

Results of the 2010 Valley of Peace Archaeology Project: Cara Blanca and Yalbac

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National Institute of Culture and History
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Chapter 1

The 2010 Season at Yalbac: Goals and Results

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The major goals of the 2010 Valley of Peace Archaeology (VOPA) project consisted of a nine-week field program at Cara Blanca and Yalbac (April 25-June 26, 2010) (Figure 1.1). For the Cara Blanca program, divers explored eight of the 25 pools (see chapters 2-5). For the Yalbac program, our goal was to continue exploring plaza activities by completing excavations at Str. 3C and testing Plaza 2 and 3 edges and the Plaza 3 platform with the assistance of a six-week University of Illinois at Urbana-Champaign (UIUC) field school (see chapters 6-8). Finally, UIUC PhD student Colleen Lindsay began collecting botanical samples along the 11 km transect mapped by Kinkella (2009) to assess the possibility that the forest we see today is the result of ancient Maya forest management (see chapter 9).

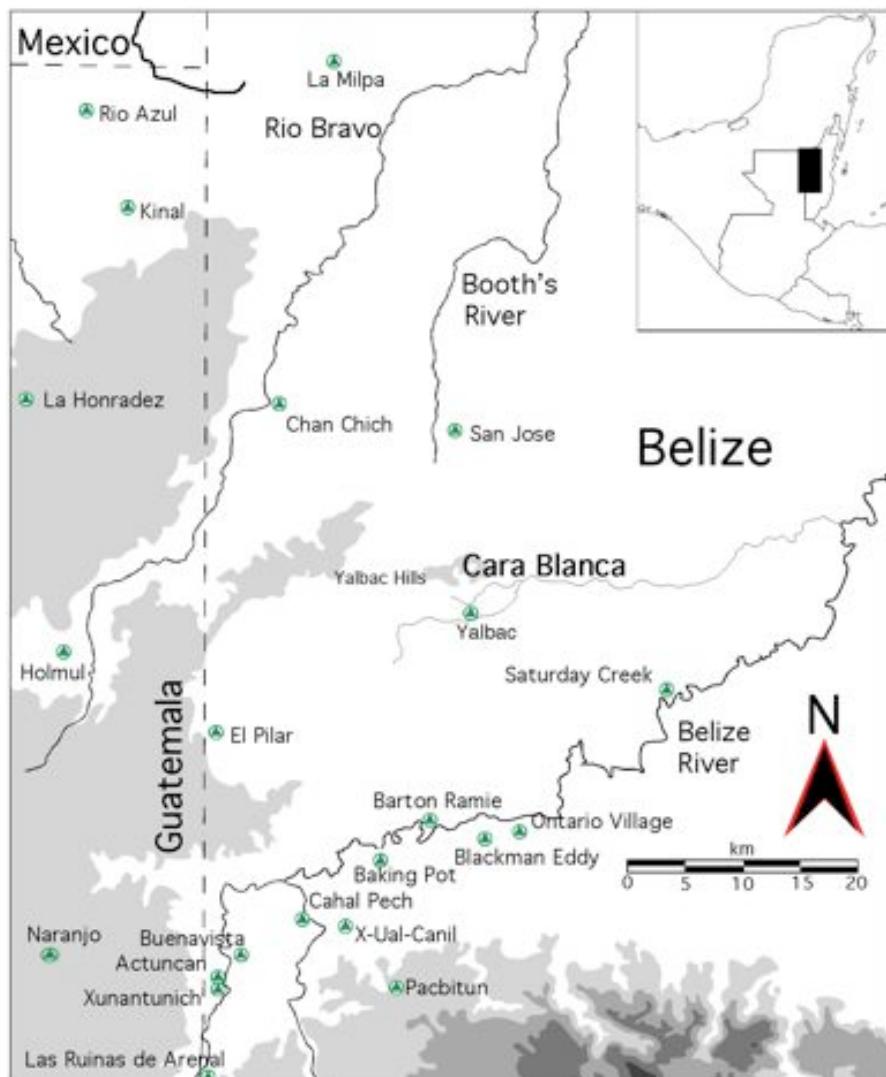


Figure 1.1 Map with location of Cara Blanca pools and Yalbac

Funding for the diving expedition was provided by a National Geographic Society grant (\$22,000) and an UIUC Arnold O. Beckman Award (\$20,846); funding for the six-week program at Yalbac was also provided by the Arnold O. Beckman Award, as well as an UIUC Research Board grant (\$11,100) for a grand total of \$53,946. The amounts listed below include project expenses only. Students paid their own expenses (airfare, tuition, food, IOA fees, transportation, etc.). Of the total, \$16,000 was spent to buy a used Grand Tiger 4 x 4 truck, \$5593.05 was for round-trip airfare for PI, two divers and field school staff; \$2851 was paid to the Institute of Archaeology for the permit application fee and administrative and consolidation fees; \$6018.38 for labor costs (including social security); \$1348.10 for vehicle insurance, maintenance, and registration; \$2524.04 for fuel (including roundtrip from Tulum for divers); \$1819.30 for food for PI (and dive team); \$8911.70 for lodging and lab at Banana Bank for PI, the dive team, and field school staff and one PhD student; \$9847.60 for supplies including phone cards, field equipment, copying, etc.; \$1764.50 for transportation costs; \$3500 for honorariums for divers; and \$23.13 for university credit card transaction fees. Total expenses for the 2010 season were \$60,200.80 (PI department funds provided the remaining funds).

The 2010 Cara Blanca crew consisted of myself as PI and the dive team, including Patricia Beddows, a hydrologist and geochemist from Northwestern University; Edward Mallon, who provided topside logistics; Marty O'Farrell, underwater videographer (<http://www.seaofarrell.com/>); and cave dive instructors Robbie Schmittner (<http://www.xibalbadivecenter.com/>), Kim Davidsson, and Bil Phillips (<http://www.speleotech.com/index.html>). Andrew Kinkella (Moorpark College) joined the team as the underwater archaeologist. Field assistants from the Valley of Peace village included Cleofo Choc, Ernesto Vasquez, Stanley Choc, Don Luna (Isabel Ascencio), and Juan Antonio Lópes.

The 2010 Yalbac staff consisted of myself as PI and two staff (who participated in the 2008 field school), Molly Haneberg and Eleonor Olszewski. Project members included eight field school students from the University of Illinois at Urbana-Champaign (Anth 454/455): Jose Gonzalez, Karl Lutz, Kayla Keller, Steve Lesniewski, Tara McGovern, Christopher Stillwell, Robbyn Travis, Hannah Woodard. Field assistants from the Valley of Peace Village included Cleofo Choc, Don Luna, Ernesto Vasquez, Jose Vasquez, Stanley Choc, Marcos Choc, and Juan Antonio Lópes. Mr. Scott maintained our equipment. Bob Hemm of the Explorers Club of New York City was responsible for documenting the expedition.

I took on a new role this season—tour guide. The first group (April 19-24) consisted of Roland Fletcher (University of Sydney, Co-Director, Greater Angkor Project) and Christophe Pottier (Director, Centre de l'École française d'Extrême-Orient à Siem Reap, Cambodia). There was also the board of directors of Forestland Group, Dr. Jaime Awe, geologists from Belize Natural Energy, Dr. and Mrs. Whalen, U.S. Ambassador to Belize Mr. Vinai Thummalapally and some of his staff including Political Officer Kelly McCarthy and Economic Officer Brianne Watts, and Hunter and Sheryl Jenkins of Forestland. We also had guests who helped in the field; first my niece came, Gabrielle Lucero (her first visit to Belize), then Jane Baldwin (her last visit was in 2002) and her father, James Arie (his last visit was in 1999). Finally, Jan Meerman, a biodiversity specialist, came to visit Yalbac and the pools as part of his biodiversity assessment of Yalbac Ranch properties.

Yalbac Ranch, on whose property the Yalbac lies, now have a security system in place to protect the 160,000 acres of jungles from illegal hunting, logging, and looting. We are now required to obtain visitor and vehicle passes. We also were required to sign release forms.

2010 Results

Cara Blanca (April 25-May 14)

The major goal of the April 26-May 15, 2010 diving expedition in central Belize was to ascertain if Cara Blanca cenotes served as portals to the underworld or Xibalba. We know that the ancient Maya left offerings in other portals, including in caves and northern lowland cenotes (Andrews and Corletta 1995). See chapter 2 for detailed descriptions of the diving expedition; chapter 3 for a discussion of the hydrology; chapter 4 for a preliminary identification of the fossils recovered from Pool 1; and chapter 5 for a description of pool settlement.

Yalbac Excavations (May 17-June 26)

Our season at Yalbac did not begin well; it rained the first day; and during the next two weeks we lost several days to rain. The last four weeks, in contrast, were largely dry and sunny.

Classic Maya public ceremonies typically bring to mind “top-down” ritual performances, that is, a ruler conducting rites atop a temple along with costumed performers, priests, ritual paraphernalia,

burning incense, music, and so on. This view disregards important ritual participants—the audience. The question of audience participation is important because audience members do more than just observe; they judge ceremonies and other public events (Bell 1997:73), and thus are active participants rather than passive witnesses (Houston 2006; Houston and Taube 2000). Successful rites integrate people, promote solidarity and result in more satisfied subjects or clients, not to mention a greater degree of obligation on both sides (Kertzer 1988). Without such participation—and people's acceptance of public messages—political plans fail. Exploring the spaces that contained the audience will help to understand how the public influences political relationships and how leaders engage their subjects. This is our goal at Yalbac.

Yalbac is located in the uplands near pockets of good agricultural land along a perennial stream, Yalbac Creek, in central Belize. It is a medium-size major center with at least six pyramid temples, several range structures, a ball court, three large plazas, and a royal acropolis over 20 meters tall (Figure 1.2) (Graebner 2002; Lucero et al. 2004). The excavated 1 x 2 m test pits in the centers of Plazas 2 yielded several construction phases consisting of plaster floors and cobble ballasts with ceramics dating from c. 300 B.C. to A.D. 900 (Conlon and Ehret 2002). Three temples, a ballcourt and a range structure encircle Plaza 2, while three temples and three smaller structures surround Plaza 3. Plaza 2 and 3 temple looters' trenches (LT) have revealed intriguing clues about their possible functions and subsequent means of attracting an audience. The variety in construction styles and artifact assemblages suggest that the Maya performed specific ceremonies at different temples (Lucero 2007). There would have been New Year celebrations, astronomical rites, ceremonies to the gods (e.g., maize, sun, rain, etc.), and accession, ancestor veneration, dedication, termination, and other rites.

Plaza 3

Our reasons for exploring areas near temples are that ritual paraphernalia had to be stored, and food for feasts prepared and stored somewhere near where they were used. Plaza 3 contains several features that may reflect such activities (see chapters 7 and 8). One such area is Str. 3C; it is relatively small (7 x 3 m, 1 m tall) and located between two large temples on a semi-restricted plaza (Plaza 3). In 2008, we exposed the structure and began trenching the central staircase (Otten 2009). We also came upon an inverted Kaway Impressed vessel (c. A.D. 800-900) on the north side of the building on the central axis associated with a burial, of which only the top of the skull was exposed. We were finally able to remove what little remained; further, since the burial was encased in a concrete-like plaster, it was slow going and the majority of bones came out fragments.

Str. 3C is a rectangular building with two staircases, one in the front and one on the west side, and is visible from the plaza, not to mention the temples. Originally we hypothesized that the structure served as a priest's house; after all, someone had to organize the rites and compile the necessary food and ceremonial items. Str. 3C may have served as a public place to gather or to bring and store large vessels filled with food and offerings. Alternatively, similar to what Thompson (1970:174-175) found in ethnohistoric sources, Str. 3C may have served as a temporary abode for priests or elites as part of preparatory rites (fasting, abstinence, e.g., Tozzer 1941:152). We removed the backdirt from Str. 3C (see Otten 2009; Lucero 2009) and bisected the structure north-south with a 1 m trench. Due to time constraints, we were unable to reach sterile bedrock.

We also placed a 2 x 1 m unit behind or north of Str. 3C to look for items that have either washed out of Str. 3C or were thrown down the plaza terrace edge. We called this unit 3C Ceremonial Trash South. While clearing this area, it became obvious that there is at least one platform/terrace wall below/ north of Str. 3C.

In 2004 we cleared and raked Plaza 3 and mapped what we think to be a Postclassic platform built with re-used stones (Lucero 2005). We placed a 2 x 1 m unit in its center to explore its function and determine its relationship to the surrounding plaza (c. A.D. 700-900) and Structure 3C.

The unit labeled 3A Stoneworks came about while Cleofo was clearing the plaza surface in front (east) of Temple 3A. He noted a line of cut and uncut boulders. In the process of following it out, we realized that it was rectangular in shape. We first exposed it entirely, and then placed a 2 x 2 m unit in the center to evaluate its possible function.

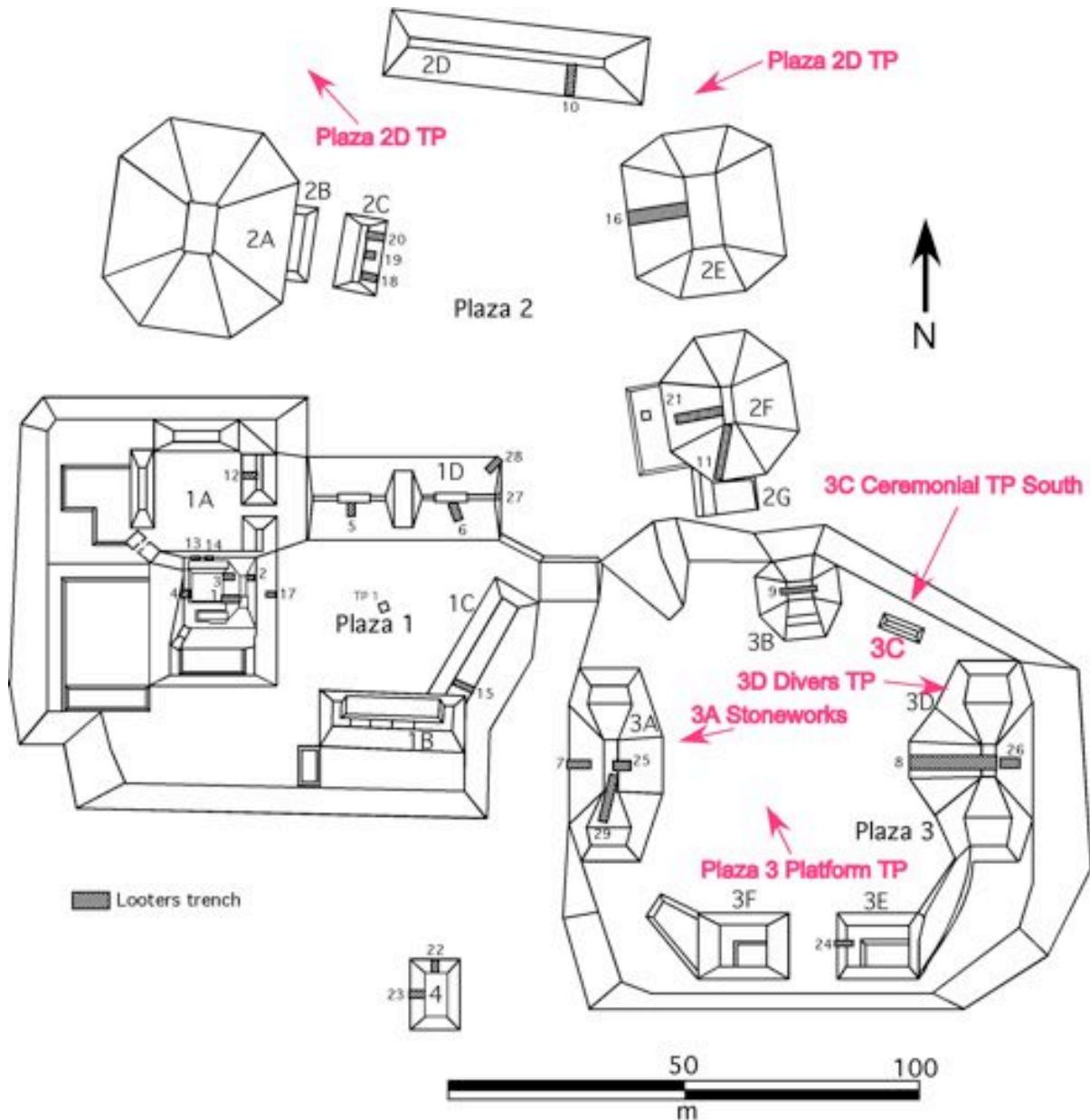


Figure 1.2 Yalbac with excavation areas noted

Our final unit in Plaza 3 was a 2×2 m unit we placed on the west edge of the north wing of Temple 3D. We named the unit 3D Divers TP in honor of the divers, who on a tour of Yalbac thought we should put in a unit to look for a tomb. Str. 3D is oriented north-south and has wings on its north and south sides. Postholes placed in front of Str. 3D in 2005 exposed a narrow platform c. 11 cm high (Lucero 2006). LT 8 revealed at least four terraces and yielded human skull fragments, sherds (vases, handles, lids, bowls, plates, spout, feet), obsidian blades, a slate disc, and a clam disc. At the roots of a fallen tree on the northwest side of Str. 3D, we found thousands of thin fine-grained pastel-colored chert blades and flakes, as well as many sherds (plates, jars, basal flange bowls, feet, handles, and decorated vessels) and a shaped white quartz pebble (Lucero 2003). We attempted to position the unit in the area with the highest concentration of lithic debris. The lithics likely came from over a tomb—the Maya were known to place thousands of chipped chert or obsidian flakes and blades over the lintel or roof of a tomb (e.g., Moholy-Nagy 1997). If a tomb is present, it is likely to be found higher up towards the center of the wing; the tree may have grown on the collapsed portion rather than falling from on top of the tomb.

An interesting feature of Plaza 3 is the plethora of thin chert debitage in nearly all units, beginning in 2001 with the plaza test pit (Graebner 2002), continuing through 2010 from the 3D Divers TP, Plaza 3 Platform TP, and 3A Stoneworks. However, no such lithics have been recovered in any noticeable quantity from Str. 3C. Further, there is evidence for occupation or use through the Terminal Classic period, and perhaps later.

Plaza 2

We also excavated two 2 x 1 m units on Plaza 2 edges to determine whether or not there is any ceremonial debris or midden areas (see chapter 6). Colonial documents write of Maya priests discarding ceremonial objects once they were finished conducting rites (e.g., Tozzer 1941). If we find such ‘ceremonial trash’ (Walker 1995), it would provide us an idea as to the types of rituals conducted. Plaza 2D TP is located between Str. 2C and 2D, while Plaza 2E TP is located between Strs. 2D and 2E.

All artifacts were washed, sorted, labeled, and photographed at Banana Bank (see appendix for artifact provenience information). Diagnostic artifacts were submitted to the Institute of Archaeology while non-diagnostic artifacts were placed in the units from which they came (bagged in 2 mm plastic Ziploc bags and labeled), covered in construction plastic and backfilled.

Landscape

Chapter 9, the final chapter, is by Colleen Lindsay, who is in the process of collecting botanical samples along Kinkella’s 11 km transect (2009) to assess the possibility that the forest we see today is the result of ancient Maya forest management. She describes her results from samples collected from the core of Yalbac and the first kilometer of the transect. Cleofo Choc showed Colleen the ropes and identified most of the over 200 different specimens collected. She could not have accomplished what she did without his help.

Concluding Remarks

Scholars have always known that the ancient Maya had a complex belief system that included several levels in the supernatural world. Water, with its role in life (aquatic life, drinking water, crops, rain, making pottery and plaster, and more) and death (floods, hurricanes, drought, disease, and more) was a vital component in their ceremonial existence. Further, with openings in the earth providing portals to Xibalba, the diving expedition at Cara Blanca will contribute to what has been missing in southern lowland Maya studies—a focus on underwater ceremonial life.

Ceremonial life at the surface is also important, especially since rituals, politics, and audience participation are inextricably linked. We know much about ritual and politics. What we lack is a firm grasp on how observers became “active participants.” One way to fill this gap is to start where the audience stood, observed, and participated—in the viewing areas, or in the case of the Maya, plazas. Excavations at Yalbac have already begun yielding intriguing clues as to what the audience did before (preparation), during (participate), and after (clean up, discard) large-scale public events for over 1000 years (Baltus 2009; Otten 2009). Further excavations are necessary to continue revealing a crucial element of Maya society, from the bottom-up. Further, little work has been conducted on ritual participation in large-scale public ceremonies. The significance of this project lies in bridging the gap between top-down and bottom-up perspectives. Thus, its applications lie beyond the Classic Maya in appreciating integrative mechanisms in complex polities from the perspective of all members of society.

The 2010 season goals, while diverse, are related because they show how important and rich Maya ceremonial life was. They also show the vital role both the built (temples, plazas) and natural (hills, pools) environment played in their daily lives.

Acknowledgements

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(www.bananabank.com); John and Carolyn Carr and their staff made us feel welcome. And special thanks go to Nathan Jaeger for allowing us to store the diving equipment in his shed. Sustenance in the field was provided by Mrs. Choc, whose breakfasts and lunches—and the all-important coffee—kept us well-fed and awake. Invaluable assistance during the diving expedition was provided by field assistants from the Valley of Peace Village—Cleofo Choc, Stanley Choc, Don Luna, Ernesto Vasquez, and Juan Antonio Lópes. At Yalbac, these field assistants were joined by Marcos Choc and Jose Vasquez. The diving expedition would not have been possible without grants from the National Geographic Society (#8673-09) and the University of Illinois via an Arnold O. Beckman Award. And the six-week program at Yalbac was funded by part of the Beckman Award, as well as a UIUC Research Board Grant. None of this would have been possible without the amazing team of divers put together by Patricia Beddows: Kim Davidsson, Marty O'Farrell, Edward Mallon, Bil Phillips, and Robbie Schmittner. Andrew Kinkella also provided the crucial archaeological perspective underwater. And a special thanks go to the field school students and the two staff (from the 2008 field school), Molly Haneberg and Elle Olszewski. And I was glad to have the able assistance of my niece, Gabs Lucero. Last but not least, I want to thank Katherine Cash, a student in my Fall Anth 469 course, The Ancient Maya, who wanted to get experience working on a project. Kate traced, scanned, and generated the line drawings in this report (unless otherwise noted).

References Cited

- Andrews, Anthony P., and Robert Corletta
 1995 A Brief History of Underwater Archaeology in the Maya Area. *Ancient Mesoamerica* 6:101-117.
- Baltus, Melissa R.
 2009 Non-Temple Ritual and Commemoration at Yalbac: Structures 2A and 2F. In *Results of the 2008 Valley of Peace Archaeology Project: Non-Temple Summit Excavations*, edited by L. J. Lucero, pp. 31-61. Report submitted to the Institute of Archaeology, National Institute of Culture and History, Belize.
- Bell, Catherine
 1997 *Ritual: Perspectives and Dimensions*. Oxford University Press, New York.
- Conlon, James M., and Jennifer J. Ehret
 2002 Time and Space: The Preliminary Ceramic Analysis for Saturday Creek and Yalbac, Cayo District, Belize, Central America. In *Results of the 2001 Valley of Peace Archaeology Project: Saturday Creek and Yalbac*, edited by L. J. Lucero, pp. 8-20. Report submitted to the Department of Archaeology, Ministry of Tourism and Culture, Belize.
- Graebner, Sean M.
 2002 Monumental Architecture and the Ancient Maya: The Royal Acropolis at Yalbac, Central Belize. M.A. Thesis. New Mexico State University, Las Cruces.
- Houston, Stephen D.
 2006 Impersonation, Dance, and the Problem of Spectacle Among the Classic Maya. In *Archaeology of Performance: Theater of Power, Community, and Politics*, edited by T. Inomata and L. S. Coben, pp. 135-155. Altamira Press, Walnut Creek.
- Houston, Stephen, and Karl Taube
 2000 An Archaeology of the Senses: Perception and Cultural Expression in Ancient Mesoamerica. *Cambridge Archaeological Journal* 10:261-294.
- Kertzer, David I.
 1988 *Ritual, Politics, and Power*. Yale University Press, New Haven.
- Kinkella, Andrew
 2009 *Draw of the Sacred Water: An Archaeological Survey of the Ancient Maya Settlement at the Cara Blanca Pools, Belize*. Unpublished Ph.D. dissertation. University of California, Riverside.
- Lucero, Lisa J.
 2003 Exploring Maya Politics: Yalbac, Central Belize. In *Results of the 2002 Valley of Peace Archaeology Project: Yalbac*, edited by L. J. Lucero, pp. 1-17. Report submitted to the Department of Archaeology, Ministry of Tourism and Culture, Belize.
- 2005 The 2004 Season at Yalbac: Plazas, Temples, and the Ballcourt. In *Results of the 2004 Valley of Peace Archaeology Project: The Temples and Ballcourt of Yalbac*, edited by L. J. Lucero, pp. 1-27. Report submitted to the Institute of Archaeology, National Institute of Culture and History, Belize.

- 2006 The 2005 Season at Yalbac: Public Places. In *Results of the 2005 Valley of Peace Archaeology Project: Yalbac Architecture and Settlement*, edited by L. J. Lucero, pp. 1-27. Report submitted to the Institute of Archaeology, National Institute of Culture and History, Belize.
- 2007 Classic Maya Temples, Politics, and the Voice of the People. *Latin American Antiquity* 18:407-427.
- 2009 The 2008 Season at Yalbac: Goals and Results. In *Results of the 2008 Valley of Peace Archaeology Project: Non-Temple Summit Excavations*, edited by L. J. Lucero, pp. 1-13. Report submitted to the Institute of Archaeology, National Institute of Culture and History, Belize.
- Lucero, Lisa J., Scott L. Fedick, Andrew Kinkella, and Sean M. Graebner
2004 Ancient Maya Settlement in the Valley of Peace Area, Belize. In *Archaeology of the Upper Belize River Valley: Half a Century of Maya Research*, edited by J. F. Garber, pp. 86-102. University Press of Florida, Gainesville.
- Moholy-Nagy, Hattula
1997 Middens, Construction Fill, and Offerings: Evidence for the Organization of Classic Period Craft Production at Tikal, Guatemala. *Journal of Field Archaeology* 24:293-313.
- Otten, Sarah E.
2009 Structure 3C: Revisiting Ritual Space. In *Results of the 2008 Valley of Peace Archaeology Project: Non-Temple Summit Excavations*, edited by L. J. Lucero, pp. 14-30. Report submitted to the Institute of Archaeology, National Institute of Culture and History, Belize.
- Thompson, J. Eric
1970 *Maya History and Religion*. University of Oklahoma Press, Norman.
- Tozzer, Alfred M.
1941 Landa's *Relación de Los Cosas de Yucatán*. Papers of the Peabody Museum of American Archaeology and Ethnology, No. 28. Harvard University, Cambridge.
- Walker, William H.
1995 Ceremonial Trash? In *Expanding Archaeology*, edited by J. M. Skibo, W. H. Walker, and A. Neilsen, pp. 67-79. University of Utah Press, Salt Lake City.

Appendix
2010 VOPA Provenience Data (Y=Y; CB=Cara Blanca)

Cat#	Sit e	Unit	Stratum/ Context	Description and comments
975	CB	Pool 1, underwater	23 m from 'x', Str. 4 @ 38°	Cayo Unslipped everted jar rim
976	CB	Pool 1, underwater	West side? near Str. 1?	Grey banded chert disc that may be modified and fire-cracked
977	Y	3C Trench	122 cobble surface	2 body sherds, 1 VA red-slipped slightly flared bowl rim sherd, exhausted chert core, 1 flake
978	Y	3C Trench	121 summit bulk	15 body sherds (including 1 VA), 1 VA red-slipped everted bowl/plate rim sherd, 6 flakes (1 FC), 1 jute, 1 Nephronaias shell fragment
979	Y	3C Trench	148 fill above 139	9 body sherds (1 in 10 pieces, 1 red-slipped VA), 1 biface fragment (hafted end), 1 flake
980	Y	3C Trench	115 floor	7 body sherds, 1 ~basalt fragment, 1 core, 4 flakes (1 FC)
981	Y	3C Trench	139 bench fill	13 body sherds (1 w/ ~carbonized surface), 1 Achote sherd, 1 Alexander Unslipped: Croja V rim; Spanish Lookout, 1 thin-walled red-slipped ~vase sherd with clink sound, 1 chalcedony/cloudy quartz chunk, 2 cores, 1 chunk, charcoal piece
982	Y	3C Trench	135 Top (bench)	1 body sherd
983	Y	Plaza 3 Platform TP	101	21 body sherds (2 red-slipped VA), 3 small rims (1 w/ black paste; 1 w/ orange and white inclusions, 1 VA bowl/plate), 3 limestone flakes, 16 thin, fine flakes, 4 yellowish ochre chunks, 2 chunks
984	Y	3C Ceremonial South (CTS) TP	101	128 body sherds (2 thick—1.47 cm, 1.07 cm), 1 handle, 1 flange, 6 necks, 30 rims, 2 bone fragments, 1 jute, 1 smooth spiral jute, 30 flakes (some ~quartz; 3 FC), 14 chunks
985	Y	CTS TP	102 surface	Ring base sherd
986	Y	CTS TP	102	78 body sherds (1 ~Achote, 1 w/ carbonized surface, several VA), 3 bases, 1 flange, 1 diagnostic sherd, 3 handles, 7 necks, 22 rims, 2+ Nephronaias, 19 jute, 1 Pomocea, 1 Pomocea fragment, 5 spiral ridge jutes, 6 smooth spiral jutes
987	Y	CTS TP	103 (originally labeled 102 inside wall 104)	25 body sherds, 2 necks, 2 bases, 3 rims, maroon ~shaped stone,
988	Y	3C Trench	139 Top (bench)	Jute
989	Y	CTS TP	102A	154 body sherds (including thick ones, 1.77 cm, and quite friable ones—one sherd crumbled, the remains of which were bagged separately), 4 diagnostic sherds, 4 bases, 6 necks, 6 handles, 53 rims, 2 possible lids, 1 obsidian blade fragment, 2 Nephronaias (1 fragment), 1 perforated animal tooth, 1 ~burned bone with holes through center, lengthwise, 2 phalanges, 9 bone fragments, 54 flakes (9 FC, 1 dark mustard yellow coarse chert), 4 FC cores, 13 chunks (5 FC), 1 white quartz chunk, 1 shaped hard fine-grained ls fragment, 1 drilled ls rock
990	Y	3A Stoneworks	101	200 body sherds (lots of VA red-slipped sherds), 12 necks, 16 bases, 79 rims, 1 flange, 1~lid, tiny sherd fragment with 'Maya blue,' 1 smooth and 1 ridged jute, 1 freshwater shell, 1 obsidian blade, 6 obsidian blade fragments, 9 bone pieces (1 incised/carved), 6 hematite mirror mosaic pieces, 2 interesting stone pieces, 1 biface fragment (tip/end?), 1 red geode, 1 ~drill, 4 cores (1 FC), 243 flakes (mostly thin, fine-grained; 7 FC), 11 striated flakes, 12 chunks (4 FC), 45 blades
991	Y	3A Stoneworks	102 (DL Pit)	17 body sherds (some thick, 1.55, 1.53 cm; some VA red-slipped), 7 rims, 2 small VA handles, 1 flange, 1 ring base, 1 ridged jute, 2 blades, 4 flakes
992	Y	3A Stoneworks North	101	183 body sherds (some VA red-slipped), 8 necks (1.56 cm, 1.54 cm), 8 bases, 47 rims, 5 diagnostic sherds, 2 bone pieces, 5 obsidian pieces, 4 chunks (1 FC), 32 blades, 1 worked blade, 1 biface tip, 98 flakes (1 FC),

				4 striated flakes; most flakes thin, fine-grained
993	Y	3D Divers TP	101	226 body sherds (one 1.61 cm thick, 1 black striated jar w/ buff interior), 19 necks, 44 rims, 1 jar rim, 1 diagnostic sherd, 1 foot (attached), 7 bases, 5 flanges, 1 laterite fragment, 1 metate piece, painted stucco piece, 1 ~chert drill, 1 obsidian blade, 1 chert adze tip, 1 biface hafted tip, 1 flake, 7 chunks (3 FC), and thin fine-grained flakes and blades: 2490 white-ish (5YR8, 10YR83, 10YR82) 11 black (75YR20) 1458 dark (10YR42, 25Y40, 25Y32) 770 red/pink (25YR53, 25YR62, 10R54, 10R64) 1108 orange (10YR66, 75YR46, 25YR66, 10YR76) 673 translucent (10YR72, 10YR62) 117 striated (25Y20, 25Y83)
994	Y	3D Divers TP	102 Near floor	19 small body sherds, 1 small rim, 12 thin and fine-grained blades, 29 thin and fine-grained flakes
995	Y	3C Trench	123 Top	1 body sherd, chunk of yellowish chalk (10YR83, 75YR76), flake
996	Y	3C Trench	123 Fill	24 body sherds (a few VA), 3 rims, 2 handles, 1 partial flange, 1 neck, 4 flakes (3 FC)
997	Y	3C Trench	149 Floor and ballast	16 body sherds (1 red-slipped VA), 2 waxy dark red slip (25YR36), 3 necks (jars), 1 chunk, 6 flakes (3 FC), 2 laterite stones, 1 burned stone, 1 orange-pink (10R68). Stones not collected
998	Y	Plaza 3 Platform TP	102	102 body sherds (several relatively thick: .43, .47, .45, .57, .54, .49, .42, .53, .43, .40, .52, .47, .42, .50 cm; noticeable VA sherds—soft and gritty), 2 bases, 2 sherds w/ 'cacao' decorations (one red-slipped VA, one blackened, ~VA, no slip), 22 rims (one is .57 cm thick), 2 bone pieces, 41 white-ish/light colored fine, thin blades (except 1), 134 fine, thin flakes (except 1; c. 4 striated), 5 larger flakes (3 FC), 24 chunks (5 FC; 1 white, milky quartz), 1 blue stone, 1 granite piece (too small to define form), tubular, vascular limestone, 1 incised (?) white fine-grained hard limestone piece
999	Y	3D Divers TP	104	38 body sherds (one is 2.1 cm thick), 4 necks, 6 rims, 5 flanges, 1 base, 1 diagnostic sherd, 3 FC chunks, 1 red oblong stone, 11 thin, fine-grained blades, 49 thin, fine-grained flakes (4 FC)
1000	Y	3C Trench	124 Wall	23 body sherds, 1 base, 2 rims, 1 diagnostic sherd, 2 flakes, 1 FC chunk
1001	Y	3C Trench	151 Wall	3 body sherds, 1 rim, 3 flakes
1002	Y	3C Trench	150 Floor	22 body sherds, 1 rim, 2 bases, 1 diagnostic sherd, 5 bone pieces, 8 chunks (5 FC), 5 pieces of vascular, tubular limestone
1003	Y	3C Trench	152 Floor	25 body sherds (3 are .84 cm thick), 1 thin VA orange sherd, 1 small rim, 1 ~flange, 2 diagnostic sherds, 4 neck (.96, 1.24, 1.07, 1.15 cm thick), 1 ridged jute, 1 ~quartz brown pebble, 4 limestone flakes, 6 flakes (3 FC), 5 chunks (1 FC)
1004	Y	3C Trench	153 Fill	40 body sherds (one .40 cm thick), 1 neck, 2 flanges, 8 rims, 2 diagnostic sherds
1005	Y	Plaza 3 Platform TP	103	4 small body sherds (VA), 1 small rim, 5 thin, fine-grained flakes
1006	Y	Plaza 3 Platform TP	104	197 body sherds (lots of Belize Red/VA red slipped; 1.19, 1.14, 1.48, 1.18, 1.26 cm thick), 6 necks, 1 base, 3 flanges, 2 diagnostic sherds, 27 rims, 1 obsidian flake, 2 obsidian blades, 1 core, 15 chunks (4 FC), 48 blades, 237 flakes (5 FC), 1 biface hafted end
1007	Y	Plaza 2D TP	101	153 body sherds (1.35, 1.21, 1.04, .97 cm thick), 4 necks, 2 Z-angle flanges, 2 stunted flanges, 1 ring base, 2 handles (look like the same vessel, but don't fit), 21 rims (most quite small), 11 blades (mostly fine, thin-grained), 25 flakes (3 FC; c. 50% fine, thin-grained), 6 chunks, 1 slate bark beater fragment, 1 obsidian blade, 3 small obsidian blades, 6 marine shell pieces, ~burned bone
1008	Y	Plaza 2E TP	101	225 body sherds (1.06, 1.10, .80, 1.10, .97, 1.22 cm thick; a few VA, several thin, red-slipped VA), 6 neck (1.53 cm), 6 painted sherds, 1 diagnostic sherd, 5 flanges (2 quite extreme—2.18, 2.32 cm), 28 rims, 1 large neck, 1 hollow slab foot piece, 2 flat bases, 1 small Z-angle, 1 ring base, 1 small jute, 1 ridged jute, 4 pieces of large marine shell, 2 obsidian blades, 7 bone pieces, 1 human tooth, 1 brown quartzite adze fragment (mostly whole), 7 blades, 35 flakes (5 FC), 6 chunks

1009	Y	Plaza 2E TP	102 and 103	48 body sherds (1.14, 1.09, 1.10 cm thick), 4 small rims, 3 diagnostic sherds, 2 necks, 3 flanges, 3 flakes
1010 (also 1026)	Y	3A Stoneworks TP	103	297 body sherds (lots of Belize Red—VA; 1.18, 1.38, 1.14, 1.06, 1.02, 1.12, 1.03, 1.08 cm), 12 necks (1.13, 1.15, 1.08, 1.48 cm), 1 diagnostic sherd, 1 flange, 6 ring bases, 2 nubbins, 1 hollow slab foot fragment, 1 flat base, 69 rims (mostly VA red-slipped—Belize Red), 18 chunks (5 FC), majority thin fine-grained: 300 flakes (5 FC), 92 blades, 1 bone piece, 1 granite 'flake,' 4 obsidian flakes, 29 obsidian blades (some quite small)
1011	Y	Plaza 2E TP	102	51 body sherds, 11 rims, 1 ring base, 6 necks, 1 chunk, 1 biface tip, 5 flakes (1 FC), 1 ~Nephronaias shell piece
1012	Y	Plaza 2E TP	103	83 body sherds, 4 necks, 2 flanges, 1 ~handle fragment, 1 spout/figurine fragment, 15 rims, 1 obsidian blade, 1 marine shell
1013	Y	Plaza 2E TP	103A	55 body sherds (1.13 cm), 3 necks, 1 ring base, 1 handle fragment, 6 diagnostic sherds, 16 rims, 2 obsidian blades, 1 disk pebble, 3 jutes, 1 ridged jute, 1 Nephronaias, 8 chunks, 2 cores, 7 flakes (2 FC)
1014	Y	Plaza 2E TP	104	103 body sherds, 7 necks, 8 flanges, 1 diagnostic sherd, 1 ring base, 1 nubbin handle, 1 straight strap ~handle, 18 rims, 2 obsidian blades, 1 obsidian flake, 18 flakes (3 FC), 1 hammerstone, 8 chunks (2 FC), 2 Nephronaias, 1 ridged jute, 1 burned bone
1015	Y	Plaza 2D TP	102	17 body sherds, 4 necks, 1 flange, 4 rims, 1 marine shell, 1 flake
1016	Y	Plaza 2D TP	103	36 body sherds, 2 necks, 2 flanges, 1 handle, 7 rims, 5 flakes, 4 chunks
1017	Y	Plaza 2D TP	104	10 body sherds, 1 flange, 2 necks, 1 rim, 1 worked flake, 1 Nephronaias
1018	Y	Plaza 2D TP	105 (incomplete)	64 body sherds, 3 necks, 1 solid nubbin, 9 rims, 12 flakes (1 FC), 1 brown quartzite pebble
1019	Y	Plaza 2D TP	106 (incomplete)	10 body sherds, 1 flange, 1 rim, 2 diagnostic sherds (all quite small), 1 metate piece (fine basalt?), 3 flakes (2 FC)
1020	Y	Plaza 2D TP	107 (incomplete)	6 body sherds, 1 neck, 1 rim, 1 flake
1021	Y	Plaza 3 Platform TP	104	47 body sherds, 3 necks, 1 ring base, 17 rims, 2 diagnostic sherds, 5 flakes
1022	Y	Plaza 3 Platform TP	105	90 body sherds, 3 necks, 1 diagnostic sherd, 1 base, 19 rims, 7 bone pieces, 1 obsidian blade, 7 chunks, 16 thin fine-grained chert blades, 77 flakes (mostly thin fine-grained)
1023	Y	Plaza 3 Platform TP	106	50 body sherds, 3 necks, 1 flange, 17 rims, 1 core, 6 blades
1024	Y	Plaza 3 Platform TP	107	31 body sherds, 3 necks, 1 ~foot, 1 sherd with lace hole, 1 ~handle, 1 flanges, 8 rims, 25 flakes
1025	Y	Plaza 3 Platform TP	108	2 body sherds, 1 neck, 2 minuscule rims
1026 (also 1010)	Y	3A Stoneworks TP	103	71 body sherds, 8 necks, 4 flanges, 3 ring bases, 1 hollow ~foot fragment, 1 diagnostic sherd, 29 rims, 2 flakes, 1 blade, 3 bone pieces, 2 ridged jutes, 1 marine shell piece
1027	Y	3A Stoneworks TP	104	84 body sherds, 21 necks, 1 flange, 1 flat base, 4 ring bases, 1 diagnostic sherd, 28 rims [light pinkish hue to ceramics], 50 thin fine-grained blades, 4 chunks, 114 thin fine-grained flakes, 1 limestone bead piece, ~coral piece, incised/drilled marine shell mosaic piece, incised bone, 3 bone pieces, 15 obsidian blades (5 fragments)
1028	Y	3A Stoneworks TP	105	131 body sherds (a few Belize Red—VA red-slipped), 11 necks, 2 flanges, 4 handles (including long strap handle), 4 diagnostic sherds, 1 hollow foot (in 2 pieces), 2 flat bases, 1 ring base, 38 rims, 4 blades, 7 chunks (3 FC), 33 flakes (5 FC), 4 jutes, 6 smooth jutes, 3 ridged jutes, 3 Nephronaias, 1 marine shell piece
1029	Y	3A Stoneworks TP	106	17 body sherds, 1 diagnostic sherd, 1 large handle, 5 rims (3 very small), 1 ridged jute, 1 obsidian blade fragment, 8 flakes (1 FC)
1030	Y	3D Divers TP	105	34 body sherds, 1 neck, 3 flanges, 3 ring bases, 1 diagnostic sherd, 1 large hollow black foot, 8 rims, 15 flakes (c. half thin, fine-grained), 1 blade, 2 chunks, 3 small jutes, 1 ridged jute, 3 Nephronaias, charcoal
1031	Y	3D Divers TP	106	117 body sherds, 6 necks, 3 handles, 2 flanges, 2 ring bases, 21 rims, 19 blades, 3 chunks (1 FC), 145 flakes (3 FC; most thin, fine-grained), 2

				bone pieces, 1 obsidian flake, 2 obsidian blade fragments, 1 Nephronaias (in pieces), 1 Pomocea piece, 5 jutes, 1 ridged jute, 1 painted stucco piece, 1 charcoal piece
1032	Y	3D Divers TP	108	8 body sherds, 1 ceramic figurine fragment, 2 rims, 1 quartz blade, 1 obsidian blade, 1 large smooth jute, 1 Nephronaias, possible quartzite mano
1033	Y	3D Divers TP	109	13 body sherds, 1 neck, 1 diagnostic sherd, 2 rims, 13 thin fine-grained flakes,
1034	Y	3C Trench	147	3 flakes, 1 charcoal piece
1035	Y	3C Trench	146	6 body sherds, 1 diagnostic sherd, 1 rim, 1 small core
1036	Y	3C Trench	153	57 body sherds, 9 necks, 2 handles, 3 flanges, 5 rims, 1 ridged jute, 2 large bone pieces, 4 chunks (2 FC), 2 flakes, 1 smooth pebble, 1 prepared brown core
1037	Y	3C Trench	154	6 body sherds, 1 diagnostic sherd, 2 flakes
1038	CB	Pool 1, Str. 1	Looters' debris (SE)	8 body sherds, 1 neck, 6 rims
1039	Y	3C Trench	155	16 necks, 415 body sherds, 9 diagnostic sherds, 3 feet, 7 ring bases, 1 flat base, 1 ~foot attachment, 9 flanges, 93 rims, 53 flakes (c. 10 FC), 17 chunks (c. 4 FC), 8 blades, 1 biface fragment (hafted end), 1 blue worn chert chunk, burnt plaster, charcoal piece, 8 jutes, 2 ridged jutes, 2 freshwater shells, 4+ Nephronaias, 1 ~limestone mosaic piece, 5 obsidian flakes, 1 obsidian flake, 12 pieces of bone from a large mammal (4 phalanges, 1 ~femur, vertebrae), 1 burned bone, 1 small mandible (rodent?), c. 15 smaller bone pieces (29 total)
1040	Y	3C Trench	156	428 body sherds, 9 necks, 10 diagnostic sherds, 3 ring bases, 17 flanges, 61 rims, 10 jutes, 2 ridged jutes, 1+ Nephronaias, 1 marine shell piece, 3 obsidian blades, c. 31 bone pieces (most from a large mammal; 4 burned), 6 chunks, 1 granite piece, 11 flakes
1041	Y	3C Trench	160 Top	Basal flange and rim
1042	Y	3C, Unit 13	Burial 145	Skeletal remains

Non-diagnostic artifacts—body sherds, flakes, and chunks—buried while backfill in units from which they came. Diagnostic artifacts stored in locked shed at Banana Bank. Unless noted, lithics are chert.

Smooth jute: *Pachychilus indiorum*

Ridged jute: *Pachychilus glaphyrius*

Chapter 2

Exploring the Sacred Pools of Cara Blanca, Belize

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The major goal of the April 26-May 15, 2010 diving expedition in central Belize was to ascertain if Cara Blanca *cenotes* served as portals to the underworld or Xibalba. We know that the ancient Maya left offerings in other portals, including caves (e.g., Actun Tunichil Muknal) and northern lowland *cenotes* (e.g., Chichén Itzá) (Andrews and Corletta 1995; Bassie-Sweet 1996; Schele and Miller 1986:42). Cara Blanca ('white face') in central Belize consists of 25 pools along the base of a limestone escarpment (up to ca. 80-100 m high) (Figure 2.1). The far western and eastern pools lie level with the ground surface, making these more pond or lake-like, while the central water bodies include exposed bedrock cliffs, a feature commonly associated with *cenotes*, or karstic sinkholes (Beddows 2003). We dove eight of the 25 pools. They are unique in that they are deep (up to 60+ m), and one (Pool 1) has associated buildings, likely ceremonial (Kinkella 2009; Lucero and Kinkella n.d.).

