41 [41a]	Bu. 4A-1
30004-003	Solanum sp.*	Seeds	< 0.01	3	4A	4A/Plaza	7b/c	4	41 [41a]	Bu. 4A-1
30004-004	Cecropia sp.*	Seeds	< 0.01	7	4A	4A/Plaza	7b/c	4	41 [41a]	Bu. 4A-1
30004-005	Unknown	Residue	< 0.01	—	4A	4A/Plaza	7b/c	4	41 [41a]	Bu. 4A-1
30005-001	Pinus sp.	Charcoal	0.51	—	4A	4A	7e/d	4	54	Bu. 4A-4
30005-002	Poaceae	Disseminules	< 0.01	3	6A	4A	7e/d	4	54	Bu. 4A-4
30006-001	Pinus sp.	Charcoal	0.21	—	6A	2A/Plaza	10	1c	36e	Midden (Cluster 4)
30006-002	Zea mays	Kernels	0.01	3	6A	2A/Plaza	10	1c	36e	Midden (Cluster 4)
30006-003	Zea mays	Cupule	< 0.01	1	6A	2A/Plaza	10	1c	36e	Midden (Cluster 4)
30006-004	Hardwood	Charcoal	0.24	—	6A	2A/Plaza	10	1c	36e	Midden (Cluster 4)
30006-005	Crescentia cujete	Rind	0.13	—	6A	2A/Plaza	10	1c	36e	Midden (Cluster 4)
30006-006	Spondias sp.	Pits	0.48	> 1	6A	2A/Plaza	10	1c	36e	Midden (Cluster 4)
30006-007	Capsicum annuum	Seeds	< 0.01	2	6A	2A/Plaza	10	1c	36e	Midden (Cluster 4)
30007-001	Pinus sp.	Charcoal	0.03	—	6A	2A/Plaza	10	1c	23/36	Collapse / Midden
30007-002	Crescentia cujete	Rind	0.02	—	6A	2A/Plaza	10	1c	23/36	Collapse / Midden
30007-003	Arecaceae	Charcoal	0.05	—	6A	2A/Plaza	10	1c	23/36	Collapse / Midden

Table 1: Continued.

ID No.	Plant	Part	Weight	Freq.	Op.	Str.	EU	Lvl	SU	Context
30008-001	Pinus sp.	Charcoal	0.04	—	6A	2A/Plaza	13	1c	33	Deposit on Floor 1
30008-002	Crescentia cujete	Rind	0.05	—	6A	2A/Plaza	13	1c	33	Deposit on Floor 1
30008-003	Zea mays	Kernels	0.02	4	6A	2A/Plaza	13	1c	33	Deposit on Floor 1
30009-001	Pinus sp.	Charcoal	0.17	—	6A	2A/Plaza	17	1c	61 [51]	Content of Vessel 61/1
30009-002	Hardwood	Charcoal	0.02	—	6A	2A/Plaza	17	1c	61 [51]	Content of Vessel 61/1
30010-001	Pinus sp.	Charcoal	0.04	—	6A	2A	18	1b	35	Collapse debris
30010-002	Crescentia cujete	Rind	0.03	—	6A	2A	18	1b	35	Collapse debris
30011-001	Pinus sp.	Charcoal	0.09	—	4A	4A/Plaza	7b	4	40	Core of Floor 3
30012-001	Pinus sp.	Charcoal	0.21	—	4A	4A/Plaza	7b	4	62 [41b]	Bu. 4A-2
30013-001	Pinus sp.	Charcoal	0.02	—	6A	2A	17	1b	39	Collapse debris
30013-002	Zea mays	Kernel	< 0.01	1	6A	2A	17	1b	39	Collapse debris
30013-003	Crescentia cujete	Rind	0.03	—	6A	2A	17	1b	39	Collapse debris
30014-001	Pinus sp.	Charcoal	0.11	—	4A	4A/Plaza	7b/c	4	41/47c	Fill over Bu. 4A-1
30014-002	Poaceae	Disseminules	< 0.01	3	4A	4A/Plaza	7b/c	4	41/47c	Fill over Bu. 4A-1
30014-003	Acrocomia aculeata	Endocarp	0.04	—	4A	4A/Plaza	7b/c	4	41/47c	Fill over Bu. 4A-1
30015-001	Pinus sp.	Charcoal	0.19	—	4A	4A/Plaza	7c	2	47a [42]	Fill of SU 55
30015-002	Crescentia cujete	Rind	0.02	—	4A	4A/Plaza	7c	2	47a [42]	Fill of SU 55
30016-001	Pinus sp.	Charcoal	0.10	—	6A	2A/Plaza	14	1b	32	Collapse debris
30016-002	Persea sp.	Charcoal	0.21	—	6A	2A/Plaza	14	1b	32	Collapse debris
30016-003	Cucurbita sp.	Seed frag.	0.01	1	6A	2A/Plaza	14	1b	32	Collapse debris