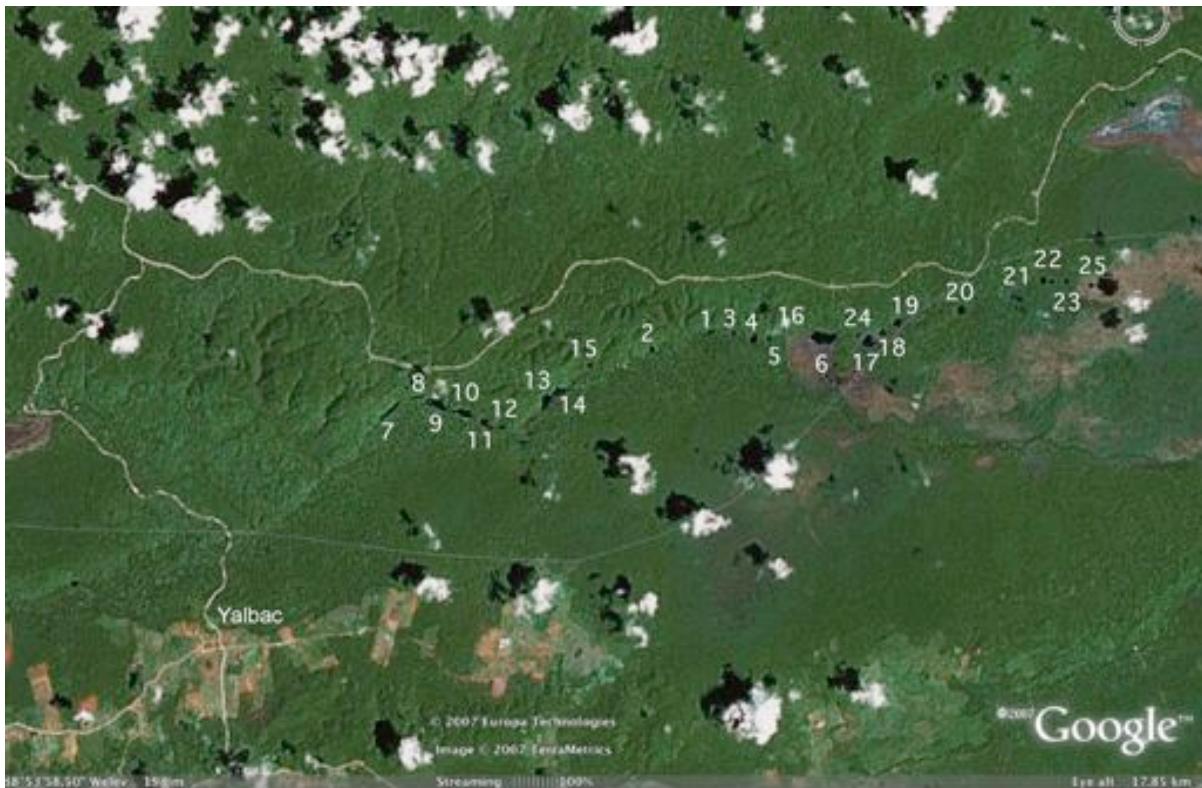


Figure 2.1 Google Map with Cara Blanca pools labeled

We have now visited the 22 of the 25 pools over the years (Nos. 1-21, 24), five of which have associated settlement: Pools 1, 7, 8, 9, and 20 (Kinkella 2009). The survey conducted in the surrounding cliffs to the north and *bajos* (seasonal swamps) to the south has thus far revealed little additional settlement. With the abundant year-round water and good agricultural land just beyond the pools, one would expect to find dense settlement, especially given the annual dry season when water became critical. The sparse settlement may indicate that Cara Blanca served as a sacred place to the ancient Maya because of its concentration of natural, sacred features in the form of mountains and portals.

The supernatural world of the Maya included three layers, an upperworld or heaven with 13 levels, the earth, and the underworld with nine levels (Schele and Freidel 1990:67). Other sacred features include mountains, home to the ancestors who are reached through visiting and leaving

offerings in portals (e.g., Kunen et al. 2002). Unlike at centers such as Tikal, Caracol and others, the Maya did not have to build artificial counterparts at Cara Blanca in the form of temples that represented mountains, temple doorways caves, and reservoirs pools (Fash 2005; Kinkella 2009; Lucero 2006a, 2006b; Lucero and Kinkella n.d.; Scarborough 1998, 2003).

Test excavations conducted in previous seasons at several structures at Pool 1 yielded mostly jars (63%) dating to the end of the Late Classic period, or c. A.D. 800-900 (Kinkella 2000, 2004), an atypical ceramic assemblage indicating a specialized rather than a residential function (e.g., Lucero 2001:Table 5.2). The Maya may have collected sacred water in jars for special ceremonies that took place either at the pool or at the closest centers (e.g., Saturday Creek, Yalbac, San Jose), similar to those documented at Zinacantecos in Chiapas, Mexico, where shamans' assistants collect water from sacred waterholes for curing ceremonies (Vogt 1993:63-65; see Taube 2001). We also could be dealing with a situation similar to that suggested for several cave deposits—that is, evidence for a drought cult at the end of the Late Classic when Maya intensified ritual activities to supplicate rain gods to bring an end to the drought (Moyes et al. 2009). Large caves have not been found in the area as of yet, likely due to the soft marl limestone present ('incompetent' limestone), which would also explain the 'white face' resulting from pieces having broken off (Beddows, pers. comm., 2008). This being said, several smaller caves and rock shelters have been noted with ceramics and features suggesting their ritual use (Kinkella 2009). The lack of large caves also signifies that the pools are the only major portals in the vicinity.

Diving Cara Blanca Pools

To begin exploring its sacred nature of Cara Blanca, I organized a preliminary diving expedition (April 26-May 15, 2010) to ascertain if Cara Blanca cenotes served as portals to the underworld.¹ The dive team was coordinated by Patricia Beddows, a hydrologist and geochemist from Northwestern University, and included Edward Mallon, who provided topside logistics; Marty O'Farrell, underwater videographer (<http://www.seafarrell.com/>); and cave dive instructors Robbie Schmittner (<http://www.xibalbadivecenter.com/>), Kim Davidsson, and Bil Phillips (<http://www.speleotech.com/index.html>). Andrew Kinkella (Moorpark College) joined the team as the underwater archaeologist. The divers, several of whom have been exploring and mapping the extensive underwater cave systems in the Yucatán in the northern lowlands, noted that Cara Blanca pools are unique—especially their depth and geology. For example, Robbie Schmittner noted that the majority of cave systems in the northern lowlands can be relatively shallow (up to c. 25 m), but can extend horizontally for kilometers.

The compressor, oxygen tanks, and scuba tanks and gear were stored in a Banana Bank Lodge shed. Divers checked the pressure on the tanks before they loaded them and their gear onto two trucks each morning. We drove c. 20 minutes to the Valley of Peace village to the Choc residence for breakfast. Field assistants Cleofo Choc, Stanley Choc, Don Luna, Ernesto Vasquez, and Juan Antonio López met us there before we headed out to the pools. It took us about 25 minutes to reach the south gate of Yalbac Ranch², on whose property the Cara Blanca pools lie. They have a security system in place to protect the 160,000 acres of jungles from illegal hunting, logging and looting, which required us to obtain visitor and vehicle passes. As a matter of fact, we had originally planned to camp at the pools; but they have had problems with illegal loggers coming over from Guatemala, just c. 30 km to the west.

Since the pools were located several kilometers from the main all-weather road, we used 4WD trucks to drive up to the pools. Yalbac Ranch personnel, especially Lloyd Castellanos and Jeffrey Roberson, cleared old logging roads, which meant that we could drive to most pools. The first few days were a bit slow going because we had to stop every so often so the guys could fix the road (e.g., by placing logs in ruts or by using a chain saw to remove stumps). Keeping track of all this information was myself, with assistance from Bob Hemm of the Explorers Club, New York City. Marty O'Farrell shot footage above and below the water surface and has some fabulous footage, as well as interviews of all project members (see <http://www.news.illinois.edu/news/10/0721dive.html>). Forestland Group also funded an airplane trip over the pools for Marty and myself.

Yalbac Ranch provided us with a satellite radio to contact their front office in case of an emergency. We had a med-evac procedure in place in case of snakebite, the bends, or any other medical

¹ Funded by a National Geographic Society grant and an University of Illinois Arnold O. Beckman Award.

² Owned by Forestland Group (www.forestlandgroup.com).

emergency. An ambulance helicopter had the coordinates of the main road from which we turned off onto logging roads.

As mentioned, we explored eight of the 25 pools: 1, 2, 3, 4, 5, 6, 16, and 20 (Table 1; see appendix for details):

Table 1. Pool features

Pool #	GPS Format	UTM easting	UTM northing	Elevation (m)*	Depth (m)
1	WGS84	301026	1927140	56	60+
2	WGS84	300140	1926909	50	5
3	WGS84	301300	1927158	56	5
4	WGS84	301683	1927021	58	13
5	WGS84	301942	1927021	62	20
6	WGS84	302795	1927154	47	18
16*	WGS84	302174	1927176	70	13
20**	NAD27 Central Datum	304753	1927404	51	>35♦

*uncertain accuracy

**recorded in 2010

*only cenote with water level below pool edges (c. 10 m)

♦bottom not reached

Once we arrived at a pool, which took anywhere from 20 to 40 minutes to reach from the south gate, the divers prepped to go into the water. Divers taught the field assistants how to handle the tanks. When a pool was first explored, the cave exploration divers first went in for one to two hours, which in the beginning consisted of Schmittner and Davidsson, who were later joined by Phillips and O'Farrell. Once they came back with the general details of the pool (depth, visibility, bottom cover, etc.), other divers would go in, including Beddows and Mallon to collect rock samples, to take in the hydrolab (for physical-chemical profiling), to identify inflows/outflows; and Kinkella to look for artifacts. The second group of divers dove up to c. 35 m, which still provided them with plenty of things to discover and information to collect. Each team did one dive per day. By the time they were rested and the gear loaded up, we did not get back to Banana Bank until between 4:00 and 6:30 pm. Then divers had to fill the tanks (nitrox) at the shed, which often took several hours. We then discussed the next day's plans over a few beers or rum (with water or coke, depending).

Pool 1

Pool 1 is a steep-sided cenote (c. 100 x 60 m) surrounded by seven mounds (Figure 2.2). Looters' trenches show that the largest structure (Str. 1, 22 x 15 m, 4 m tall) is a vaulted range building consisting of six rooms, three to a side, radiating out from a central spine wall with a series of four pillar-like walls that run the poolside length of the structure. The structure sits so close to the pool's edge that part of its eastern wall has collapsed into the water. Kinkella (2009:176) posits that Str. 1 may have served as a sweatbath based on its similar configuration to one at Piedras Negras. In addition, a larger group of mounds is located c. 400 m west of Pool 1 (and c. 400 m east of Pool 2) consisting of 15 mounds including several range structures and a sweatbath (Kinkella 2008) (Figure 2.3). There was a preliminary dive in 1998 to c. 20 m (Kinkella 2000; Osterholtz 1999), but we realized we needed experienced deep cave divers due to its obvious depth.

On the first day, Schmittner and Davidsson discovered a massive cave entrance beginning 30 m below surface that extended to 60 m, or the pool floor, which we named Actun Ek Nen (Black Mirror Cave). They, along with Phillips and O'Farrell, explored it further to reveal that it is at least 40 m wide (at 40 m below the surface) and 80 m deep—which according the Belize Institute of Archaeology files makes it the largest freshwater cave on record in Belize. There is a possibility that a passage leads to dry land; if so, we would need to find the cave entrance on the escarpment.

The depth of the pool is impressive as well; according to a list of deepest caves in Quintana Roo, Mexico (<http://www.caves.org/project/qrss/qrdeep.htm>), Pool 1 would be the 4th or 5th deepest. Divers mapped its dimensions by attaching knotted nylon line (every 10 feet) at various depths (5-6 m, 14-16 m) of the pool perimeter spiraling down to c. 40 m. They also laid a line north-south bisecting the pool at c. 40 m deep to map its bathymetry (underwater topography) (Figure 2.4). The pool floor at center is

higher (c. 35 m) than towards the cliff face (60 m). In other words, the pool bottom slopes down north towards the escarpment. This fact begs the question if the slope continues its downward slope once inside the cave. The walls of the *cenote* are steep, though there are slight ledges at c. 7 m deep and 20 m.

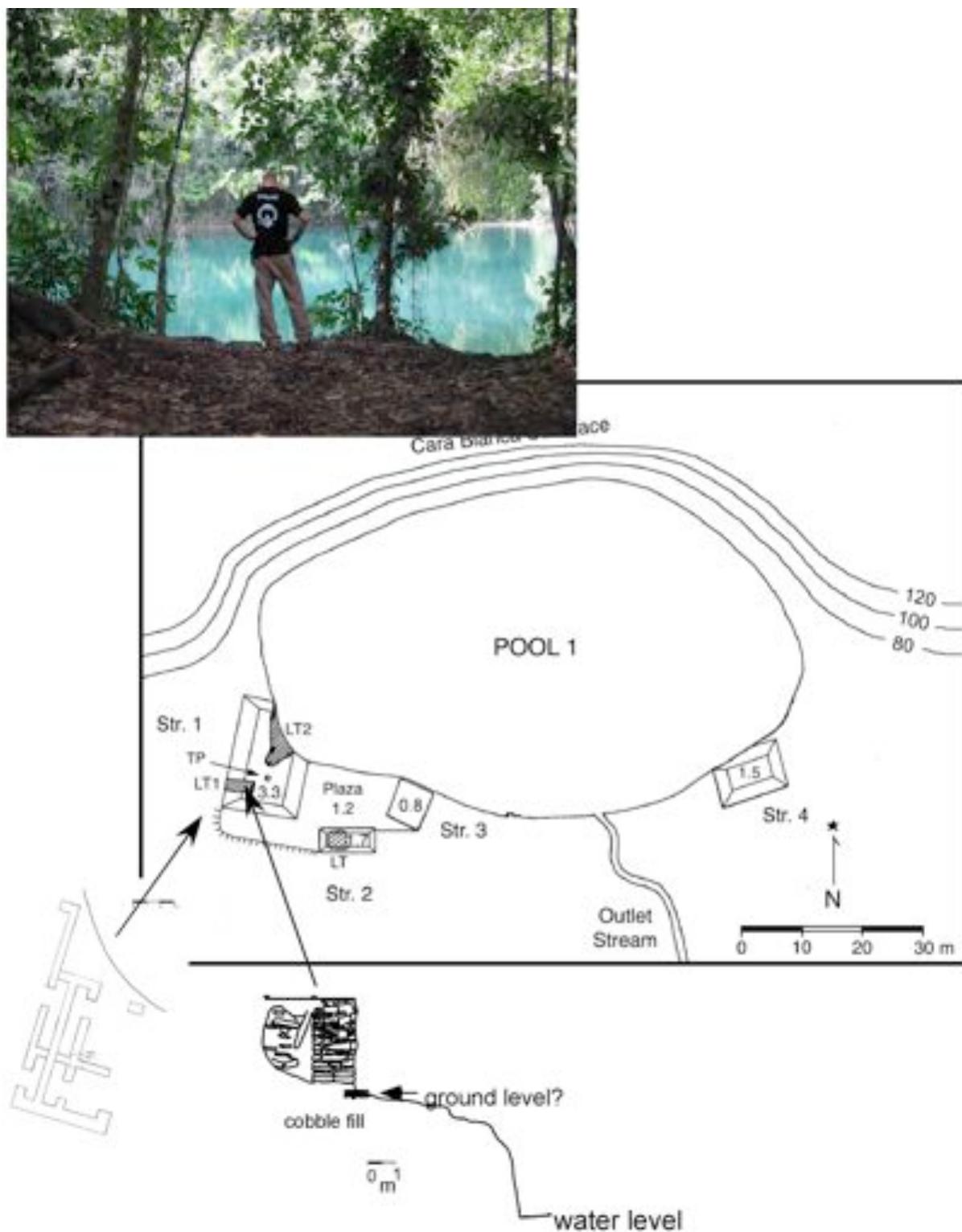


Figure 2.2 Pool 1 (line drawings by A. Kinkella)



Figure 2.3 Pools 1 and 2 settlement and sweatbath architecture (line drawings by A. Kinkella)

Along the steep *cenote* walls in the northwest side, divers also discovered geological beds laden with fossilized mega-fauna bones (e.g., tusk, humerus, pelvis, vertebra, etc.), the first recorded in Belize (see chapter 4) (Figure 2.5). The fossil beds lie 20 m and 30 m below surface; Davidsson thinks that part of the 20 m deposit collapsed and that the 30 m deposit actually represents the 20 m collapsed bed. Divers collected three specimens; a rib and vertebra fragments from c. 30 m below surface on the south side of Pool 1, and an arm bone c. 20 m below surface on the west side (curated at the IOA) (Figure 2.6). They also noted large crystal veins that begin at c. 13.5 m below the surface and extend to 50 m (Figure 2.7).

Kinkella and Mallon also recovered a jar rim immediately beneath the surface at the pool's edge near Str. 4 (15 x 11 m, 1.65 m tall) dating to c. A.D. 800-900 (Table 2) (Figure 2.8). They also recovered a grey-banded cracked (fire-cracked?) chert disc (Figure 2.9) c. 10 m below surface near Str. 1 that was lodged in the sidewall. Mallon also found a polychrome sherd that he collected near Str. 1 that was subsequently lost. Mallon snorkeled the area immediately below the surface between Strs. 1 and 4 and noted the presence of several sherds, including a polychrome one with black and orange designs near Str. 4 c. 15 cm from the jar rim near St. 4.

Table 2. Pool 1 ceramics

Catalog #	Unit	Stratum/Context	Ceramic chronology (based on Gifford et al. 1976)
975	Pool 1, underwater near Str. 4	23 m from 'x' at Str. 4 @ 38° (see Figure 2.8)	Cayo Unslipped: Cayo variety (late facet Spanish Lookout) everted jar rim: c. A.D. 800-900
1038	Pool 1, Str. 1	Looter's debris (SE)	Belize Red (?) plates (one with ridge near rim), 1 bowl (late facet Spanish Lookout), 2 jars, 1 Cayo Unslipped (late facet Spanish Lookout), necks: c. A.D. 800-900

Due to its depth, size, visibility conditions and their breathing gas depth limitations, neither the cave's lower section was explored, nor the pool's floor for artifacts—this awaits future exploration.

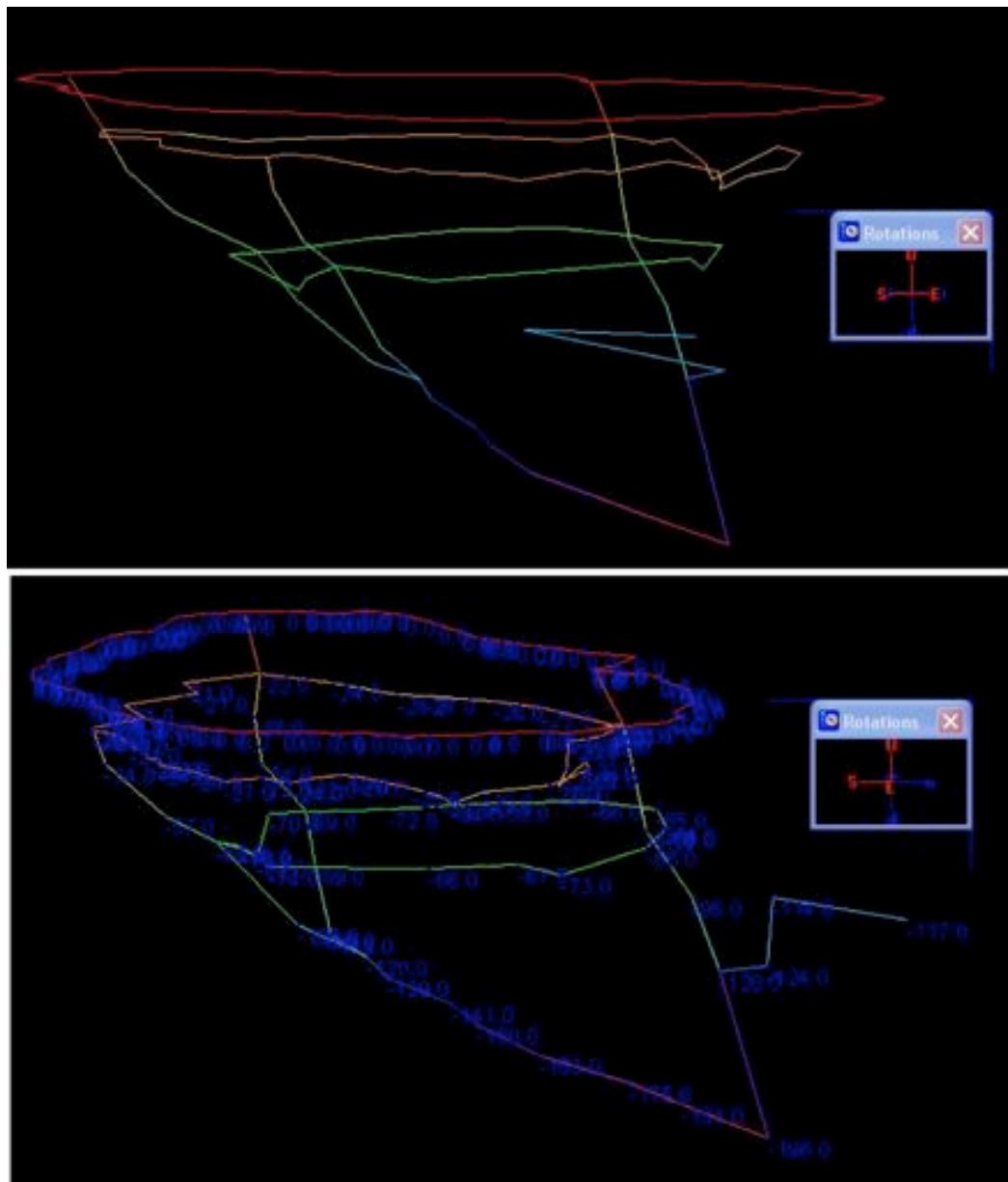


Figure 2.4 3D map of Pool 1 bathymetry (generated by R. Schmittner)

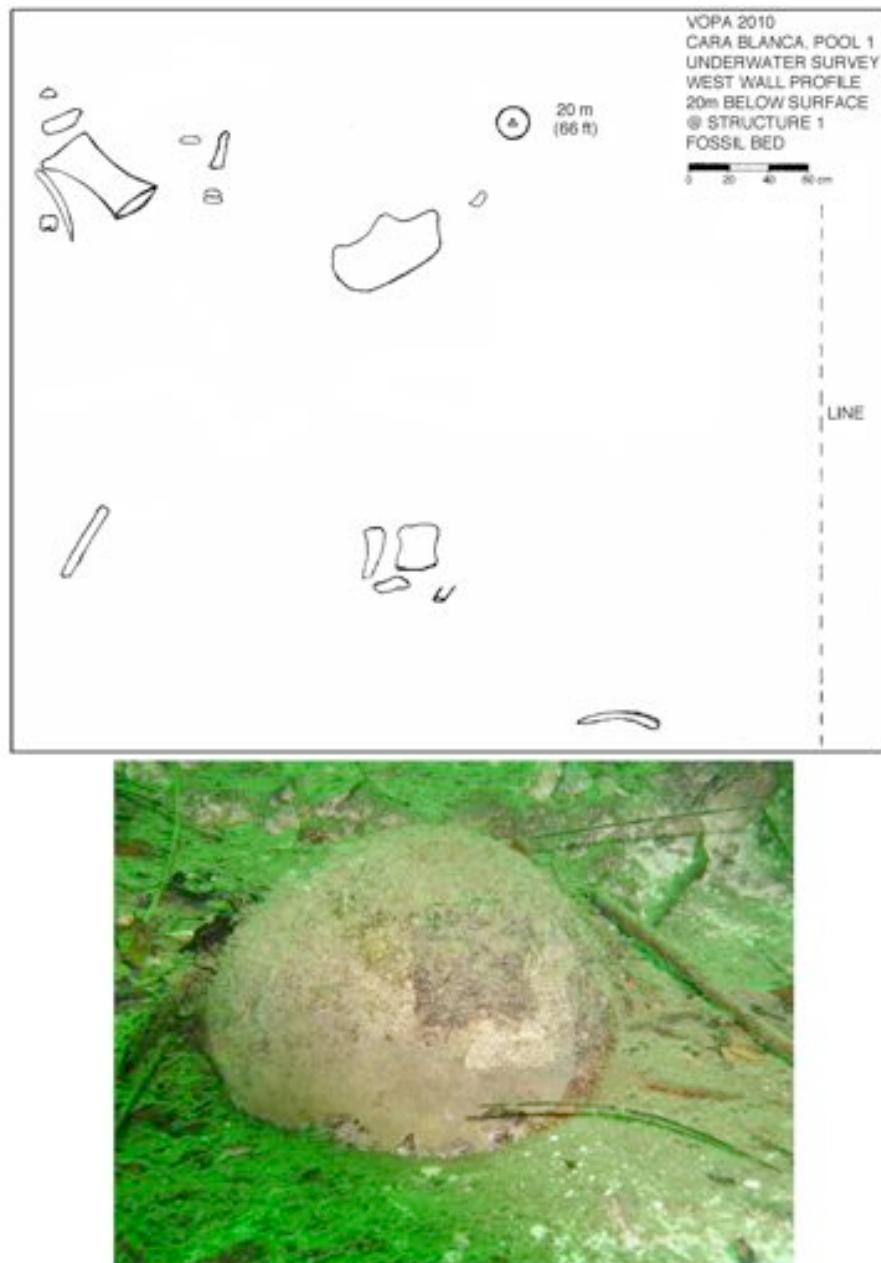


Figure 2.5 Underwater profile of fossil bed; humerus fossil *in situ*



Figure 2.6 Kim Davidsson with humerus fossil; rib fragment on left; vertebra on right with humerus



Figure 2.7 Crystal vein and crystal sample from Pool 1



Figure 2.8 West profile of Str. 4, Pool 1, and jar rim



Figure 2.9 Chert disc from Pool 1 beneath Str. 1 on west side

Unfortunately looters visited Pool 1 structures immediately after our departure in May, 2010. They undercut an older trench on the southeast side of Str. 1, severely weakening the summit, and began two new pits, one on the top of the structure on the south side (c. 80 x 70 cm, 37 cm deep), and another on the west and south side (80 x 55 cm, 40 cm deep) (Figure 2.10). We collected broken and discarded sherds from the southeast trench that mostly consisted of dish sherds and jar rims and necks largely dating to c. A.D. 800-900 (see Table 2) (Figure 2.11). I returned with field assistants in late June where we covered the looters' pits with construction plastic and backfilled them. Yalbac Ranch has since installed monitoring cameras at Pool 1 and on the access road. Jan Meerman, who is conducting a six-month biodiversity assessment of the Yalbac property (<http://biological-diversity.info/>), saw no recent looting activities on an August 5 visit. The recent Hurricane Richard (October 24, 2010) devastated swaths of forests on the 160,000 acre Yalbac Ranch property, and we have no idea about the status of pool structures. The limestone-loving tree roots grow deep into structures and when snapped or uprooted can take buildings with them.



Figure 2.10 Recent looting at Str. 1, Pool 1, southeast side



Figure 2.11 Ceramics broken and/or discarded by looters, southeast trench, Str. 1, Pool 1

Pools 2, 3, 4, 5, 6, 16, and 20

We also explored several other *cenotes* (see appendix for details): Pools 2, 3, 4, 5, 6, 16, and 20. They all differ from one another, especially geologically. Pool 20 has associated Maya settlement c. 25 m north of the pool consisting of a large platform (c. 35 x 30 m) with three structures, one c. 2.3 m tall that faces south towards the pool (see chapter 5). On the last day of diving (May 14) at Pool 20, divers found more fossil beds 5-8 m below surface on the north side—likely the same as those in Pool 1. This pool is relatively deep (over 35 m), though divers were unable to reach bottom due to time constraints. Further, this *cenote* lies a little beyond the eastern escarpment and, in contrast to Pool 1, does not sit at the base of a cliff.

Divers also explored several other pools in 2010 that range in depth from 5 to 18 m: Pools 2, 3, 4, 5, 6, and 16. Some pools have lots of fish, others few; some have lots of plant life, others less so; some have hundreds of burrows (likely eel), whereas others are covered with debris (e.g., leaves). Divers noted that large trees are found in all pools, some quite massive. The crocodiles seen at most pools ignored the divers. There are also turtles, catfish, eels, crabs, and snails (but few or no mollusks). Outcrops of calcite crystal were noted in some of the pool walls (e.g., Pools 1, 16), which became larger the deeper one went. Every pool has outflows and inflows, indicating that they are connected through an underground cave system.

Divers also extracted two approximately 3 m sediment cores (3" diameter) from Pools 2 (4-5 m deep) and 6 (17-18 m deep) that should yield information to reconstruct past environment and climate, which should be illuminating in view of our ideas about the drought and how it impacted the lowland Maya (e.g., Lucero 2002). Patricia Beddows is currently conducting soil analysis, while University of Illinois at Urbana-Champaign (UIUC) Ph.D. student Colleen Lindsay has started working with plant biologist Surangi Punyasena in her lab at UIUC (<http://www.life.illinois.edu/plantbio/People/Faculty/Punyasena.htm>) on the pollen analysis. Lindsay is in the process of collecting botanical samples along Kinkella's 11 km transect to assess the possibility that the forest we see today is the result of ancient Maya forest management (see chapter 8). We are also sending out carbon samples for AMS dating to Hong Wang of the Geochronology Laboratory of the Illinois State Geological Survey and the Institute of Natural Resource Sustainability, UIUC (<http://www.isgs.illinois.edu/about-isgs/staff-dir/w/wang.shtml>).

Beddows also conducted a chemical profile of the water using a hydrolab. Most of the pools contain elevated dissolved solids, especially sulfur, which reduces water quality (see chapter 3; Lucero et al. 2010). Pool 1 appears to have the freshest water to date. That said, in most cases, drinking water over the long term could have resulted in kidney problems. The low oxygen, however, is quite good for preserving organic materials, including those found in the sediment cores. Eels, which were found in the two pools from which we extracted the cores, unfortunately are notorious for their partiality to low oxygen and can noticeably interfere with the sediment horizon.

Jan Meerman (email correspondence, August 8) informed me that he had visited several of the pools on August 5, 2010. Due to a tropical storm and heavy rains, the forest south of the pools was flooded. He thinks that the area likely remains inundated or at least extremely wet during the wet season, making access near impossible. Meerman also noted drainage patterns (quoting from his email) (Figure 2.12):

At Pool 1 the water was flowing OUT of the pool (water fairly clear but probably too murky for diving), while at Pool 3 the water was flowing INTO the pool over a broad front, and at great speed. Not surprisingly, the water in this pool was very murky. I couldn't get past Pool 3 as the water along the trail was getting too deep for comfort. Pool 2 was completely "submerged". The water on the trail leading to it, 200 m before reaching the pool was already knee deep. And I couldn't say whether this pond was producing or draining....Unfortunately I have not been able to reach the other pools.

Concluding Remarks

It is interesting that we find settlement at the deeper pools. Did the ancient Maya know they were so deep? Why did they build specialized structures near these pools more so than at other pools? Future explorations should address these questions. As mentioned, there is increasing evidence that the Maya intensified ritual activities in sacred places at the end of the Late Classic

period amidst an extended drought. This could have been the case at Cara Blanca since the majority of ceramics recovered date to the end of the Late Classic period. Further, most of the ceramics consist of water jars.

The concentration of so many pools in one area and the relatively small-scale and unique settlement indicate that Cara Blanca likely served as a sacred place to the ancient Maya, likely as a pilgrimage center. Similarities to pilgrimage sites elsewhere (e.g., Cenote of Sacrifice at Chichén Itzá) and other types of evidence, such as the predominance of jars, indicate such a place. In fact, the Maya may have collected sacred or virgin water in jars for special ceremonies that took place either at the Cara Blanca pools or in nearby centers, similar to the Zinacanteco case mentioned earlier. A comparison of Cara Blanca jars and artifacts with collections from the centers of Yalbac (c. 7 km distant), San Jose (c. 11 km distant), Saturday Creek (c. 11 km distant) and others, should reveal if people from different areas deposited offerings in pools and collected sacred water, a plan in the works as part of future investigations. I am also planning additional diving expeditions.

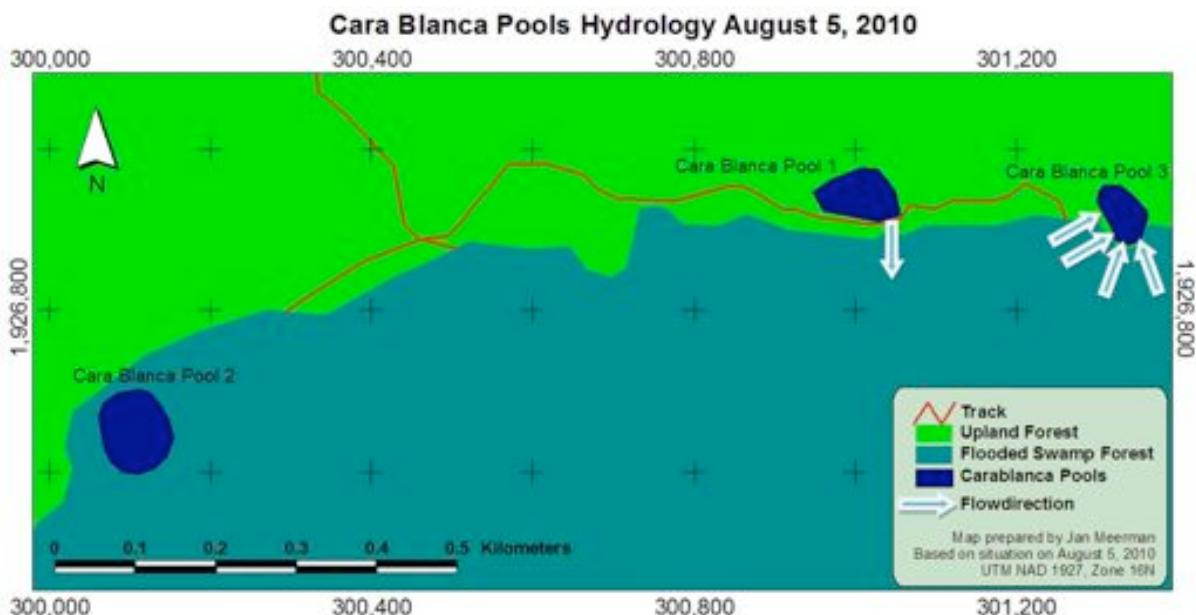


Figure 2.12 Water drainage after major rainfall, August 5, 2010. Courtesy of Jan Meerman

Acknowledgements

I would like to thank the Institute of Archaeology, especially Jaime Awe and John Morris, and Forestland Group, especially Hunter Jenkins and Mike Hincher, for their support and permission. We would not have been able to drive to the pools if it hadn't been for Lloyd Castellanos and his crew clearing roads to most of the pools we explored this season. Jeffrey Roberson also provided his support, which we greatly appreciate. And the dive would not have been possible without the legal expertise of Thomas Kennerly (TK) and his associate Jose Cardenas. And thanks go to Dr. and Mrs. Whalen for their enthusiastic visit and medical advice. Specials thanks to Bob Hemm of the Explorers Club in New York City for his documenting skills. We were able to relax and eat well at Banana Bank Lodge (www.bananabank.com); John and Carolyn Carr and their staff made us all feel welcome. And special thanks go to Nathan Jaeger for allowing us to store the diving equipment in his shed. Sustenance in the field was provided by Mrs. Choc, whose breakfasts and lunches—and the all-important coffee—kept us well-fed and awake. Invaluable assistance was provided by field assistants from the Valley of Peace Village—Cleofo Choc, Stanley Choc, Don Luna, Ernesto Vasquez, and Juan Antonio Lópes; I could not do what I do without them. The diving expedition would not have been possible without grants from the National Geographic Society (#8673-09) and the University of Illinois via an Arnold O. Beckman Award. None of this would have been possible without the amazing team of divers put together by Patricia Beddows: Kim Davidsson, Marty O'Farrell, Edward Mallon, Bil Phillips, and Robbie Schmittner. Andrew Kinkella also provided the crucial archaeological perspective underwater.

References Cited

- Andrews, Anthony P., and Robert Corletta
1995 A Brief History of Underwater Archaeology in the Maya Area. *Ancient Mesoamerica* 6:101-117.
- Bassie-Sweet, Karen
1996 *At the Edge of the World: Caves and Late Classic Maya World View*. University of Oklahoma Press, Norman.
- Beddows, Patricia A.
2003 Yucatán Phreatic Mexico. In *Encyclopedia of Cave and Karst Science*, edited by J. Gunn, pp. 794-796. Routledge, New York.
- Fash, Barbara W.
2005 Iconographic Evidence for Water Management and Social Organization at Copán. In *Copán: The History of an Ancient Maya Kingdom*, edited by E. W. Andrews and W. L. Fash, pp. 103-138. School of American Research, Santa Fe.
- Gifford, James C., Robert J. Sharer, Joseph W. Ball, Arlen F. Chase, Carol A. Gifford, Muriel Kirkpatrick, and George H. Myer
1976 *Prehistoric Pottery Analysis and the Ceramics of Barton Ramie in the Belize Valley*. Peabody Museum of Archaeology and Ethnology Memoirs, Vol. 18. Cambridge: Harvard University.
- Kinkella, Andrew
2000 Settlement at the Sacred Pools: Preliminary Archaeological Investigations at the Late Classic Maya Site of Cara Blanca, Belize. M.A. Thesis, California State University, Northridge.
- 2004 The Pools at Cara Blanca: Archaeology in the Valley of Peace Above and Below the Water. *Research Reports in Belizean Archaeology* 1:93-102.
- 2008 Over the Bajo and Through the Pools: The 2007 Settlement Survey Transect from Yalbac to the Cara Blanca Pools. In *Results of the 2007 Valley of Peace Archaeology Project: Yalbac's Settlement*, edited by L. J. Lucero, pp. 19-114. Report submitted to the Institute of Archaeology, National Institute of Culture and History, Belize.
- 2009 *Draw of the Sacred Water: An Archaeological Survey of the Ancient Maya Settlement at the Cara Blanca Pools, Belize*. Unpublished Ph.D. dissertation. University of California, Riverside.
- Kunen, Julie L., Mary Jo Galindo, and Erin Chase
2002 Pits and Bones: Identifying Maya Ritual Behavior in the Archaeological Record. *Ancient Mesoamerica* 13:197-211.
- Lucero, Lisa J.
2001 *Social Integration in the Ancient Maya Hinterlands: Ceramic Variability in the Belize River Area*. Anthropological Research Paper No. 53. Arizona State University, Tempe.
- 2002 The Collapse of the Classic Maya: A Case for the Role of Water Control. *American Anthropologist* 104:814-826.
- 2006a The Political and Sacred Power of Water in Ancient Maya Society. In *Precolumbian Water Management: Ideology, Ritual, and Politics*, edited by L. J. Lucero and B. Fash, pp. 116-128. University of Arizona Press, Tucson.
- 2006b *Water and Ritual: The Rise and Fall of Classic Maya Rulers*. University of Texas Press, Austin.
- Lucero, Lisa J., Patricia A. Beddows, and Andrew Kinkella
2010 Diving the Sacred Pools of the Ancient Maya. Paper presented at the 8th Annual Belize Archaeology Symposium, June 30-July 2, San Ignacio, Belize.
- Lucero, Lisa J., and Andrew Kinkella
n.d. A Place for Pilgrimage: The Ancient Maya Sacred Landscape of Cara Blanca, Belize. In *Drawing on Rocks, Gathering by the Water: Archaeological Fieldwork at Rock Reliefs, Sacred Springs and Other Places*, edited by Ömür Harmansah. Joukowsky Institute for Archaeology and the Ancient World. Brown University, Providence, RI. Under review.
- Moyes, Holley, Jaime J. Awe, G. A. Brook, and J. W. Webster
2009 The Ancient Maya Drought Cult: Late Classic Cave Use in Belize. *Latin American Antiquity* 20:175-206.
- Osterholtz, Anna
1999 Underwater Archaeology of the Maya Area: A History and Study of the Methodological Approaches for the Recovery and Treatment of Cultural Materials Recovered from a Freshwater Environment. Honors Thesis. New Mexico State University, Las Cruces.

- Scarborough, Vernon L.
- 1998 Ecology and Ritual: Water Management and the Maya. *Latin American Antiquity* 9:135-159.
- 2003 *The Flow of Power: Ancient Water Systems and Landscapes*. School of American Research Press, Santa Fe.
- Schele, Linda, and David Freidel
- 1990 *A Forest of Kings: The Untold Story of the Ancient Maya*. William Morrow, New York.
- Schele, Linda, and Mary Ellen Miller
- 1986 *The Blood of Kings: Dynasty and Ritual in Maya Art*. George Braziller, New York.
- Taube, Karl A.
- 2001 The Breath of Life: Symbolism of Wind in Mesoamerica and the American Southwest. In *The Road to Aztlan: Art from a Mythic Homeland*, edited by Virginia Fields and Victor Zamudio-Taylor, pp. 102-123. Los Angeles County Museum of Art, Los Angeles.
- Vogt, Evon Z.
- 1993 *Tortillas for the Gods: A Symbolic Analysis of Zinacanteco Rituals*. Second Edition. University of Oklahoma Press, Norman.

Appendix

Cara Blanca Pools (April 26-May 14, 2010)

Pool 1

Depth: 32 (center)-60 m (north side)

Visibility: better below 7 m (a thermocline); a little bit better at c. 15 m.

Bottom cover: leaves, debris, silt

Features (e.g., outflows, inflows, etc.): large cave that goes in 80 m deep at 40 m below surface.

Fossil beds with arm bones, vertebra, possible pelvis and tusk, etc. (c. 1 m thick c. 20 and 32 m below surface; northwest and south side—might be continuous, or could be the same fossil bed, and some of it collapsed). Crystal outcrops (13.5 to 50 m deep) northwest side; smaller ones in more shallow areas, larger ones as one goes deeper. Hydrogen sulfide—wispy white—but does not smell. Floor slopes downward to the north.

Comments: fish (tetras—needs lots of oxygen, mollies—does not need as much oxygen, cuicilides (needs oxygen), crocodile, crabs, two different kinds of turtles (one snapping), eel. Huge trees. Outlet streams dry. Two sherds found immediately below surface under roots near Str. 4; one body sherd and one jar rim and neck (inside of which is burned); other small sherds noted

Hydrolab; fresher than other pools, but still has relatively high concentration of dissolved minerals. Largest, deepest inland cave recorded in Belize—Actun Ek Nen, or Black Mirror Cave. Also, first recorded fossilized bones.

Surrounding soils: clay and clay loam

Associated settlement: seven structures, including a standing-wall multi-roomed building on southeast edge of Pool 1 (Kinkella 2009:Figures 4.7, 5.24, pp. 89-90, 149). There is also a cluster 400 m west of Pool 1, including a sweathouse (M186) (pp. 152-157, 351-352).

Pool 2

Depth: 4-5 m

Visibility: poor visibility

Bottom cover: clay bottom in center; leaves elsewhere; lots of relatively small trees compared to other pools. Likely eel burrows at bottom.

Features: couple of outflows and inflows

Comments: vertical and linear rock wall with sediment that slopes down; good evidence for groundwater upwelling. Likely lots of eels based on presence of 20-30 cm long excrement tubes (c. 4 mm diameter). Lots of burrows (1 per 1 sq. m). Extracted 2.87 m compacted core from pool center without obvious layers.

Hydrolab

Surrounding soils: clayey

No associated settlement

Pool 3

Depth: up to c. 5 m

Visibility: relatively clear; 20-30 m; beautiful

Bottom cover: fish pooh/loose organic

Features: burrows, 1 every m². Trees covered in organic growth that drapes off of them; lots of fish

Comments: large trees; in the center there was an upstanding tree upon which an island had formed on the surface.

Hydrolab

Candidate for coring

Surrounding soils: clayey

No associated settlement

Pool 4

Depth: c. 13?

Visibility: murky; visibility poor (4-5 m)

Bottom cover: photosynthesis to 3 m, leaf debris to 5 m.

Features: funnel-shaped sediment-covered

Comments: scarce rock outcrops; sediment depth at least c. 1 m; misty white clouds in the water (floating bacteria colonies that actually might ingest hydrogen sulfide; smelled it a little—one of the few times it did; elsewhere sulfur smell less obvious, though it was present).

Hydrolab

Surrounding soils: clayey

Associated settlement: Kinkella (2009:159, 299) noted a small mound (M102) at the foot of the escarpment immediately north of Pool 4.

Pool 5

Depth: 15 m, 20 m at center

Visibility: poor visibility 5 m.

Bottom cover: hydrogen sulfide bottom 3 m. Mud especially in the center; some leaves; low oxygen.

Features: Hydrogen sulfide—quite smelly, especially bottom 2 m.

Comments: some eel excrement; flat center

Hydrolab

Surrounding soils: clayey

Associated settlement: Kinkella (2009:342) noted a small rectangular mound (M169) c. 100 m south of Pool 5. There is also a cluster of mounds (M100) east of Pool 5 that is likely associated with Pool 6 (pp. 159, 298)

Pool 6

Depth: 17-18 m

Visibility: good once beyond surface, c. 17 m

Bottom cover: disaggregated approximated 3 mm sub-spherical pellets (~broken up tubes) excrement tubes with mucus sheath. Grass also on bottom in parts, large trees.

Features: diverse fish (tetras, siglets, and turtles), greater diversity than what divers are used to seeing in Mexico; ‘volcano’ outflow a result of a fissure. Hydrogen sulfide; but did not smell it like water bodies usually do.

Comments: several kinds of tetras. Likely lots of eels based on presence of 20-30 cm long excrement tubes (c. 4 mm diameter). Extracted 3.02 m compacted core from deepest part of eastern basin 11.2 m deep. Huge trees.

Hydrolab; high concentration of dissolved minerals that can result in kidney stones and other ailments

Surrounding soils: clay loam and clayey

Associate settlement: cluster of mounds (M100) west of Pool 6 (Kinkella 2009:159, 298)

Pool 16

Depth: 13 m

Visibility: murky (but very clear in 2008 according to Kinkella)

Bottom cover: leaves and sediment

Features: crystals similar to Pool 1

Comments:

Hydrolab

Surrounding soils: steep hilly area with clay loam/limestone rocks

No associated settlement

Pool 20

Depth: c. 35+ m; bottom not reached due to time constraints

Visibility: poor visibility (3-8 m max); biogenic calcite (algae)

Bottom cover: unknown.

Features: slope 45 degrees; outlet stream, thus some kind of outflow on the southwest side towards the road.

Comments: sinkhole; clay sides on north/northwest side (the only part they saw); lots of mussel shells in outlet stream (with water). Larger than Pool 1.

Hydrolab

Surrounding soils:

Associated settlement c. 25 m north of the pool consisting of a large platform (c. 35 x 30 m) with three structures, one c. 2.3 m tall that faces south towards the pool (see chapter 5).

Chapter 3

The Hydrogeochemistry and Geological Context of the Pools of Cara Blanca as a Foundation for Holocene Paleoenvironmental Reconstruction

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Department of Earth and Planetary Sciences, Northwestern University

The primary goal of the May 2010 Cara Blanca diving expedition was to ascertain if the pools represented portals to the underworld of Xibalba to the ancient Maya. If so, the technical diving expedition aimed to locate and document artifacts of the past activities undertaken at these sites.

In broad support of the primary goals of the expedition, a suite of hydrogeochemical and paleoenvironmental sampling and research was undertaken to elucidate what the geological and hydrogeochemical nature of the field area and the pools in the present context, and thus to better understand the landscape and conditions in which Maya settlements may have existed on the site in the past. This report provides preliminary results and findings on the geological and hydrogeochemical environmental context of the site, and the activities towards providing a rich multi-proxy paleolimnological record from the lacustrine sediment cores recovered from 2 of the Pools (Table 3.1).

Initial interpretation of the available data is provided, with the caveat that additional aspects revealed with ongoing analysis will undoubtedly modify the final conclusions.

Geological setting of the Pools at Cara Blanca

The country of Belize is located in the SW quadrant of the Western Caribbean Basin. The northern half of the country is dominated by a coastal margin carbonate platform, where topography rarely exceeds 50 m asl (Figure 3.1a). Directly west from Belize City and inland ~70 km, the topography changes with a set of at least 4 south-south-east facing escarpment faults of varying relief ranging up to ~100 m (~200 m asl). The field area is focused on this set of escarpment faults, and is known as Yalbac, and also Cara Blanca. The site lies mid-distance between the north boundary of the Maya Mountains demarcated by the Northern Boundary Fault, and the NNE trending Yalbac Fault further to the NW (Figure 3.2).

Table 3.1 Summary of the geological and hydrogeochemical goals and sampling undertaken

Discipline	Goal	Sampling
Geology	Assess landscape evolution of the field area.	Field observations
Hydrogeology	Assess landscape scale interactions of the pools with each other, and with regional water resources.	Surface and subsurface water flows Geological sampling
Hydrogeochemistry	Determine environmental quality and the suitability of the pool water to support large populations	Hydrolab profiles
Paleolimnology	Reconstruct past environmental conditions at the pools and regionally	Sediment Cores

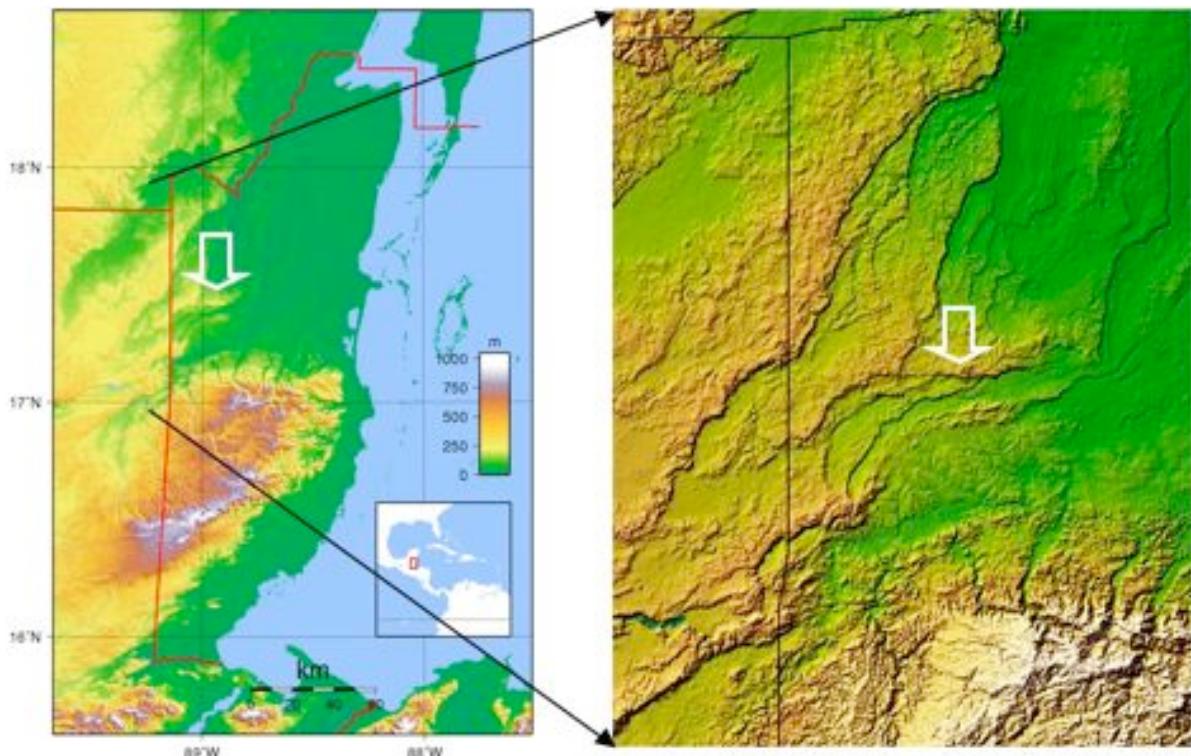


Figure 3.1 A. (left) Geographical location of Belize, and topography in meters (Wikimedia Commons, 2011). B. (right) NASA false color (uncalibrated) altimetry image focused on Cara Blanca (Source NASA's Shuttle Radar Topography Mission). White arrow shows the location of the Cara Blanca escarpment fault on both panels.

Structural Geology, Tectonics, and Erosion

The structural geology of Belize is dominated by NNE trending major and minor faults, including the Yalbac and the Northern Boundary Fault flanking the Cara Blanca Field area (black arrow in Figure 3.2) to the north and south respectively. The major motions throughout the country are described by Purdy et al. 2003 as transpressional, with landward movement. The orientation and surface expression of these Yalbac/Cara Blanca escarpment faults are consistent with the regional tectonic movement which includes landward directed thrusting motion along major and minor faults that span the whole geographical region of the country of Belize (Purdy et al. 2003). While uplift of the escarpment block has undoubtedly occurred, tectonic inversion (with older material overlying younger formations) was not evident in the specific field area of Yalbac / Cara Blanca but may be identified with systematic geological mapping as Purdy et al. (2003) report for elsewhere in Belize.

The escarpment faces of Yalbac/Cara Blanca escarpments are broadly masked by mature and near mature tropical hardwood vegetation growing on significant talus slopes and sedimentary deposits that approach the escarpment crest over much of the length. However, the escarpment face is exposed in some short segments (20-100 m) of distinct un-vegetated escarpment faces, forming the “white faces” of Cara Blanca. Erosion and mass-movements occur in localized areas, notably along the seasonally activated gully ravines, that down-cut and trench into the escarpment crest beginning some 100-300 m back from the brow. Otherwise, evidence of active large scale erosion and possible tectonic movement is at least rare on the landscape and none was observed during the month of field research. Notwithstanding, biogeochemical erosion of all exposed rock surfaces is high in this mature tropical hardwood forest, such that surface erosion penetrates deeply on any exposed bedrock. In the modern context, all of Belize is seismically inactive (IRIS, 2011).

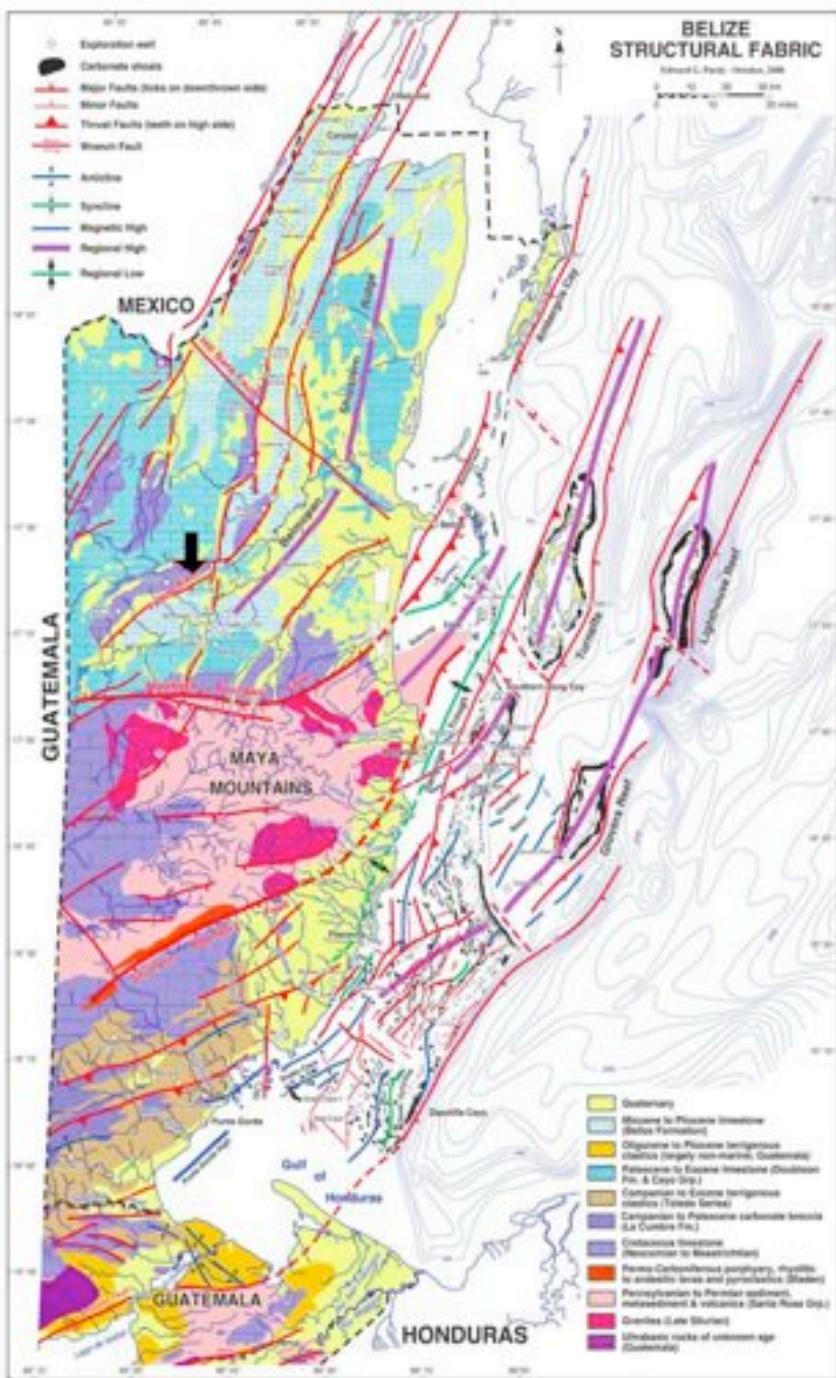


Figure 3.2 Structural geology map of Belize from Purdy et al. (2003) with location of Cara Blanca indicated by black arrow.

Surface Geology and Lithology

The surface geology of the Cara Blanca field area can be broadly described as Paleocene-Eocene in age along the top of Yalbac escarpment, with Pleistocene through to recent deposits along the base of the escarpment, and Miocene-Pleistocene along the valley floor (Figure 3.3).

Detailed lithological information for each of these units or for the Yalbac/Cara Blanca field area have not been yet found in the indexed literature, and may not exist in the public domain. Valuable stratigraphic sections down to the base of the escarpment development may be provided by

exploiting the exposures along the numerous gully ravines. Visual observations while traveling by truck on 2 of the gully ravines showed only carbonates with varying bed thickness from the most massive at ~ 2 m, down to fine bedding at ~ 0.1 m or less.

All of the bedrock exposed in the gully ravines was well-lithified, with apparently low primary porosity. Examined hand specimens showed them to be fine grained, with often significantly <5% porosity. Fracturing is variable including grading up to extensive in some beds, while distinct well-karstified strata exist at several depths above the base level of the escarpment fault.

It is notable that the Maya structures at the Pools at Cara Blanca (see section below on the pools) as well as the stone used in construction at the Valley of Peace archeological sites appeared to have been preferentially constructed using higher porosity rock with reef rock characteristics, the source of which was not found during the field expedition. It can be presumed that the Maya sought out the reef rock for the balance between lower weight and adequate structural integrity for construction of blocks of suitable size for manual transport. Such reef rock inherently has permeability ranging from moderate to high.

These lithologies exposed in the ravines contrast with the higher porosity, friable, and fine grained and blanched material forming the Cara Blanca actively eroded faces. Similar poorly-lithified fine grained and blanched materials were also evident on the surface in patches, and appeared to be the preferred road bed construction material. The local quarry, which might be on the Yalbac property, was not identified during the field season. The field observations suggest that the friable blanched lithology is spatially discontinuous and occurs in patches.

See below for a discussion on gypsum mineralogy.

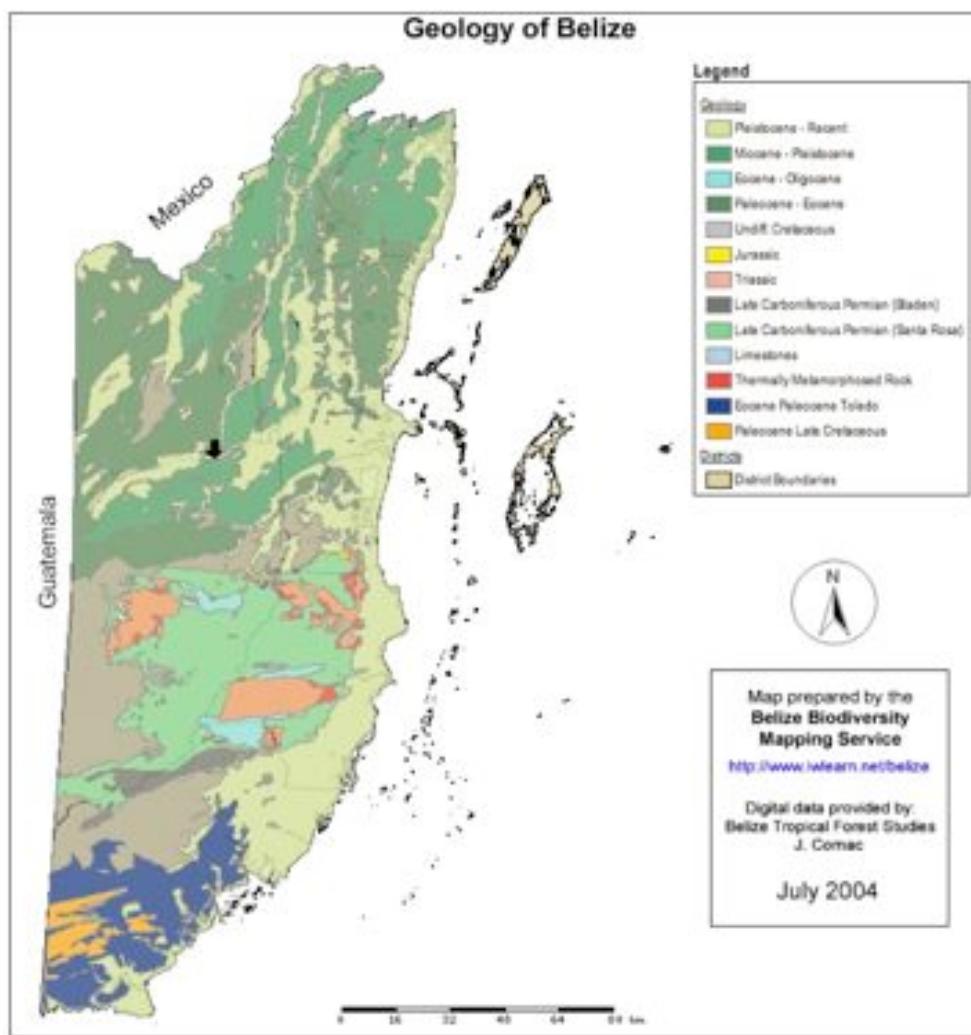


Figure 3.3 Surface geology of Belize from the Belize Biodiversity Mapping Service (Comac 2004).

Climate

The climate of Belize is tropical and with an uneven rainfall distribution creating a wetter summer and a drier winter. The 20+ year climate norms based on data from the NOAA NCDC show that for San Ignacio and Belmopan cities located in central western Belize, the closest reporting stations to the Yalbac/Cara Blanca field area, have mean annual precipitation of ~1.5-2.0 m per year (NCDC, 2011; Figure 3.4). The climate of the field area is in the Am – Tropical Monsoonal - class using the Koppen climate classification system (McKnight and Hess 2000). At these stations, the nominal wet season spans 7 months from June to December and receives ~80% of the mean annual precipitation. While the slightly shorter dry season spans January to May, there is ~20% of the mean annual precipitation during this time. The month with the least rainfall is April, with March being second least. During this driest of the dry season, the mean monthly precipitation is 30-60 mm, which meets the Köppen cutoff criteria of being less than 60 mm, but more than the lower limit of precipitation (in mm) for this climate category of 100 - (MAP / 25) (McNight and Hess 2000). While the inland central portion of Belize is Tropical Monsoonal, it is approaching the seasonal “tropical rainforest” climate category of Af. It is clear however that in cultural and environmental considerations that the winter months are considered a dry season.

A subtle mid-season break in precipitation occurs in August, which undoubtedly relates to the poleward movement of the inter-tropical convergence zone (ITCZ).

At this time, no data for potential or actual evapotranspiration has been located. The calculation of at least potential evapotranspiration is required in support of understanding the water budgets, including the magnitude of surface and groundwater flux through the field area.

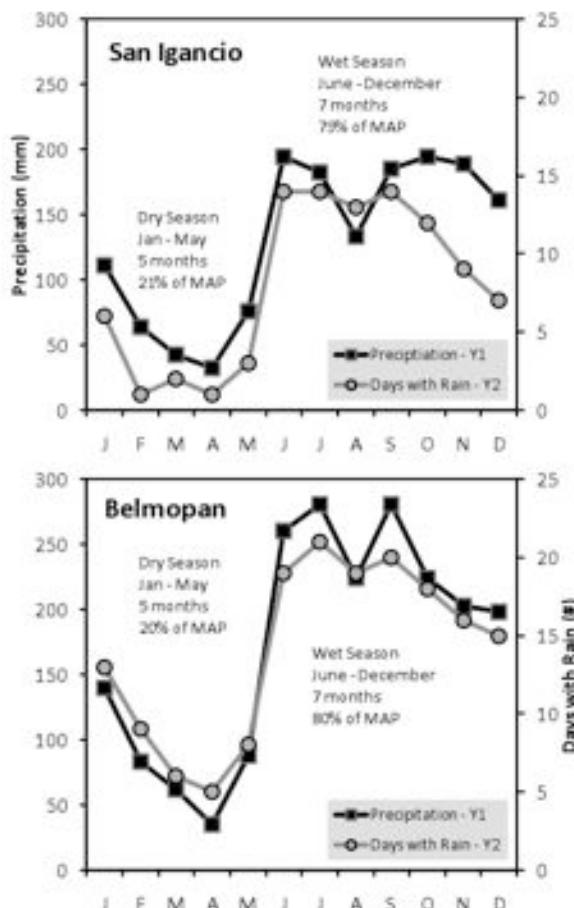


Figure 3.4 Climate data of precipitation and days Data from the US NOAA National Climate Data Centre station GHCN 1, with 180 months of data from 1966-1980 for San Ignacio and 127 months of data for Belmopan from 1968-1980 (NCDC, 2001; www.ncdc.noaa.gov/oa/ncdc.html).

Pools of Cara Blanca - Hydrology and Hydrogeology

At least 25 pool of perennial freshwater have been previously identified (see Kinkella 2009) and colleagues geographically aligned along the base of the escarpment fault. These water bodies are perennial, with local reports of seasonal and episodic water level variations creating localized flooding and filling connecting channels between the pools. Some channels were actively flowing during the May 2010 expedition, although many are only seasonally active and were dry at the time of the field work. Visual assessment of the various creek beds in the field areas assessed the channel cross sectional area to be a maximum of $2-5 \text{ m}^2$ at bank full, and with a low channel gradient. The channels were at low flow or dry during observation making estimates of maximum potential discharge impossible. Observations within the active and dry channels showed reasonably mature bank vegetation, sediment included a fine to medium grains which would be the first to be removed under significant stream velocities, intact clam beds along the channel beds, mature channel floor vegetation, and failed to reveal significant channel migration or bank undercutting or significant failure. It is concluded that the bank morphology is reasonably stable over 10+ year time spans, and that even under maximum discharge that the stream power is not particularly significant.

With the evidence of limited surface hydrological flux between the pools, the potential for hydrogeological controls is now explored. Subsets of the pools align with apparent conjugate fracture sets, most likely revealing regional structural controls (Figure 3.5). The local and regional hydraulic gradient is shown by a first order approximation using Google Earth elevations drawn for the clear sky view water bodies (Figure 3.6); the western pools at Cara Blanca have water elevations of 65-70 m ASL, while the eastern pools have elevations of ~40 m ASL. This impressive gradient of 3 m per km (30 m head loss over 10 km) clearly demonstrates that the water level in individual pools is at least semi-perched with restricted discharge. Initial interpretation is that the dominant water flux is by groundwater flow through fractures, fissures, and primary porosity of the rock and sediments infilling the escarpment fault. This evidence of restricted groundwater flow is consistent with the tectonic compression with landward movements across Belize.

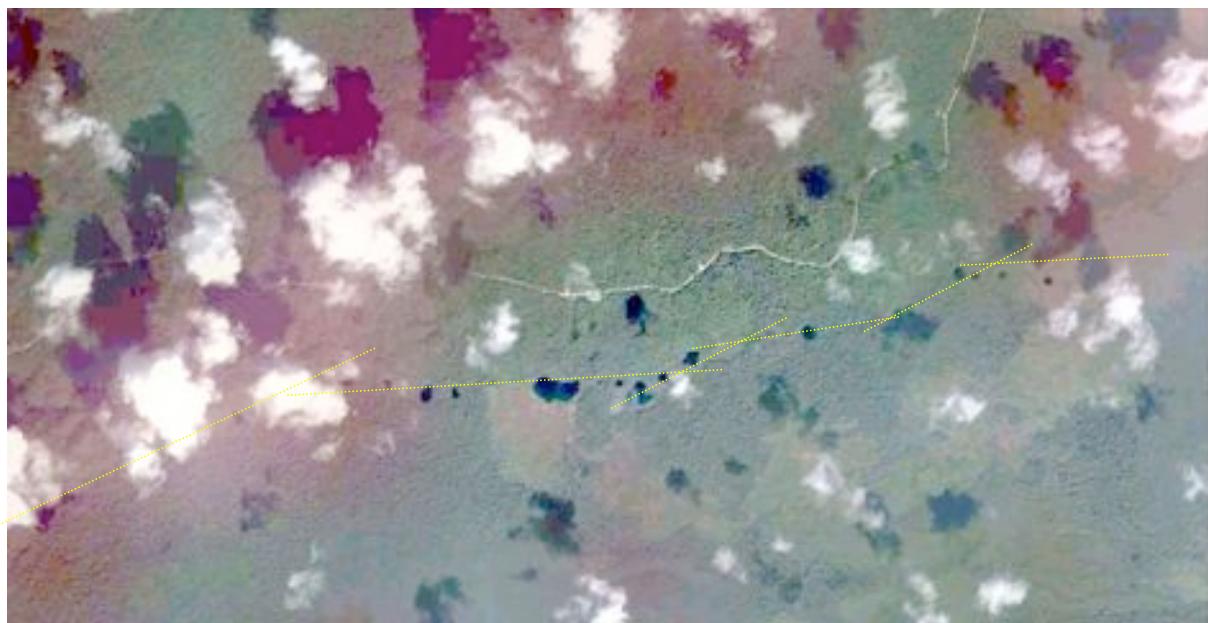


Figure 3.5 Google Earth images of the Pools of Cara Blanca, with dashed yellow lines showing apparent fracture alignment of the pools in conjugate sets.



Figure 3.6 Google Earth elevations to the closest 5 m increment for clear sky view water bodies, including the Pools of Cara Blanca, and other seasonal flooding wetlands and river channels.

Exploration of the Pools of Cara Blanca

The technical diving team explored and documented 8 of the 25 pools in May 2010. Underwater survey techniques were standard for cave exploration, including the use of a knotted line survey for distance between tie-off stations underwater, azimuth measured using an underwater compass, and inclination being calculated from changes in station depth as measured using SCUBA depth gauges (Table 3.2).

Table 3.2 Summary of maximum depth and electrical conductivity for the 8 explored pools.

Pool Number	Maximum depth (m) to the closest m	Electrical Conductivity Bottom Water (uS/cm)
1	60	2600 - 2670
2	5	2650
3	5	2665
4	13	2660
5	15	2700
6	18	2650
16	13	2690
20	+35	2620

Tabulation of the sub-aqueous observations within each of the pools by the expedition divers is included in chapter 2. The biology was found to be rich and diverse between the pools.

Pool 1 and Actun Ek Nen

Pool 1, flanked by the “white face” of Cara Blanca for which the field area is named, proved to be the deepest pool with a maximum depth of ~60 m. The site was surveyed using nested perimeter lines at the water surface, and then also at 5-6 m, and 14-16 m depth following natural submerged ledges and changes in slope in the basin bathymetry that extended along the south side of the pool. In addition, a north-south transect line was laid across the basin, to provide a full bathymetry. The “white face” escarpment face was found to extend near vertically below the water, to a depth of ~40 m, where the ceiling of an overhanging a cave chamber ceiling was discovered, with a floor depth down to ~60 m in the cave. This cave was named Actun Ek Nen, a Maya phrase meaning “Black Mirror Cave”. The width of the cave chamber to the pool is 40 m wide, and the deep diving explorers (Schmittner, Davidsson, O’Farrell, and Phillips) penetrated to 80 m beyond the ‘drip line’ where the cave is considered to start.

Hydrolab Profiles

Physical-chemical data for each pool was collected using a Hydrolab 4A multi-parameter data-sonde, equipped with a depth sensor, electrical conductivity, temperature, pH, and dissolved oxygen sensor. All sensors were calibrated each day of use using company specified protocols. A redox sensor was also actively collecting data but was not calibrated during the field season.

The hydrolab profiles are rich in details, with each pool showing distinct characteristics in one or more variables. For this preliminary report, the full compilation of the profiles is provided (Appendix A).

Electrical Conductivity All of the pools contained brackish water with electrical conductivity ranging from 2.5-2.7 mS/cm, which corresponds to a total dissolved solids of 1.5-1.7 g/L. The bulk water quality is therefore questionable, and these waters may not be potable enough to sustain a population. Such notable brackish waters may stress the human metabolism over time, leading to disorders and reduced kidney function.

NOTE that for the May 10 profile in Pool 1 the electrical conductivity is lower than in the other pools, and proved to not be replicated in a repeat profile on May 13, only 3 days later. The repeat profile was undertaken because of the suspiciously low EC compared to the other pools, and the lack of reproducibility suggests that this data (May 10) may be erroneous. The full data is included in this preliminary report for the sake of completeness.

Dissolved Oxygen While the surface waters were oxic with reasonable concentrations of oxygen, the bottom waters in the pools is notably depleted in oxygen with values ranging from 0.2-1.5 mg/L. Such anoxic conditions are typical of groundwaters that do not exchange or interact with the atmosphere. However, such low oxygen is also good for preserving organics since biological breakdown processes by anaerobic bacteria as well as populations of insects and other bioturbating organisms are inhibited. Unfortunately, some organisms such as eels can withstand low oxygen levels and these are efficient at bioturbating sediments in pool bottoms.

Aquatic vegetation was common in pools, but severely limited to the pool margins where water depths were shallowest. Either the vegetation and photosynthesis is contributing oxygen to the surface water counterbalancing the oxygen depletion from organic breakdown at the sediment water interface, or this surface water circulates and interacts adequately with the atmosphere to maintain the observed oxygen concentrations. Indeed, the profiles suggest the former is the case, and that the surface water has limited oxygen present due to photosynthesis. Pool 16 was devoid of aquatic vegetation, rich in S and suspended sediment, and even has near anoxic surface waters. Even in the pools with aquatic vegetation, the maximum dissolved oxygen only approaches 80%, but is commonly 60%, indicating the oxygen depletion processes are more than adequate to prevent saturation.

Temperature A distinct layer of warmer surface water was present in most of the pools, and this is typical of solar insulated ponds with restricted circulation. Maximum temperatures exceeded 30°C in the surface waters, while deeper waters (>1-3 m) were typically cooler with values of 27-28 °C, which likely approximates the mean annual temperature of this region. The bottom water temperature in Pool 6 West Basin, and Pool 5 were also notably warmer (~28.5 °C), which may relate to hydrogeological regimes, possibly geothermal inputs, or even more restricted circulation allowing for seasonal heating to penetrate deeper in the water column.

Sulphur and Gypsum

Observations in the field included the smell of sulphur underwater, and also escaping the water table as expanding diver bubbles reached the surface, tarnishing of metal components on dive equipment, floating white particulate (bacterial?) matter within the water columns, dense deep layers of very clearly noxious hydrogen sulphide lade water, and the surprising existence of the highly soluble gypsum (CaSO_4) crystals. All observations are consistent with high concentrations of S, and anoxic (oxygen depleted) water conditions.

Underwater, significant crystals were observed, largely well developed intact and even twinned. In Pool 1 for example, these were observed to mantle some segments of the vertical walls, notably near the escarpment face, but also occurred as large veins with infilling gypsum crystals that begin at c. 13.5 m below the surface and extend to 50 m. Outcrops of crystals were noted in some of the other pool wall including 16 where they became larger with depth. The crystal habit indicated gypsum, and raman spectroscopy confirmed this surprising mineralogy (Figure 3.7), since this soluble mineral in such pure form does not tend to survive in aqueous or exposed environments. The perfect faces on most of the observed crystals indicate that the water is presently supersaturated with respect to gypsum, and have

sustained this saturation state. Nonetheless, some of the crystals recovered from Pool 1 included dissolution etching and corrosion, indicating that at some depths, if not at some times, under-saturated groundwater flow through the pool. One of the samples recovered, physically described as a “white clay” proved not to be gypsumiferous, and as yet has not been identified.

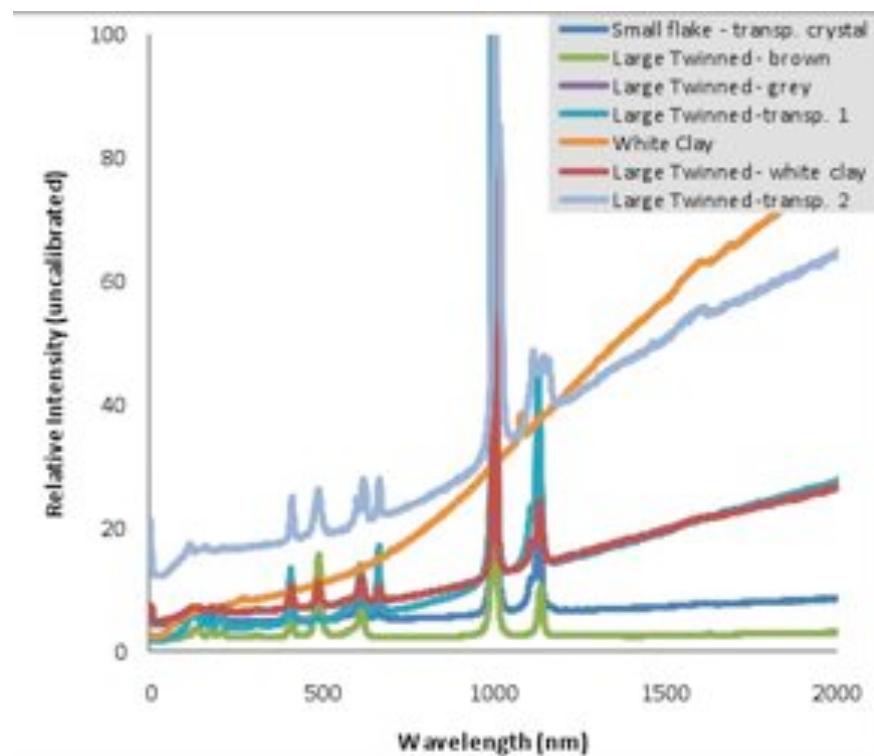


Figure 3.7 Raman spectroscopy of the crystalline samples recovered from Pool 1, showing the typical peak pattern at wavelengths indicating the mineral gypsum.

Sediment Cores for Paleo-environmental reconstruction

Novel techniques for the recovery of multiple meter long manual push cores were developed for this expedition, with the potential recovery of up to 6 m long sediment cores in 4" diameter PVC pipe (see Appendix B for a photo essay). Two cores were recovered from the Pools of Cara Blanca, including ~ 3 m penetrations from Pool 2 and Pool 6. On site, these were measured, and sectioned into ~1 m long sub-segments using a hacksaw to allow for vertical transportation back to the lodge without disturbing the sedimentary sequence. The cores were allowed to dewater by gravity, although below the sediment-water interface, there was little freely draining water.

The core tubes were split, with the sediment sequence exposed. The smell of sulphur was notable for both cores. Each segment was photo-documented with scale (e.g., Figure 3.8). The core from P02 overall demonstrated little textural or color variation, and was sectioned in 2.5 cm increments. The core from P06 proved to be highly structured, and included significant lithological, textural, and color variation, and was therefore sectioned in 1 cm increments. Of particular note are the cream/bland bands that appear at several depths, accompanied by indurated mineral inclusions in the sediment. These appear to be gypsum nodules.



Figure 3.8 Example photograph of sediment core P06 basal section 0.0-1.0 m. Note the changes in texture, and the light cream banding at ~14 cm.

During sectioning, all identifiable macro-fossils and mineral inclusions were extracted, logged, and bagged separately. Table 3.3 identifies each item, and Figure 3.9 schematically shows their distribution by type and depth within each core.

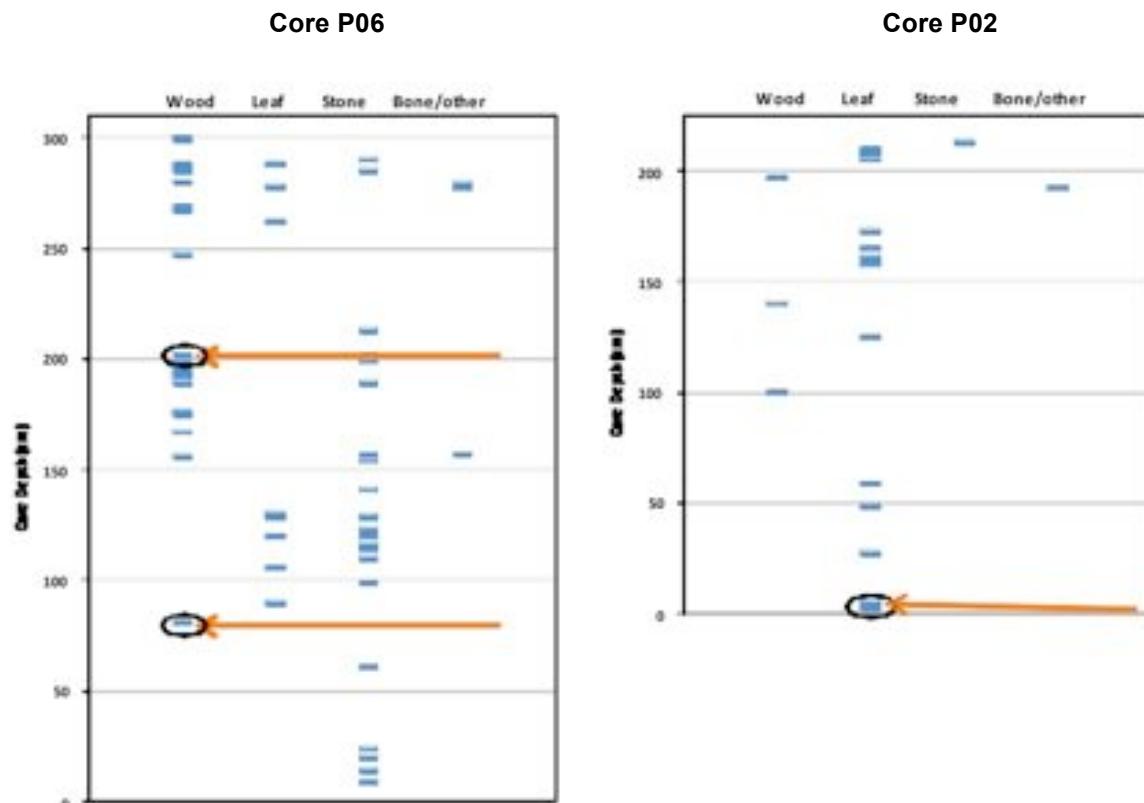


Figure 3.9 Nature and depth distribution of macro fossil material manually extracted from the sectioned cores based on visual examination and physical manipulation of the sediment at the time of bagging. Orange arrows indicate materials submitted to BetaAnalytics for ^{14}C dating.

The results of three samples submitted for ^{14}C dating to the commercial laboratory BetaAnalytics provide the initial rudimentary chronology for the cores, on which ongoing multi-proxy analysis and the interpretation will be based. With the assumption of a modern age for the sediment-water interface, two initial chronologies are presented for consideration. The simplest chronology is to assume continuous deposition (Case A, Figure 3.10), however the basal date of Core P06 indicates that a significant and progressive shift occurred over time, which may be a decrease in sedimentation rate, increase in sediment preservation, or decreased compaction. An alternative chronology (Case B, Figure 12) includes the consideration of a depositional or preservation hiatus,

where in the early 16th century about the time of conquering and settlement of the region by the Spanish, that lacustrine sediments were potentially disrupted and removed from the pools. Both of these age chronology models allow for the possible increased rate of sedimentation rate and/or preservation since the conquest and settlement of the region, compared to pre-western disturbance. More radiometric dates are being sought to flesh out the necessary age chronology of the cores.

Analysis of the cores aims to provide a rich multi-variate record of environmental change for this field area: Loss on ignition, and stable isotope records for $d^{13}C$ and $\delta^{18}O$. The core records include the painstaking palynology by Colleen Lindsay, PhD student with Lisa Lucero, and working under the supervision of Surangi Punyasena.

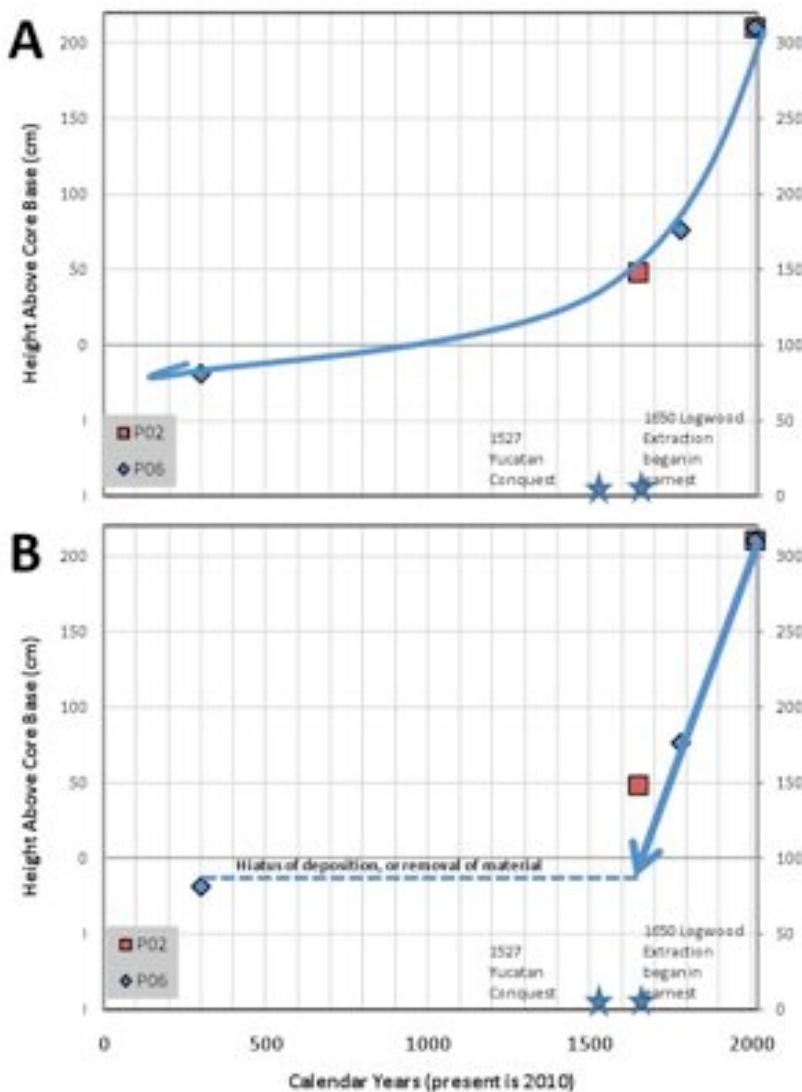


Figure 3.10 Initial results of $3^{14}C$ radiometric carbon dates for cores P06 and P02 from the Pools of Cara Blanca.

Wall rock sampling and mega-fauna fossil beds

Mega-faunal rich strata were discovered in Pool 1 and Pool 20. These contained obvious partially fossilized remnants eroding from friable white poorly lithified material on submerged near-vertical faces. The correlation in the beds between Pool 1 and 20 remains to be done, but observations by Beddows support that the fossil bed may be continuous, and extensive between the pool sites, although the strike/dip of the strata may be significant given the differences in depth at which the outcropping occurs in the two adjacent pools.

Wall rock samples were collected from pools in order to provide a framework lithological section, and potentially allow for correlation in stratigraphy between pools. However, initial examination on site and at the university shows that much of the pool wall material is brecciated, reworked, re-lithified and cemented, and covered in biogenic calcites. This sample set is very complicated, and planned work beyond initial documentation and descriptions, includes Raman spectroscopy of sub-samples, and potentially thin sections of the biogenic fresh-water carbonates.

Table 3.3 Extracted materials from sediment cores from Pool 6 and Pool 2. Target material for ^{14}C material for dating identified (in green) with ^{14}C dating by BetaAnalytics on samples identified by green shading.

P06-C1 - Pool 06				P02-C1 - Pool 02			
Depth in core				Depth in core			
Upper (cm)	Lower (cm)	Material Description	Material Category	Upper (cm)	Lower (cm)	Material Description	Material Category
302	302	wood - chunk	3	216		leaf	2
300		wood - leaf - twig	1	213	223	mineral precipitate	3
298		wood	1	210		leaf	2
296	291	mineral precipitate	3	208		leaf	2
288	291	wood - chunk	1	207.5		leaf	2
288	289	leaf - soft wood	3	205		leaf	2
287	289	wood fragment	1	197	198	twig	1
285	286	wood	1	192.5		shell	4
285	286	mineral precipitate	3	173		leaf	2
280	281	bark with some wood	1	165		leaf	2
279	280	animal cuticle material?	4	163		leaf	2
278	279	leaf	2	158		leaf	2
277	278	bone	4	140		twig	1
269	270	wood - twig - curled vine?	1	125		leaf	2
267	268	bark	1	100	100.5	wood	4
262	264	leaves - clump	2	59		leaves	2
247	249	root	1	48.5		leaves - 2 diff types	2
213	223	mineral precipitate	3	27.5	30	leaf	2
202	208	mineral precipitate	3	5	7.5	leaf frags	2
202	203	wood - twig	1	2.5			
199	200	mineral precipitate	3				
198	199	root	1				
196	197	root	4				
194	197	wood	1				
193	195	wood	1				
192	193	wood	1				
189	193	mineral precipitate	3				
189	191	mineral precipitate	3				
189	193	mineral precipitate	3				
189	191	wood	1				
176	181	wood - large chunk	1				
175	176	wood	1				
167	168	wood	1				
157	159	mineral precipitate	3				
157	157	fragment - bone?	4				
156	158	root	1				
154	155	mineral precipitate	3				
141	142	mineral precipitate	3				
130	131	leaf	2				
129	130	mineral precipitate	3				
129	130	leaf	2				
128	129	mineral precipitate	3				
129	124	mineral precipitate	3				
120	121	mineral precipitate	3				
120	121	leaf	2				
116	117	mineral precipitate	3				
115	116	mineral precipitate	3				
114	115	mineral precipitate	3				
110	111	mineral precipitate	3				
106	107	leaf + twig	2				
99	101	mineral precipitate	3				
90	91	leaf - very small frags	2				
81	86	wood - massive	1				
62	64	pebble - clastic	3				
24	25	mineral precipitate	3				
20	21	mineral precipitate	3				

- 1 - wood
- 2 - leaf
- 3 - stone
- 4 - bone, other
- 5 - C14 date

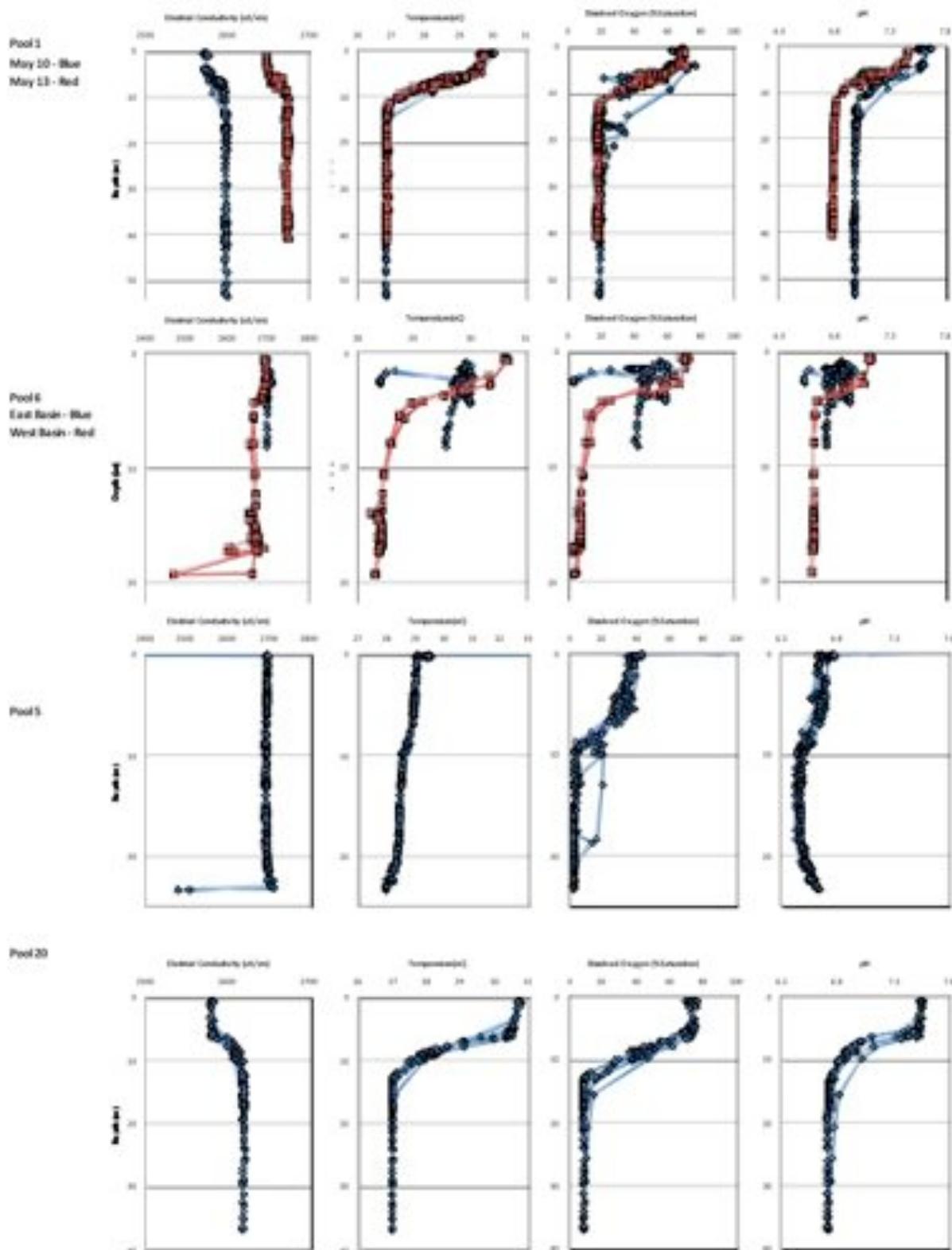
* - All masses of moist samples in ziplock sample bags

References Cited

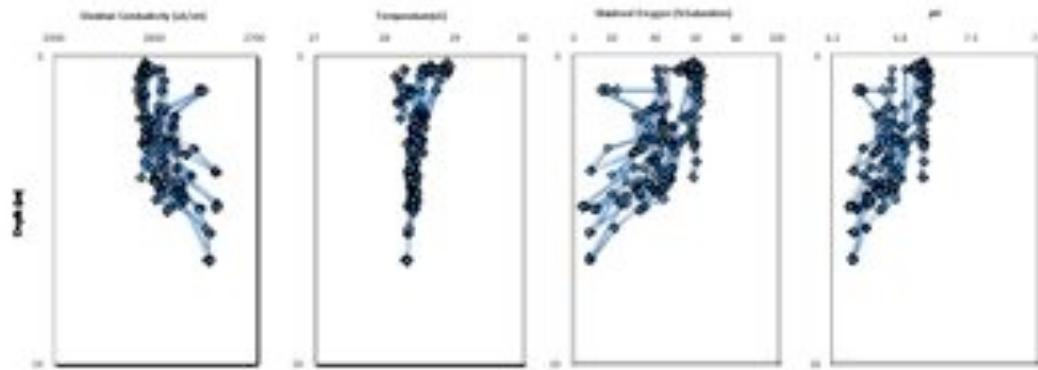
- Comac, J.
2004 Geology of Belize. Map prepared by the Belize Biodiversity Mapping Service. Accessed April 2011 via the Biodiversity & Environmental Resource Data System of Belize (BERDS) site at www.biodiversity.bz/downloads/geology.jpg
- IRIS – Incorporated Research Institutions for Seismology
2011 Seismic Monitor. <http://www.iris.edu/dms/seismon.htm>
- Kinkella, Andrew
2009 *Draw of the Sacred Water: An Archaeological Survey of the Ancient Maya Settlement at the Cara Blanca Pools, Belize*. Unpublished Ph.D. dissertation. University of California, Riverside.
- McKnight T.L., and D. Hess
2000 *Physical Geography: A Landscape Appreciation*. Prentice Hall.
- NASA – SRTM - Shuttle Radar Topography Mission
2000 PIA03364: Colored Height and Shaded Relief, Central America.
<http://photojournal.jpl.nasa.gov/catalog/PIA03364>
- NCDC–National Climate Data Centre
2011 Climate data. www.ncdc.noaa.gov/oa/ncdc.html
- Purdy, E.G., E. Gischler, and A.J. Lomando
2003 The Belize margin revisited. 2. Origin of Holocene antecedent topography. International Journal of Earth Sciences 92(4): 552 -572
- Wikimedia Commons
2007 Topographic map of Belize. Created with GMT from SRTM data. Sep 16, 2007 Contributing author Sadalmelik.