Maize was perhaps the most significant staple of the ancient Maya. Thus, the discovery of maize at Pook's Hill 1 is no surprise. Although no morphological measurements were made of the maize remains from Pook's Hill 1, they do show some affinity to *Chapalote-Nal-Tel* type maize, especially in their round, non-dented kernels. Mangelsdorf (1974) and Wellhausen et al. (1957) describe *Chapalote-Nal-Tel* as an ancient and primitive maize complex. *Chapalote-Nal-Tel* is comprised of two maize types, *Chapalote* and *Nal Tel*. Both are composed of short, tapered cobs with narrow rachises and 8 to 12 rows of non-dented kernels. They are found at lower elevations in more tropical environments (Benz 1986). Both types mature rapidly, allowing multiple harvests per year. Maize from most Maya sites are attributable to *Chapalote-Nal-Tel* (Lentz 1999). Sites where *Chapalote-Nal-Tel* type maize have been found include Copán (Lentz 1991), Cuello (Miksicek et al. 1981), Cerén (Lentz et al. 1996a), Altar de Sacrificios, Guatemala (Willey 1972: 248), and Barton Ramie, Belize (Willey et al. 1965: 529).

Squash was another component of ancient Maya diets. Squash is a good source of carbohydrates and vitamins (Dunne 1990). At least two species of squash were cultivated by the Maya: *Cucurbita pepo* and *C. moschata* (Lentz 1999). Unfortunately, the fragmentary condition of the squash seed (*Cucurbita* sp.) from Pook's Hill 1 prevented species identification. On the other hand, most squash remains from Maya sites are rind fragments, a layer of tissue that cannot be easily identified to species (Lentz 1999: 10). Squash macro-remains have been found in Formative period deposits at Cerros (Crane 1996), Cuello (Miksicek et al. 1991), Albion Island (Miksicek 1990), Yarumela (Lentz et al. 1997), and Tolok, Belize (near Cahal Pech) (Wiesen and Lentz 1999) and Classic period contexts at Copán (Lentz 1991), Cerén (Lentz et al. 1996a), Kaminaljuyu (Stenholm 1984, From Pohl and Miksicek 1985), and Tikal (Turner and Miksicek 1984).

The remains of chile pepper seeds (*Capsicum annuum*) from Pook's Hill 1 are of particular interest. Due to their small size, chile peppers are not frequently recovered from Maya sites. Formative period chile remains have been found at Cuello (Miksicek et al. 1991) and Cerros, Belize (Crane 1996), and Classic period deposits from Dos Pilas, Guatemala (Lentz 1994) and Cerén, El Salvador (Lentz et al. 1996) have yielded chile peppers.