Appendix A

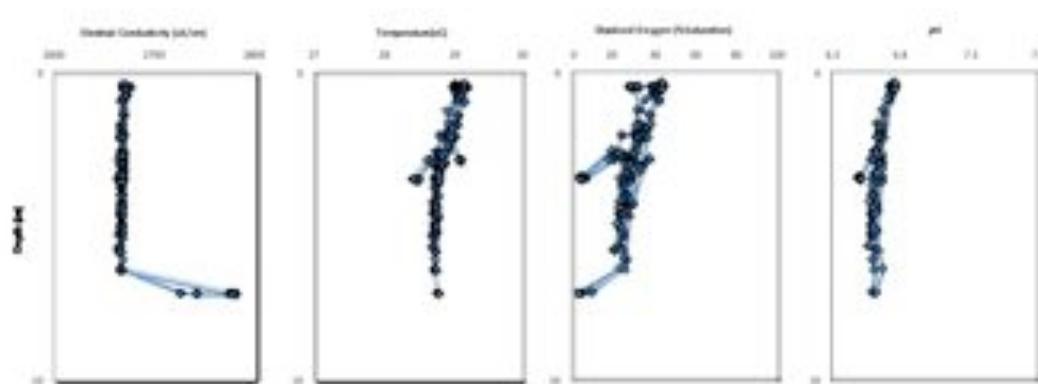
Water column profiles for the Cara Blanca Pools obtained using a Hydrolab 4A for the variables electrical conductivity, temperature, dissolved oxygen, and pH.



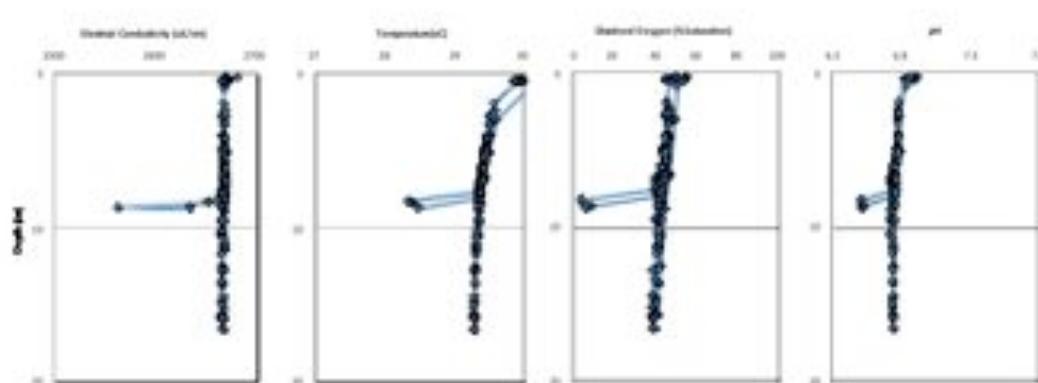
Pool 2



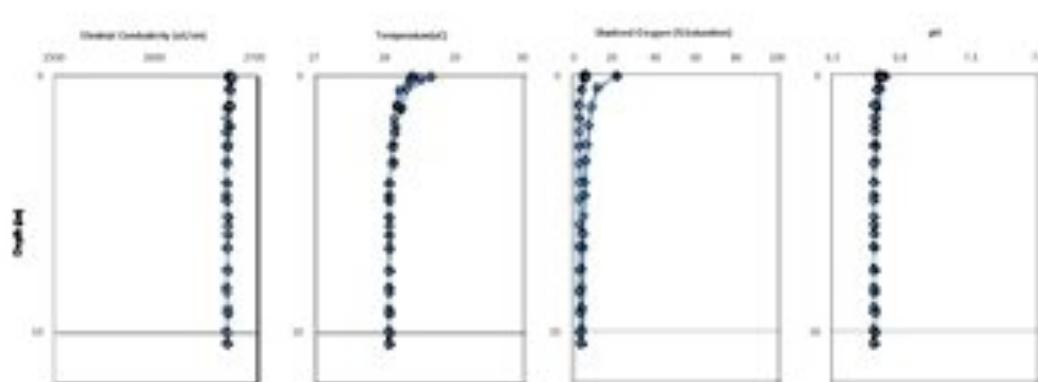
Pool 3



Pool 4



Pool 16



Appendix B

Photo-essay of methods to recover multi-meter long manual push cores from cenotes and water pools.

	
Plumbing the sediment depth with a thin diameter pocker stick.	Once coring site identified, the wide diameter PVC pipe is manually positioned.
	
Initial 1-2 m of penetration is possible with body weight.	Additional penetration is achieved using a SCUBA tank (not used for breathing) as a pile-hammer. The core tube reverberates once it hits rock. Wood in the sediment is easily dissected.
	
Once maximum penetration is achieved, measurements are taking of the depth of penetration of the core tube. A round sponge is inserted into the core tube.	The sediment-water interface is stabilized using the sponge, which is gently pushed down using the pocker stick. The depth of penetration of the pocker stick is noted, allowing for calculation of the core compaction.

	
<p>Oil wrenches are slipped over the top of the core tube, above which is a lanyard wrapped around the tube made from braided nylon rope.</p>	<p>The top end cap is placed to prevent the tube contents from falling out the bottom.</p>
	
<p>A lift bag is attached to the landyard, and partially inflated.</p>	<p>The wrenches are used to rotate the core tube, breaking the suction.</p>
	
<p>Lift is applied to the core tube using the lift bag.</p>	<p>Once the core tube is loosened from the sediment and begins to rise, the lift bag is partially deflated to prevent the tube from an uncontrolled ascent. The base end cap is brought into position, and the depth markings on the core tube vigilantly watched until ~0.5 m is left.</p>
	

<p>A hand is slide down the side of the core tube to manually hold the core contents in the tube, prior to the base leaving the sediment.</p>	<p>The end cap is efficiently placed on the end of the tube. This final 0.5 m of extraction happens very quickly.</p>
 <p>Bolts are inserted through pre-drilled holes in the base end cap and the core tube, holding the end cap in place. This allows for a very swimming vertical transport of the core, while it still has the partially inflated lift bag maintaining orientation.</p>	 <p>Removal of the core from the water is challenging given its vertical length, and so pre-planning is crucial to maintain the core integrity.</p>

Chapter 4

Preliminary Identifications of Pleistocene Mammal Remains from Cara Blanca, Belize

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Preliminary examination of bones recovered from the Cara Blanca Pool 1, Belize, recovered by the dive team under the direction of Dr. Lisa J. Lucero, Department of Anthropology, University of Illinois, Urbana-Champaign indicates that they are from the extinct giant ground sloth, *Eremotherium laurillardi* (Figure 4.1). None of the bones recovered are complete and many of recovered specimens are covered by matrix, which obscures some anatomical details. Since this preliminary report of their identification is based on photographs (Figures 4.2, 4.3, 4.4), it should be considered cursory and subject to revision based on direct examination of the specimens in order to confirm or revise these preliminary identifications.

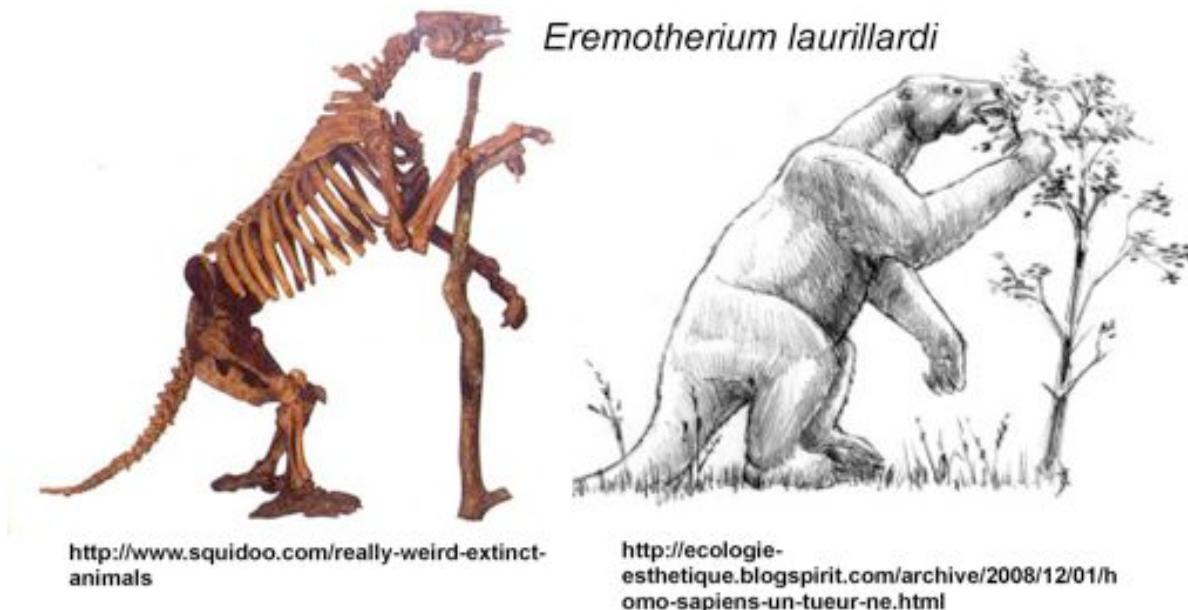


Figure 4.1 Giant Sloth



Figure 4.2 Rib fragment



Figure 4.3 Vertebra



Figure 4.4 Humerus fragment

Specimen Description

The most diagnostic element recovered is the proximal end of a left humerus representing about one fourth of the complete bone. Unfortunately because the bone is incomplete many of the more distinctive features of the diaphysis and distal end are lacking. The other identifiable bones collected include partial thoracic and caudal vertebrae, both of which are covered by cemented matrix. Numerous bone fragments were recovered but were not sufficiently diagnostic to permit identification based on the photographs provided. Removal of the matrix and first hand examination of the specimens may permit identification as to skeletal element.

The morphology of the Cara Blanca proximal humerus matches that of other *Eremotherium* in that the greater tubercle forms a prominent flat shelf on the anterior margin of the head while the lesser tubercle is a long narrow process confined to the medial side of the proximal end with its long axis parallel to that of the shaft.

The diaphysis of the humerus of megatheriid sloths have two prominent crests on the anterior surface for the insertions of the deltoid and pectoral musculature (Deluliis 2003) with the former inserting on the middle of the lateral surface of the shaft and the latter centrally on the shaft. A small portion of the proximal end of the crest for the pectoralis is present on the humerus. The distal end of the humerus lacks an entepicondylar foramen and recovery of this part of the humerus should aid in confirming the preliminary determination that the bones recovered are from *Eremotherium*.

The caudal vertebrae has matrix adhering to the anterior face of the centrum and between the neural arch and left transverse process and there is some matrix in the neural canal and on the

ventral surface. The right transverse process is incomplete and is broke near to the centrum. Based on the size and proportions it appears that it may be from the distal third of the tail.

The possible thoracic vertebra is also covered with matrix on the right side and posterior at the level of the neural canal. The view and matrix makes it difficult to more precisely determine its position other than to suggest it is one of the more posterior thoracic vertebrae. One of the other specimens appears to be a dorsal portion of a neural spine of a vertebra.

Based on the bones recovered so far there is no indication of more than one individual present. Only the single species is represented by identifiable bones. Based on other sites in Central America other species of sloth could potentially be recovered. Other taxa that may be encountered includes the gomphothere, *Cuvieronius*, which is commonly associated with *Eremotherium* in faunas and the South American notoungulate, *Mixotoxodon*. It is also possible that bones of smaller taxa may be present and the collection of bulk sediment samples which are screened through fine-mesh screen may permit their recovery.

Taphonomically the preservation of the bones is interesting in terms of the breakage. Usually in sinkhole or cenote depositional environments bones are usually recovered as complete. Many of the bones recovered show signs of weathering prior to burial. Since there is no radiocarbon date available the only age assignment is Pleistocene. During the late Glacial maximum during the Pleistocene sea level would have been 100 meters lower so the water table in the carbonate platform forming the Yucatan Peninsula and Belize would have also been lower. Bones of animals may have been exposed on the surface and only became submerged after the rise in sea level and the water table in the region. Careful excavation of the bones still *in situ* may provide some information as to the mode of accumulation.

Biogeography

Eremotherium laurillardi had the largest distribution of any extinct ground sloth and ranged from southern Brazil through tropical and the northwestern coast of South America into Central America and Mexico as far north as the southeastern United States (Figure 4.5) (Cartelle and Deluliis 1995; McDonald and Lundelius 2009). While this is the first record of the genus from Belize, it has been recorded in all of the other Central American countries; Guatemala (4), Honduras (2), Nicaragua (2), Costa Rica (3), El Salvador (3), Panama (3) and in Mexico (12 localities) (Table 1).



FIGURE 6. Map showing approximate positions of major localities yielding remains of *Eremotherium laurillardi*. Brazil: 1, Rio Grande do Sul; 2, Paraná; 3, Mato Grosso do Sul; 4, Rio de Janeiro; 5, Espírito Santo; 6, Minas Gerais; 7, Goiás; 8, Bahia; 9, Sergipe; 10, Pernambuco; 11, Paraíba; 12, Rio Grande do Norte; 13, Ceará; 14, Piauí; 15, Acre. Peru: 16, Piura. Ecuador: 17, Guayas. Panama: 18, Herrera. Colombia: 19, Huila; 20, Cundinamarca; 21, Norte de Santander. Venezuela: 22, Lara; 23, Falcón. El Salvador: 24, San Miguel. Honduras: 25, Copán. Mexico: 26, Tabasco; 27, Jalisco; 28, Guanajuato. USA: 29, Texas; 30, Florida; 31, Georgia; 32, South Carolina.

Figure 4.5 Distribution map of *Eremotherium laurillardi* from Cartelle and Deluliis (1995)

Table 1. Central American localities for *Eremotherium laurillardi*

Country	State/Province/ Department	Site	Latitude	Longitude	Elevation (m)	Reference
Belize	Orange Walk	Cara Blanca	17.42° N	88.87° W	51	
Costa Rica	Provincia de Alajuela	Bajo de los Barrantes de San Ramón de Alajuela, Río Piedras, San Miguel	8.86° N	82.87° W	1060	Valerio and Laurita, 2004; Segura, 1942 Laurito, 1993
	Provincia de Alajuela	Pital de San Carlos, Aguas Zarcas	10.38	84.35	150	Gómez, 1986 Specimen lost
	Puntarenas Prov.	El Indio	8.86° N	83.07° W	680	Mead et al. 2006
El Salvador	Dept. San Miguel	Hormiguero, Hacienda San Juan del Sur				Stirton and Gealy, 1949; Webb and Perrigo, 1984
		Rio Tomayate, apopa Munic.	13.78° N	89.17° W	404	Cisneros, 2005
	Department of San Vicente	Barranca del Sisimico,	13° 38' 32.6° N	88° 43' 45.0°W	281	Webb and Perrigo, 1985
Guatemala	Peten	Rio de la Passion, Santa Amelia	16.25° N	90.03° W	136	
	Zacapa	Estanzuela	14.32° N	90.29° W	967	
	Guatemala City	Guatemala City	14.63° N	90.55° W	1500	
	Chiquimula	Chiquimula	14.8° N	89.55° W	424	
Honduras	Dept. of Copan	Yeroconte, near Dolores de Copan	14.87	88.83	1167	McGrew, 1942; Webb and Perrigo, 1984
	Dept. of Comayagua	Orillas del Humuya			600	Webb and Perrigo, 1984
	Dept. of Olancho	Manto				
Nicaragua		El Bosque	13.32 N	86.55 W		Gruhn, 1978
	Dept. De Managua	Masachapa	11.79 N	86.52 W	0	Lucas et al. 2008
Panama	Herrera Prov.	El Hatillo .5 miles W of Pesé	7.91° N	80.63°W	85	Gazin, 1957
	Herrera Prov.	La Trinitaria, Azuero Peninsula	7.92 ° N	80.72° W	98	Pearson, 2005
	Herrera Prov.	Llano Hato Azuero Peninsula	7.97 ° N	80.68 ° W	105	Pearson, 2005

References Cited

- Cartelle, C. and G. De Iuliis
1995 *Eremotherium laurillardi*: The Panamerican Late Pleistocene Megatheriid Sloth. *Journal of Vertebrate Paleontology* 15:830-841.
- Deluliis, G.
2003 Toward a Morphofunctional Understanding of the Humerus of Megatheriinae: The Identity and Homology of Some Diaphyseal Humeral Features (Mammalia, Xenarthra, Megatheriidae). *Senckenbergiana biologica* 83:69-78.
- McDonald, H.G. and E.L. Lundelius Jr.
2009 The Fiant Ground Sloth, *Eremotherium laurillardi*, (Xenarthra, Megatheriidae) in Texas. Pp. 407-421 in L. B. Albright III (ed.). *Papers on Geology*,

Chapter 5

Return to Pool 1 and Reconnaissance at Pool 20: The 2010 Cara Blanca Settlement Survey

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Moorpark College

The 2010 Cara Blanca Settlement Survey represents a new phase in the study of the Cara Blanca Pools, going beyond the parameters set for my dissertation research (see Kinkella 2009). The previous work was a 400-meter-wide transect which began at the site of Yalbac and progressed northeast for four kilometers to the westernmost Cara Blanca pool (Pool 7). The survey then continued east, following the Cara Blanca escarpment and ending in an impassable swampy area immediately east of Pool 6. Ultimately, 16 of the 25 known pools and their associated settlement were recorded (Figure 5.1). For this season, the settlement survey had three goals: to re-map the settlement directly around Pool 1, to continue searching for artifacts at the edge of Pool 1, and to continue the transect northeast from Pool 6 towards the remaining pools.



Figure 5.1 The 25 Cara Blanca Pools (Pools 1-16 were the subject of my dissertation).

The data obtained from the Cara Blanca Settlement Survey is utilized to learn more about how the ancient Maya interacted with the pools in their daily lives. These pools can be generally placed on a continuum where the westernmost are best defined as scarp-foot springs (shallow with gentle-sloping sides - Pools 7-14), changing to classic cenotes in form as one travels east (deep with sheer sides - Pools 1-5, 16+). Some of these pools have ancient Maya dwellings around them, and some do not. I hope to answer questions about how these pools were used by the ancient Maya, such as: Which pools acted as ritual entryways to the underworld of Xibalba, where Maya families prayed to ancestors? Which pools were merely used as a water resource? Why do some pools have settlement around them, while some do not?

Research Strategy

The work described here was undertaken during May 5-14, 2010. The primary objective of these investigations was to continue the transect northeast from the previous termination at Pool 6 in order to visit the easternmost pools, and record any settlement found during the journey using a handheld GPS in tandem with the 1:50000 Belize Government maps. A second objective was to re-record the settlement at Pool 1 using new compass bearings and tape measurements in order to produce a finer-grained map than was previously drawn. Lastly, a simple underwater survey of Pool 1 was planned using a mask and snorkel in order to locate any ceramic sherds in the pool sidewall within the shallow, first two meters of the pool.

New Pools and Settlement 2010

Six new pools were visited during the 2010 season, numbered from 17 to 21 and 24 (Pools 22, 23, and 25 have yet to be visited –Figure 5.2). Described below are my initial impressions of these pools, their location, and the associated settlement recorded on the transect.



Figure 5.2 The Cara Blanca Settlement Survey (2010 survey path in red, dissertation transect in white).

The order of the pools presented below corresponds to the order in which we came upon them as we walked eastward from Pool 6 (Figure 5.3):

Pool 24: A small pool (approximately 30 m in diameter) located 300 meters due east from Pool 6, and very full of jungle detritus. The south side of the pool is a good access point for any future dives.

Pool 17: A larger pool (approximately 100 m in diameter) of the same variety as Pool 6. Many reeds are growing at the edge, and several poisonwood trees.

Pool 18: Approximately 60 meters in diameter. The west side is overgrown and very muddy. This pool looks deeper than Pool 17, especially in the north. Cleofo said he has seen large mounds to the east of here while hunting, but this memory is quite old.

Pool 19: Approximately 100 m in diameter. The west edge is easy to get to for pool access, but the trail is undulating and difficult. Alligators were seen swimming along the surface.

Of the pools described above, no settlement was encountered (there may be some to the north on slightly higher ground). The area is undulating, with bajos and drainages. The first settlement encountered this season was in the vicinity of Pool 20:

Pool 20: Approximately 100 m in diameter. Rounder and more cenote-like than the others, and the pool appears to be deeper than most. There is settlement concentrated near this pool, with one structure only 40 meters to the north, and a small group of 7-8 structures approximately 450 meters northeast (see below).

Pool 21: Approximately 90 m in diameter. Appears shallower than Pool 20.

As of this year, all pools have been visited with the exception of Pools 22, 23, and 25 at the easternmost terminus of the Cara Blanca Settlement Survey area.

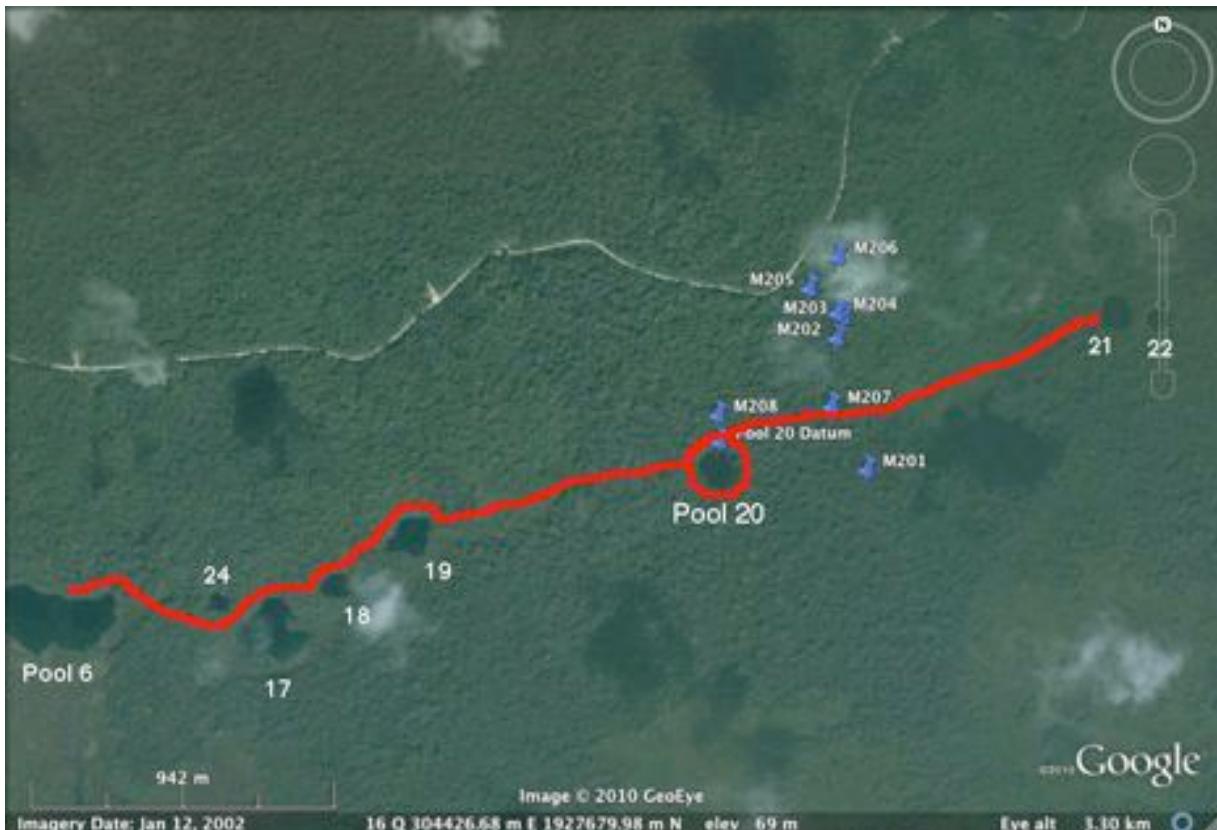


Figure 5.3 2010 Cara Blanca Settlement Survey path from Pool 6 (in red).

Settlement at Pool 20

The only settlement found during the 2010 survey work east of Pool 6 is located in the vicinity of Pool 20 (Figure 5.4). Eight mounds and/or mound groups, labeled M201-M208, form a loose cluster of settlement in the area immediately northeast of Pool 20 (Figure 5.5). Of special note are structures M205 and M208 (see Appendix). M208 is located 40 meters north of the northern edge of Pool 20, making it one of the very few structures on the Cara Blanca Settlement Survey that is constructed directly in relation to a pool, with possible ritual implications. M205 is a large plazuela group with structures measuring between three and five meters tall, making it the largest structure yet recorded on the entire Cara Blanca transect east of Pool 1.

I had expected to find more settlement in this area, as Pool 6 has a moderate amount of settlement along its northern side. The low-lying, inundated nature of some of the terrain in the vicinity of several of the pools may be a partial explanation as to the dearth of settlement. Also, the initial explorations here were not on a 400-meter-wide transect; more survey coverage of the area may reveal additional structures (especially in the higher ground located to the north of the pools).



Figure 5.4 Settlement location in the Pool 20 vicinity.

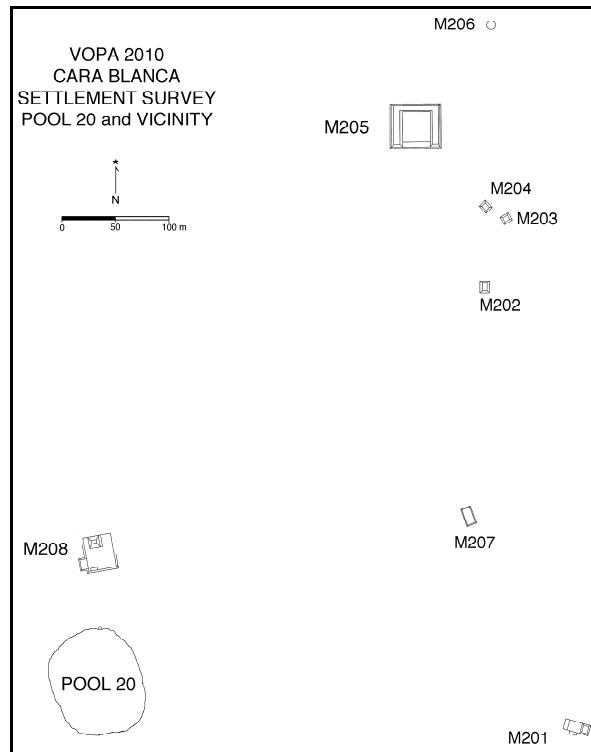


Figure 5.5 Settlement at Pool 20.

Return to Pool 1

In addition to extending the Cara Blanca Settlement Survey further east, I also spent time re-recording some of the structures at Pool 1. Previous research has shown that Pool 1 and the four structures immediately associated with it (Figure 5.6) were likely used for water ritual during the Late Classic Period (Kinkella 2000, 2004, 2009), consistent with watery locales in other areas of the ancient Maya world (see Andrews and Corletta 1995; Lucero 2006). This pool is the backbone of the underwater component of the VOPA project, where most underwater work has been done. As covered elsewhere in this report (see Chapter 2), Pool 1 has now recorded depths ranging up to 80 meters or more in the northern portion of the pool, and is referred to by the name Actun Ek Nen (Black Mirror Cave), plunging into the depths of Xibalba as it abuts the steep Cara Blanca cliffs.

One of the goals of the 2010 Cara Blanca Settlement Survey was to re-map the main structures surrounding Pool 1, and collect any ceramic sherds found underwater in association with the structures. I was able to re-map Structures 1, 2, and 4. These structures have turned out to be more complicated than was first assumed, and additional mapping and excavation will be required to have a full understanding of the number and arrangement of rooms in each structure, especially Structure 1.

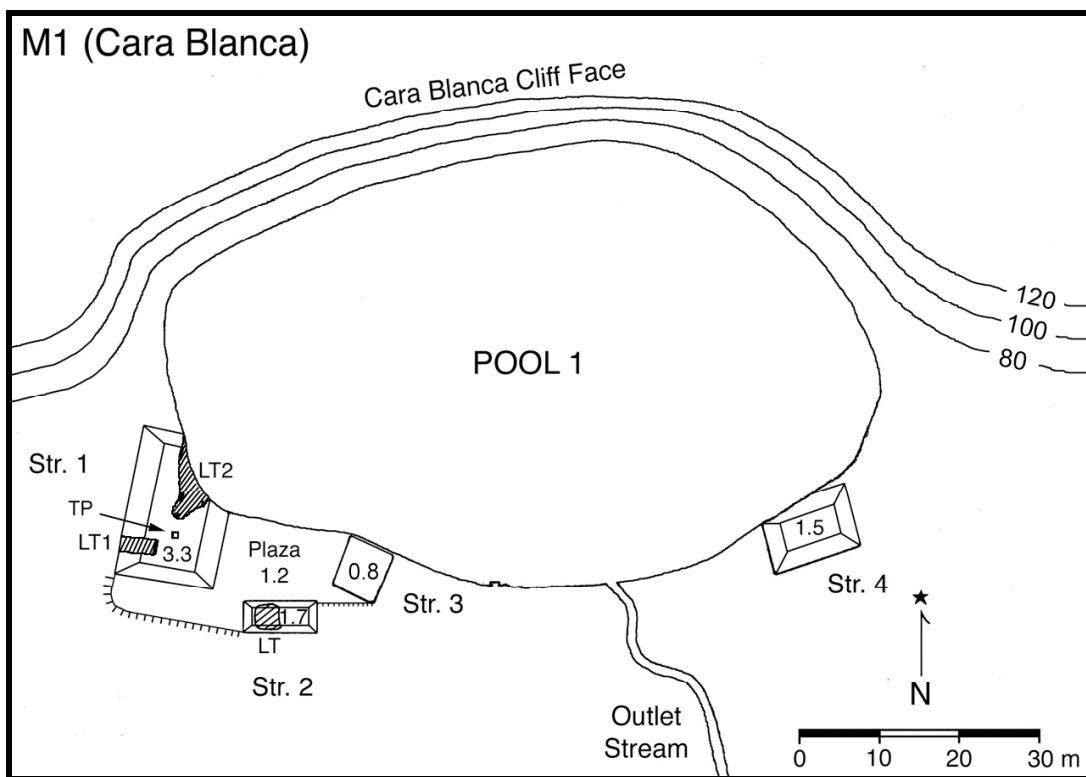


Figure 5.6 Cara Blanca M1 Including Structures 1-4 (from Kinkella 2009).

Structure 1, M1

Although I have mapped and re-mapped this structure several times (see Kinkella 2000), each new analysis seems to yield new information. The longer, north/south axis runs at 17 degrees from true north and general dimensions are 20 m long, 10 m wide, and 3.3 m tall (Figure 5.7). Two looter's trenches (LT 1 and LT 2) and one 1x1 m test pit show that Structure 1 is quite complex in its architectural design, consisting of a vaulted, "L" shaped range building with six rooms, where four rooms radiate out from a central spine wall (two on each side), and two larger rooms are located at the north and southwest ends. In addition, there are one or more detached, pillar-like walls built two meters east of the structure, running the poolside length of the structure.

Excessive debris build-up in at the southeast corner indicates that the southeast room may be of a heavier construction than the rest of the building, which may hold some significance such as being

the remains of a sweatbath, similar in configuration to the one encountered at M186 on the Cara Blanca transect, or others at sites such as Piedras Negras (Kinkella 2009:176). Structure 1 sits so close to the pool's edge that part of its eastern wall has collapsed into the water, revealing the fine cut-stone construction of its walls (Figure 5.8). As of this writing, some of the associations between rooms as drawn on the map below are speculative; additional excavation is needed to secure the exact relationships of rooms, walls, and doorways.

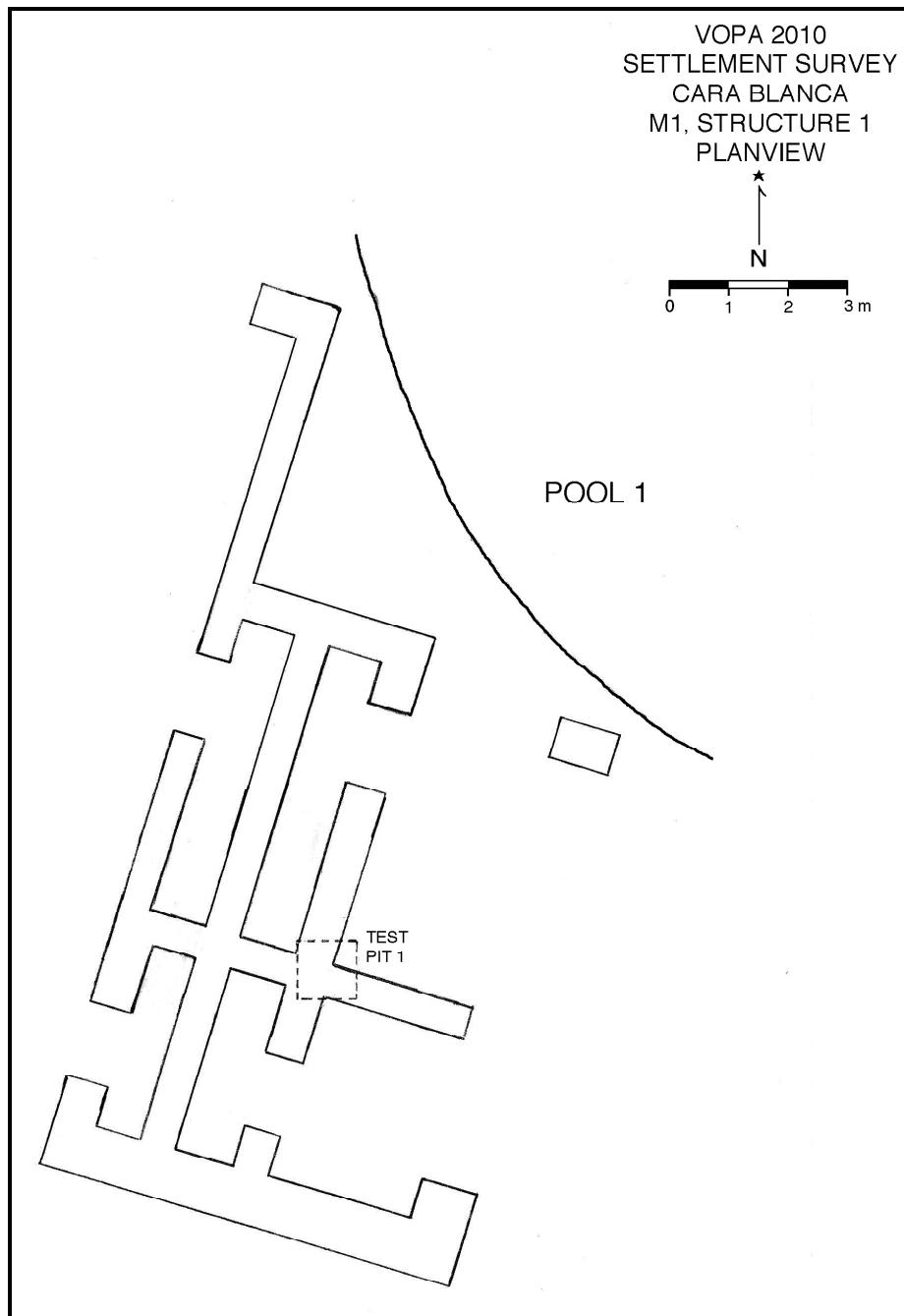


Figure 5.7 M1, Structure 1 at Pool 1



Figure 5.8 East side of Structure 1 at Looter's Trench 2 as it crumbles into Pool 1

Structure 2, M1

With the exception of a single Late Classic jar sherd collected in 1999 (see Kinkella 2000), Structure 2 at Pool 1 has been largely ignored by my investigations, mainly because the looting that has taken place here is extreme. The center of the mound is a crater-like, confused collection of broken cut stone, cobble ballast, and debris. This season, I noticed that the looting had become so bad that the walls of a room had been uncovered. Structure 2 consists of a single square room, approximately 5 m long, 4 m wide, 1.7 m high, and aligned to 98 degrees along its long axis. The room has a single doorway on the northern side, which is offset to the east. The offset of the doorway may have enabled better viewing of the pool. This room is likely built upon a low platform, but looter's debris and general site destruction make the measurement of the platform tenuous. Because of this, the drawing below (Figure 5.8) shows only the room itself and a scale for comparison to the other structures in the vicinity.

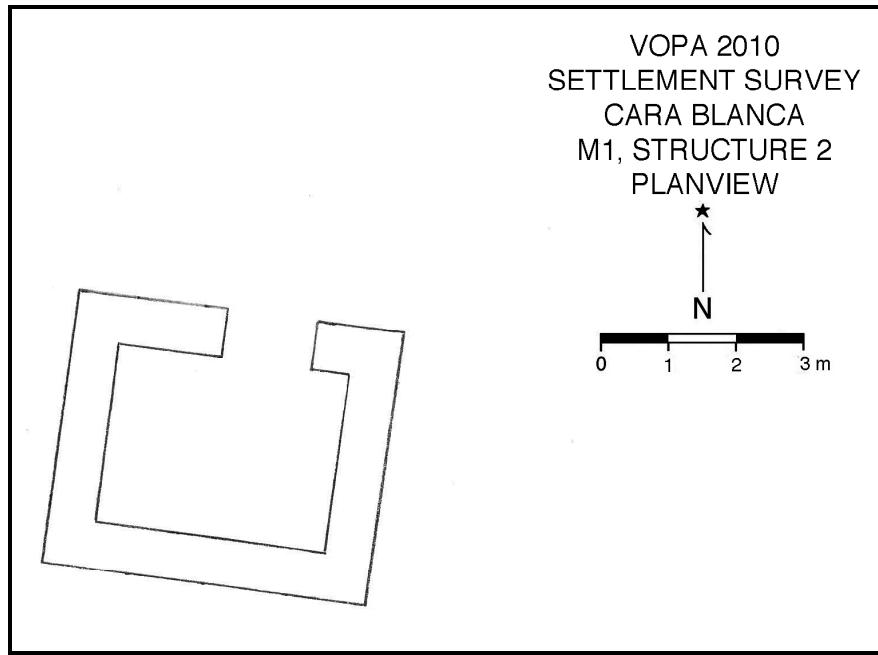


Figure 5.8 Structure 2 at Pool 1

Structure 4, M1

Structure 4 appears to be a platform mound with an attached porch on the north side, directly abutting the southeastern edge of Pool 1 (Figure 5.9). Dr. Lucero and I mapped this structure using tape and compass, recording the dimensions of this structure as 11 m long, 7 m wide, and 1.8 m high. The long axis of Structure 4 runs generally east/west, aligned to 82 degrees from true north. Unlike Structures 1 and 2, Structure 4 appears to have no cut-stone walls; only a platform remains. Several sherds were found in the pool in the vicinity directly below this structure, at approximately 1 m below the surface.

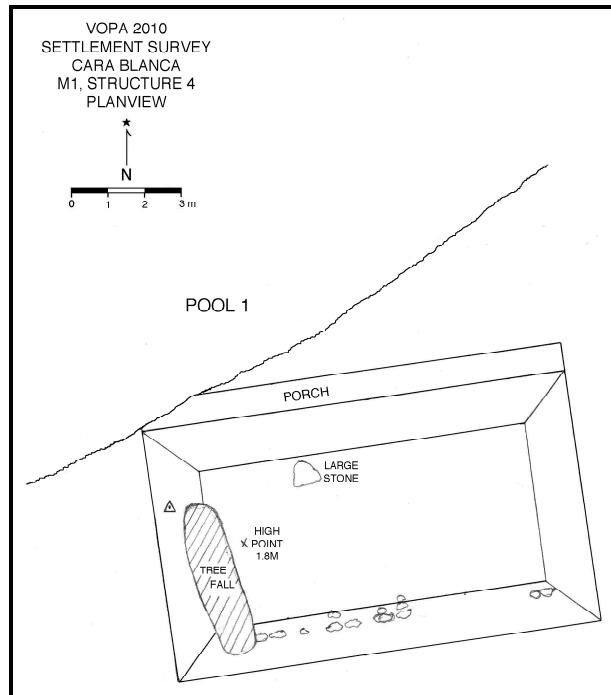


Figure 5.9. Structure 4 at Pool 1

Underwater at Pool 1

While most of the dive team surveyed the deepest depths of Pool 1 (see Chapter 2 of this report) myself and divers Ed Mallon and Robbie Schmittner conducted a simple underwater survey for ceramic sherds, using a mask and snorkel to free-dive alongside the pool walls. This technique was continued all the way around the pool until the entire underwater wall had been surveyed. Several new ceramic sherds were found in the shallow water (never deeper than two meters), specifically in the vicinity of Structures 1 and 4.

When recognizable, all potsherds date to the Spanish Lookout Phase, Late Classic Period, between A.D. 600-900 (Gifford 1976). The recovered ceramic sherds included a jar rim I found approximately 1.2 meters beneath the surface at the pool's edge near the eastern side of Structure 4, identified as Cayo Unslipped (Figure 5.10). Ed Mallon snorkeled the area immediately below the surface between Structures 1 and 4 and noted the presence of several additional sherds, including a polychrome sherd near Structure 1, and a second polychrome sherd with black and orange designs near Structure 4 approximately 15 cm from the jar rim described above. Specific sherd classifications are listed on a table in Chapter 2 of this report.

In order to preserve the ceramic sherds once removed from their watery environment, we merely allowed them to dry slowly in the shade. This seemed to work fine – a perusal of the collected artifacts next season will tell if our efforts were correct (see Hamilton 1998). While these simple preservation measures seemed successful, I did notice that submerged ceramics are more brittle and easier to break than ceramics that have been deposited in an underground context, so special care should be taken when removing ceramics from an underwater environment and preparing them for long-term storage.



Figure 5.10 Jar rim *in situ* underwater near Structure 4 (Catalog #975).

The discovery of a fossil bed below Structure 1, in the Pool 1 sidewall at a depth of between 20 and 25 meters was something completely unexpected. We were so unaccustomed to finding something of this sort that our initial guess was that the material was not fossils, but portions of a ceramic vessel! As an archaeologist, I have no direct experience with the identification and/or dating of these fossils, but I was able to draw the fossils to scale from a datum set at 20 meters below surface. They consist of long bones, ball joints, and possibly a pelvis (Figure 5.11 – the datum is a large ball joint protruding from the sidewall) (see chapter 4).

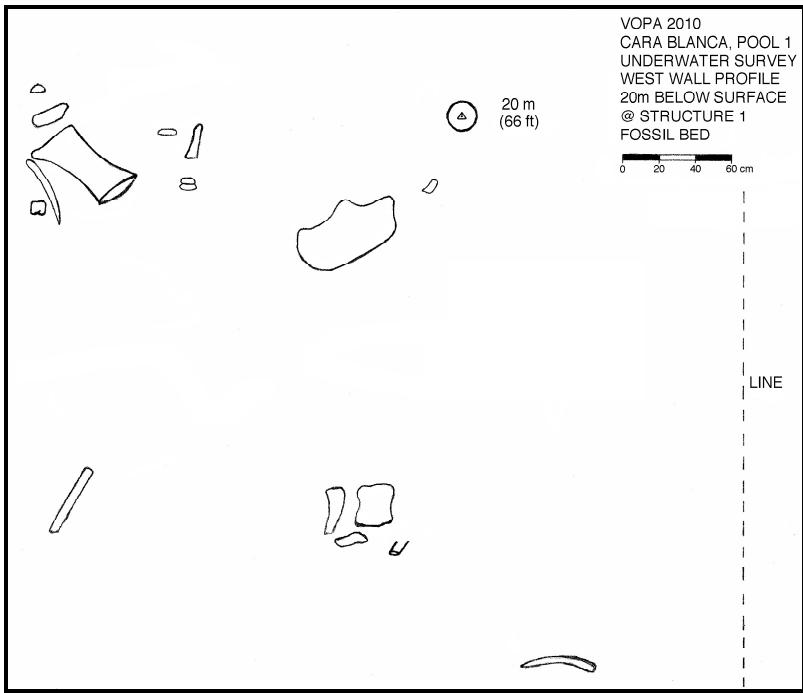


Figure 5.11 Fossil remains in sidewall of cenote, 20-25m below water surface

Results

The 2010 Cara Blanca Settlement Survey was successful in its primary objective of continuing the transect northeast from the previous termination at Pool 6, in the process recording six new pools and the associated settlement at Pool 20. The settlement at Pool 20 included eight previously unrecorded structures (M201-208), two of which appear to have special significance. As M208 is only located 40 meters away from Pool 20, later excavations may uncover evidence of ritual activity. The large plazuela group of M205 is of interest for its size, as the largest structure yet recorded on the transect east of Pool 1.

The second objective of re-recording the settlement at Pool 1 in order to produce a finer-grained map was successful as well. I was previously unaware that Structure 1 was "L" shaped, and the reconfiguration of rooms adds credence to the possibility that Structure 1 includes a sweatbath in its construction. I had also never recorded the room on top of Structure 2, and this new data encourages a more thorough comparison of Structures 1 and 2 in future reports. Structure 4 stands alone, on the eastern side of Pool 1 (Structures 1-3 are on the western side), and is also constructed in a simpler manner than Strs. 1 and 2 (no standing walls). However, Structure 4 does include the remains of a porch that is located directly on the pool's edge, and sherds underwater directly below.

Lastly, the underwater survey of Pool 1 for ceramic sherds in the pool sidewall also met with success, as we found several sherds within the first two meters of depth. The location of these sherds, specifically in the vicinities of Structures 1 and 4, may earmark these structures as ritually important nodes where the Maya gathered to throw offerings into the watery underworld below.

In sum, the Cara Blanca Settlement Survey continues to acquire data that informs us on the function and meaning of the settlement located at the Cara Blanca Pools. The distant location of these ritual sites (e.g. Pool 1 and possibly Pool 20) from local centers, the artifacts found in the pools, and the dates of habitation (the latter part of the Late Classic – A.D. 800-900) may earmark them as locations where pilgrimage occurred in order to practice water ritual during the latter days of the Late Classic Period, away from the direct control of local leaders (see Kinkella 2009).

Future Research and Concluding Remarks

There are many options for future research in this area. The most straightforward approach would be to expand the settlement survey further east to include the final three pools, and widen the new transect to 400 meters in order to match the new dataset with the existing one. Because of the settlement survey focus of this research, larger and more numerous excavations would be a welcome

addition to the current data set. Of special consideration is Structure 1 at Pool 1 (M1); this structure may include a second sweatbath, and an excavation focused on uncovering telltale sweatbath attributes would answer this question unequivocally. Other strong candidates for excavation would be Structure M208 directly North of Pool 20 (to search for ritual attributes), and the large structure M205 in the Pool 20 vicinity (to ascertain the function of these large buildings). Underwater research can be expanded as well in future projects, with more intensive explorations of the underwater environment.

Further study will increase our understanding of the relationship between the pools and the surrounding communities, as well as cement current ideas on the pools as pilgrimage destinations of ritual importance.

Acknowledgements

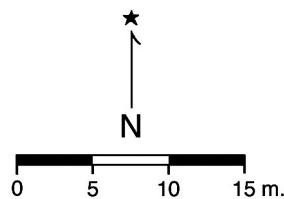
Special thanks go to the employees at Yalbac Ranch and Cattle Corporation (Belize) Limited for allowing us onto their property and then helping us once we were there, to our crew from Valley of Peace Village for their unfailing aid in difficult situations, to the Carr family at Banana Bank Lodge for their kindness and hospitality, and to my wife Susan for her help, love, and support.

References Cited

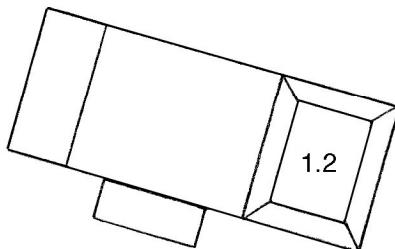
- Andrews, Anthony and William Corletta
1995 Diving the Sacred Pools. *Ancient Mesoamerica* 6:101-117.
- Gifford, James C.
1976 *Prehistoric Pottery Analysis and the Ceramics of Barton Ramie in the Belize Valley*. Peabody Museum of Archaeology and Ethnology Memoirs, Vol. 18, Harvard University, Cambridge.
- Hamilton, Donny L.
1998 Methods of Conserving Underwater Archaeological Material Culture. Conservation Files: ANTH 605, Conservation of Cultural Resources I. Nautical Archaeology Program, Texas A&M University, World Wide Web, <http://nautarch.tamu.edu/class/ANTH605>
- Kinkella, Andrew
2000 Settlement at the Sacred Pools: Preliminary Archaeological Investigations at the Late Classic Maya Site of Cara Blanca, Belize. Unpublished Master's Thesis. California State University, Northridge.
- 2004 The Pools at Cara Blanca: Archaeology in the Valley of Peace Above and Below the Water. *Research Reports in Belizean Archaeology* 1:93-102.
- 2009 *Draw of the Sacred Water: An Archaeological Survey of the Ancient Maya Settlement at the Cara Blanca Pools, Belize*. Unpublished PhD Dissertation, University of California, Riverside.
- Lucero, Lisa J.
2006 *Water and Ritual: The Rise and Fall of Classic Maya Rulers*. University of Texas Press, Austin.

Appendix: 2010 Settlement Data from Pool 20 and Vicinity

Each of the structures recorded below were assigned an "M" number (short for "mound"). Numbers for the 2010 season start at M201. All structures described below include brief notes on location and overall form, and are drawn to the same scale, which is reproduced below:



M201



VISIBLE FORM: Small, three-mound plazuela group. Largest structure is 1.2 m tall.

RECORDATION DATE: 6 May 2010

GPS LOCATION: 16 Q 305206 1927314

BASAL ELEVATION: 62 m.

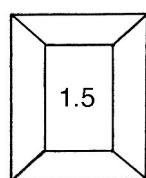
CONSTRUCTION MATERIAL: Cobbles.

SURFACE COLLECTION/EXCAVATION: None.

CHRONOLOGICAL PLACEMENT: None.

DISCUSSION: Located in the vicinity of Pool 20.

M202



VISIBLE FORM: Small, rectangular mound, 1.5 m tall.

RECORDATION DATE: 6 May 2010

GPS LOCATION: 16 Q 305112 1927716

BASAL ELEVATION: 87 m.

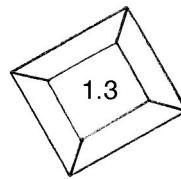
CONSTRUCTION MATERIAL:

SURFACE COLLECTION/EXCAVATION: None.

CHRONOLOGICAL PLACEMENT: None.

DISCUSSION: Located in the vicinity of Pool 20.

M203



VISIBLE FORM: Small, rectangular mound, 1.3 m tall.

DATE RECORDED: 6 May 2010

GPS LOCATION: 16 Q 305132 1927781

BASAL ELEVATION: 88 m.

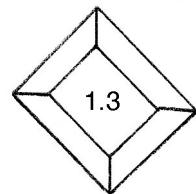
CONSTRUCTION MATERIAL:

SURFACE COLLECTION/EXCAVATION: None.

CHRONOLOGICAL PLACEMENT: None.

DISCUSSION: Located in the vicinity of Pool 20.

M204



VISIBLE FORM: Small, rectangular mound, 1.3 m tall.

DATE RECORDED: 6 May 2010

GPS LOCATION: 16 Q 305113 1927792

BASAL ELEVATION: 91 m.

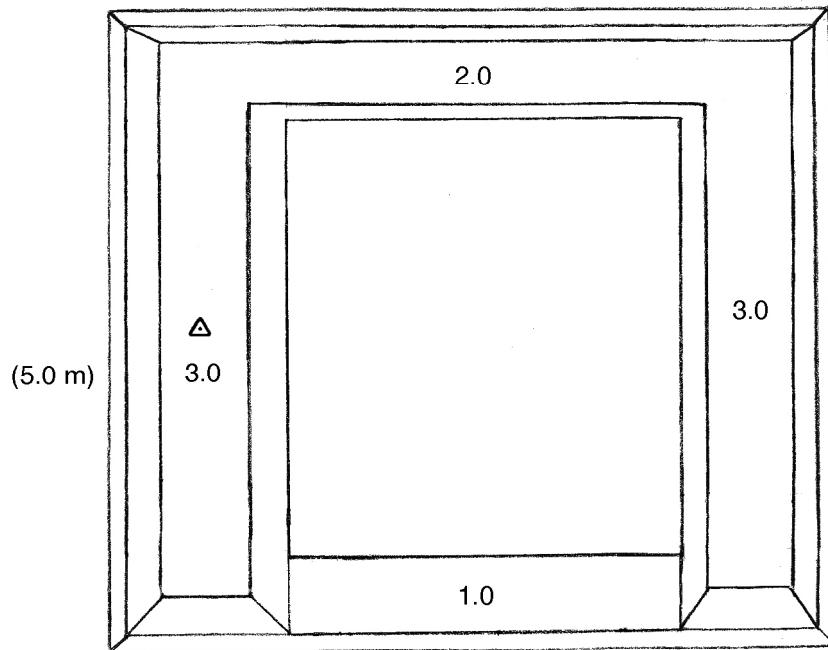
CONSTRUCTION MATERIAL:

SURFACE COLLECTION/EXCAVATION: None.

CHRONOLOGICAL PLACEMENT: None.

DISCUSSION: Located in the vicinity of Pool 20.

M205



VISIBLE FORM: Very large, four-sided plazuela group on a 1 m tall platform. Largest structure is 3.0 m tall above platform (5.0 m tall from ground surface).

DATE RECORDED: 6 May 2010

GPS LOCATION: 16 Q 305030 1927868

BASAL ELEVATION: 96 m.

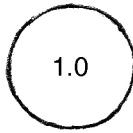
CONSTRUCTION MATERIAL: Cut limestone architecture with cobble ballast.

SURFACE COLLECTION/EXCAVATION: None.

CHRONOLOGICAL PLACEMENT: None.

DISCUSSION: M205 is the largest structure encountered in the Pool 20 vicinity, as well as being the largest structure encountered east of Pool 1.

M206



VISIBLE FORM: Small, circular mound, 1 m tall.

DATE RECORDED: 6 May 2010

GPS LOCATION: 16 Q 305118 1927963

BASAL ELEVATION: 96 m.

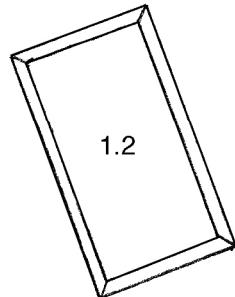
CONSTRUCTION MATERIAL: Cobbles

SURFACE COLLECTION/EXCAVATION: None.

CHRONOLOGICAL PLACEMENT: None.

DISCUSSION: Located in the vicinity of Pool 20.

M207



VISIBLE FORM: Rectangular mound, 1.2 m tall.

DATE RECORDED: 9 May 2010

GPS LOCATION: 16 Q 305097 1927510

BASAL ELEVATION: 52 m.

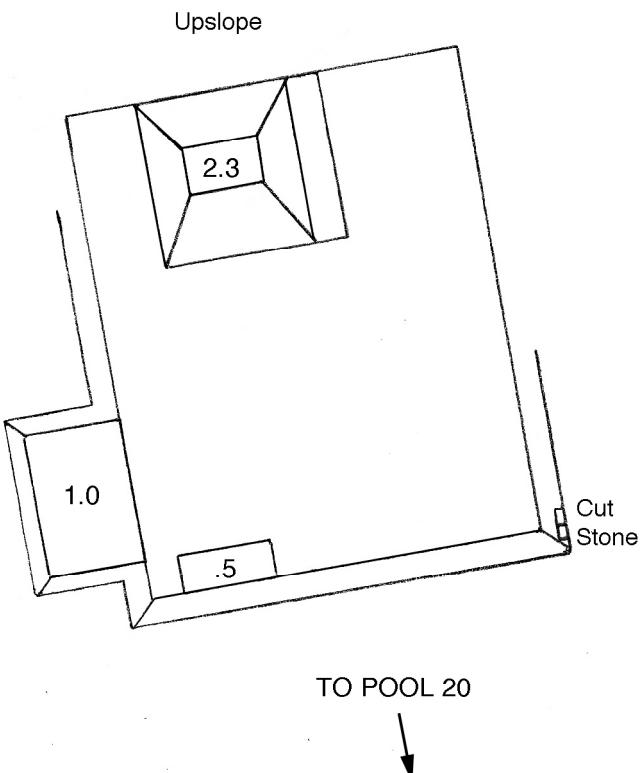
CONSTRUCTION MATERIAL:

SURFACE COLLECTION/EXCAVATION: None.

CHRONOLOGICAL PLACEMENT: None.

DISCUSSION: Located in the vicinity of Pool 20.

M208



VISIBLE FORM: Plazuela group with three structures, built on a south-facing slope directly north of Pool 20. Tallest structure (2.3 m) is located at the northern, upslope portion of the plaza.

DATE RECORDED: 9 May 2010

GPS LOCATION: 16 Q 304747 1927486

BASAL ELEVATION: 68 m.

CONSTRUCTION MATERIAL: Cut stone with cobble ballast.

SURFACE COLLECTION/EXCAVATION: None.

CHRONOLOGICAL PLACEMENT: None.

DISCUSSION: M208 is noted for its close location to Pool 20. At only 25 meters North of the northern rim of Pool 20, M208 is one of a handful of structures on the Cara Blanca Settlement Survey that have a direct association with a pool.

Chapter 6

Plaza 2 Plaza Perimeter Explorations

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The 2008 goal at Yalbac was to “assess the roles of temples in Classic Maya society” (Lucero 2009:5). The excavations in Plaza 2 in 2008 were to assess ritual activity at the base of temples: “Exploring the spaces that contained the audience, as well as from where they came (surrounding areas), will help to understand how the public influences political relationships and how leaders engage their subjects” (Lucero 2009:5). The 2010 Plaza 2 excavations continued this goal and focused on the entrances to the plaza. The units were placed at the northern plaza edges to look for middens (see Figure 1.2). The intent was to discover what ritual observers and participants used and left behind in the plaza. The units were located at two plaza entrances at its northeast and northwest edges on either side of the range building Str. 2D. Str. 2D is the northernmost of the Yalbac’s monumental buildings, forming the northern border of both Plaza 2 and the site core. These two entrances are bottlenecks for those entering or leaving Plaza 2 from the north, so the middens if found there should have a high concentration of debris; in addition, the Classic period strata likely have been compressed from heavy foot traffic.

Plaza 2 has the lowest elevation and is the most accessible of Yalbac’s three plazas (Lucero 2007). Therefore, it was the site of the most inclusive rituals, involving every class of Yalbac’s surrounding population. The largest and least restricted plaza was designed to contain all the people associated with the center (Inomata 2006:819). Individuals entering the plaza from the north came directly from the hinterlands, not from the restricted plazas for elites and royals. Thus, the people walking through these entrances included commoners.

There are two potential sources for the “ceremonial trash” we expected to find at the test pits: discarded objects from Str. 2D or Temple 2E, or discarded objects from people entering or leaving the plaza. The reasons that commoners would enter the plaza probably varied. Plazas did not have exclusively ritualistic purposes; markets, ball games, and community events also took place. Farmers were “tied to the land” during the wet season; during the dry season they most likely came to centers for resources like water and community rituals during the dry season (Inomata 2006:818). Other aspects of the location of the test pits may affect the remains found there. Yalbac’s ballcourt, oddly placed in front of the Temple 2A, is just south of the Plaza 2D test pit. Game spectators and their discarded objects may figure in the area of the Plaza 2D test pit.

Unexpectedly, architecture was found in both Plaza 2E and 2D test pits. The presence of architecture, presumably walls, suggests that Plaza 2 was perhaps not quite as open and inclusive as previously assumed. Architecture likely controlled the flow of people and whatever they carried with them in and out of the plaza.

Plaza 2E Test Pit

The 2 x 1 m Plaza 2E test pit’s southwest corner served as the datum provenience point, 15.08 m distant and 240° from traverse point YK (68.70 m asl). It was measured with meter tapes and a Brunton compass. The surface elevation of the SW corner was 70.02 m asl, and from this point we determined the surface elevations of the other corners of the 2 x 1 m unit: NW 69.94 m asl, NE 69.68 m asl, SE 69.79 m asl, and center 69.79 m asl.

Excavation was conducted with pick-a-hoes and trowels, and the matrix was screened through 1/2" mesh. The topsoil, or stratum 101, yielded a variety of plain and decorated ceramics, as well as obsidian and several shell and bone fragments (Table 6.1). A human tooth was also found. The frequency of artifacts declined and the soil color lightened as the stratum progressed. A concentration of boulders and cobbles with sherds packed among them indicated an unexpected structure. Ceramics from 101, not surprisingly, show a range of time periods, mostly Late and Terminal Classic.

The uncovered boulders in the southern part of the test pit were recognized to be architecture, a wall of some sort (wall 102). We labeled the rest of the unit stratum 103, characterized by lighter, denser soil than 101. Since strata 102 and 103 were not recognized as distinct strata for the first few

days of their excavation, some of the artifacts from 102 and 103 were mixed. It was noted that most of the 102 and 103 artifacts came from between the boulders of 102, and the ceramics crumbled extremely easily. Both strata contained shell, lithics, and ceramics; stratum 103 also contained an obsidian blade. We were able to identify a Roaring Creek Red plate that would date this feature to as late as c. A.D. 800-900.

The remaining ceramic dates are suspect due to the ‘hoax’ sherd recovered in stratum 104 (described below) (see Table 6.1 for ceramic dates).

Visible in the profile of the north wall of the test pit was a sloped line of white rock with lighter soil underneath, which we distinguished as stratum 103A (Figure 6.1). Strata 103 and 103A had patchy, light grey soil (10YR6/3, 10YR7/3, 10YR6/2) with tiny, interspersed black spots that may have been burnt charcoal or simply decaying organic matter. Ceramics were more abundant than lithics (including a polychrome basal flange), and near the bottom of 103 we found two obsidian blades.

Table 6.1 Plaza 2E TP Strata

Stratum	Description	Elevation (m asl)	Munsell Color	Artifacts	Ceramic Dates
101	Topsoil: Clay loam	70.02	10YR2/1 10YR 3/2 (topsoil) 10YR5/2 10YR4/2	225 body sherds (1.06, 1.10, .80, 1.10, .97, 1.22 cm thick; a few VA, several thin, red-slipped VA), 6 neck (1.53 cm), 6 painted sherds, 1 diagnostic sherd, 5 flanges (2 quite extreme—2.18, 2.32 cm), 28 rims, 1 large neck, 1 hollow slab foot piece, 2 flat bases, 1 small Z-angle, 1 ring base, 1 small jute, 1 ridged jute, 4 pieces of large marine shell (likely conch), 2 obsidian blades, 7 bone pieces, 1 human tooth, 1 brown quartzite adze fragment (mostly whole), 7 blades, 35 flakes (5 FC), 6 chunks	225 body sherds (some thick; a few VA, several thin, red-slipped VA) 3 Benque Viejo Polychrome: variety unspecified open dish sherds (Spanish Lookout) incurving bowl Belize Red rim with lacing hole (in 3 large pieces) VA sherds: vase, hollow slab foot, Z-angle Tall jar rim (c. 10 cm high) with horizontal striations
102*	Boulders and cobbles-- architecture; burnt pebbles	69.27	10YR6/2 10YR7/2 7.5YR6/2 10YR5/2 (wall) 10YR /1	51 body sherds, 11 rims, 1 ring base, 6 necks, 1 chunk, 1 biface tip, 5 flakes (1 FC), 1 ~Nephronaias shell piece	~Roaring Creek Red Plate (late facet Spanish Lookout)
102 and 103	The upper part of both strata, before they were distinguished	69.43		48 body sherds (1.14, 1.09, 1.10 cm thick), 4 small rims, 3 diagnostic sherds, 2 necks, 3 flanges, 3 flakes	~Benque Viejo Polychrome: variety unspecified (Spanish Lookout) sherds? All quite small
103	Lighter, denser soil without boulders or cobbles	68.4	10YR6/3	83 body sherds, 4 necks, 2 flanges, 1 ~handle fragment, 1 spout/figurine fragment, 15 rims, 1 obsidian blade, 1 marine shell	Jocote Orange-Brown: Jocote variety spout, p. 63 (Jenny Creek) Several orange paste sherds Saxche Orange-Polychrome: variety unspecified (Tiger Run)
103A	Patchy light grey soil; some dark patches, possibly burnt	c. 68.2	10YR7/3 10YR6/2	55 body sherds (1.13 cm), 3 necks, 1 ring base, 1 handle fragment, 6 diagnostic sherds, 16 rims, 2 obsidian blades, 1 disk pebble, 3 jutes, 1 ridged	Mahogany Creek Incised: Mahogany Creek variety, Fig. 85m (Hermitage) Polychrome basal flange, pp. 205-6 (Tiger Run) 1 small VA sherd w/ light

				jute, 1 <i>Nephronaias</i> , 8 chunks, 2 cores, 7 flakes (2 FC)	orange slip; Garbutt Creek (Spanish Lookout) Thick VA open bowl/dish sherd Flanges, other Hermitage Tiger Run punctuated sherd? Fig. 135I—Zibal Unslipped (but has brown slip. Actually could be a lid=> Fig. 94b, Boletto Black-on-Orange (Hermitage) Dos Arroyos Orange Polychrome: variety unspecified rim and flange (Hermitage)
104	Dark clay-like soil	68.13	10YR6/2	103 body sherds, 7 necks, 8 flanges, 1 diagnostic sherd, 1 ring base, 1 nubbin handle, 1 straight strap ~handle, 18 rims, 2 obsidian blades, 1 obsidian flake, 18 flakes (3 FC), 1 hammerstone, 8 chunks (2 FC), 2 <i>Nephronaias</i> , 1 ridged jute, 1 burned bone	Assemblage might be contaminated—related to road fill Strap handle (long) similar to others found at Yalbac. Orange paste sherd Sierra Red rim (Barton Creek) VA flange Flange with 'LMNO' carved on one side, and 'WEST' on the other!!! How? Over edge of 102; but who? Road workers? Hermitage sherds Few other flange pieces, and EC polychrome sherds Lucha Incised small vase rim sherd (Hermitage)
105	Darker soil	68.12		Not excavated	

*not completely excavated

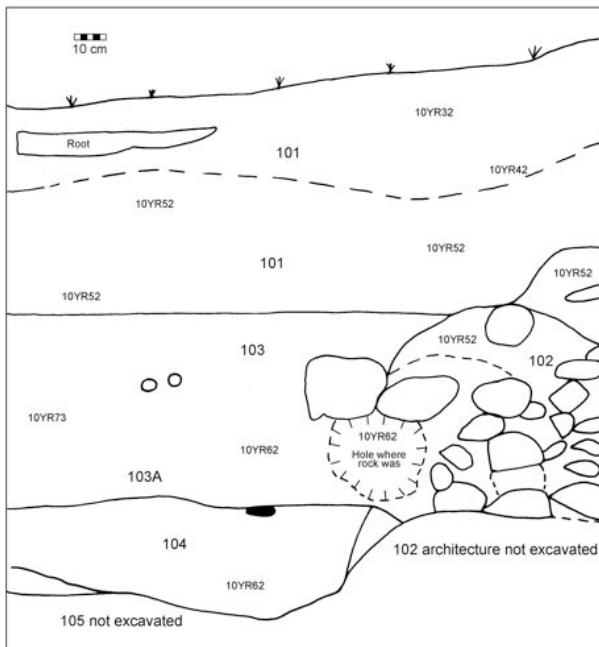


Figure 6.1 Profile of south wall of Plaza 2E test pit

As strata 103 and 103A were removed from around wall 102, it became quite clear that stratum 102 represented a wall. We excavated stratum 102 after 103 and 103A were leveled out when the soil turned darker (10YR6/2). At this point, so many artifacts had been collected that we stopped collecting sherds and lithics smaller than a quarter. A planview of wall 102 was mapped, as well as its profile (Figure 6.2). A profile of the south-west corner was drawn using a profile line running parallel to the wall, located 1.075 m below the SW corner, or 68.045 m asl (Figure 6.3). Two groups of boulders extended beyond the profile line, so they were mapped as insets.

A notable artifact wedged between boulders in the wall of stratum 102 was a large plate sherd .88 m directly below the SW corner. It was photographed in situ (Figure 6.4). Wall 102 yielded many artifacts, particularly on the vertical axis aligned with the larger sherd. On the boulders were some crumbly yellow-rust-colored sections that did not match the pale grey tones of the rest of the unit. The boulders grew larger as the unit went deeper; the largest were in the last layer we removed, measuring 48 x 35 x 20 cm and 46 x 39 x 19 cm. Stratum 105, underneath stratum 102, was not excavated, though the architecture appears to proceed in the same pattern.

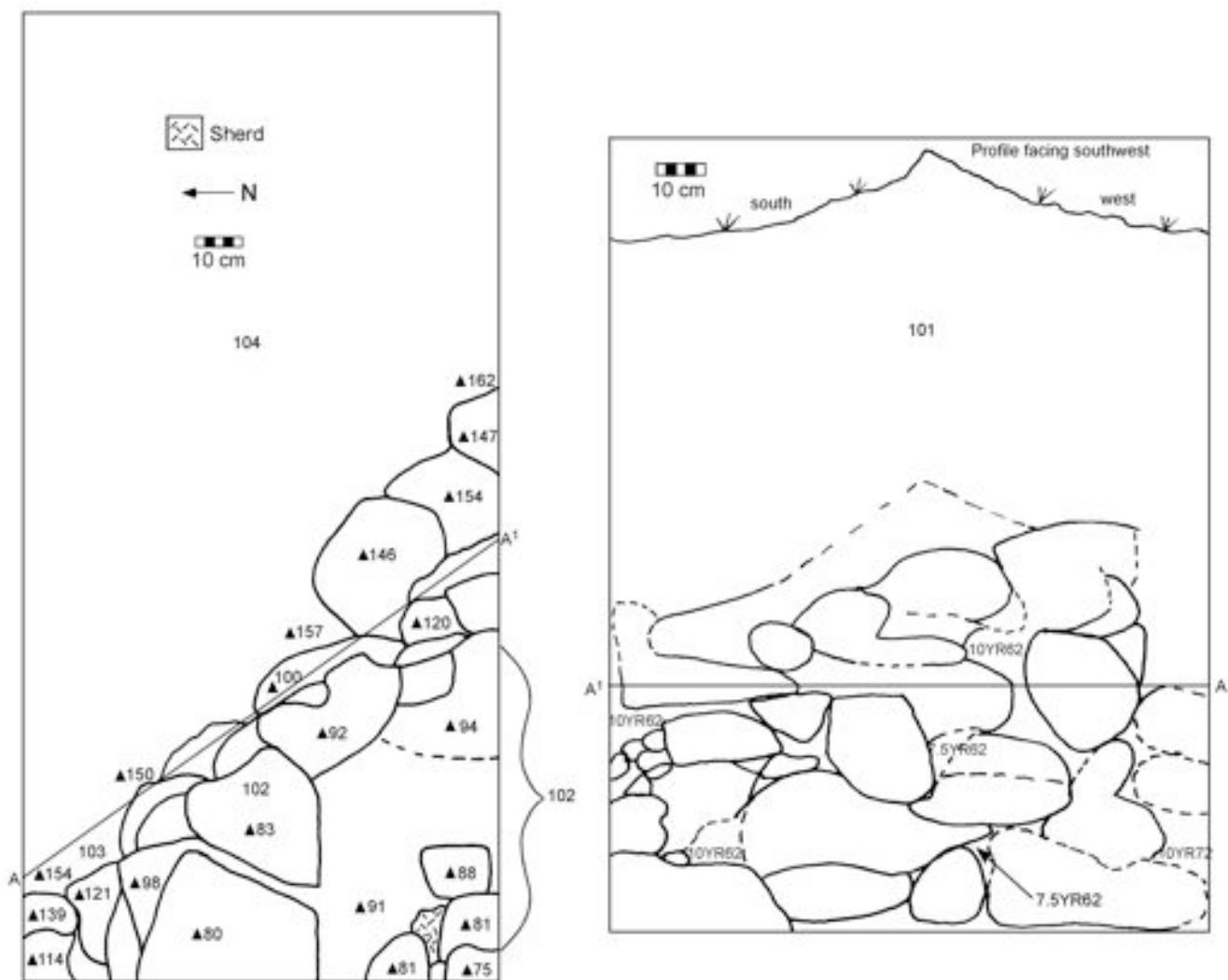


Figure 6.2 Planview and profile of Plaza 2E test pit architecture (wall 102). Elevations on left taken from southwest corner (70.02 m asl); right illustration is profile of wall 102 looking southwest.

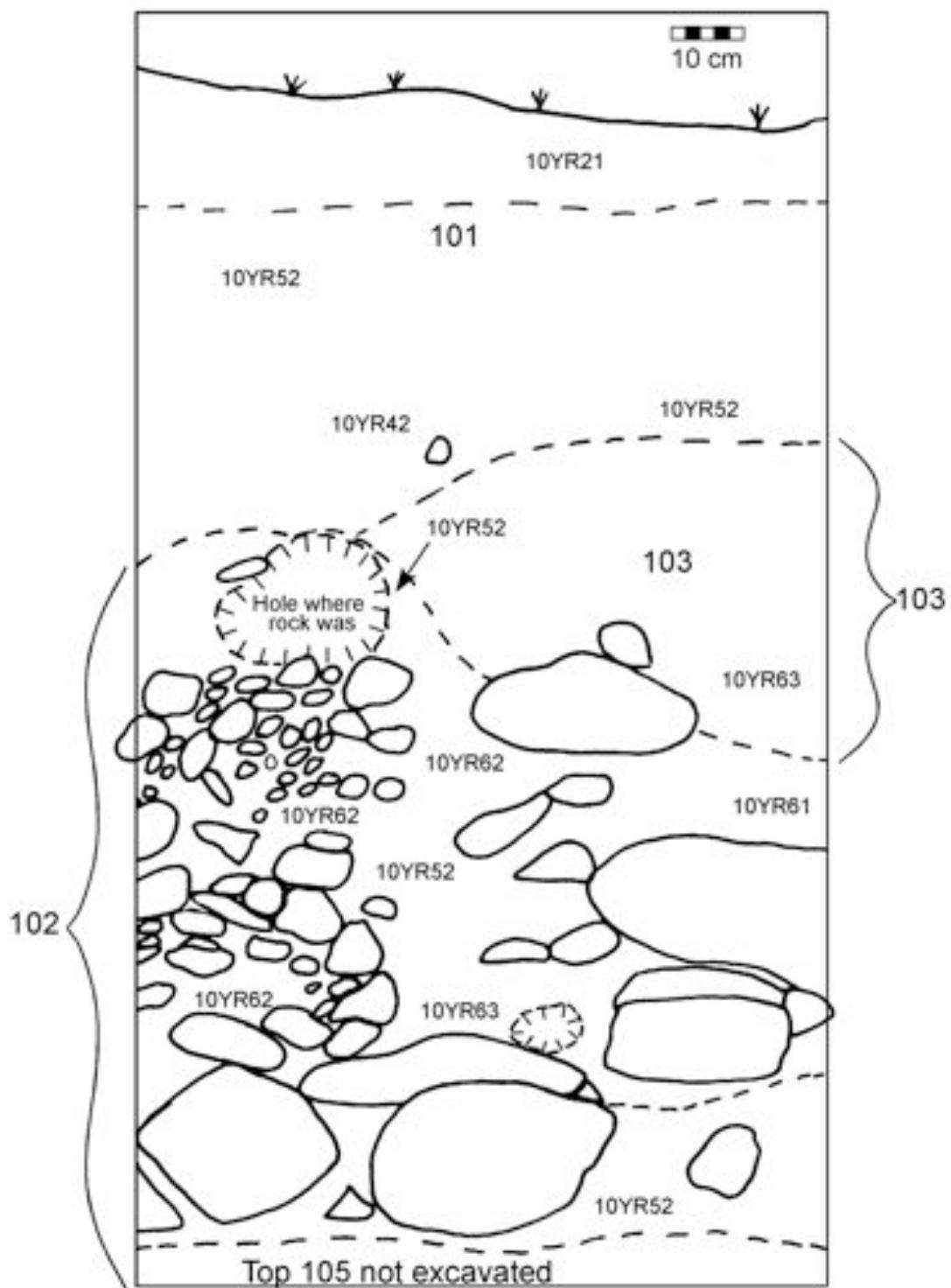


Figure 6.3 Profile of Plaza 2E Test Pit west wall



Figure 6.4 Plaza 2E Test Pit Wall 102 and associated artifacts

Stratum 104, the last stratum excavated, was characterized by darker (10YR6/2) clay-like soil and contamination. Several chunks of white chalky limestone were found. We still terminated the unit even though sherds were visible at the bottom of the unit due to time constraints. The final elevations may be slightly altered because rainwater swept a layer of mud into the unit between completing the excavation and the mapping, though the profiled south and west walls remained dry.

With strata 104 and 105 still intact, profiles of the south and west walls without the slanted profile line and planviews were drawn.

The “Hoax” Sherd

The chronology of the stratigraphy of the Plaza 2E test pit has been brought into question. A problematic sherd was uncovered in stratum 104, the lowest stratum. The flange has distinct Latin letters carved into it (Figure 6.5). The fact that the single coherent word, “WEST,” is in English indicates that whoever carved the sherd was literate in English. The Plaza 2E test pit was located on the east end of 2D, and the northwest side of 2E. It could have fallen in a root or rodent hole.



Figure 6.5 The “hoax” sherd of stratum 104 in Plaza 2E test pit

The Plaza 2E test pit was situated near the bottom of the slopes of two mounds. Therefore, the stratigraphy of this unit would have been complicated by over a thousand years of erosion. Thousands of rainy seasons have been sweeping dirt, stones, artifacts, etc. down the slope of Strs. 2E and 2D and built up in the valley between the mounds, right where the Plaza 2E test pit was placed. The relative proximity of looter’s trench (LT) 10 (Str. 2D) and LT 16 (Str. 2E) must also be taken into account. If not road workers, the “WEST” sherd may be part of the looter’s backdirt from LT 10 or LT 16 and somehow been washed to where we found it six feet below surface. This indicates that all the ceramics were eroded from backdirt left by looters or part of roadfill, a notion strengthened by the lack of an obvious plaster floor. There is no doubt that the ceramics date to a wide time range (300 B.C. through A.D. 800, if not later). It also has a diverse artifact assemblage, which would reflect ‘ceremonial trash’ quite well. There are no contamination problems at the Plaza 2D test pit.

Plaza 2D Test Pit

The Plaza 2D test pit was placed at the west end of Structure 2D, just north of 2008’s 2A units (Baltus 2009:31). The datum provenience was the 2 x 1 m unit’s southwest corner (elevation 69.73 m asl), measured from traverse point YO (69.49 m asl) at a distance of 16.49 m and an orientation of 12°, using meter tapes and a Brunton compass. Like the Plaza 2E test pit, this unit was placed at the plaza edge to look for a midden.

Beneath the topsoil the soil became lighter (5YR6/2, 10YR4/2). Stratum 101 had a high density and variety of artifacts, including obsidian, large mammal bones, marine shell, a slate bark beater

fragment, and many ceramic sherds, many of which date to the Terminal Classic (Table 6.2; Figure 6.6). The large metate fragment was with part of wall 104 or fill 106.

Table 6.2 Plaza 2D TP strata

Stratum	Description	Elevation (m asl)	Munsell Color	Artifacts	Ceramic Dates
101	Topsoil and possible floor	69.73	7.5YR4/1 2.5YR3/1 5YR6/2 10YR4/2	153 body sherds (1.35, 1.21, 1.04, .97 cm thick), 4 necks, 2 Z-angle flanges, 2 stunted flanges, 1 ring base, 2 handles (look like the same vessel), 21 rims (most quite small), 11 blades (mostly fine, thin-grained), 25 flakes (3 FC; c. 50% fine, thin-grained), 6 chunks, 1 slate bark beater fragment, 1 obsidian blade, 3 small obsidian blades, 6 marine shell pieces (likely conch), ~burned bone	Belize Red sherds (late facet Spanish Lookout) Black-slipped vase sherd
102	Large boulders fewer, smaller ceramics	68.91	10YR4/2 10YR6/2 10YR6/3	17 body sherds, 4 necks, 1 flange, 4 rims, 1 marine shell, 1 flake	Small sherds; looks Hermitage; Minanha Red?
103	Small cobbles Larger ceramic sherds	68.76	10YR6/2 10YR7/3	36 body sherds, 2 necks, 2 flanges, 1 handle, 7 rims, 5 flakes, 4 chunks	Actuncan Orange Polychrome (Hermitage) Strap handle
104	Revised 102, large boulders and cobbles; clay	68.81	10YR6/2 10YR4/2 10YR6/3	10 body sherds, 1 flange, 2 necks, 1 rim, 1 worked flake, 1 <i>Nephronaias</i>	Large polychrome basal flange Dos Arroyos Orange-Polychrome: variety unspecified (Hermitage)
105*	Black, smelly soil; cobble surface	68.76	2.5YR7/2	64 body sherds, 3 necks, 1 solid nubbin, 9 rims, 12 flakes (1 FC), 1 brown quartzite pebble	Early sherds but one small polychrome sherd—so EC at the earliest
106*	Evidence of burning	68.75	10YR5/2	10 body sherds, 1 flange, 1 rim, 2 diagnostic sherds (all quite small), 1 metate piece (fine basalt?), 3 flakes (2 FC)	Small sherds, but 2 polychrome
107*	Black, smelly soil and possible plaster floor	68.56	10YR4/1	6 body sherds, 1 neck, 1 rim, 1 flake	Mostly body sherds, some with orange surface Small polychrome rim with VA and calcite inclusions
108	Black organic soil	68.48	10YR4/1	Not excavated	

*not completely excavated

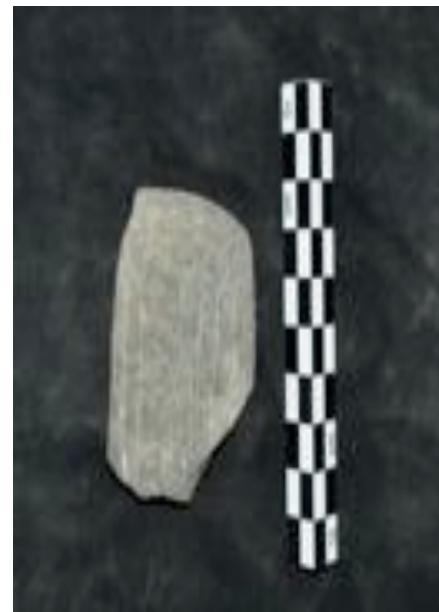


Figure 6.6 Plaza 2D artifacts: metate fragment from 106, marine shell (likely conch) and obsidian from 101, and slate bark beater from 101



Figure 6.7 Less distinct, but complex, Plaza 2D test pit architecture and features

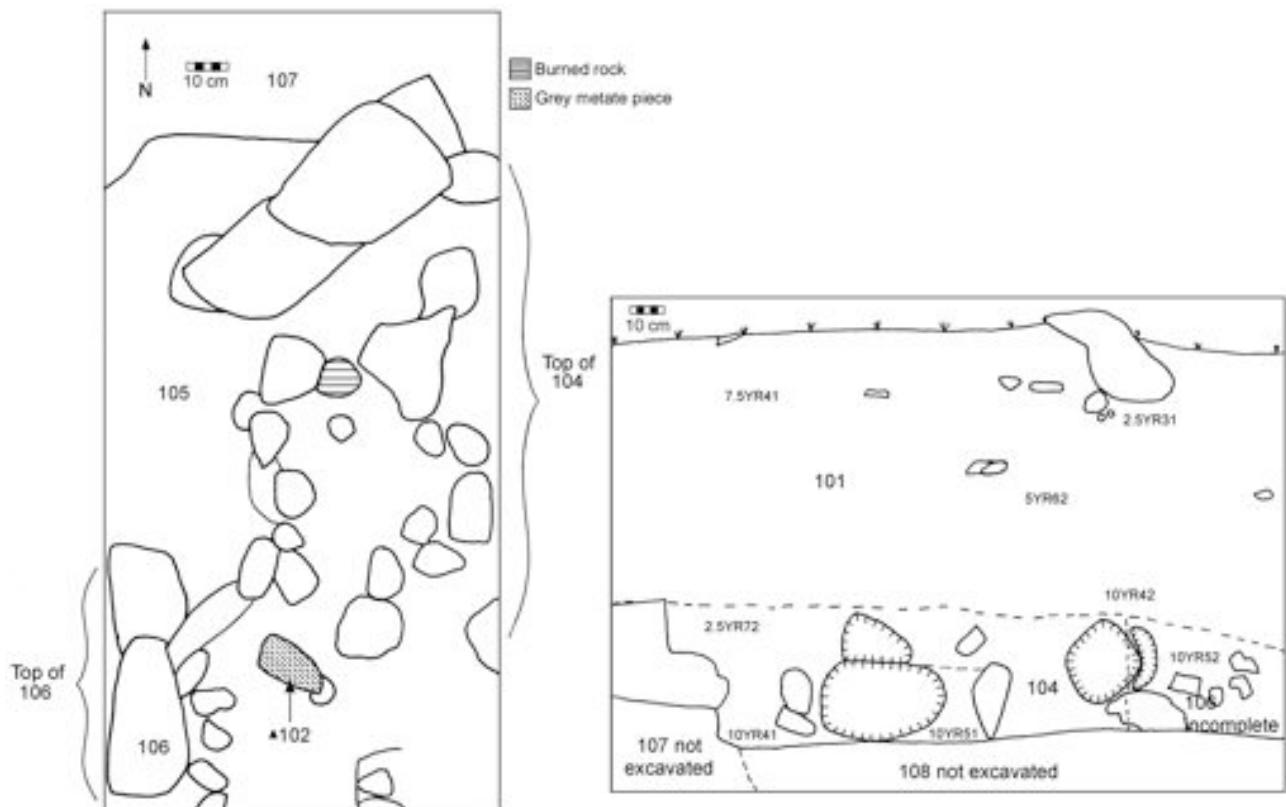


Figure 6.8 Mid-season planview (to show features) and end of season profile of east wall of Plaza 2D test pit

Again, architecture unexpectedly appeared in what was supposed to be a midden test pit, though it was less distinct than that exposed in Plaza 2E test pit (Figure 6.7). As we continued to remove stratum 101, it became apparent that the northern and southern halves of the test pit were very distinct. The northern half became stratum 102, characterized by fewer, larger boulders with fewer, smaller sherds that make it difficult to place temporally. The southern half, labeled stratum 103, was characterized by more, larger ceramics and more, smaller cobbles that date to c. A.D. 260-580. There was a particularly large cluster of very small cobbles in the northwest corner of 103. The division between strata 102 and 103 was marked by a burnt cobble between two larger boulders, included in 102 as its southern border (Figure 6.8) 102 and 103 were cleaned and mapped.

Once stratum 103 was removed, we came upon several strata. A planview map of the top of 104, 105, 106, and 107 was drawn to delineate the new boundaries after the removal of 102 and 103. The lower part of stratum 102 was changed to 104 because the boulders that emerged in 102 went far deeper (see Figures 6.7 and 6.8). Stratum 104 also includes boulders uncovered in the central eastern portion of the test pit, including a large metate fragment. Some of the boulders in 104 were so large that they had to be removed using a lever system. Large sherds and some lithics were underneath the large boulders. Stratum 104 terminated at a black, organic soil (10YR4/1), stratum 108, which was not excavated.

The central western portion of the test pit became 105, possibly a midden because of the abundance of artifacts and black, smelly soil (2.5YR7/2). Underneath the midden of 105 was a cobbled surface, where digging ceased before the unit was completed. Stratum 105 was divided into 105 and 106. The southwestern portion became 106 because it was a set of cobbles and boulders distinct from those of 104. Stratum 106 had a metate fragment, fire cracked lithics, and strong evidence of burning. Strata 105, 106, and 107 were not completely excavated due to time constraints, but indications are that the Maya built and used them in the Early Classic.

An unexcavated strip along the northern end of the unit appeared to be a floor, so it was denoted as Stratum 107, though it may be just a continuation of 105. While cleaning, some ceramic

pieces were found, but were too small for dating purposes (though some had an orange surface and one consisted of a small polychrome sherd (Figure 6.9).



Figure 6.9 Plaza 2D test pit stratum 107 artifacts, including polychrome sherd (top, second from right)

The unit planview was mapped, as well as a profile of the east wall. After the final mapping, the pits were lined with non-diagnostic artifacts (body and neck sherds, chert flakes and debitage) in .2 mm curation Ziploc bags with tags and labels. The entire unit, including sidewalls, was lined with construction plastic and backfilled.

Discussion

The most significant aspect of the Plaza 2 test pits was the unexpected discovery of architectural features in both units. The combinations of walls and middens found in the pits alter our understanding of Yalbac's overall architectural plan. Plaza 2, the least restricted of Yalbac's plazas, appears to be more restricted than perhaps previously thought. Architecture around the base of Temples Str. 2E and 2D indicates that there was less space for people to walk between the temples and enter the plaza. It raises the question of how much rulers controlled access by commoners through architecture. Time periods reflect a similar pattern to that found elsewhere in Plaza 2 (e.g., Baltus 2009), as well as in Plaza 3 (Otten 2009; see chapters 7, 8).

The artifacts of the Plaza 2E test pit are difficult to discuss because of the "hoax" sherd and the problems it raises regarding the accuracy of the stratigraphy. However, assuming that the architecture in the pit—stratum 102—was not affected by the pollution of the "hoax" sherd, we can ask some questions about the artifacts found in the wall itself. Was the large sherd lodged in the southwest corner wall of Plaza 2E test pit a dedication deposit of some sort? Would we find similar upturned broken bowls if we continued to excavate the wall in 2E? If so, would it signify that the wall near Str. 2E was different or significant compared to other buildings?

The Plaza 2D test pit is less problematic but more complex. Architecture and middens and/or fill beg the question of what purposes this area served. Did it comprise "ceremonial trash?" Was it related more strongly to the ballcourt or to other areas of ritual and ceremony? Does it suggest any ideas about the function of the structure, Str. 2D? The bark beater and the metate may be sacrificial or ritual objects from common people. In temple construction, artifacts used in fill "could represent different community work parties or special interest groups" (Lucero 2007:421). Metates, valuable because they were crucial for consumption of the staple of maize and because the hard stone had to

be imported, would be significant sacrificial objects for commoners. This metate fragment and other artifacts could be ceremonial trash from the commoners entering the plaza at Str. 2D.

Future excavations could yield valuable information when compared to the findings at the Plaza 2E and 2D test pits. For example, test pits placed between the other Plaza 2 structures could provide a profile of the people entering Plaza 2 from other areas. What were the elite depositing as they made their way from Plaza 1 or 3 to Plaza 2? Were they going there at all? It would also be useful to excavate other test pits in Plaza 2E. A non-tainted stratigraphy of the entrance area would be much more useful. In addition, we might explore the area around the Plaza 2 ballcourt. If the assemblages near the ballcourt and the Plaza 2E and 2D test pits were related, it would provide information about who was attending ballcourt games. At any rate, the architecture of both the Plaza 2E and 2D test pits are mysterious enough to encourage further excavation, especially concerning questions of control of the masses through architecture and ritual.

Acknowledgements. I would like to thank Dr. Lucero for my first opportunity to experience fieldwork and for guiding me through writing this report. I would especially like to thank José Vásquez for his wonderful conversation, sense of humor, and miraculous arm-strength at Plaza 2E test pit. At Plaza 2D test pit, gratitude is due to Isabel Ascencio (Don Luna or “Don Chavelito”) for his hard work and life advice, and to my peer Steve Lesniewski for taking most of the Plaza 2D test pit field notes. A “thank you” is also necessary for Cleofo Choc, Juan Antonio, Stanley Choc, and Ernesto Vásquez for their help throughout the excavations.