By using ecological data and ethnohistoric documents, many researchers have attempted to demonstrate that the Maya had developed some system of arboriculture. For instance, Puleston (e.g., 1982) theorized that the high density and prominent distribution of ramón trees (*Brosimum alicastrum*) around the site of Tikal, Guatemala, is evidence that it was once a major staple for the prehistoric Maya during the Classic period. Puleston's proposition was criticized because archaeobotanical remains of ramón are largely unattested (Lentz 1999; Turner and Miksicek 1984), and because the contemporary distribution of ramón trees can be related to edaphic conditions (Lambert and Arnason 1982). Despite the opposition to Puleston's approach, his methodology has been applied elsewhere in the Maya lowlands, such as Cobá, Mexico (Folan et al. 1979).

Although there is never a one to one correlation between explanatory models and archaeological data, the archaeobotanical remains from Pook's Hill 1 provides possible evidence for arboricultural practices. Fruit remains from three economically useful tree

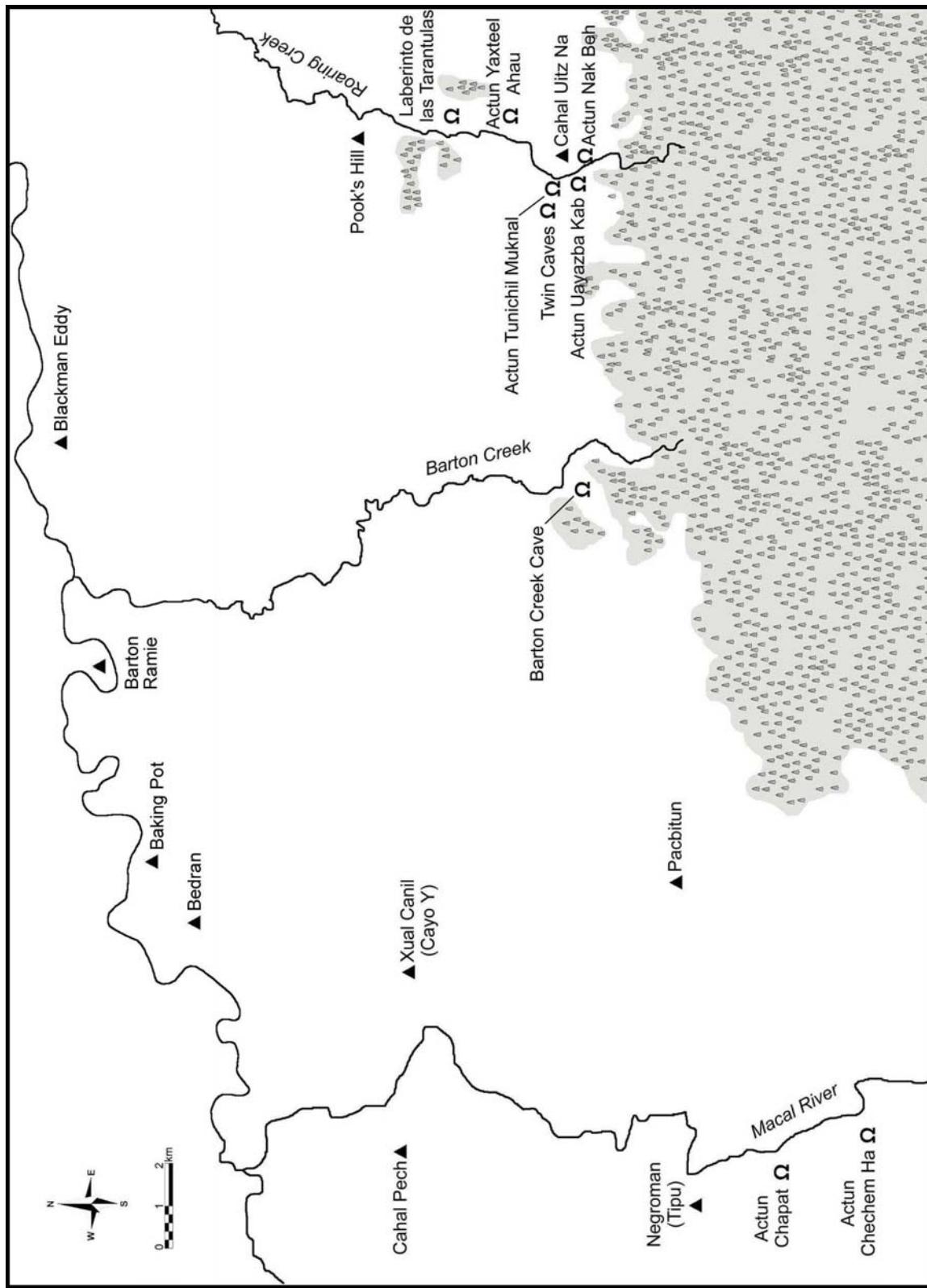


Figure 5: Modern distribution of pine in the upper Belize River valley, in relation to ancient sites.

species were recovered: coyol palm (*Acrocomia aculeata*), hog plum (*Spondias* sp.), and calabash (*Crescentia cujete*). In addition, wood charcoal from avocado (*Persea* sp.) and chico sapote (*Manilkara* sp.) were found. Because their fruits were not retrieved, the wood charcoal may actually indicate the use of these species for fuel wood or construction material. Avocado and chico sapote fruits have been recovered at other sites in the Maya lowlands, however (Lentz 1999: Table 1).

Three Maya sites that have produced notable archaeobotanical evidence of arboriculture include Copán, Honduras, Cerros, Belize, and Wild Cane Cay, Belize. At Copán, the coyol palm was the dominant plant food in terms of weight (13.66 grams of coyol versus 4.62 grams of maize [Lentz 1991: Table 1]), leading Lentz (1990) to conclude that the coyol palm was one of the most prevalent food crops in the Copán Valley. At the Formative period site of Cerros, located in northern Belize, there is evidence of changing patterns of food production involving palms and other tree crops (Cliff and Crane 1989). Maize was the dominant macrofossil recovered throughout all time periods. As Cerros became more sociopolitically complex, however, there was a reduction in maize and a concomitant increase in nancé (*Byrsonima crassifolia*) and