References Cited

- Baltus, Melissa R.
2009 Non-Temple Ritual and Commemoration at Yalbac: Structures 2A and 2F. In *Results of the 2008 Valley of Peace Archaeology Project: Yalbac*, edited by L. J. Lucero, pp. 31-72. Report submitted to the Institute of Archaeology, National Institute of Culture and History, Government of Belize.
- Inomata, Takeshi
2006 Plazas, Performers, and Spectators: Political Theaters of the Classic Maya. *Current Anthropology* 47:805-842.
- Lucero, Lisa J.
2007 Classic Maya Temples, Politics, and the Voice of the People. *Latin American Antiquity* 18:407-427.
2009 The 2008 Season at Yalbac: Goals and Results. In *Results of the 2008 Valley of Peace Archaeology Project: Yalbac*, edited by L. J. Lucero, pp. 1-7. Report submitted to the Institute of Archaeology, National Institute of Culture and History, Government of Belize.
- Otten, Sarah E.
2009 Structure 3C: Revisiting Ritual Space. In *Results of the 2008 Valley of Peace Archaeology Project: Non-Temple Summit Excavations*, edited by L. J. Lucero, pp. 14-30. Report submitted to the Institute of Archaeology, National Institute of Culture and History, Belize.

Chapter 7

Plaza 3 Excavations: Ancient Maya Plaza Activities

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One of the goals for the 2010 field season was to explore the relationship between leaders and their subjects. Our interest lay in understanding how audience members participated during ceremonial activities since successful rites would have incorporated the public and created a sense of belonging (Kertzer 1988). To accomplish this goal, we excavated four test pits in Plaza 3 near temples (Figure 7.1). The first one described, 3D Divers Test Pit, was located along the edge of Temple 3D's north wing, where previous explorations had revealed a large number of chert debitage. Plaza 3 Platform Test Pit, located near the center of Plaza 3, was used to examine how the surface the audience stood upon reflects the activities in which they participated. Behind and downhill from Structure 3C was 3C Ceremonial Trash South (CTS) test pit, which was selected as a possible disposal location of ceremonial paraphernalia. A larger exploratory test unit, 3A Stoneworks, was selected to examine the platform where an audience would have gathered in front of Temple 3A.

These excavations took place during the University of Illinois at Urbana-Champaign archaeology field school with eight students from May 17 to June 26, 2010. The field school was directed by Lisa J. Lucero with Teaching Assistants Eleanor Olszewski and Molly Haneberg. Additionally, we had experienced assistance from seven excavation assistants.

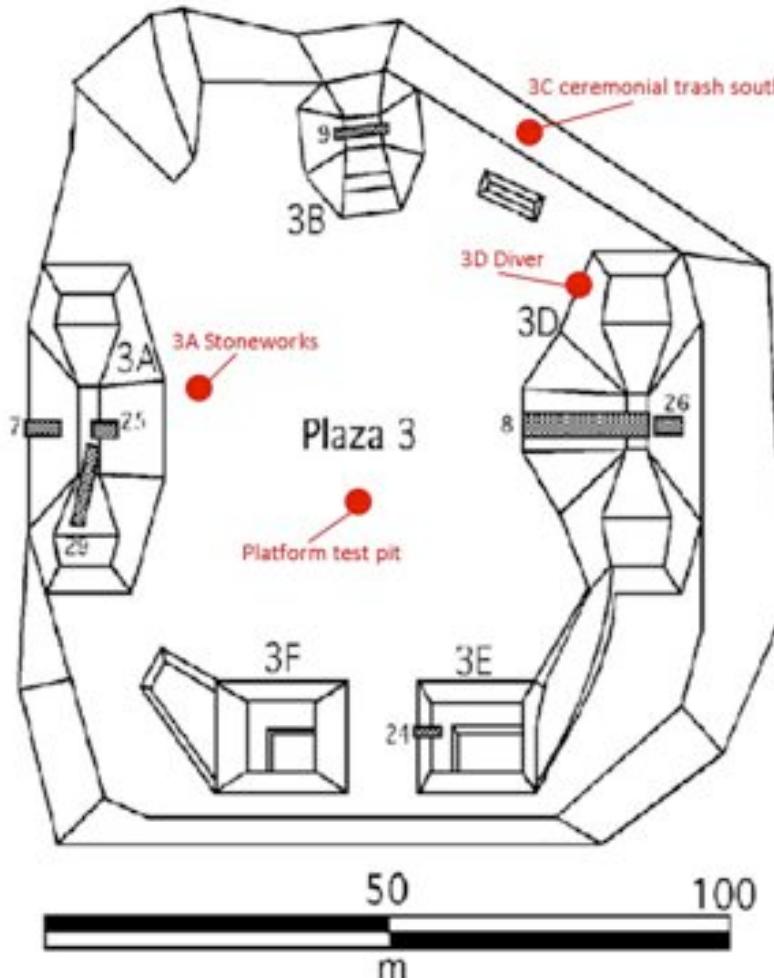


Figure 7.1 Plaza 3 with test unit loci

3D Diver Test Pit

During survey of Plaza 3, prior to the 2010 field school, a large fallen tree was noted at the northwest edge of Temple 3D (Lucero 2003). Imbedded with the tree's roots were ceramic sherds and a large quantity of chert flakes and blades. The tree was believed to have fallen where it presently lay, and not to have rolled down from the top of Temple 3D. The artifacts found within its roots led us to suspect that it once stood over a tomb (see Moholy-Nagy 1997).

A 2 x 2 meter test unit was placed on the slope of Temple 3D (Figure 7.2). The unit covered most of the area where we calculated the tree's trunk to have stood. Using information gathered in 2005 on the location of the temple's edge (Lucero 2003), we were able to located the test pit over part of the northern wing of Temple 3D to assess whether or not a tomb was located in the north wing. Due to the extreme slope on which the unit was located, we used the southeast unit corner as the datum. The SE corner was 76.50 m asl; SW corner 75.42 m asl; NW corner 75.55 m asl; NE corner 76.17 m asl; and the unit center was 76.0 m asl. The orientation of the southeast corner was 132° from traverse point YH at a distance of 19.06 m (using a Brunton compass).

The surface of the unit was covered with roots, light vegetation, and loose boulders; the topsoil consisted of clay loam. Roughly 80% of the surface boulders are weathered, porous limestone, while the rest are a denser and finely grained limestone and are believed to be from building collapse. Scattered among the topsoil were chert flakes ranging from 1 to 5 cm long, similar to those founds in the fallen tree's roots (Table 7.1). Pick-a-hoes and trowels were used to remove topsoil (101), and everything was screened through a 1/2" mesh.



Figure 7.2 Location of 3D Diver test pit

While removing stratum 101, a section of a red plastic bag was discovered partially underneath a large boulder in the northwest corner of the unit. This boulder resided 110 cm southwest of the point we marked as where the 2005 field season determined the edge of Temple 3D. As the area was examined, we also recovered a Pop-tart wrapper and a zip lock bag with a tear containing non-diagnostic lithics. On the outside of the bag the number 10163 was written. Using this Institute of Archaeology accession number, we were able to verify that the trash and ripped bag containing lithics were part of the back fill from 2005 when post hole test pits were used to determine the location of the edge of the temple's wings (see Lucero 2006).

We soon came across a wall (103) of faced stones roughly 75.75 m asl and 50 cm east of the unit wall. On the west side of wall 103 the soil became lighter in color and a plaster floor was revealed (floor 102), which covered the length of the western side of the unit at an elevation of 75.17 m asl. To the east of wall 103 was a fill (104) consisting of loosely packed cobbles and boulders, likely collapse. As we excavated deeper, we found fewer chert pieces, but found more sherds, largely from large, thick-walled vessels. As more of the fill was removed, we exposed stacked boulders towards the north side of the unit (wall 107), which separated strata 105 to the south and

strata 106 to the north. Once more of fills 105 and 106 were removed, we could see that underneath the boulders making up wall 107 there was loose dirt and cobble, so the strata was terminated and combined with fill 106. Stratum 108 was the fill located under 105; although it contained few ceramics, part of a figurine was found and a possible mano. Fill 108 was terminated at boulder fill 109, located on the western portion abutting wall 103, and the possible plaster surface 110 in the southeast unit corner, both of which were not completely excavated due to time constraints.

Table 7.1 3D Diver Test Pit strata information

Stratum	Munsell	Description	Artifacts	Ceramic dates
101	10YR4/2 10YR5/2 10YR5/3	Topsoil clay loam with small cobbles to boulders	226 body sherds (one 1.61 cm thick, 1 black striated jar w/ buff interior), 19 necks, 44 rims, 1 jar rim, 1 diagnostic sherd, 1 foot (attached), 7 bases, 5 flanges, 1 laterite fragment, 1 metate piece, painted stucco piece, 1 ~chert drill, 1 obsidian blade, 1 chert adze tip, 1 biface hafted tip, 1 flake, 7 chunks (3 FC), and thin fine-grained flakes and blades: 2490 white-ish (5YR8, 10YR83, 10YR82), 11 black (75YR20), 1458 dark (10YR42, 25Y40, 25Y32), 770 red/pink (25YR53, 25YR62, 10R54, 10R64), 1108 orange (10YR66, 75YR46, 25YR66, 10YR76), 673 translucent (10YR72, 10YR62), 117 striated (25Y20, 25Y83)	~Achote Black sherd (Spanish Lookout) Cubeta Incised: variety unspecified, p. 248 (Spanish Lookout) Vaca Falls Red jar slipped on exterior and interior neck, p. 237, 255 (late facet Spanish Lookout) Paxceme Red: Paxceme Red variety (late facet New Town)—VA, though! Post-abandonment offering? Paxceme Red hollow foot? The rest, mostly Late/Terminal Classic (VA red-slipped Belize Red) Tall black jar Thin black paste vase (VA) Garbutt Creek Red: Garbutt Creek variety, pp. 230-1, Figure 142c (Spanish Lookout, could continue to TC)
Near floor 102	7.5YR4/2	Topsoil approaching plaster floor	19 small body sherds, 1 small rim, 12 thin and fine-grained blades, 29 thin and fine-grained flakes	Chan Pond Unslipped: variety unspecified? Pp. 149-50, Figure 78d (Floral Park)
103		Wall, elevation= 75.51-75.66 m asl	Not excavated	
104	10YR6/2	Fill east of wall 103	38 body sherds (one is 2.1 cm thick), 4 necks, 6 rims, 5 flanges, 1 base, 1 diagnostic sherd, 3 FC chunks, 1 red oblong stone, 11 thin, fine-grained blades, 49 thin, fine-grained flakes (4 FC)	Achote black vase sherd (Spanish Lookout), Achote median flanges (2) that might attached to rim sherd with squared lip Belize Red flanged dish (late facet Spanish Lookout)
105	10YR6/2	Fill in southeast section 75.34-74.92 m asl	34 body sherds, 1 neck, 3 flanges, 3 ring bases, 1 diagnostic sherd, 1 large hollow black foot, 8 rims, 15 flakes (c. half thin, fine-grained), 1 blade, 2 chunks, 3 small jutes, 1 ridged jute, 3 <i>Nephronaias</i> , charcoal	Belize Red ring base (late facet Spanish Lookout), Achote black vase sherd (Spanish Lookout), Ring basal flange Huge hollow foot—Balanza Black, Figure 86j (Hermitage), Cubeta Incised sherd (Spanish Lookout)

106	10YR8/2 10YR5/1 7.5YR7/6	Fill in northeast section 75.52-74.74 m asl	117 body sherds, 6 necks, 3 handles, 2 flanges, 2 ring bases, 21 rims, 19 blades, 3 chunks (1 FC), 145 flakes (3 FC; most thin, fine-grained), 2 bone pieces, 1 obsidian flake, 2 obsidian blade fragments, 1 <i>Nephronaias</i> (in pieces), 1 <i>Pomocea</i> piece, 5 jutes, 1 ridged jute, 1 painted stucco piece, 1 charcoal piece	Belize Red dish (late facet Spanish Lookout) or Aguacate Orange (Hermitage), 2 Minanha Red: Minanha variety dish, Figure 82a (Hermitage), Strap handle, Flange?, ~Hermitage/Tiger Run sherds (~Rosario Incised: Rosario variety; Tiger Run)
108	NA	Fill south east section	8 body sherds, 1 ceramic figurine fragment, 2 rims, 1 quartz blade, 1 obsidian blade, 1 large smooth jute, 1 <i>Nephronaias</i> , possible quartzite mano	
109	10YR8/3	Boulder fill	13 body sherds, 1 neck, 1 diagnostic sherd, 2 rims, 13 thin fine-grained flakes	Belize Red bowl (Spanish Lookout/late facet Spanish Lookout), ~vase; ~Sotero Red-Brown: Sotero variety, p. 210 (Tiger Run)
110	NA	Flat surface	Not excavated	

In the end, the highest concentration of mostly pastel colored chert debitage was found on or immediately under the surface. Similar lithics were found around Looters Trench 8, located on the top of Temple 3D (Lucero 2003). To see if there was any pattern to the colors, we sorted them by color when wet and counted them. The Mayan language spoken in the Yucatan has only five basic color terms (*ěek*, 'black; *čak*, red/pink; *k'aan*, yellow/orange; *sak*, white; *yă aš*, green), which could be combined with stems to better describe the saturation or hue of the color (Bricker 1999). Each of these major color categories were represented, except for shades of green (Figure 7.3). The color we found most of the flakes and blades often were shades of white (n=2490). The shades varied between Munsel colors 5YR8, 10YR83, and 10YR82. Dark, which included shades of gray and brown, was the next most prominent color category (n=1458) (10YR42, 25Y40, 25Y32). Only 11 true black (75YR20) flakes were recovered. There were 1108 orange (10YR66, 75YR46, 25YR66, 10YR76) and 770 red/pink (25YR53, 25YR62, 10R54, 10R64) flakes and blades. While the lithics were still wet, we separated out those which appeared translucent (10YR72, 10YR62) for a total of 673. However, once dry some of every color category was represented. Although many of the flakes and blades separated into the previously listed categories were not homogeneous in color, we did notice a particular set of striated flakes (Figure 7.4) (n=117) that exhibited an alternating pattern of dark and light streaks (25Y20, 25Y83).



Figure 7.3 Stratum 101 chert blades and flakes grouped by color: (A) translucent, n=673; (B) dark, n=1458; (C) orange, n=1108; (D) pink/red, n=770; (E) white, n=2490.



Figure 7.4 Striated chert debitage

The dimensions of the chert flakes vary, though most tend to be between 1 and 5 cm in length and width. Similarly, the thickness of the flakes tended to measure between .1 and 1 cm, though some fell outside of this range. Although the thinness makes the flake edges quite sharp, there was no evidence of use wear. We did note that the lightness of the flakes made a ‘clinking’ noise when touched, which may have played a role in ritual activities.

When the excavation began at 3D Divers test pit, we suspected that the high concentration of chert debitage might indicate the presence of a tomb. At Tikal, the largest chert debitage deposits were found “above and around the chamber burials of its most important persons” (Moholy-Nagy 1997:296). In addition to forming a mantel over tombs, significant quantities of chert pieces were often found in votive caches associated with elites and placed in temples (Moholy-Nagy 1997). The caches first appeared in the early Late Preclassic Period and continued through the Classic Period. As we excavated more into the 3D Diver TP, we did not see any evidence of a burial or a cache. That, in addition to less of a presence of chert debitage as we excavated deeper, led us to think that the flakes and blades may have washed down from higher on Temple 3D. We wanted to expand the unit c. 6 meters east to include where the flakes that may have slid down from higher up, but were unable to due to time constraints.

Wall 103 was found approximately 30 cm below the surface running nearly parallel to the west wall of the test pit. It consisted of thick, faced boulders stacked over each other resting on top of a plaster floor (102) (Figure 7.5). The plaster floor was not excavated, so we cannot determine if wall 103 extended beneath it. With the exception of the boulder located in the southwest corner, the faced boulders were found in a nearly perfectly straight line oriented 15°. Temple 3D, as we knew from previous surveys, has its primary axis orientated north and south. To account for this deviation, we decided to re-map the temple.



Figure 7.5 West face of wall 103 (north-south); floor 102 located on bottom of photo; wall 107 (east-west) is perpendicular to wall 103

Using faced stones visible on the surface to guide us, we marked out where we expected the corners of the temple to be. All of the corners were marked with pink flagging tape on trees, except the one located on the temple's west face a little south of the center. Once we had located the four corners of the central section of the temple, as well as where the wings extended north and south, we went back and measured the distance and direction between consecutive markers using a reel tape and hand-held compass. The lengths and directions of the edges we measured did not result in a symmetrical structure (Figure 7.6). We think that the temple was built to be symmetrical and that our results did not reflect this because of difficulties determining the edges due to the amount of overgrowth which has occurred, the slope of the hill located to the immediate east of the temple, backfill piles from the looter's trenches and other erosion factors. The survey, however, did indicate that the wings flanking the north and south sides of the temple were tapered. On the western side, the plaza side, the angle of the taper was approximately 20° . This matches with the direction of wall 103.

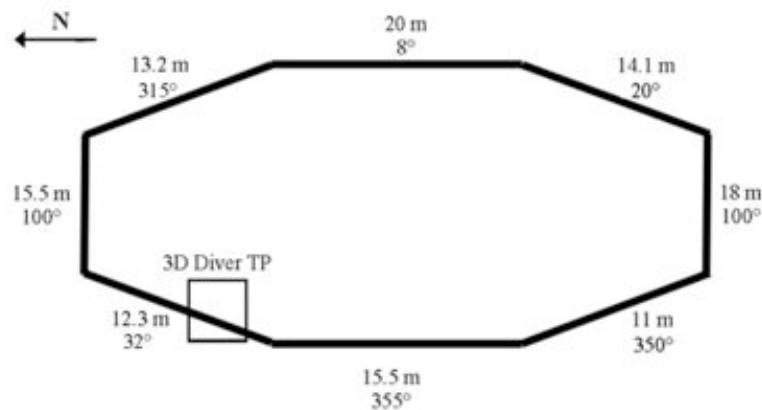


Figure 7.6 Temple 3D dimensions

Along with the chert debitage, stratum 101 also yielded an assortment of other lithics, including the end of a chert adze (7 cm long) found along the west side of the unit above, but not resting on, floor 102 (Figure 7.7). The adze chert consists of alternating pastel shades and its edge shows signs of use (smooth and polished). In the southeast of the unit, a 2 cm thick fragment of shaped laterite was found. The fragment was triangular measuring 3 x 3 x 5 cm. As laterite is formed near iron deposits and it was the only piece found, it is likely that it was transported some distance to this spot.

The stone is a deep red color and glitters in the sunlight. In the southwest quadrant of the unit a fractured piece of granite was found. The stone fragment shows one curved corner with smooth edges. It appears to be a section of a metate showing some use.



Figure 7.7 Lithics from strata 101. (A) chert adze fragment; (B) laterite fragment; (C) biface hafted tip; (D) metate fragment

We recovered a portion of a black striated jar with a buff interior 1.61 cm thick. Ceramic sherds of similar thickness were common in stratum 101, most dating to the Late/Terminal Classic Period. In the southwest quadrant of the unit, slightly above where wall 103 began, a fragment of an Achote Black vessel was found. The sherd included a portion of an incised rim (4 x 4 cm) (Figure 7.8); it dates to the Spanish Lookout Period (c. A.D. 680-900).

The diagnostic sherds also included a Paxcaman Red dating to late facet New Town Period, or c. A.D. 1150-1500. This late date suggests that these may be the remains of post abandonment offerings, including a hollow foot (Figure 7.7). The foot has a diameter of approximately 5 cm and a red vertical stripe. The ceramics of fill 104 were predominantly Achote Black dating to the Spanish Lookout Phase.



Figure 7.8 Achote Black rim with engraving (Spanish Lookout) and Paxcaman Red hollow foot (New Town late facet)

As we moved into stratum 105, located about 110 cm below the surface level on the south side of the unit, we continued to find Spanish Lookout ceramics (an Achote black vase sherd, a Ring basal flange and a Cubeta incised sherd). However, we also found a large hollow foot identified as Balanza Black dating to the Hermitage (c. A.D. 260-580). The foot is very robust and oval shaped with a maximum length of 7 cm.

Located at approximately the same elevation but on the north side of the unit, stratum 106 contained fewer Spanish Lookout ceramics than 105. Many of the rims either were a Belize Red dish dating to late facet Spanish Lookout (c. A.D. 800-900), or Aguacate Orange dating to Hermitage (A.D. 260-580) (Figure 7.9). Other sherd included two Hermitage Minanha Red dish rims, as well as some

Tiger Run (A.D. 580-680) sherds (Rosario incised). The stratum also turned up a painted stucco fragment (Figure 7.10).



Figure 7.9 Stratum 106 Hermitage and Tiger Run sherds



Figure 7.10 Stratum 106 painted stucco fragment

Stratum 108, the small boulder and cobble fill situated about 15 cm above what we believe to be plaster floor 110, contained fewer artifacts than previous strata. A figurine fragment was found, but as it is small and partially eroded we were unable to determine its shape. An intact, thick walled conch shell measuring about 7 cm long was recovered along with smaller fragments and a *Pomocea* shell. The stratum also contained a shaped obsidian blade and a possible quartzite mano (Figure 7.11).

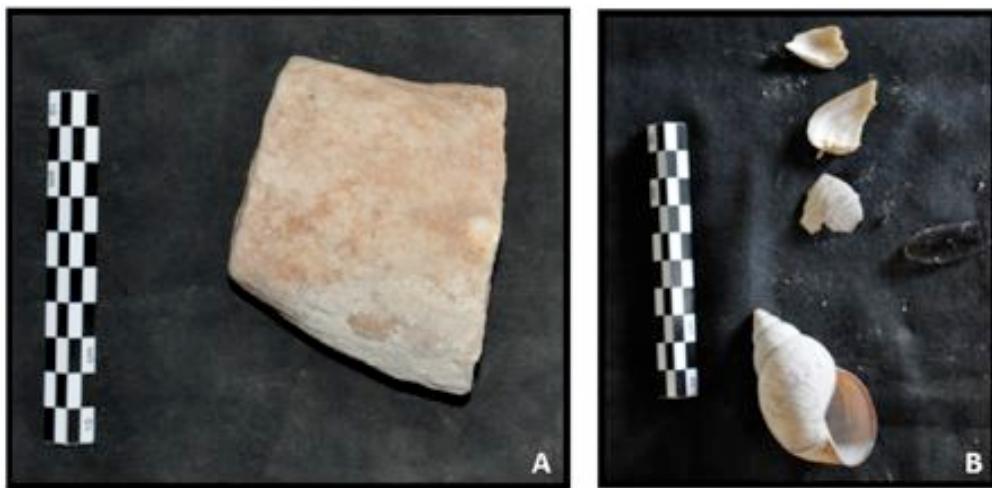


Figure 7.11 Stratum 108 (A) granite mano; (B) conch shell and obsidian blade

Even fewer artifacts were found in stratum 109, which consisted of a large boulder fill; the 13 body sherds and 13 fine-grained flakes were mostly located near wall 103. It is possible that the blades and flakes, which are similar to those we found in stratum 101, slipped between the boulders over time. A Belize Red bowl was found and what might be a Tiger Run vase (Sotero Red-Brown).

In conclusion, we did not find any features to explain the presence of over 6627 chert fine-grained micro flakes and blades. Although we had reasons to suspect that this was the location of a tomb, no human remains were found. The Achote Black rim from stratum 101 resembled one of the two inverted bowls found in a burial near Pool 1 in 2007, but that was the extent of artifacts associated with burials (Kinkella 2008). The chert flakes were integrated within the topsoil loosely and could easily have been carried to their present location by rain runoff or slope erosion. The only stacked and faced stones in the unit were those of wall 103. We know from the survey of Temple 3D that this wall is part of the west wall of the north wing which tapers out from the center portion of the temple at approximately 20 degrees.

The presence of Hermitage and Tiger Run Period ceramics in the lower strata on the inside of the temple wall indicates that the wing was constructed between A.D. 260 and 680. The location saw continual use through the Late Terminal Classic period and may even have been used as a post abandonment ceremonial site.

Plaza 3 Platform Test Pit

Audience participation by commoners in ceremonies is as important to understand as the rites performed atop the temples by rulers and priests. Since successful rituals would have involved active participation by people in the plaza, we placed a 2 x 1 m test pit near the center of Plaza 3 on a roughly-built platform to determine associated activities (Figures 7.12, 7.13). The southwest corner is 7 m due west of traverse point YG (75.80 m asl). The elevation of the SW corner is 75.95 m asl; SE corner, 75.95 m asl; NW corner, 75.89 m asl; NE corner, 75.86 m asl; and center ,75.95 m asl. All soil was sifted through a 1/2" mesh screen.

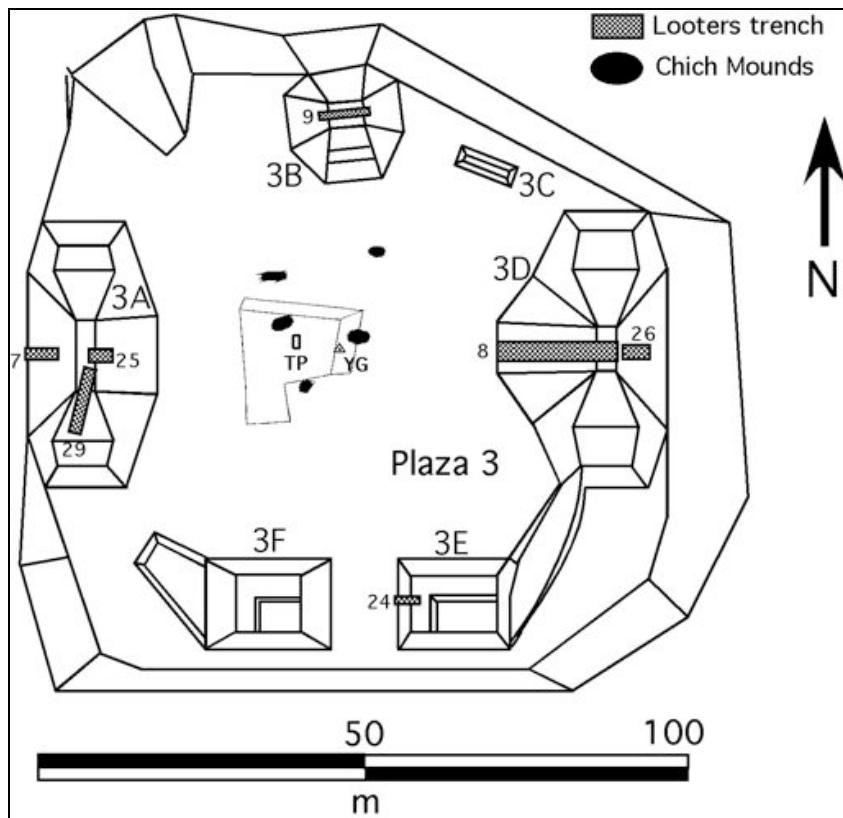


Figure 7.12 Plaza 3 with location of platform and test pit



Figure 7.12 Plaza 3 Platform test pit surface

Stratum 101, a clay loam topsoil, contained many cobbles that were distributed loosely within the strata. At roughly 8 cm below the surface, a cobble and boulder surface was encountered (102), that appeared to be a platform. A few lithics and ceramics were found in the level, with a larger concentration in the southern end (Table 7.2). As the top of 102 was removed, we saw that it was laid on top of more boulder, cobble and dirt fill similar to what was above it.

Table 7.2 Plaza 3 platform test pit strata information

Stratum	Munsell	Description	Artifacts	Ceramic dates
101	10YR7/3	Topsoil clay loam with small cobbles to boulders	21 body sherds (2 red-slipped VA), 3 small rims (1 w/ black paste; 1 w/ orange and white inclusions, 1 VA bowl/plate), 3 limestone flakes, 16 thin, fine flakes, 4 yellowish ochre chunks, 2 chunks	
102	10YR7/3	cobble and boulder surface	102 body sherds (several relatively thick: .43, .47, .45, .57, .54, .49, .42, .53, .43, .40, .52, .47, .42, .50 cm; noticeable VA sherds—soft and gritty), 2 bases, 2 sherds w/ 'cacao' decorations (one red-slipped VA, one blackened, ~VA, no slip), 22 rims (one is .57 cm thick), 2 bone pieces, 41 white-ish/light colored fine, thin blades (except 1), 134 fine, thin flakes (except 1; c. 4 striated), 5 larger flakes (3 FC), 24 chunks (5 FC; 1 white, milky quartz), 1 blue stone, 1 granite piece (too small to define form), tubular, vascular limestone, 1 incised (?) white fine-grained hard limestone piece	~Garbutt Creek Red (Spanish Lookout, could continue to TC), or more likely Platon Punctated-incised, Figure 162g (Spanish Lookout) Vaca Falls Red: Vaca Falls variety "eye," Figure 145c (late facet Spanish Lookout) ~Yalbac Smudge-Brown bowl (Spanish Lookout) Belize Red: Belize Red variety bowl/plate w/ small ridge/flange on upper section (late facet Spanish Lookout) ~Alexander Unslipped: Beaverdam variety grooved jar rim (Spanish Lookout) ~Jocote Orange-brown: Jocote variety ~red-brown rim with vertical nail impressions (Jenny Creek)
103	2.5YR6/2	Boulder wall, north side of unit	4 small body sherds (VA), 1 small rim, 5 thin, fine-grained flakes	
104	10Y6/2	Surface/fill, southern part of unit	244 body sherds (lots of Belize Red/VA red slipped; 1.19, 1.14, 1.48, 1.18, 1.26 cm thick), 9 necks, 1 base, 1 ring base, 3 flanges, 4 diagnostic sherds, 44 rims, 1 obsidian flake, 2 obsidian blades, 1 core, 15 chunks (4 FC), 48 blades, 242 flakes (5 FC), 1 biface hafted end	Belize Red plate/bowl with lacing hole (late facet Spanish Lookout) ~Kaway Impressed bowl (late facet Spanish Lookout) Earlier sherds (flange, orange paste) ~Mount Pleasant Red bowl (Tiger Run) Roaring Creek Red: Roaring Creek variety (late facet Spanish Lookout) Chunhuitz Orange plate (Spanish Lookout)
105	2.5YR7/3	Surface/fill, north and partially under wall 103	90 body sherds, 3 necks, 1 diagnostic sherd, 1 base, 19 rims, 7 bone pieces, 1 obsidian blade, 7 chunks, 16 thin fine-grained chert blades, 77 flakes (mostly thin fine-grained)	Belize Red (late facet Spanish Lookout)
106	10YR7/3	Cobble surface/fill	50 body sherds, 3 necks, 1 flange, 17 rims, 1 core, 6 blades	Belize Red flared bowl rim (or Roaring Creek) (late facet Spanish Lookout) Belize Red bowl rim could be Daylight? Still Terminal Classic
107		Boulder wall	31 body sherds, 3 necks, 1 ~foot, 1 sherd with lace hole, 1 ~handle, 1 flanges, 8 rims, 25 flakes	

108	10YR5/3	cobble-less layer	2 body sherds, 1 neck, 2 minuscule rims	One sherd has reddish-brown slip, similar to Paxcaman Red (but not); 25YR46/54. Flange, Belize Red (late facet Spanish Lookout)
109	10YR5/3	Cobble surface	Not excavated	

Stratum 102 yielded lots of sherds, many thick walled (about .50 cm). Two of the sherds depicted 'cacao' decorations, one with red-slip and the other blackened with no slip. The ceramics were mostly dated to the Spanish Lookout Period, possibly extending into the Terminal Classic. The lithics included both thin flakes and chunks. A section of an incised white fine-grained limestone was found measuring 2 x 3 cm. Some of the cobbles removed from the fill appeared to be worked, creating rounded edges (Figure 7.14).



Figure 7.14 Incised limestone piece and shaped cobble

As more of the surface/fill was removed, the soil became lighter, indicating that there may have been a plaster floor, which if it did exist, by now had disintegrated. As stratum 102 was being removed in the northern section of the unit, we uncovered a faced-boulder wall (103) two course wide and high (c. 40 cm) (Figure 7.15). The section south of wall 103 was designated as stratum 104.



Figure 7.15 Wall 103

Fill/surface 104 primarily consisted of small cobbles and stones. The soil continued to appear lighter than the previous layers, yet there was still no evidence of a plaster floor. Many artifacts were found in the southern section of this unit, including over 200 sherds and lithics. Many of the body sherds were Belize Red volcanic ash tempered and red slipped (late facet Spanish Lookout). We were also able to identify a Mount Pleasant Red bowl sherd (Tiger Run, A.D. 580-680). Two obsidian blades and an obsidian flake were also recovered.

Wall 103 was removed once we determined that we reached a cobble floor to its south of it (104). The fill between the boulder wall was screened, but of the few sherds that were found, none were diagnostic. Once the wall was removed, the northern most 65 cm of the unit, we labeled the surface/fill 105. We excavated surface/fill 105 until we exposed the cobble surface (106, 75.18 m asl) underneath surface/fill 104. On top of the cobble floor 106 was a boulder wall (107) in the southeast corner of the unit at a 45° angle measuring 70 x 45 cm (Figure 7.16a). Among the artifacts found within the wall was a sherd (shaped?) with a drilled hole (Figure 7.16b). The wall terminated the cobble surface 106.



Figure 7.16 (A) Wall 107; (B) ceramic sherds from wall 107

We removed cobble surface 106, which yielded lots of sherds that mostly date to late facet Spanish Lookout. One of the bowl rims could be Daylight Orange, which would still date the platform to the Terminal Classic. About 20 cm below the cobble surface we encountered a cobble-free layer, stratum 108. This cobble-less section only lasted between 4 and 6 cm at which point another cobble floor was encountered (109), which was not excavated. A total of five sherds were recovered from this stratum, but they also appeared to be Belize Red.

To conclude, in this platform test pit we were able to locate a series of cobble surfaces. There was no evidence of plaster floors, however. It is likely that the surface of the plaza went through multiple construction phases during its use by adding layers of fill and cobbles over the existing ones. This would result in a surface similar to those found today in the outdoor living spaces of Maya. We located three noticeable living surfaces, strata 102, 106, and 109. Portions of two walls were located; one below the surface of 102 on the northern side and one above surface 106 on that southern side of the unit. Nearly all of the ceramics we dated to the Spanish Lookout Period, A.D. 680-900, indicating that the platform likely was added at the end of the Classic period.

3C Ceremonial Trash South (CTS) Test Pit

As detailed in chapter 8, Structure 3C may have been used to store and prepare ritual goods (see also Otten 2009). The Maya were described to have frequently discarded ritual objects once used in ceremonies in nearby trash middens (Tozzer 1941). To determine whether ritual paraphernalia was discarded behind Str. 3C, we put in a 2 x 1 m test unit c. 3 meters to the north of it on the terrace slope (Figure 7.17). The north side of the structure is opposite the semi-restricted Plaza 3 and is made up of an inclined surface with a fairly consistent slope of c. 35°. Although the test pit was closer to traverse point YH, we used traverse point YI (71.67 m asl) for measurements, located northeast of Temple 3B, because it had an unobstructed view of the southwest corner of the unit, orientated at 130° at a distance of 33 m. Using a Survey line level we determined the elevations of the unit: SW corner 73.04 m asl; SE corner 72.88 m asl; NW corner 72.475 m asl; NE corner 72.37 m asl; center 72.65 m asl.

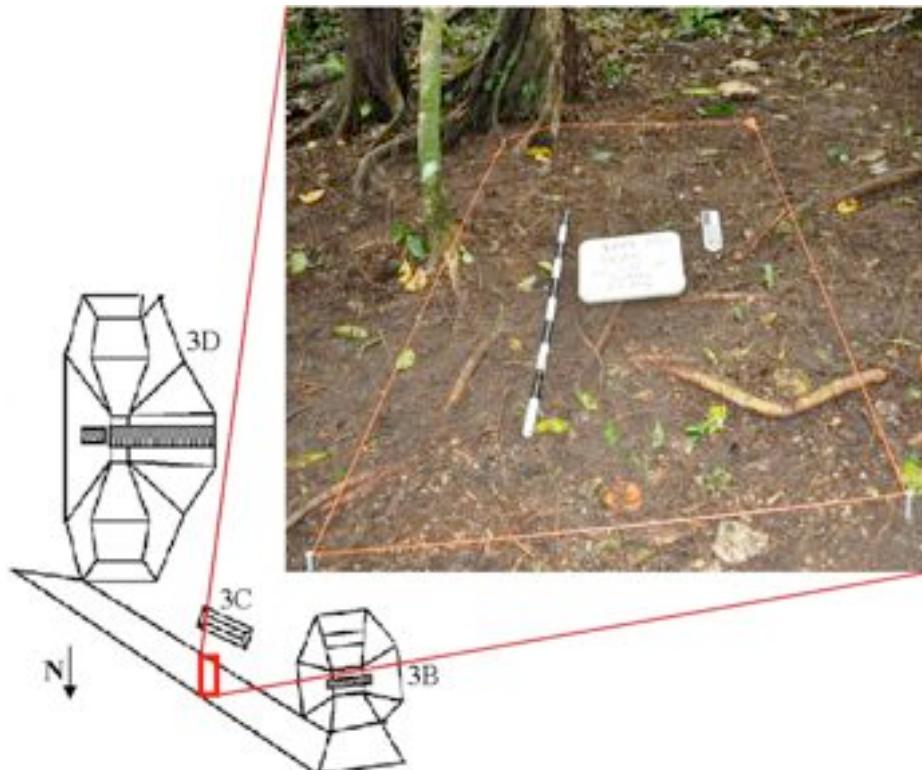


Figure 7.17 Location of 3C CTS TP

Stratum 101, a clay loam topsoil, included lots of cobbles and comprised the top 30 cm of the unit. Mostly small and thin body sherds were found, though two were noticeable thicker at 1.47 and 1.07 cm (Table 7.3). The sherds date to the Spanish Lookout Period (c. A.D. 680-900). Near the center of the unit, we exposed a terrace wall consisting of small boulders (104) extending east-west (Figure 7.18). A concentration of burnt cobble and ceramics was noted in the center and southern end. The largest of these burnt cobbles was 24 cm across, with one side almost completely covered with soot.

Table 7.3 3C ceremonial trash south test pit strata information

Stratum	Munsell	Description	Artifacts	Ceramic dates
101	7.5YR4/3 10YR5/3	Top soil, clay loam	128 body sherds (2 thick—1.47 cm, 1.07 cm), 1 handle, 1 flange, 6 necks, 30 rims, 2 bone fragments, 1 jute, 1 smooth spiral jute, 30 flakes (some ~quartz; 3 FC), 14 chunks	Tu-Tu Camp Striated: Tzimin variety (Spanish Lookout) VA red-slipped vase, Polychrome VA plate; Benque Viejo polychrome: variety unspecified (Spanish Lookout) Yaha Creek Cream: Yaha Creek variety (Spanish Lookout, continues into TC)
Top of 102	10YR6/3	Cobble to small boulder layer	Ring base sherd	Ring base w/ cream underslip and tannish paste; Yaha Creek Cream: Yaha Creek variety (Spanish Lookout, continues into TC)?
102	10YR6/2 10YR6/3	Cobble boulder fill	78 body sherds (1 ~Achote, 1 w/ carbonized surface, several VA), 3 bases, 1 flange, 1 diagnostic sherd, 3 handles, 7 necks, 22 rims, 2+ <i>Nephronaias</i> , 19 jute, 1 <i>Pomocea</i> , 1 <i>Pomocea</i> fragment, 5 spiral ridge jutes, 6 smooth spiral jutes	1 ~Achote, 1 w/ carbonized surface, several VA sherds—one of the possible strap handles (quite straight), 2 different Tu-Tu Camp Striated: Tzimin variety (Spanish Lookout), Mixed: early bowls, handles, and Jocote Orange-Brown (Jenny Creek), Lid; VA w/ calcite inclusions; Alexander Unslipped: Beaverdam variety (Spanish Lookout), Belize Red VA bowl (Spanish Lookout/late facet Spanish Lookout)
103	10YR6/3	Inside/south of wall 104	25 body sherds, 2 necks, 2 bases, 3 rims, maroon ~shaped stone	Tu-Tu Camp Striated: Tzimin variety (Spanish Lookout)
102A	10YR6/3 10YR7/2 7.5YR7/2 10YR4/2	Fill above step 105	154 body sherds (including thick ones, 1.77 cm, and quite friable ones—one sherd crumbled, the remains of which were bagged separately), 4 diagnostic sherds, 4 bases, 6 necks, 6 handles, 53 rims, 2 possible lids, 1 obsidian blade fragment, 2 <i>Nephronaias</i> (1 fragment), 1 perforated animal tooth, 1 ~burned bone with holes through center, lengthwise, 2 phalanges, 9 bone fragments, 54 flakes (9 FC, 1 dark mustard yellow coarse chert), 4 FC cores, 13 chunks (5 FC), 1 white quartz chunk, 1 shaped hard fine-grained ls fragment, 1 drilled ls rock	Sierra Red (c. 4 sherds) (Barton Creek) ~Jocote Orange-brown bowl with nubbin design (Jenny Creek) Belize Red bowl (Spanish Lookout/late facet Spanish Lookout) Cayo Unslipped Jar (late facet Spanish Lookout) or Tu-Tu Striated (Spanish Lookout)
105	10YR7/2	Terrace step	Not excavated	
106	NA	Surface of some sort?	Not excavated	

Resting on top of the platform surface, in the northeast section, a ring base sherd was recovered with a cream underslip and tannish paste of the Yaha Creek variety (Figure 7.19). This sherd dates to Spanish Lookout Period and may even extend into the Terminal Classic period.

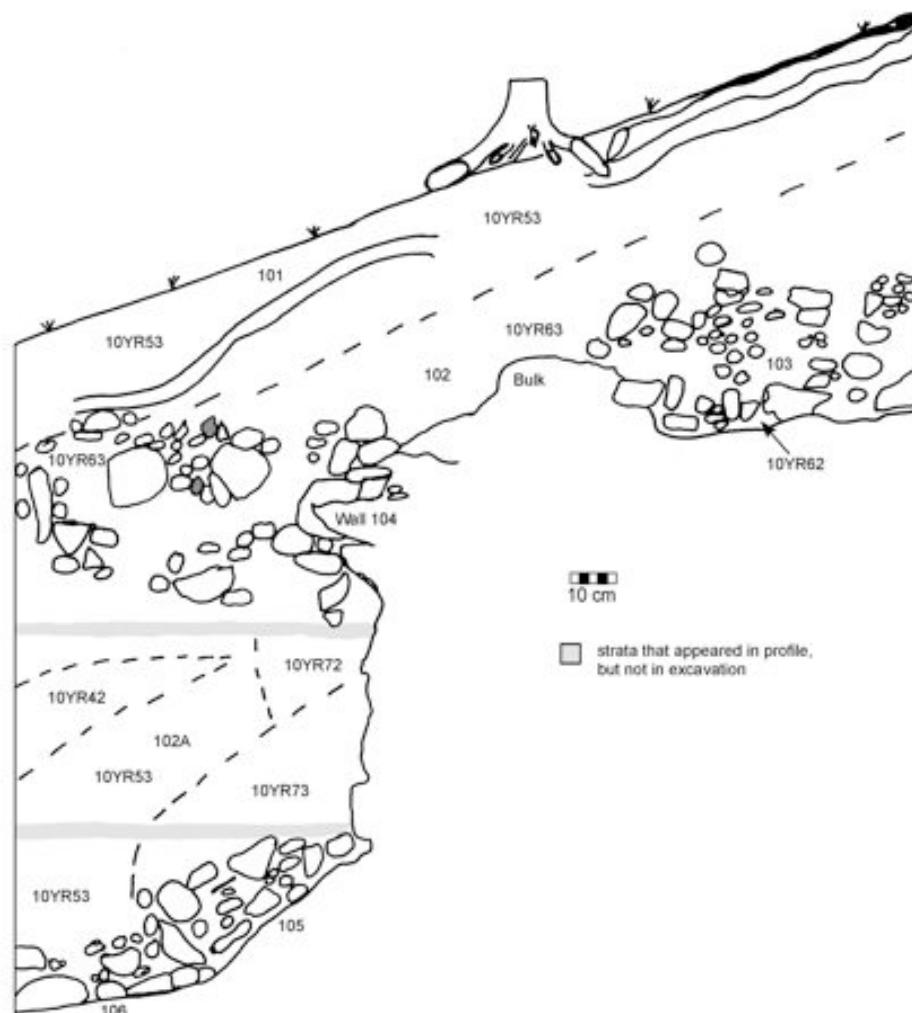


Figure 7.18 3C CTS test pit east wall profile



Figure 7.19 Ring base sherd found on top of 102

As the large cobbles and small boulders comprising collapse/topsoil 102 were removed, we exposed wall 104 c. 50 cm below surface (72.22 m asl). In exposing the north side of wall 104, crew might have dug down too deep in an attempt to find a plaster floor. After we realized they had gone below the bottom level of wall 104, we began labeling the stratum 102A (vs. fill 102); stratum 102 abuts wall 104, while 102A abuts the smaller cobble/boulder wall below the three courses of large boulders of wall 104. To the south of the wall, fill 103, we continued to find burnt ceramics and lithics and in general the cobbles were smaller than those removed north of the wall. Stratum 102A finally ended at what might be a sloped/collapsed terrace step (105). On the north side of the wall a step was discovered (strata 105). The step started 40 cm from the north wall of the unit and abutted the bulk of wall 104. We removed the remaining fill to the north end of the unit in hopes of reaching another platform or floor but did not find any by the time time-constraints ended the excavation.

Found among the fill at the bottom of the unit, near step 105, were several sherds and chert flakes. One of these sherds came from a Jocote Orange-brown bowl dating to the Jenny Creek period, 600-300 B.C (Figure 7.20a). The bowl was identified by its nubbin design that forms a hatched, curved line.



Figure 7.20 (A) Jocote Orange-brown bowl with nubbin design (Jenny Creek); (B) bone, shell, perforated canine, etc.

Located at the same level as the Jenny Creek bowl were a number of shell, bone and obsidian pieces (Figure 7.20b). A perforated animal tooth was recovered, which may have been used as a decorative bead. Among the bone fragments was a burnt bone with longitudinal openings through it, two phalanges and nine other unidentified fragments. It is unclear whether these artifacts are evidence of ceremonial trash being discarded behind Structure 3C. The assemblage is somewhat similar to that found in the Plaza 1 test pit (Lucero 2008)—that is, Preclassic sherds, *Nephronaias* shells, *Pomocea* shells, and faunal bones.

In conclusion, although we did not find a large quantity of ceremonial trash, the excavations assist with our understanding of how Structure 3C was utilized. Many of the ceramics consisted of large and thick-walled vessels indicating a public use, perhaps for feasts. The presence of burnt stone may also represent discarded ceremonial paraphernalia. Objects, such as the burnt vessels, were frequently ritually de-animated after ceremonies by burning, breaking, or with a kill hole.

This excavation also gave us a clearer picture of the layout of Plaza 3. The front (south side) of Str. 3C was situated at about the same elevation. Wall 104 indicates that the slope behind (north) of Str. 3C likely was terraced (Figure 7.21). Since Plaza 3 was semi-restricted, this terracing may have served to limit access. It would be interesting in future to expand the unit along the length of the slope to see if there was a staircase into Plaza 3.



Figure 7.21 3C CTS test pit at end of the season showing exposed terrace wall (104), step 105, and surface 106

3A Stoneworks

In our effort to understand audience participation on the plaza level, an exploratory excavation was conducted at the base of Temple 3A. Based on surface stones first exposed by Cleofo Choc and Don Luna, we determined that there was a platform located in front of and slightly to the north of Temple 3A (Figure 7.22). Once we started to find a series of walls and artifacts (Table 7.4), we formally divided the 6 x 4 meter area into six 2 x 2 meter units.



Figure 7.22 Location of 3A Stoneworks

The northwest corner of the unit was located 19.50 meters and 310° from traverse point YG. Using a survey line level, the elevation of the corner was determined to be 76.0 m asl. The topsoil resembled that found in the rest of Plaza 3, with heavy root cover and many cobbles and lithics (Figure 7.23). Initially, we did not screen the topsoil; once we began excavating stratum 103, $\frac{1}{2}$ " screens were used. Pit 102 was accidentally created in the southeast corner of the platform.

Table 7.4 3A Stoneworks strata information

Stratum	Munsell	Description	Artifacts	Ceramic dates
101 explorations	10YR7/3	Topsoil from exploratory test unit	200 body sherds (lots of VA red-slipped sherds), 12 necks, 16 bases, 79 rims, 1 flange, 1~lid, tiny sherd fragment with 'Maya blue,' 1 smooth and 1 ridged jute, 1 freshwater shell, 1 obsidian blade, 6 obsidian blade fragments, 9 bone pieces (1 incised/carved), 6 hematite mirror mosaic pieces, 2 interesting stone pieces, 1 biface fragment (tip/end?), 1 red geode, 1 ~drill, 4 cores (1 FC), 243 flakes (mostly thin, fine-grained; 7 FC), 11 striated flakes, 12 chunks (4 FC), 45 blades	~Dolphin Head Red bowl (early facet Spanish Lookout); e.g., p. 101 ~Garbutt Creek Red: Garbutt Creek variety (Spanish Lookout) Roaring Creek Red plate (late facet Spanish Lookout) Belize Red (late facet Spanish Lookout) ~Alexander Unslipped: Beaverdam variety (Spanish Lookout), p. 284
102 (DL pit)	NA	Pit in platform southeast corner of the	17 body sherds (some thick, 1.55, 1.53 cm; some VA red-slipped), 7 rims, 2 small VA handles, 1 flange, 1 ring-base, 1 ridged jute, 2 blades, 4 flakes	Actuncan Orange-polychrome: Actuncan variety w/ flange (Early Hermitage), ~Belize Red bowl (Spanish Lookout/late facet Spanish Lookout) or Mount Pleasant Red: Mount Pleasant variety; p. 196, Figure 112c, d (Tiger Run) (description does not mention VA, though sherd has some; but ceramicists have noted that Yalbac sherds seem to have more VA/calcite pastes than other sites)

101 test unit	5YR3/2 7.5YR3/3		183 body sherds (some VA red-slipped), 8 necks (1.56 cm, 1.54 cm), 8 bases, 47 rims, 5 diagnostic sherds, 2 bone pieces, 5 obsidian pieces, 4 chunks (1 FC), 32 blades, 1 worked blade, 1 biface tip, 98 flakes (1 FC), 4 striated flakes; most flakes thin, fine-grained	Alexander Unslipped jar, p. 283 (Spanish Lookout) Belize Red bowls/plates (late facet Spanish Lookout)
103	5YR3/2	Platform surface	368 body sherds (lots of Belize Red—VA; 1.18, 1.38, 1.14, 1.06, 1.02, 1.12, 1.03, 1.08 cm), 12 necks (1.13, 1.15, 1.08, 1.48 cm), 2 diagnostic sherds, 8 necks, 5 flanges, 9 ring-bases, 2 nubbins, 1 hollow slab foot fragment, 1 hollow ~foot fragment, 1 flat base, 98 rims (mostly VA red-slipped—Belize Red), 18 chunks (5 FC), majority thin fine-grained: 307 flakes (5 FC), 93 blades, 4 bone pieces, 1 granite 'flake,' 4 obsidian flakes, 29 obsidian blades (some quite small), 2 ridged jutes	sherds practically all Belize Red (late facet Spanish Lookout) Huge, thick Belize Red bowls (late facet Spanish Lookout); possibly Paxcaman Red: Paxcaman variety (though only a few suppose to be VA, p. 294) (early facet New Town)
104	10YR5/2 10YR4/3	Boulder wall	84 body sherds, 21 necks, 1 flange, 1 flat base, 4 ring bases, 1 diagnostic sherd, 28 rims [light pinkish hue to ceramics], 50 thin fine-grained blades, 4 chunks, 114 thin fine-grained flakes, 1 limestone bead piece, ~coral piece, incised/drilled marine shell mosaic piece, incised bone, 3 bone pieces, 15 obsidian blades (5 fragments)	Mostly VA Belize Red plates, bowls, flat base, ring base (late facet Spanish Lookout)
105	10YR5/2	Cobble surface	131 body sherds, 11 necks, 2 flanges, 4 handles (including long strap handle), 4 diagnostic sherds, 1 hollow foot (in 2 pieces), 2 flat bases, 1 ring base, 38 rims, 4 blades, 7 chunks (3 FC), 33 flakes (5 FC), 4 jutes, 6 smooth jutes, 3 ridged jutes, 3 <i>Nephronaias</i> , 1 marine shell piece	a few Belize Red Belize Red flared rims (late facet Spanish Lookout) Long strap handle; either Figure 24h (Jenny Creek) or Daylight Orange Figure 197r (Terminal Classic) ~San Antonio Golden-Brown: San Antonio variety, ~p. 115 (Mount Hope) ~Jocote Orange-Brown: Jocote variety, p. 63 (Jenny Creek)
106	10YR5/2	Earthen floor	17 body sherds, 1 diagnostic sherd, 1 large handle, 5 rims (3 very small), 1 ridged jute, 1 obsidian blade fragment, 8 flakes (1 FC)	
107	NA	Plaster floor	Not excavated	

In part of the initial process to determine the size of the platform, we discovered six pieces of hematite polished and shaped mosaic pieces immediately below the surface on the western side of the unit (Figure 7.24). The hematite pieces were all found near each other on the west side of the platform closest to Temple 3A. In addition to the hematite pieces, seven obsidian flakes and blades were found in various locations within the unit in stratum 101, including a 3 cm long blade. There were also nine bone fragments, one of which was incised or carved.



Figure 7.23 Topsoil (101) lithics

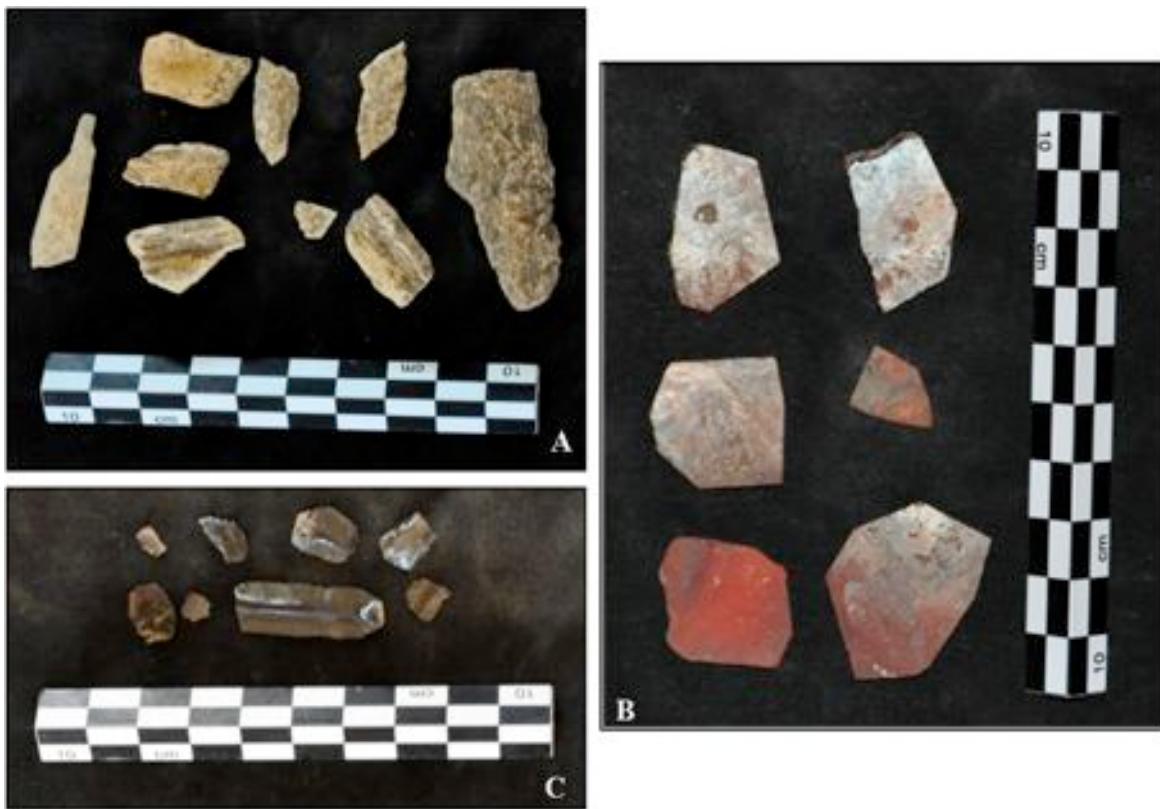


Figure 7.24 Topsoil (101) artifacts: (A) bone fragments; (B) hematite mosaic pieces; (C) obsidian

Near the south end of the unit, a Postclassic arrowhead was discovered (unfortunately, it was misplaced during excavations and subsequently lost). A majority of the 200+ body sherds uncovered were volcanic ash tempered and red-slipped; there was also a tiny (c. 1 cm) sherd which appears to have a fragment of Maya blue paint.

As for the architecture found in the unit, several lines of faced stones were uncovered (Figure 7.25). Running along the east side of the unit, cut stones were found abutting each other forming a north-south wall. Closer to Temple 3A was a series of three parallel lines of stone, perhaps a small staircase. It was near these stones that the hematite was located. Connecting these two groups of faced stones there was another line of stones running east west at the south end of the unit. In the center portion of the test unit a few of the faced stones were burned; we also noted fire-cracked rocks as well. The northern most section of the unit, about 2 meters long, was separated from the rest of the structure to the south by a small trench.

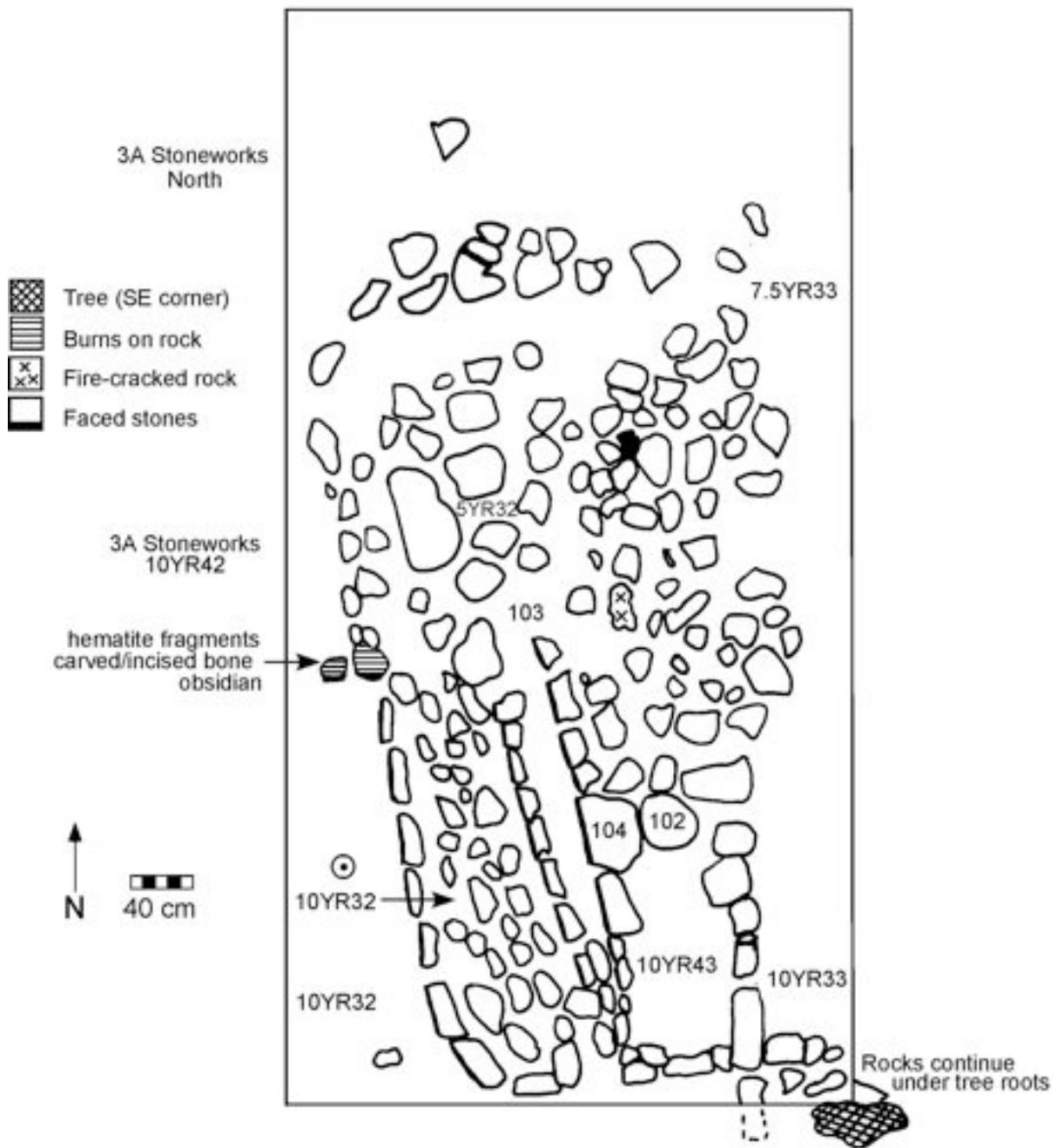


Figure 7.25 Plan of 3A Stoneworks

Once the entire platform was exposed, we set up a 2 x 2 m test unit located at the center of the western side of the larger unit. The southwest corner of this test pit was located 20.21 meters at 266° from traverse point YG. This unit includes the location where most of the hematite and part of the staircase was found. The southwest corner was measured to be 75.50 m asl. From this elevation we determined that the northwest corner was 75.16 m asl, the northeast corner was 75.36m asl, the southeast corner was at 75.47 m asl and the center was 75.37m asl. All soil was screened through a ½" mesh.

As strata 103 (platform surface) and 104 (wall) were removed, high concentrations of ceramic sherds and chert flakes were found underneath the steps, as well as 49 obsidian pieces, including blades and prepared cores. We also found bone fragments and a half of a stone bead (Figure 7.26) measuring 3 x 1.5 cm with an internal diameter of c. 0.5 cm. In the same area a single small bone

mosaic tile was also found (c. 1 x 1 cm), as well as a piece of what might possibly be coral. Although these items were located near where we found the hematite mosaic fragments, they were not found in direct association.



Figure 7.26 Stratum 104 artifacts

We eventually came across a cobble floor (105); ceramics found included Belize Red flared rims (late facet of Spanish Lookout), diagnostic sherds from Jenny Creek and Mount Hope and a long strap handle which may either be from Jenny Creek period or a Terminal Classic Daylight Orange (Figure 7.27). Under the cobble floor there was an earthen floor (106); for the most part, we found few artifacts. Just under the earthen floor there was a mostly level plaster floor (107) around the edges of the unit. The center of this floor contained a lower (108) packed cobble surface. This was the end of our excavations due to time constraints.

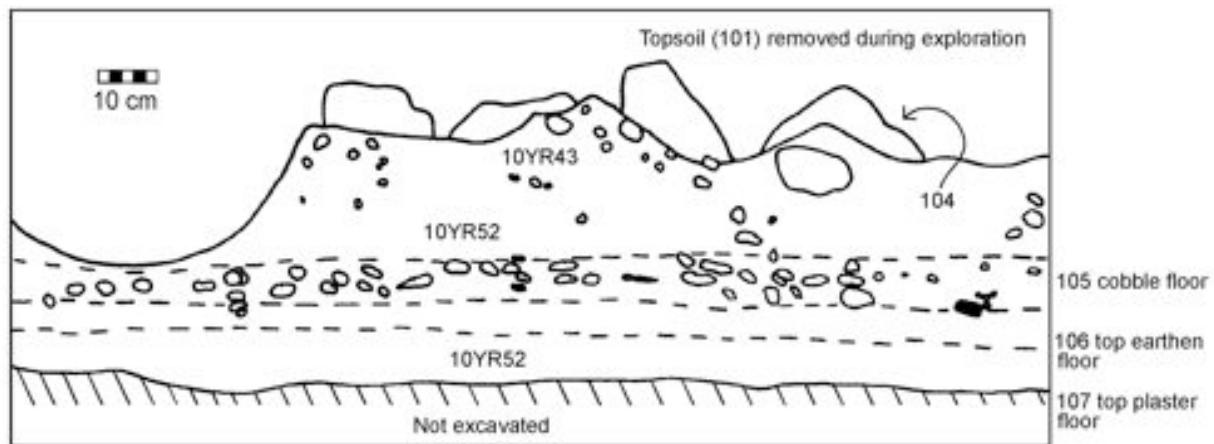


Figure 7.27 3A Stoneworks test pit south wall profile

Discussion

Focusing our excavations in the plaza allowed us to gain insight into how audience members went beyond being mere observers and became “active participants.” Attention is most often paid to the events taking place atop the temples conducted by rulers and ritual leaders, while the plaza level is often regarded as empty space. However, this space was far from empty as observers filled the area and were engaged with others and the ceremonies. This public space thus was used to celebrate and create ties with each other, as well as with elites and rulers (Freidel 1981).

In each of the areas we excavated in Plaza 3, we found possible evidence for ritual activities. The test pit in the center of the plaza platform revealed a series of cobble surfaces. It appears that feasting and communal celebrations took place during which vessels would be passed around and occasionally broken. The thin pastel-colored chert flakes and blades found throughout Plaza 3 also imply a particular kind of specialized activity, likely involving audience participation. Though similar chert flakes and blades have been found associated with burials (Moholy-Nagy 1997), in Plaza 3, this was not the case, at least not as of yet. The chert debitage was first discovered in Plaza 3 in the 2001 plaza test pit, and later at the tree root at the base of Temple 3D, the Platform TP, 3A Stoneworks, and in vast quantities in the 3D Diver TP. Their presence throughout the plaza (other than Str. 3C) suggests that they comprised an important part of ceremonies. While their exact purpose remains unknown, it is possible that the Maya incorporated the clinking sounds that the flakes and blades made when jostled in certain ceremonies.

As Table 7.5 shows, Plaza 3 activities, whether ritual or no, take place at least through the end of the Classic period. Further, floor 105 at 3A Stoneworks, might be the same as the Terminal Classic floor in the plaza center 2001 test pit due to their similar elevations (Graebner 2002).

Table 7.5 Plaza 3 floor elevations and ceramic dates

Site	Floor	Elevation (m asl)	Ceramic dates
Plaza 3 Platform TP	102	75.83+/-	A.D. 800-900
	104	75.36-75.44	A.D. 800-900
	105	75.32-75.40	A.D. 800-900
	106	75.11-75.17	A.D. 800-900
	109	74.88-74.94	Not excavated
3D Divers TP	102	75.12-75.20	Not excavated
	~110	74.67	Not excavated
3A Stoneworks	105	75.10-75.18	A.D. 800-900
	106	75.02-75.05	NA
	107	74.93-74.99	Not excavated
	108	74.86-74.89	Not excavated
3C CTS TP	105	71.07-71.34	Not excavated
	106	70.77	Not excavated

In fact, most of the upper surfaces throughout Plaza 3 dates to the end of the Classic period; it thus is not a surprise that floor/surface elevations throughout the plaza are similar.

Further evidence that temple and ceremonial events served to entertain and involve the public is the ease with which events could have been viewed by everyone. This engagement with ritual objects, whether they are chert flakes and blades, colorful mosaics or feasting paraphernalia, contributes to improving integration and building a common history (Lucero et al. n.d.). Results from Plaza 3 excavations provide evidence that plaza public events took place over a period of close to a thousand years, through at least the Terminal Classic period, at which point the site was abandoned. This enduring tradition was possible since active participation by audience members benefited both the elite, who had access to labor and services, and the non-elite, who strengthened their own bonds with the rest of the community with their sense of shared history.

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contributed in the field, for staying upbeat when drenched by rain day after day, and for hours of entertainment. Finally, I want to thank Stanley Choc, Jane Baldwin and James Arie for helping me re-map Temple 3D.

References Cited

- Bricker, Victoria
1999 Color and Texture in the Mayan Language of Yucatan. *Anthropological Linguistics* 41:287-307.
- Freidel, David
1981 The Political Economies of Residential Dispersion among the Lowland Maya. In *Lowland Maya Settlement Patterns*, edited by W. A. Ashmore, pp. 371-382. University of New Mexico Press, Albuquerque.
- Graebner, Sean M.
2002 Monumental Architecture and the Ancient Maya: The Royal Acropolis at Yalbac, Central Belize. M.A. Thesis. New Mexico State University, Las Cruces.
- Kertzer, David
1988 *Ritual, Politics and Power*. Yale University Press, New Haven.
- Kinkella, Andrew
2008 Over the Bajo and Through the Pools: The 2007 Settlement Survey Transect from Yalbac to the Cara Blanca Pools. In *Results of the 2007 Valley of Peace Archaeology Project: Yalbac's Settlement*, edited by L. J. Lucero, pp. 19-114. Report submitted to the Institute of Archaeology, National Institute of Culture and History, Belize.
- Lucero, Lisa J.
2003 Exploring Maya Politics: Yalbac, Central Belize. In *Results of the 2002 Valley of Peace Archaeology Project: Yalbac*, edited by L. J. Lucero, pp. 1-17. Report submitted to the Department of Archaeology, Ministry of Tourism and Culture, Belize.
- 2006 The 2005 Season at Yalbac: Public Places. In *Results of the 2005 Valley of Peace Archaeology Project: Yalbac Architecture and Settlement*, edited by L. J. Lucero, pp. 1-27. Report submitted to the Institute of Archaeology, National Institute of Culture and History, Belize.
- 2008 The 2007 Season at Yalbac: Goals and Results. In *Results of the 2007 Valley of Peace Archaeology Project: Yalbac's Settlement*, edited by L. J. Lucero, pp. 1-19. Report submitted to the Institute of Archaeology, National Institute of Culture and History, Belize.
- Lucero, Lisa J., Melissa Baltus, and Sarah Otten
n.d. The Politics of Inclusion: Classic Maya Plaza Ceremonies. Manuscript in possession of author.
- Moholy-Nagy, Hattula
1997 Middens, Construction Fill, and Offerings: Evidence for the Creation of Classic Period Craft Production at Tikal, Guatemala. *Journal of Field Archaeology* 24:293-313.
- Otten, Sarah E.
2009 Structure 3C: Revisiting Ritual Space. In *Results of the 2008 Valley of Peace Archaeology Project: Non-Temple Summit Excavations*, edited by L. J. Lucero, pp. 14-30. Report submitted to the Institute of Archaeology, National Institute of Culture and History, Belize.
- Tozzer, Alfred M.
1941 *Landa's Relación de Los Cosas de Yucatán*. Papers of the Peabody Museum of American Archaeology and Ethnology, No. 28. Harvard University Press, Cambridge.

Chapter 8

Structure 3C Trench and Burial 145

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This report details the trenching of Structure 3C at Yalbac by the University of Illinois at Urbana-Champaign field school from 25 May to 24 June 2010. Structure 3C (7 x 3 m, 1 m tall) sits on semi-restricted Plaza 3 between Temples 3D and 3B (see Figure 1.2; Figure 8.1). The excavation of the structure began during the 2008 season and was selected because of its location and relatively small size compared to the surrounding architecture. The 2008 excavations focused on assessing the use and purpose of the structure (Lucero 2009; Otten 2009). The goal for the 2010 season was to excavate a center trench to assess its purpose based on the 2008 preliminary results suggesting the structure was used either as a ceremonial space for commoners and elites, and/or a ritual storage and preparation structure (Figure 8.2). While we were able to excavate over 2 meters deep in the 1-m wide trench, due to time constraints we were unable to reach sterile soil or bedrock. We also continued exposing a burial first revealed in 2008 (the top of the skull).



Figure 8.1 Structure 3C looking just west of north with 2010 trench

The 2010 crew consisted of P.I. Lisa J. Lucero, T.A. Molly Haneberg, T.A. Eleanor Olszewski, field assistants, and field school students. I supervised the excavation of the trench with Dr. Lucero's guidance. After locating the 2 x 1 m 2008 trench, we continued from the trench and laid out a 1 x 6.4 m trench through the center of Structure 3C through Units 3, 8, and 13 (Figures 8.3, 8.4, 8.5). We used traverse point YH (76 m asl) to orient the trench at 20° off of north using a Brunton compass. As the excavation progressed, interference from the elevation of the structure forced us to take some elevation measurements from a second location. The architecture in the southern end of the trench blocked the view of the stadia rod from traverse point YH, so a second location was selected as a point of reference for measurements. The 'second nail' set in at 76.37 m asl, which is located 2.75 m north of the 2008 'root nail' (75.93 m asl 1.90 m from traverse point YH at 92°). Eventually the 2nd

Nail became loose, so we started taking measurements from YH again (since it was now possible due to excavations removing obstructions), at least in the southern section of the trench. The lower strata required two points from which to take elevations (all noted on planviews): for northern sections, since it was too low using the 2-meter stadia rod, we used a 1-m stick and string from a known elevation (which itself originated from YH).

Throughout the trench excavation, plan maps and detailed photographs were taken of the strata, the trench, and all of Structure 3C. In what follows, I detail the excavation of the Structure 3C trench during the 2010 field season.

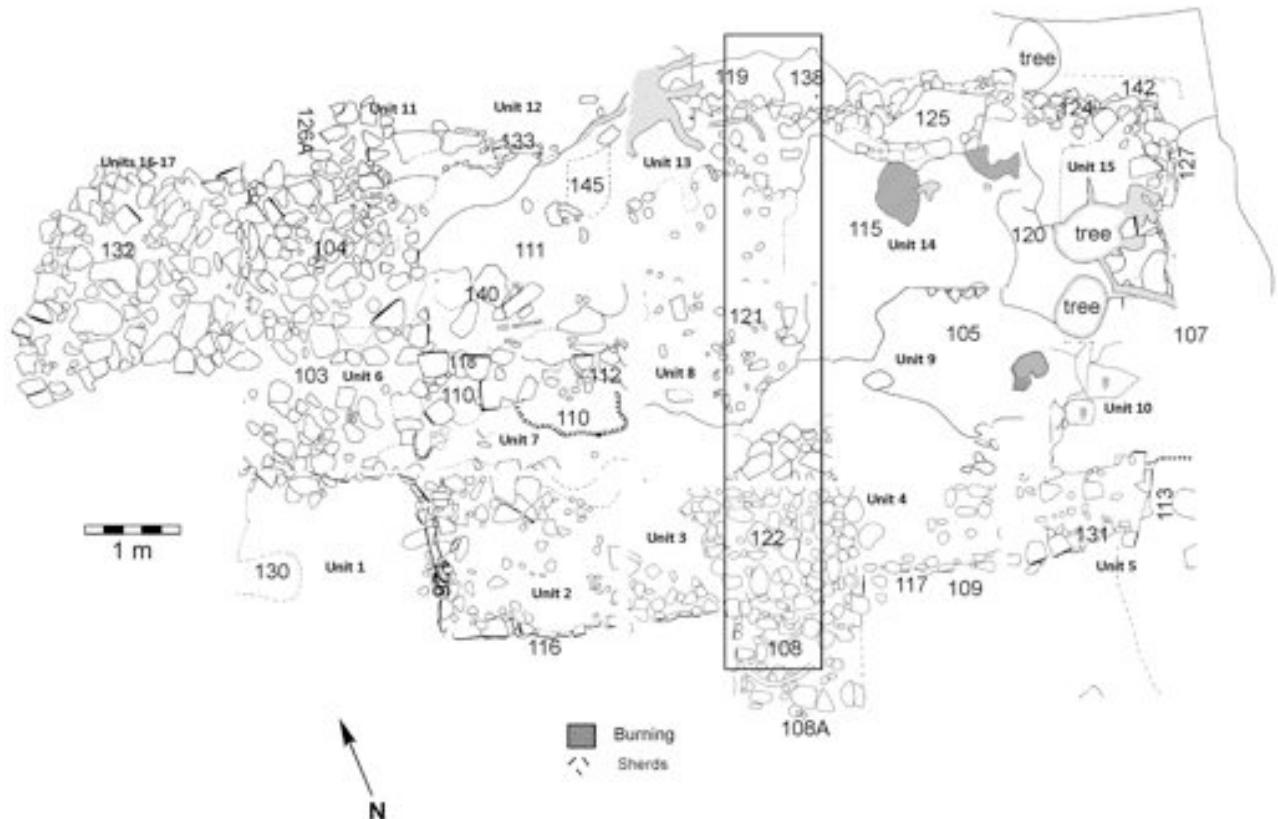
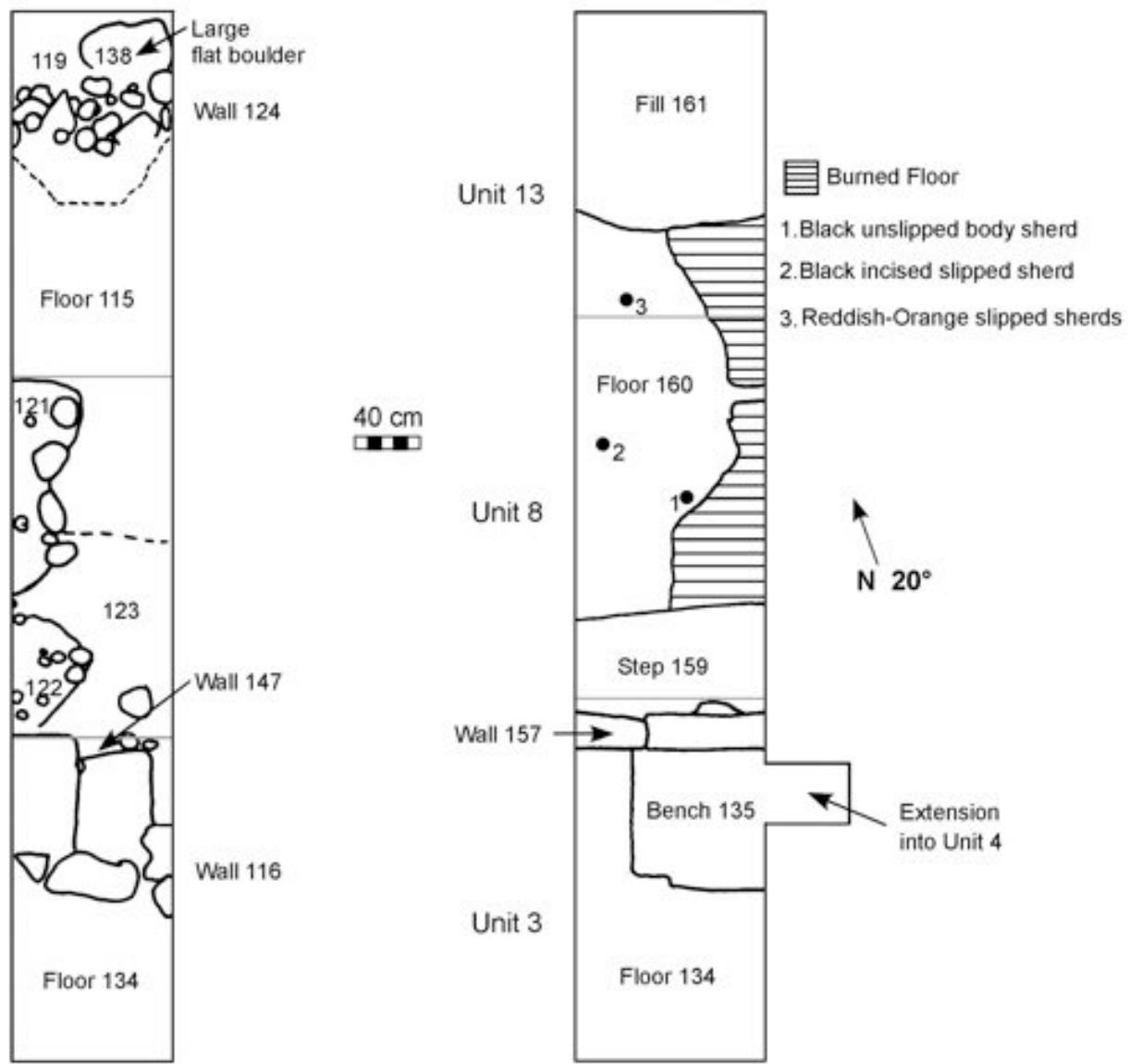


Figure 8.2 Plan of Structure 3C from 2008 season with the 2010 1 m wide trench. Stratum 130, a concentration of marl, was no longer visible in 2010



Eastern 1 meter of Unit 3, southern edge

Figure 8.3 Planview of the trench at the beginning and end of seasons. The right one (end of season) is wider due to expanding trench during excavations. Numbered sherds on floor 160 left *in situ*.



Figure 8.4 Str. 3C trench, looking southwest

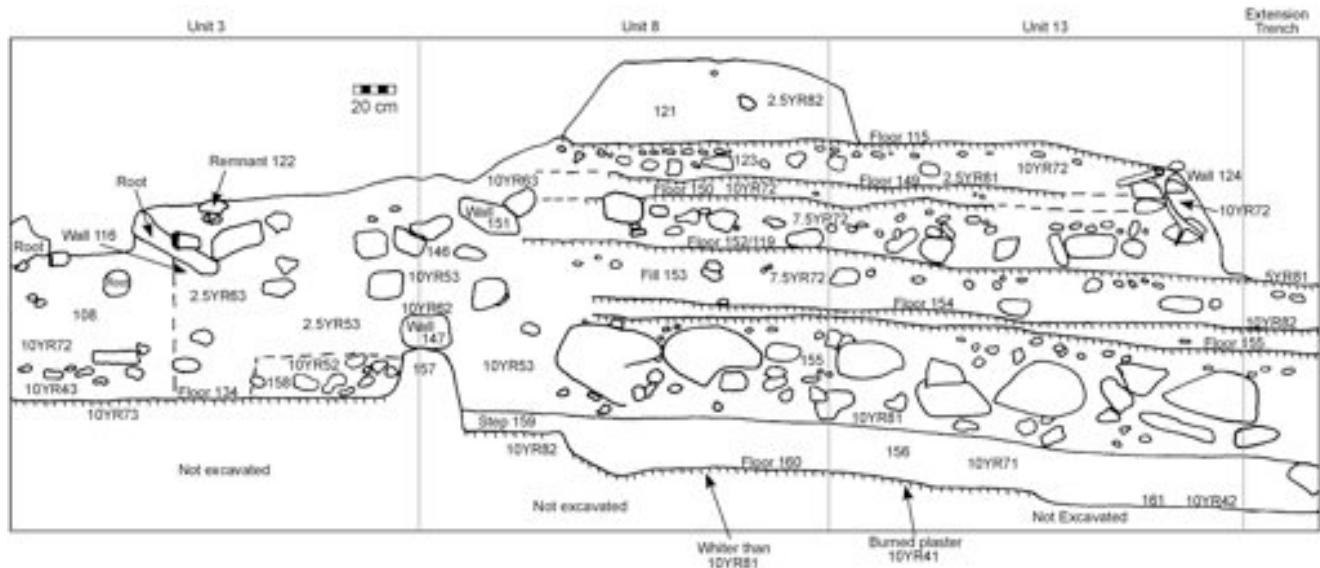


Figure 8.5 Profile of west wall of Str. 3C trench

Str. 3C Excavations

The trench began during the 2008 field season under the direction of T.A Sarah Otten and P.I. Lisa Lucero. The 2008 goal was to horizontally expose the structure and excavate a center trench to help determine the use of the structure and its relationship to the surrounding temples (Otten 2009). Reaching sterile soil was not possible due to time constraints. The small trench exposed a plaster floor (134) and two benches (strata 135 and 139); artifacts recovered include a few ceramic sherds of orange paste with volcanic ash that may date to the early facet Late Classic. The 2008 excavations concluded Structure 3C was a semi-public ritual space, to prepare or store ritual materials, and as an

inclusive remembrance center for both commoners and elite as it was visible from the plaza, jungle floor, and temple tops (Otten 2008).

The 2010 season continued trench excavation on 31 May. We spent several days removing 2008 back dirt, from which we recovered a granite mano fragment, lithics, the hafted end of chert hoe, an everted jar rim, a small bone fragment, a fire-cracked flake, a nubbin foot support, and c. 10 small sherds. At the southern end of the trench, various construction periods became evident through overlapping strata and feature remodeling. At the end of 2008 excavations, a small trench had been started underneath stair 108, revealing two overlapping benches (139 and 135). At the start of the 2010 excavation, bench 139 was removed to determine its relationship to bench 135. During excavation we recovered burnt plaster and rocks in addition to some ceramic sherds and lithics, including a large ceramic sherd on top of bench 135, but there was no conclusive date from the ceramics. In 2008, Lucero (2009) suggested that the Maya may have partially dug into bench 139; 2010 excavations confirmed that they had. Lucero also added some stratum numbers to the original 2008 profile of the 2 m long east-west trench (Figures 8.6, 8.7).

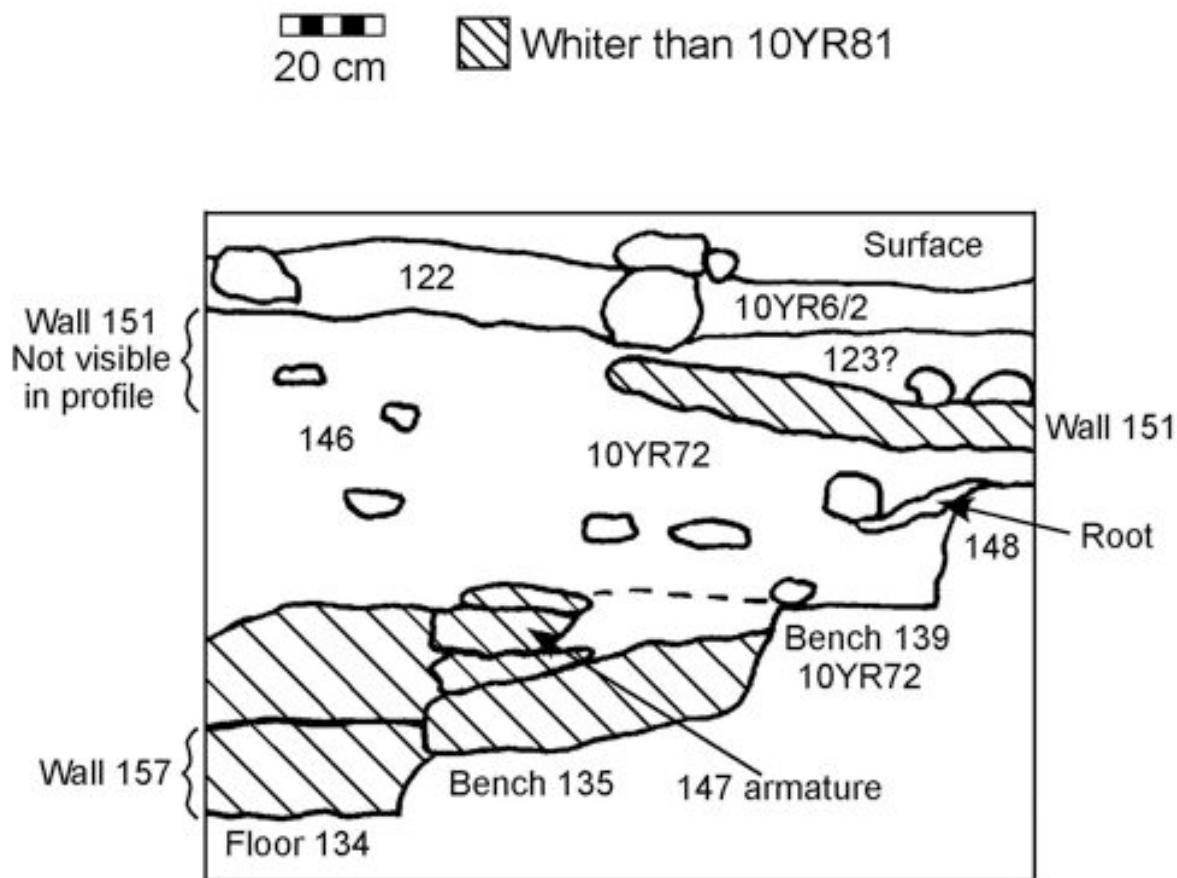


Figure 8.6 Updated profile of north wall of south 2008 trench before 2010 excavations



Figure 8.7 Benches 135 and 139. Arrows show how the Maya filled in area (fill 158) after they had removed part of Bench 135

Bench 135 seems to begin where floor 134 (unexcavated) ends. We took out the southernmost wall (116) that also served as the northern support of the 108 stairs; since wall 116 was small and yielded no artifacts, no unit form was used; it abuts Bench 135 and thus was likely added to the bench when it either was no longer in use, or it served as an outer wall to the bench. Stair 108 was added (abutting) wall 116 (see Figure 8.2). We also noted that the Maya used flat river cobbles to build the wall.

An armature (147) was placed on top of the bench, abutting Bench 139. After the armature was built on top of bench 135 a thin layer of plaster was laid over both features. While removing the armature we found charcoal and several non-diagnostic ceramic sherds, but few lithics (Table 8.1). Armature/wall 147 lies below a level of fill (146) and rests top of a wall (157) (Figure 8.8). Stratum 157 both abuts and covers a portion of bench 135 (c. 8 cm). The main component of the wall is a limestone boulder cut specifically to fit over the bench, after which both features were plastered. The plaster is thin and has not been smoothed over indicating a quick and inexpensive project. Wall 157 covers the bench, indicating it was added in a later building phase but we do not know how much time elapsed between the two construction periods. The Maya may have filled in the area west of the bench and south of wall 157 to even it out (158 cobble fill; see schematic on Figure 8.8). Cobble fill

158 appears to correspond in height and length to Bench 135; the molded edge of 135 indicates the Maya added wall 157 and plastered over it so it would blend in with Bench 135, and filled in the space with fill 158. As noted on the trench profile (see Figure 8.5), wall 157 might also be a lower course of wall 147 (armature). We do not know how far the expanded bench extends; we would have to excavate west outside of the trench to determine this.