coyol. Wild Cane Cay, a Late Classic period to Postclassic period site on the Caribbean coast of Belize, is another site that has yielded a significant number of tree fruits, such as cohune, coyol, coconoboy (*Bactris* sp.), nancé, hog plum, avocado, and calabash (McKillop 1994). The distribution of maize is limited compared to tree crops (McKillop 1994: Table 1), suggesting that the inhabitants of Wild Cane Cay had a greater reliance on tree cropping than other cultivation practices.

CONCLUSION

While the botanical data recovered from Pook's Hill is minimal compared to other sites in the Maya region, the assemblage provides informative insight into ancient Maya ethnobotany. Overall, the data are in conformity with what is now known about prehistoric Maya subsistence strategies. Maize, chile peppers, and squash have been recovered from numerous archaeological sites, and they were no doubt basic elements in Maya dietary practices. Also, the archaeobotanical data provide indirect evidence that the ancient inhabitants of Pook's Hill practiced some form of tree-cropping. Finally, the overwhelming dominance of pine charcoal from Pook's Hill indicates that pine was a highly valued resource that served many functions, such as domestic firewood, construction materials, and ceremonial burning. Overall, the archaeobotanical remains from Pook's Hill provides a brief glimpse at a much more complex and diverse sphere of human-plant interactions. Future research will likely further illuminate these processes.

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**REPORT ON AN INFORMAL MEETING ON MAYA CERAMICS
FROM WESTERN AND NORTHERN BELIZE,
SATURDAY, 1 JULY 2000**

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University of California, Riverside**

**Jaime J. Awe
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INTRODUCTION

In the summer of 1999, Jaime Awe of the BVAR Project organized an informal meeting for archaeologists working in northern Belize and the Belize Valley in an effort to discuss different approaches to ceramic analyses in the two sub-regions. The idea for the meeting arose during a visit to the BVAR Project by Marilyn Masson when she examined some Post-Classic ceramics from the site of Baking Pot. At this time it was noted that certain type:variety names utilized by Masson and Awe differed due to contrasting typological identifications in two discrete ceramic sequences and because the respective projects employed separate modal and stylistic attributes in the study of ceramic collections.

For northern Belize, paste was considered a primary attribute for determining temporal placement. In contrast, BVAR archaeologists employ a type:variety mode format for identifying diagnostic temporal markers. Because regional variation occurs with all ceramic industries, either approaches are adequate, depending on the region and perhaps the type or ware in question. However, when comparing pottery types that crosscut regional borders, discrepancies in typological analysis can create problems in their identification. It became apparent, therefore, that archaeologists across the Maya area should attempt to standardize the method for examining ceramics and formulating ceramic sequences that would be compatible across site boundaries and regions. We recognized that this could only be achieved through frequent communication among ceramicists from the different sub-regions. In view of the above, the major objectives of the informal session were to address these concerns, to allow researchers in the two areas to exchange information, and to provide students an opportunity to participate in a very informative meeting on archaeological methodology.

Below, we describe some of the ideas discussed by the participating ceramicists. It should be noted, however, that these ideas do not represent all the themes discussed during the meeting. Indeed, the session included many interesting and valuable perspectives, far more than this brief report can outline.

SOME NOTES FROM THE SESSION

From the Belize Valley, Lisa LeCount demonstrated some interesting conclusions from her ceramic analysis on the Xunantunich collection. LeCount noted that at Xunantunich, 40 % of the ceramic assemblage is Fugitive Black bowls (Mount Maloney Black bowls), a Late Classic type for which she has established a microseriation based on lip form. With regard to bowls, black-slipped pottery seems to be the prominent monochrome in the upper Belize River Valley. In contrast, Awe and Helmke noted that red-slipped bowls (Garbutt Creek Red) are the dominant Late Classic type bowl at sites in the middle regions of the valley (primarily Roaring Creek Valley).

As for jars, LeCount noted that earlier specimens have a smaller rim. Within the chronological framework from the Late Classic to the Terminal Classic period, the rims of the jars of Cayo Unslipped and Alexanders Unslipped (both of which are Uaxactun Unslipped Ware) become more everted. In the Terminal Classic, the lips of the thick rims are folded over on the exterior. Here, LeCount explicitly defines the time period of the Terminal Classic (TC) phase to be 800-900 A.D.

The type Daylight Orange: Darknight Variety, is easily distinguished by its characteristic orange-and-black patterned fireclouding on the interior of dishes or shallow bowls with outflared walls, sometimes with tripod supports. This type is attributed to the Postclassic period in Gifford's typology at Barton Ramie (1976), but research by the BVAR project indicates that this type is present from the Terminal Classic. It was further pointed out by Christophe Helmke (BVAR) that the vessel forms of Daylight Orange: Darknight Variety are reminiscent of vessels of the Roaring Creek Red: Roaring Creek Variety. This observation is supported by LeCount's comment that height of pedestal and size of everted lip of the Roaring Creek Red type are both temporal markers. However, a unique specimen discovered in one of the caves in the Roaring Creek Valley (BVAR) displays a mosaic of attributes of the Daylight Orange vessel with its typical surface treatment but with hollow bulbous tripod feet. This is a good example of a transitional specimen, where the vessel form and the tripod support reflect different temporal stylistic attributes.

Also added to the list of Terminal Classic markers was the Tinaja Red type “carenated” tripod bowl (Sabloff 1975), and the McRae Impressed type bowls and dishes (which are relatively similar in form to the aforementioned Tinaja Red bowls). On another note, it is common in western Belize to consider jars with “pie-crust” rims as characteristic of the Terminal Classic; however, it was reported that they are not found in northern Belize, thus making it a more regionally specific temporal marker.

According to LeCount, at Xunantunich, polychromes occur but only represent 2 to 3 % of the entire ceramic assemblage and are only found in elite context. Furthermore, the relatively “crude” polychrome decoration of the Benque Viejo Polychrome type (of Spanish Lookout Complex) replaces the more finely decorated Saxche Orange Polychrome (Tiger Run) at Xunantunich. It was also noted that in the Terminal Classic phase, the Benque Viejo Polychrome type categorized by Gifford (1976) in the Spanish Lookout complex (700-900 A.D.) loses its polychrome decoration. LeCount therefore concluded that it could be implied that Benque Viejo Polychrome is of LC II date, and is eventually replaced by a non-polychrome with the same vessel form in the Terminal Classic period.

Within the Vaca Falls Group, the Roaring Creek Red type is characterized as having an orange to red slip, with its jars having a constricted rim, and with soft, calcite tempered paste. It was noted that there is a black-slipped version of the same type at La Milpa. Also in this ceramic group is Kaway Impressed, but LeCount mentioned that they are not found in abundance at Xunantunich, while on the other hand, it was noted that they occur in relatively high frequency at Baking Pot. Achote Black, attributed to the Tepeu 2-3 phase, was considered a poor temporal marker.

It was also interesting to note that mica is found as tempering in jars from Belize valley sites and Colha, but not at Cerros. Awe suggested that the reason for this may be that mica is a byproduct of the weathering of batholiths (granites) that are more common to the Macal River valley. Given that Colha is located on or near old Belize River channels, this material is also likely available in clay deposits at this site.

LeCount noted that common domestic forms should tell us more for temporal change, and Liz Graham pointed out the need for examination of domestic forms such as jars. This is particularly important for those interested in cave ceramic assemblages because unslipped jars generally represent the most common vessel forms at subterranean sites.

Linda Howie-Langs presented some interesting information on the use of granite temper at Lamanai. First of all, granitic temper can be discerned as pinkish inclusions (schist of granite) with sparkly specks (mica) while white inclusions are quartzite. The noteworthy point is that granite is only available in the Maya Mountains and in the Pine Ridge area. At Lamanai, the terrain of the area is limestone; thus, no granite can be obtained in the vicinity. However, it has been noted that granite is being used for temper in the coarse ware. Therefore, the commonly held view that fine ware moves from area to area as an item of exchange or trade does not seem to hold true for Lamanai; rather, Linda suggests that at Lamanai the coarse ware is what moves and the fine ware is made locally. Alternatively, it could mean that the Lamanai Maya imported the temper from the Belize Valley, or that it could have been collected in the Pine Ridge area across the eastern banks of the lake.

Finally, Awe discussed the ceramics recovered at some of the cave and surface sites by WBRCP and BVAR. He noted that in order to define a “cave assemblage;” it was first necessary to identify stratigraphic deposits from nearby surface sites. The reason being that materials in cave sites are generally not sealed in stratigraphic contexts, thus by comparing ceramics from the two types of sites, one could more accurately provide the temporal framework of ancient Maya cave use. Awe and Helmke also presented some of the ceramics from Actun Tunichil Muknal and Actun Yaxteel Ahau of the Roaring Creek Valley, as well as some illustrations of the ceramics from Actun Chechem Ha in the Macal River Valley.

SUMMARY

The informal ceramic session provided participants a special opportunity to exchange ideas on the archaeological ceramics in Belize. However, this is only the start of a dialogue that should continue in a collaborative effort to improve ceramic analytical methods and ceramic sequences that help explain ancient socio-political processes in the Maya area. We are grateful to all the ceramicists and archaeologists who gathered together with such short notice. In the future we hope to organize another session in which type collections from various sites will be available for participants to work with and handle.

Participants (in alphabetical order):

Jim Aimers, Carolyn Audet, Jaime Awe (Organizer), Grant Aylesworth, Juan Luis Bonor, Kathryn Brown, Josalyn Ferguson, Liz Graham, Nadine Gray, Christina Halperin, Christophe Helmke, Linda Howie-Langs, Gyles Iannone, Reiko Ishihara, Lisa LeCount, Dave Lee, Marilyn Masson, Vanessa Mirro, Jen Piehl, Terry Powis, Sonja Schwake, Jeff Seibert, Fred Valdez, Darcy Wiewall.

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