Table 8.1 Structure 3C Trench strata information

Stratum	Description	Munsell Color	Artifacts	Ceramic Dates (based on Gifford et al. 1976)
115	Plaster floor	10YR8/3* 10YR6/1*	7 body sherds, 1 ~basalt fragment, 1 core, 4 flakes (1 fire-cracked [FC])	
121	Summit bulk	2.5Y8/2	15 body sherds (including 1 VA), 6 flakes (1 FC), 1 jute, 1 <i>Nephronaias</i> shell fragment	1 VA red-slipped everted bowl/plate rim sherd,
122	Cobble surface above stair 108	2.5Y6/3	2 body sherds, exhausted chert core, 1 flake	1 VA red-slipped slightly flared bowl rim sherd
Top of 123	115 ballast	10YR6/3	1 body sherd, chunk of yellowish chalk (10YR83, 75YR76), flake	
123	115 ballast, above 149	10YR7/2	24 body sherds (a few VA), 3 rims, 2 handles, 1 partial flange, 1 neck, 4 flakes (3 FC)	Handle is Mountain Pine Red: Old Jim Variety (p.193 Tiger Run); Jar rim is Jones Camp Striated (Tiger Run)
124	North wall, east side	10YR7/2	23 body sherds, 1 base, 2 rims, 1 diagnostic sherd, 2 flakes, 1 FC chunk	Aguacate Orange: Variety unspecified jar rim (Floral Park); One sherd of Guacamallo Red-on-Orange (pp. 137-9, Floral Park)
Top of 135	Lower bench	10YR7/2*	1 body sherd, jute	
Top of 139	Upper bench	10YR7/2*	Jute	
139	Bench fill	No Munsell	13 body sherds (1 w/ ~carbonized surface), 1 thin-walled red-slipped ~vase sherd with clink sound, 1 chalcedony/cloudy quartz chunk, 2 cores, 1 chunk, charcoal piece	Alexander Unslipped: Croja B rim (Spanish Lookout), 1 Achote sherd
146	Stair 108 fill	10YR5/3	6 body sherds, 1 diagnostic sherd, 1 rim, 1 small core	Perfect example of Tu-Tu Camp Striated: Tzimin Variety (Fig. 179n, Spanish Lookout); Lucha Incised: Variety unspecified sherd (Hermitage); Sherds with interior and exterior black slip, incised or grooved with a fine brown; ~ash pasted small sherd
147	Armature	10YR6/2	3 flakes, 1 charcoal	
148	Fill above bench 139	No Munsell	9 body sherds (1 in 10 pieces), 1 biface fragment (hafted end), 1 flake	1 body sherd of red-slipped VA
149	Floor and ballast below 123; above floor 105 on its east side	25Y8/1	16 body sherds, 3 necks (jars), 1 chunk, 6 flakes (3 FC), 2 laterite stones, 1 burned stone, 1 orange-pink (10R68). Stones not collected	1 body sherd red-slipped VA; 2 sherds with a waxy dark red slip (25YR36)
150	Floor and ballast	10YR7/2	22 body sherds, 1 rim, 2 bases, 1 diagnostic sherd, 5 bone pieces, 8 chunks (5 FC), 5 pieces of vascular, tubular limestone	Belize Red sherd (late facet Spanish Lookout); Achote Black Incised: Cubeta Incised sherd (Spanish Lookout)

151	Wall at south end of structure	10YR6/3	3 body sherds, 1 rim, 3 flakes	Achote Black vase sherd (p. 248, Spanish Lookout); 2 small VA sherds
152 (119)	Floor	5YR8/11 Plaster is more vibrant than the Munsell color	25 body sherds (3 are .84 cm thick), 1 small rim, 1 ~flange, 2 diagnostic sherds, 4 neck (.96, 1.24, 1.07, 1.15 cm thick), 1 ridged jute, 1 ~quartz brown pebble, 4 limestone flakes, 6 flakes (3 FC), 5 chunks (1 FC)	1 thin VA orange sherd; Mount Pleasant Red (p. 198 Fig. 112, Tiger Run); Early Classic fine VA sherd Yaha Creek Cream: Yaha Creek Variety (pp.272-3, Spanish Lookout continuing into the Terminal Classic)
153	Boulder fill below floor 152	7.5YR7/2	97 body sherds (one .40 cm thick), 10 necks, 2 handles, 5 flanges, 13 rims, 2 diagnostic sherds, 1 ridged jute, 2 large bone pieces, 4 chunks (2 FC), 2 flakes, 1 smooth pebble, 1 prepared brown core	Polychrome sherd, handles of 2 different sizes; slipped basal flange; Saturday Creek Polychrome (Tiger Run); Possible Mateo Red on Cream bowl (pp.95-6, Barton Creek); Polychrome VA red and black on orange flange; ~Benque Viejo Polychrome: Variety Unspecified (p. 269, Spanish Lookout); ~Minanha Red (p. 156-7, Hermitage)
154	Floor under 153	10YR8/2	6 body sherds, 1 diagnostic sherd, 2 flakes	One grooved, slipped sherd of either Belize Red or Aguila Orange (p. 182, Hermitage)
155	Floor and ballast under 154	10YR8/1	16 necks, 415 body sherds, 9 diagnostic sherds, 3 feet, 7 ring bases, 1 flat base, 1 ~foot attachment, 9 flanges, 93 rims, 53 flakes (c. 10 FC), 17 chunks (c. 4 FC), 8 blades, 1 biface fragment (hafted end), 1 blue worn chert chunk, burnt plaster, charcoal piece, 8 jutes, 2 ridged jutes, 2 freshwater shells, 4+ <i>Nephronaias</i> , 1 ~limestone mosaic piece, 5 obsidian blades, 1 obsidian flake, 12 pieces of bone from a large mammal (4 phalanges, 1 ~femur, vertebrae), 1 burned bone, 1 small mandible (rodent?), c. 15 smaller bone pieces (29 total)	~Gavilan Black-on-Orange: Gavilan Variety (Floral Park); Several ring bases and flange of Minanha Red: Minanha Variety (Hermitage); Mahogany Creek Incised: Mahogany Creek Variety (Hermitage); ~Aguacate Orange bowls (Floral Park); Lucha Incised vase (Hermitage)
156	Clay loam	10YR7/1	428 body sherds, 9 necks, 10 diagnostic sherds, 3 ring bases, 17 flanges, 61 rims, 10 jutes, 2 ridged jutes, 1+ <i>Nephronaias</i> , 1 marine shell piece, 3 obsidian blades, c. 31 bone pieces (most from a large mammal; 4 burned), 6 chunks, 1 granite piece, 11 flakes	Lucha Incised incurving vase or bowl (Fig. 88I, Hermitage); 2 Minanha Red: Minanha variety bowl flange rims (Hermitage); Grooved VA red-slipped sherd, possibly Sierra Red (Fig. 35B, Barton Creek); Actuncan Orange-Polychrome basal flange and part of body (Early Hermitage); other sherds also dated to Hermitage
Top of 160	Floor below 156	Whiter than 10YR8/1	Basal flange and rim	Minanha Red: Minanha Variety (p. 157, Hermitage)
161	Clay loam abutting floor 160	10YR4/2	Unexcavated	Unexcavated

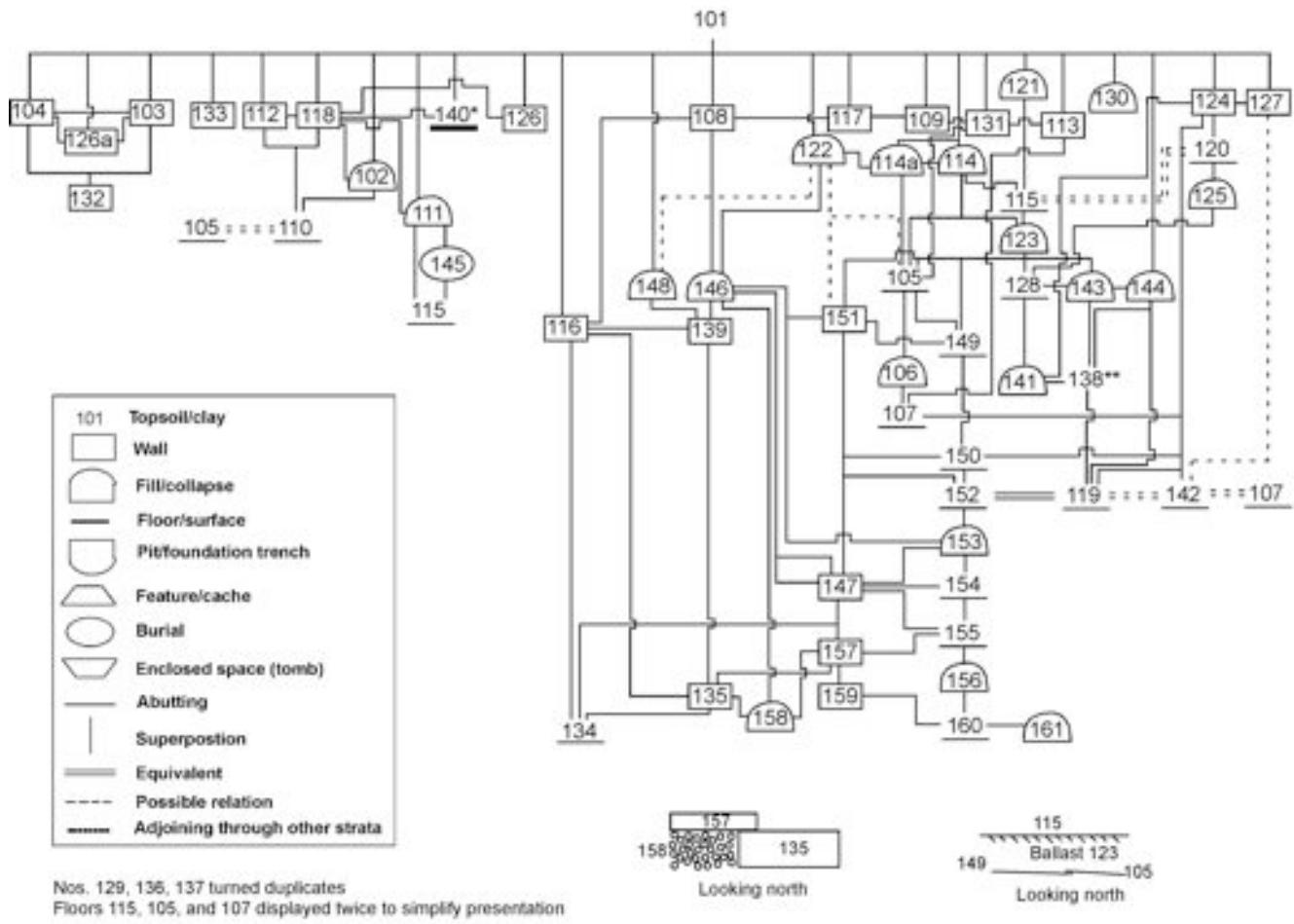


Figure 8.8 Matrix of Structure 3C including schematic depictions of relationships mentioned in text

The intrusive construction phases of the lower strata in the southern end of the trench are not mirrored in those located in the northern end. Of the artifacts removed from strata 135, 139, 147, 157, and 158, only a few can date the construction periods. In the fill of bench 139 we recovered ceramic sherds including an Alexander Unslipped: Croja V rim of the Spanish Lookout period (A.D. 680-900). In the northern end of the trench, the lower strata also date to the Late Classic period.

The excavation reached its lowest stratum at soil level (161) (see Figure 8.3). The presence of several ceramic sherds embedded in clay loam 161 indicated the soil is cultural but due to time constraints the sherds were left in situ. The clay loam of stratum 161 abuts a plaster floor (160). The plaster is burned in large patches focused along the eastern edge of the trench and extending 0.5 meters into the center of the trench at the widest point. The plaster ends approximately 1.4 meters from the northern end of the trench (Figure 8.9).



Figure 8.9 Floor 160 highlighting burned area (not excavated)

A rim sherd on top of Floor 160 was identified as a Minanha Red basal flange and rim dating to the Hermitage period (A.D. 260-580), dating the lower cultural levels of the trench to the Early Classic period (Figure 8.10).



Figure 8.10 Rim from top of floor 160

Floor 160 appears to lip onto Step 159 approximately 3.8 meters from the southern end of the trench (Figure 8.11). The step appears to have been built over Wall 157 and measures 37 cm below Bench 135. There were no artifacts recovered from this stratum.



Figure 8.11 Wall 157 and Step 159 looking south

Packed on top of floor 160 and clay loam 161 is a clay loam fill (156). Beginning at Wall 157 and continuing to the northern end of the trench, fill 156 contains a large number of faunal remains and ceramics, indicating that they Maya placed midden items that may have been used in terminating the earlier construction event (Figure 8.12). Large mammal bones ($n=31$) were recovered, four showing evidence of burning. Fire-cracked lithics, obsidian, shell, and charcoal were also recovered from the fill in addition to many ceramic sherds.



Figure 8.12 Fill 156 artifacts

The Early Classic ceramics dated from A.D. 260-580, including an Actuncan Orange Polychrome basal flange and a Lucha Incised incurving vase or bowl (Figures 8.13, 8.14). Also present was a Grooved red-slipped sherd, possibly of the Sierra Red variety of the Barton Creek phase dating to 300-100 B.C. As it is unlikely that ceramics from the Late Preclassic were still in use 200 years later, the sherd may have been a part of a ritual or remembrance ceremony as suggested by the 2008 excavations.



Figure 8.13 Fill 156 rims



Figure 8.14 Fill 156 body sherds

A thick ballast (155) composed of large boulders with diameters in excess of 43.5 cm was placed on top of fill 156 to create the largest construction phase visible in the trench profile. One boulder recovered from the southern portion of the trench measured 53 x 36 cm (Figure 8.15). Another one of the boulders Ernesto removed from the ballast measures 66.2 cm in length (and c. 40 cm in thickness). The ballast was over laid with plaster (floor 155) 3-4 cm thick. Ernesto Vasquez, an experienced excavation assistant, noted several flat stones similar in size to the burned one concentrated under a burned section of plaster in the northeast corner of the trench measuring 60 x 45 cm.



Figure 8.15 Floor 155 ballast with large and burned boulders

Excavations of floor and ballast 155 yielded a large quantity and variety of artifacts including several pieces of obsidian, tubular limestone, rim sherds, lithics, burnt limestone, and faunal bones. The bones included a large mammal femur and vertebrae in addition to a rodent mandible and several unidentifiable pieces (see Table 8.1) (Figures 8.16, 8.17). A small boulder, found in the north end below the burnt plaster, has a cut top with evidence of burning on the flat portion. Charcoal and charred wood was also collected.



Figure 8.16 Floor 155 rims



Figure 8.17 Floor 155 artifacts

Decorated ceramics were present throughout stratum 155 including a Gavilan Black-on-Orange piece of the Gavilan variety from Floral Park, a sherd of Mahogany Creek incised in the Mahogany variety of the Hermitage, a Lucha Incised vase, and several bowl sherds of Aguacate Orange. The ceramic dates range from A.D. 1-580, encompassing the Protoclassic and Early Classic periods. The large number and variety of ballast/fill artifacts indicate the use of remains reflecting a wide variety of activities. A large construction phase with the burning of the plaster floor and ballast rocks suggests a large-scale ritual that likely was related to termination rituals.

The large construction phase topped by floor 155 was followed by a very small construction; a very hard and thick plaster floor (154) on top of a thin layer of pebble and cobble ballast. The two floors are separated by such a small space (approximately 6-10 cm) that some areas did not include any ballast. There is a large burnt patch of plaster in the middle of the floor on the eastern side of the trench that measures 65 x 45 cm at the widest point. A Belize Red or Aguila Orange sherd from the Hermitage period (c. A.D. 260-580) was found along with several fire-cracked rocks, burnt limestone, and burnt ceramics. Floor 154 ends approximately 2.8 m from the southern end of the trench.

Floor 154 was covered by a boulder fill (153) containing many sherds and large lithics (Figure 8.18). The fill also contained ridged jute, bone fragments, lithic chunks, and a prepared core. Ceramic sherds were identified as Benque Viejo Polychrome of Spanish Lookout, a Saturday Creek Polychrome from Tiger Run (A.D. 580-680), and Minanha Red from the Hermitage phase (A.D. 260-580). A Mateo red on Cream bowl dating to the Barton Creek phase (300-100 B.C.) was also recovered. The ceramics date from the Classic period except for the Barton Creek bowl which is Late Preclassic. Again, ceramic dating indicates some items were for ritual rather than daily usage as they would not have been able to withstand hundreds of years of use.



Figure 8.18 Fill 153 artifacts

In the southern section of the trench, ballast 153 abuts fill 146, that may have been added to connect armature/wall 147 and wall 151 (see Figure 8.5). While the top of fill 146 held few artifacts, as excavation went deeper we recovered large ceramics identified as Tu-Tu Camp Striated of the Tzimin variety and a Lucha Incised sherd dating to the Late Classic period. Abutting the stratum to the east, fill 148 was added to on top of Bench 139 (see Figures 8.6, 8.7). The fill included several non-diagnostic ceramic sherds, including a red-slipped volcanic ash tempered one. The final construction period on the southern end of the trench covered the area between wall 116 and fill 146 with a cobble surface (122). The easily distinguishable plaster floors in the northern end of the trench originally led us to believe there would be a floor between Strata 122 and 146. Stratum 122 yielded three sherds (including a red-slipped volcanic ash bowl rim sherd), a burned rock, a large fire-cracked blue chert flake/chunk, and a thin chert flake. Assigning a date to the construction phases was problematic because of the contents of the strata.

Abutting fill 146 to the north is a wall (151), which is mirrored on the north edge of the trench by wall 124 (see Figure 8.5). Although the two are similar, wall 151 is not as well constructed as wall 124 because its cobbles are spaced farther apart. Wall 151 revealed a few lithics and Spanish Lookout ceramics including an Achote Black vase sherd. Wall 124 consisted of cobbles, boulders, and compacted soil. A jar rim of Aguacate Orange pottery dated to the Floral Park Phase, a Protoclassic period. Stratum 124 is on the edge of Structure 3C and has a large tree root growing through the cobbles. The root growth disrupted the wall construction and may have deposited materials not originally found within the stratum or churned up materials within the growing area.

Running between two walls are several floor and ballast layers of varying length. Directly above fill 153, Floor 152 abuts the wall to the south and slopes downward to extend below wall 124 in the northern section of the trench. Stratum 152 was originally discovered during the 2008 field season in unit 13 and labeled floor 119. Comparisons in elevation made between floors 152 and 119 revealed them to be the same, a fact confirmed when wall 124 was removed. The plaster is quite hard and thick, indicating great construction expense. The plaster of floor 119 is much thicker in some areas than others and in some places it includes pebbles and small cobbles. It is a bright white, almost blue color that does not register on the Munsell color chart. Removing floor 119 and its ballast uncovered burnt pebbles and a river stone but few lithics or ceramic sherds. One of the pieces recovered was a very thin, fine piece of Yaha Creek Cream from the Spanish Lookout phase, a style that continued into the Terminal Classic. The floor terminates at wall 151, indicating they may have been created in the same construction phase but the floor slopes below wall 124 which must have been built later. Nearby, stratum 138 is not a plaster floor like they first thought in 2008; rather, it is a massive flat boulder (see Figure 8.2).

Both walls were standing at the time of the construction of floor 150 as indicated by the stratum abutting wall 124 to the north and wall 151 to the south. We excavated Floor 150 with its ballast since the plaster had bled into the thick ballast of limestone cobbles and small boulders. This stratum also contained fire-crack flakes, pieces of bone, and a noticeable amount of tubular limestone fragments. A Belize Red sherd and an Achote Black sherd incised in the Cubeta style were found, both from the Spanish Lookout phase, A.D. 680-900. Achote Black sherds were found in strata 150 and 151, which date both features to the Classic period.

Walls 151 and 124 also abut Floor 149. The plaster is well preserved and cemented to the one-course cobble ballast beneath the floor. A ceramic neck sherd was found in the fill in addition to volcanic ash and dark red slipped body sherds. A large orange-pink stone (10R68) and a burned stone were found within the stratum. At the north end of the floor, close to wall 124 the plaster becomes softer and less compact than in the southern section. To the east, outside of the trench boundaries, floor 105 lips over floor 149 (see schematic on Figure 8.8). Additionally, a pit 22 cm in diameter and 26 cm deep developed in a soft area of floor 149. At first we thought this may have been an indication of burning or other use modification but inspection of the pit uncovered very soft soil, roots, and a few small rocks but no artifacts, indicating there was no premeditated purpose to the spot. It may have developed as a weak spot over time, perhaps because of dampness in the northern section of the layer of ballast (123) that was piled on top of floor 149. Following the 2008 season, ballast 123 was covered with two different tarps, leading to a difference in soil color; the north end of the stratum is darker and damper while the southern end is lighter and dustier. Ballast 123 was laid down over floor 149 to prepare for yet another floor (115).

Floor 115 rests above wall 151 and tapers downward to abut wall 124. Ballast 123 contained brightly colored quartz pieces, chunks of yellowish chalk (10YR83 and 75YR76), and three fire-cracked ceramic sherds. The ceramics dated to the Tiger Run phase (c. A.D. 580-680) include a handle or slab foot of the Mountain Pine Red Old Jim variety and a jar rim with decoratively chipped edges in the Jones Camp Striated phase. The fill dates to the Late Classic period, as does the floor that was laid on top of it. Floor 115 begins approximately 3.6 m from the southern end of the trench and tapers down to cover wall 124 at the northern end. The floor is plastered over the wall and was clearly built on top of wall 124. While removing the floor we found a basalt fragment, a fire-cracked flake, and several body sherds but nothing diagnostic. Although Wall 124 was found to contain Preclassic materials, the surrounding strata make it unlikely that floor 115 was constructed before the Classic period.

The latest construction phase included in the trench is a layer of cobble fill (ballast 121) that we only found as a bulk in the central portion of Str. 3C (see Figure 8.2). The fill contained small ceramics that became more prevalent as excavation continued. At the time of excavation, we thought

the plaster-covered boulders that made up the lower portions of 121 may have been a part of a different stratum because of their size. We distinguished the bulk of boulders under fill 121 as 121A when they were found to be resting just below ballast 123. The boulders were removed without any artifacts found in the surrounding soil. Within 121 proper we found jute and a *Nephronaias* shell fragment, several volcanic ash body sherds, and a red-slipped everted bowl or plate rim sherd but none of the ceramics revealed a date for the most recent stratum included in the trench.

Despite the difficulties in finding useable dates for various strata, the 2010 trench excavation uncovered a longer history of use for Structure 3C. The presence of pottery from a wide range of ceramic phases indicates active use of the structure over time, perhaps as a ceremonial preparation station or as an inclusive ritual space as indicated by earlier reports.

Structure 3C Burial 145

During the 2008 field season, we exposed the top of a human skull (145) at the back (north) of the structure near the central axis (see Figure 8.2) in unit 13 (Otten 2009). Preliminary excavations revealed a leg bone, rib bone, a piece of mandible, the top of the skull, and other unidentifiable human bone fragments that were left *in situ*. Associated with the burial was an inverted Kaway Impressed bowl with a red slipped interior. This cache was located 20-25 cm west of the skull. The skull was in poor condition, had a small red a blue chert flake pushed up against the exterior, and had a superficial, circular puncture mark on top of the skull that was suspected to be post mortem. Due to time constraints, the skull was left in place and no further excavation was done in the area. Photographs were taken of the skull *in situ* and a protective ring of boulders was added around the perimeter (Figure 8.19). Plastic and dirt were added for further protection. At the time, the burial was thought to be the termination episode for Structure 3C; the burial was revisited in 2010 to further examine its position and purpose related to the structure.



Figure 8.19 Burial 145 2008 tomb and state of skull once 'tomb' removed

Unfortunately, the make-shift tomb built in 2008 did not prevent damage to the skull. The burial was reopened midway through the 2010 field season to find a family of mice living within the protected area. As a result of their activity and other natural causes, the skull was more fragmented than in 2008. The burial was excavated by T.A.s Molly Haneberg and Eleanor Olszewski with the help of student Robbyn Travis under the guidance of Dr. Lucero. Measurements for the planview

maps from 10 June to 14 June were taken from the ‘burial nail,’ which also comprises the southwest corner of unit 13, 4.67 m (4.65 m in 2008) from YH at 24° (23° in 2008) and at an elevation of 76.73 m asl. After excavation had lowered the elevation somewhat, we used a grid to draw the burial and tied in one of the nails (north side, in a root) to YH: 16° at a distance of 6.04 m at an elevation of 76.58 m asl. In the end, only a small portion of the skeleton was located and collected; only a partial skull, bones from one foot, one arm bone, three teeth (and three roots), another long bone and lots of fragments (Figures 8.20, 8.21, 8.22). Also, faunal teeth of several different species were recovered, as well as bird bones (Figure 8.23).



Figure 8.20 Burial 145 long bones and phalanges



Figure 8.21 Burial 145 teeth



Figure 8.22 Burial 145 fragments



Figure 8.23 Burial 145 associated faunal remains including teeth and bird bone

Excavation was completed with small, angled pieces of bamboo because it is both strong enough to dig, but soft enough to not scratch bone. The remains were encased in a hard, almost cement-like plaster. Excavated matrix was screened using window screen to collect small bone fragments. The delicate nature of the bones may have been compromised by using artifact bags so various plastic containers were used to store the fragments. Throughout the recovery, bones that

were identifiable or located in non-fragmentary pieces were left in situ for as long as possible to provide information on the placement of the bones and their relationship to one another. Mapping the burial was aided by two lines running north-south and east-west from the 'burial nail'. Once removed, the fragments were sorted based on preliminary identification or by geographic location related to the skull. The associated faunal remains, lithics (3 chert chunks, 18 flakes), ceramics (31 small sherds), and shells were also collected and sorted by object type rather than location (Figure 8.24).



Figure 8.24 Burial 145 associated artifacts; lithics are on the left, small sherds on the right

Burial 145 Excavations

Excavation began by removing the surrounding boulders and photographing the visible skull fragments and the two limestone rocks that protruded from a plaster floor, likely floor 115, that may have been placed to protect the bones (Figures 8.25, 8.26). A large root from the tree that grew through the center of Structure 3C also grew through area surrounding the skull, displacing bone fragments and possibly shifting the original placement of the materials. The position of the skull may have been adjusted over time as the root grew; based on the visible sutures on the skull we determined the individual must have been facing to the side or downward towards the feet. The top of the skull was measured at 48 cm while the bottom rested at 39 cm based on the placement of the burial nail. At the time, we suspected a full skeleton to be located within the structure based on the presence of the skull and possible ribs and long bones. In this first stage of excavation we recovered several small ceramic sherds, lithic pieces, and small conical shells.

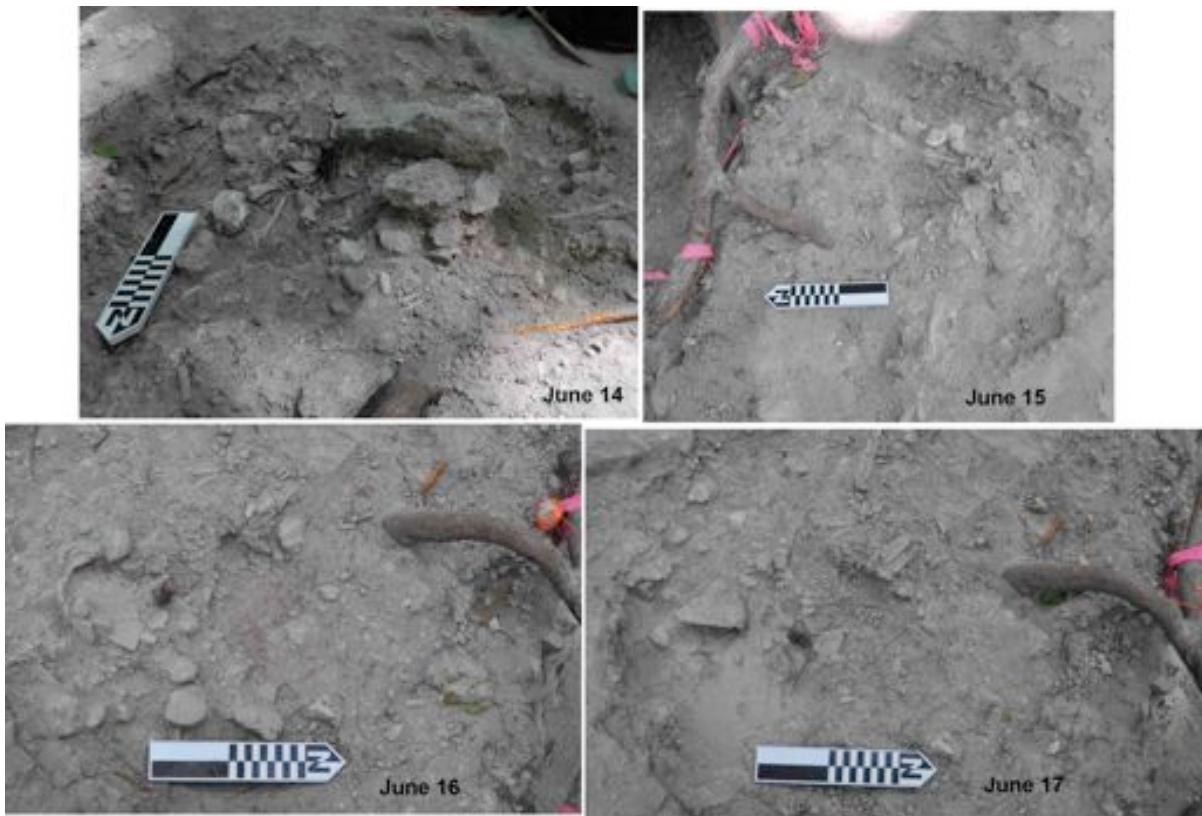


Figure 8.25 Progression of Burial 145 removal



Figure 8.26 Floor 115 after removal of Burial 145

After mapping the burial, removing the large fragments and rocks became necessary to move forward with excavation. The skull remained in place to aid in judging the placement of the bones. At this stage in excavation several wide, thick bones were found northeast of the skull. A tooth thought to be a human incisor and an animal claw were uncovered. Additionally, a possible radius and ulna were uncovered northeast of the skull. The angle and position of the bones indicate the arm was crossed or turned over. Upon further inspection, the arm fragments were found to lack any

connecting bones on either the fractured or smooth ends. We continued to uncover small conical shells, lithics, ceramics, and faunal teeth. A small, red cobble, possibly laterite, was located within the burial area.

Beneath the center of the burial, to the direct northeast of the skull, we found a possible joint made up of a small ball and a concave half circle that fit together. Based on its proximity to the radius and ulna, this was believed to be a portion of the wrist.

The burial area was excavated down to the bottom of the skull before the top of the skull was collected. The dirt within the skull cavity was compact, with a density similar to plaster. Outside of the skull were several lithic pieces, faunal teeth, and a black rock. These were located near bones placed at the westernmost section of the radius and ulna. Based on descriptions in Buikstra and Ubelaker (1994), we determined the three parallel bones to be either a portion of the hand or foot. No artifacts were found when removing the bottom of the skull but several bone fragments were located around the back of the skull.

A mastoid process was located beneath where the skull had been (Figure 8.27). Behind the skull, a large, flat portion of floor 115 remained in the strata. A lack of a cut edge on the plaster indicates the tree root may have disturbed the structure more than originally thought. At this time, we discovered that several of the bones left in situ from the beginning of the excavation were actually bird bones (see Figure 8.23). The bones were marked as hollow on each map to distinguish faunal from human remains. Faunal and human teeth were located near where the skull formerly stood. Ceramic sherds, a small shell, and several faunal teeth were located at this level of excavation.



Figure 8.27 Burial 145 mastoid process (top) and skull fragments

The tree root that grew through the burial location disturbed both the placement of the bones and the accompanying materials in addition to the plaster floors of the structure. Although it was assumed the Maya had cut through plaster to place the burial inside Structure 3C, there is no clear cut edge on Strata 115 indicating the bones were placed on top of the floor instead of in a chamber cleared for the remains. The faunal bones within the burial area may have been placed there with the human bones or have been used as part of a ritual connected to the interment. We suspect the faunal teeth were feline due to the structure of the roots and the pointed tooth. The small number of ceramic sherds and lithics recovered with the bones were non-diagnostic and could not provide a chronology for the burial. The human bones do not indicate sex and it is possible they belong to more than one individual. Although there were no indicators of the condition of the bone when they were placed within the structure, it is possible they were reinterred after being buried for some time. The angle of the skull could not be confirmed as intentional because of the proximity of the tree root.

The human joint and foot or hand could not be certainly identified as they were not complete. The skull rested 1.5 cm above the plaster, perhaps shifted by the movement of the root. All human and faunal bones and teeth were uncovered above floor 115, close to surface at 76.52 m asl. The placement of the bones must have occurred near the end of the period of use for the structure, perhaps as a termination ritual for a ceremonial site.

Based on the 2008 ceramic analysis, the strata surrounding the burial were dated to the Late/Terminal Classic phases, indicating the burial was placed near the end of the period of use for the structure. Otten (2009) posited that Structure 3C was used as a storage facility for ceremonial objects and/or as a place of inclusive ritual. The presence of a re-interred burial, even fragmented, supports this hypothesis as it may signify the need to perform a termination ritual for a ceremonial structure at the end of its use period. The lack of an obvious north wall may indicate either that it collapsed or that the Maya removed the wall to inter the individual.

Discussion and Conclusions

Structure 3C was selected for ongoing excavation after 2008 season results indicated that it functioned as a semi-public ritual space and possibly as a place to prepare and store ritual materials (Otten 2009). The structure may also have served as an important place for Yalbac's inhabitants since its various stages of construction and deconstruction demonstrate continual use and ritual activities. The 2008 artifact assemblage includes Late and Terminal Classic sherds, red laterite, colored chert pieces, obsidian, and faunal remains. What it did not include were the fine-grained pastel chert debitage found in every other context throughout Plaza 3, which could be significant. I quote here from Otten (2009:29):

Overall, Str. 3C and the plaza were used and occupied at approximately the same time as indicated by the artifact assemblage. This is also indicated by the fact that it is located on the edge of the plaza (along with temples) versus in the middle of the plaza. The structure appears to have functioned as some sort of semi-public ritual space; there is no conclusive evidence to suggest that it served as a priest's house per se. Indications are that it may have served to prepare and/or store ceremonial paraphernalia. Structure 3C also may have served as a place of remembrance and ritual at various points in the history of Yalbac. Part of this practice may be reflected in how they dug through and burned the east side of the structure, while adding to its west side. Here, memory was enacted in the building, deconstructing, caching and burying of a possible important person in a presumably public ritual space between two large temples. This space was accessible from the plaza and could have easily been viewed from the temple tops and the jungle floor below. The uncharacteristic assortment of artifacts and the adding and removing of stairs, floors, and platforms suggests that Structure 3C was important in the everyday ritual and practice of remembering of the people of Yalbac during the Late and Terminal Classic periods.

Str. 3C is in many ways similar to a building in the ancient village of Cerén in El Salvador that was covered by a thick layer of ash as a result of the c. A.D. 590 eruption of the Loma Caldera volcano (Sheets 1992). Things were left *in situ* as people ran for their lives to safety. Str. 10, a two-room building (4.55 x 1.75 m) constructed of wattle-and-daub with a thatch roof, "was utilized for production of community festivals and the storage of festival paraphernalia" (Brown and Gerstle 2002:97). Archaeologists found three hearths, large open bowls and jars, a metate, a mano fragment, some worked lithics, obsidian pieces, and an antler and long bone tool, "both presumably used to husk corn" (p. 98). Brown and Gerstle were also able to identify use activity areas, such as one for storing serving and cooking vessels. The east room yielded a deer skull (painted red) headdress and other ritual items (e.g., beads, bone ornaments, notched deer scapula, a painted organic object, and a green celт). Among some contemporary Maya groups, "...the white-tailed deer was associated with the *cuch* ceremony that linked together agricultural fertility, the sun, rain, economic prosperity, and the cyclical nature of time, death, renewal, and rebirth" (p. 102).³ They

³ While the faunal remains at Str. 3C have yet to be identified, we are positive, based on their size, that most of them consist of deer remains.

conclude that Str. 10 was used for food preparation and distribution, as well as for storage of related items. In this case, the ritual storage/preparation structure is located within a small farming village c. 5 m from the nearest residential compound. It is also located near Str. 12, proposed to have served a ceremonial function, specifically divination, based on its location, orientation, construction style, decorative features, and artifact assemblage comprising of only 33 artifacts (16 vessels, 2 spindle whorls, 2 manos, metate, greenstone disk, worked stone, 4 obsidian and chert pieces, 2 painted gourds, deer antler, woven fiber ring, marine shells, figurine fragment of a female, and beans) (Simmons and Sheets 2002). Many of the smaller items were left at its entrance, suggesting people left them as offerings/payment.

Although the 2010 excavations were limited by time constraints and did not reach sterile soil, results show a longer time span of construction and use than previously thought. Associated activities the Maya likely conducted, however, appear to have been similar through the centuries at Str. 3C as evidenced in the artifact assemblages and series of burned floors. The 2010 artifact assemblage consists of a range of ceramic sherds (Aguacate Orange, Lucha Incised, Achote Black, Belize Red, etc.) dating from the Protoclassic and the Classic periods. We also found lithic cores, chunks, and bifaces, several red laterite stones, a notable amount of vascular tubular limestone, *Nephronaias* shells, and a large number of faunal bones. These artifacts are similar to the assemblage found in the 2008 excavations; recovering similar items from strata throughout the structure implies similarities in use throughout its history. It is possible that Str. 3C was used continuously for semi-public ritual from the Protoclassic through the Terminal Classic periods.

This building could also have been revisited during the Terminal Classic at certain times for remembrance rituals in which ceremonial objects previously used in earlier rituals were left as offerings. Constructing new ceremonial spaces explains the removal, remodeling, and rebuilding that is prominent in the southern section of the trench. The ceramic assemblage consists of a large number of vase, bowl, and jar sherds dating from A.D. 300 to 900 (though ceramics in lower fills dating to Floral Park were recovered). The variety of vessels could have been used in ceremonial contexts in keeping with the suspected use of the structure. The majority of ceramics recovered during the 2010 excavations dated between the Early and Late Classic periods. Although each stratum contained a unique combination of objects, there was little change throughout the trench layers. Within strata 155 and 156, however, there was an increase in the number and variety of objects left in the fill such as faunal bone, shell, and obsidian. These could represent a large ritual or series of rituals as a unique event in the history of the structure; further excavation into the fill of floor 160 and soil level 161 may reveal the large amount of variety and quantity of artifacts to be the standard in the earlier use of the structure. The high frequency of burned floors in the lower strata lessens as construction progresses, possibly another indicator of change in ritual or use of the structure over time.

The burial associated with the trench could be the end result of the Terminal Classic rituals. Instead of ongoing use, the Maya may have left Yalbac and returned only to perform rituals of remembrance. That said, a comparison of Str. 3C floor elevations with those exposed in the 2001 Plaza 3 test pit, a 2 x 1 m unit in the center of the plaza (Lucero 2002), suggest other Terminal Classic use of Plaza 3 (Table 8.2), as do the artifacts found throughout surface and excavated contexts at Temple 3D, the platform in the southwest sector (see Figure 1.2), and the 3A stoneworks (see chapter 7). Plaza 2 test pits also have a late facet Spanish Lookout/Terminal Classic presence (see chapter 6). Table 8.2, as well as the matrix (see Figure 8.8), also show that differently numbered floors may turn out to be the same based on elevation and location. Floors were given different stratum numbers because they appeared in different parts of the structure and/or are separated by features (e.g., walls).

Table 8.2 Structure 3C trench profile floor and Plaza 3 test pit elevations

Str. 3C			Plaza 3 TP		
Floor	Elevation (m asl)	Ceramic dates	Level/ Description	SW corner elevation (m asl)	Ceramic dates
105* (might be the same as 110)	76.28-76.37	Not excavated	1/topsoil	75.66	A.D. 800-900
107* (might be the same as 119/152, 142)	75.90-76.05	Not excavated			

110* (might be the same as 105)	76.27-76.36	Not excavated			
115	76.55	No diagnostic sherds			
120*	76.52	Not excavated			
128	75.92?	Not excavated			
134	75.29	Not excavated	2/floor	75.37	A.D. 800-900
142 (might be the same as 107, 119/152)	75.79?	Not excavated			
149	76.36	No diagnostic sherds; 1 VA red-slipped, 2 waxy dark red slip (25YR36) sherds			
150	76.28	A.D. 700-900/~800-900			
152/119 (might be the same as 107, 142)	76.04-75.85**	A.D. 700-900			
154	75.79-75.65**	A.D. 300-600	1/topsoil	75.66	A.D. 800-900
155	75.70-75.52**	A.D. 300-600	1/topsoil	75.66	A.D. 800-900
160	74.95-74.85**	A.D. 300-600	3/floor	74.87	A.D. 400-600
Step 159	75.14	Not excavated			
Bench 135*	75.33-75.50	Not excavated	2/floor	75.37	A.D. 700-900
Bench 139*	76.39-76.60	A.D. 700-900			

*recorded on planviews (2008 or 2010)

** Elevations slope down south to north

The burial was situated quite close to the top of the structure and was interred with an inverted Kaway Impressed bowl (Otten 2009). We also recovered small lithics, faunal bone, and teeth that may have been a part of an offering. We did not find a fully articulated skeleton. A very limited number of bones were recovered and those present had little connection to the other human bones. Even the bones themselves were often missing key parts such as the arm missing evidence of connection to other bones. The burial could have been a termination ritual for the entire structure at the Terminal Classic. The bones may have been moved from elsewhere and re-interred or the bones themselves could also have been a part of a ritual in which they were placed in situ as other ceremonial objects were. On a final note, the associated faunal remain are intriguing, especially the bird bones; indications are that Classic Maya considered birds as messengers of the gods (Houston et al. 2006:241-243).

The presence of Late Preclassic sherds in lower strata (156 and 153) may have been part of a termination or memorial ritual involving ceramics of past ceremonial importance in which the sherds played a role and were then deposited. The presence of Late Preclassic ceramics suggests the structure may have been used before the Early Classic and additional excavation is needed. Further excavation at Yalbac can also focus attention on the possibly inclusive nature of rituals. Traditionally, archaeologists have suggested rituals were performed for either commoners or the elite, but at Yalbac the size and location of Str. 3C, a small structure situated between two monumental temples and yet also visible from the plaza, suggests the possible participation of a large audience of both commoners and elite. If so, the use of the structure from the Protoclassic to the Terminal Classic suggests a successful adaptation of this style of ceremony or that the structure was important enough for the Maya to repeatedly return to use the area as a memory space to continue construction and inter a possibly important individual.

Acknowledgements I would like to thank Dr. Lisa Lucero for the opportunity to work at Yalbac and contribute to her ongoing research there. A big thank you goes to Ernesto Vasquez who worked tirelessly in the trench lifting huge boulders - but always with a smile! Cleofa Choc, Stanley Choc, Don Luna, and Juan Antonio also deserve a thank you for their knowledge of the jungle and archaeology and their willingness to share both. Mrs. Choc and Banana Bank made Belize welcoming and the field school students kept it entertaining; thank you to all involved in the 2010 field season!

References Cited

- Brown, Linda A., and Andrea I. Gerstle
2002 Structure 10: Feasting and Village Festivals. In *Before the Volcano Erupted: The Ancient Cerén Village in Central America*, edited by P. Sheets, pp. 97-103. University of Texas Press, Austin.
- Buikstra, Jane E., and Douglas H. Ubelaker
1994 *Standards for Data Collection from Human Skeletal Remains: Proceedings of a Seminar at the Field Museum of Natural History*. Arkansas Archaeological Survey
- Gifford, James C., Robert J. Sharer, Joseph W. Ball, Arlen F. Chase, Carol A. Gifford, Muriel Kirkpatrick, and George H. Myer
1976 *Prehistoric Pottery Analysis and the Ceramics of Barton Ramie in the Belize Valley*. Peabody Museum of Archaeology and Ethnology Memoirs, Vol. 18. Cambridge: Harvard University.
- Houston, Stephen D., David Stuart, and Karl Taube
2006 *The Memory of Bones: Body, Being, and Experience among the Classic Maya*. University of Texas Press, Austin.
- Lucero, Lisa J.
2002 Ritual and Power in the Valley of Peace Area: 2001 Field Season. In *Results of the 2001 Valley of Peace Archaeology Project: Saturday Creek and Belize*, edited by L. J. Lucero, pp. 1-7. Report submitted to the Department of Archaeology, Ministry of Tourism and Culture, Belize.
2009 The 2008 Season at Yalbac: Goals and Results. In *Results of the 2008 Valley of Peace Archaeology Project: Non-Temple Summit Excavations*, edited by L. J. Lucero, pp. 1-13. Report submitted to the Institute of Archaeology, National Institute of Culture and History, Belize.
- Otten, Sarah E.
2009 Structure 3C: Revisiting Ritual Space. In *Results of the 2008 Valley of Peace Archaeology Project: Non-Temple Summit Excavations*, edited by L. J. Lucero, pp. 14-30. Report submitted to the Institute of Archaeology, National Institute of Culture and History, Belize.
- Sheets, Payson
1992 *The Cerén Site*. Harcourt, Brace, Jovanovich, New York.
- Simmons, Scott E., and Payson Sheets
2002 Divination at Cerén: The Evidence from Structure 12. In *Before the Volcano Erupted: The Ancient Cerén Village in Central America*, edited by P. Sheets, pp. 104-113. University of Texas Press, Austin.

Chapter 9

Assessing Ancient Maya Forest Management in Peripheral Yalbac

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The goal of the 2010 (May 25-June 17) field season was to conduct a pilot study on the feasibility of addressing the question of whether or not the Classic Maya modified the landscape in such a way that they conserved and maintained useful plant species through assessing the patterning of jungle flora. Research on Maya landscape modifications has relatively recent roots (e.g., Fedick 2010; Ford 2008; Freidel 1992; Gómez-Pompa 1987; Lentz et al. 2005; Morehart et al. 2005; Pope et al. 2001; Rico-Gray and Chemás 1991). The area around Yalbac provided an excellent location because it has not been widely occupied since the Maya abandoned parts of the area by c. A.D. 900.

The goal was to determine which plants were useful (e.g., food, medicinal, ornamental). I relied on the expertise of Cleofo Choc, an excavation assistant and Mopan Maya who has extensive knowledge of flora. To accurately depict which plants the Maya might have maintained, it is necessary to determine which plants they used or did not use (Arvigo 1994; Balick et al. 2000; Beletsky 2005; Harris 2009; Honychurch 1980; Schlesinger 2001). Cleofo provided the description of the plants we encountered during plant surveys and his knowledge of the plant uses provided the basis of the below plant descriptions.

In devising my research plans, I used settlement data in a previously surveyed 11 km transect between Yalbac and the Cara Blanca pools (Kinkella 2009). Plant specimens were collected along the first kilometer of the transect beginning at Yalbac (Figures 9.1, 9.2). Different sizes of concentric circles were set up. The locations for the circular collection units were chosen based on location (either distant or close to the Yalbac mound groups). I compared and contrasted four different regions of Maya landscape surveyed. The first area surveyed was located in an area any known structures. I collected plants in jungle areas 500 meters and 1 kilometer distant from Yalbac.

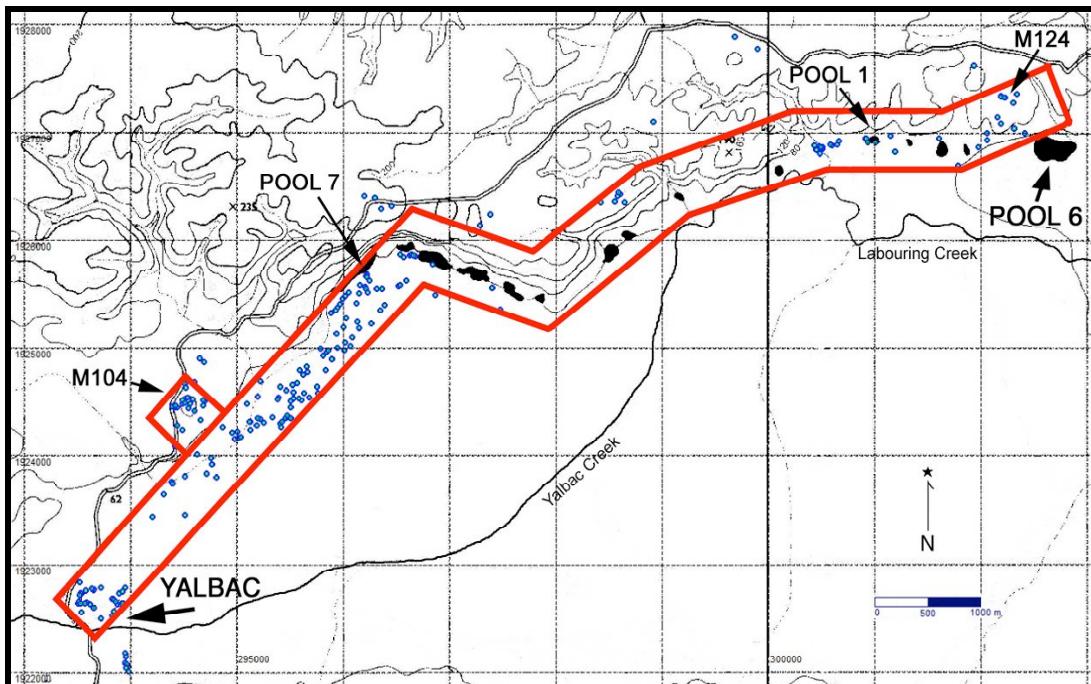


Figure 9.1 11 km Yalbac transect. Courtesy of Andrew Kinkella (2009: Figure 4.12)

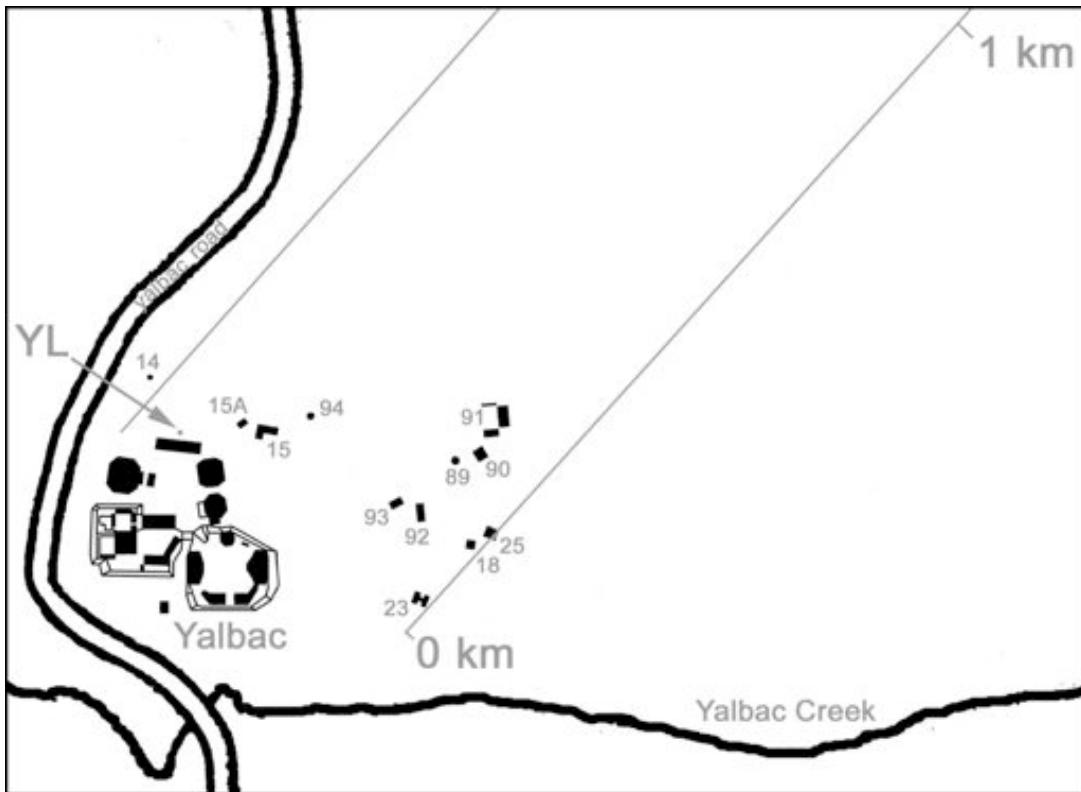


Figure 9.2 1 km of Yalbac Transect. Courtesy of Andrew Kinkella (2009:239)

The next regions surveyed were small house mounds. They were selected based on their proximity to Yalbac and previous archaeological explorations. The first house-mound settlement survey was conducted between two mounds in a three-mound group (M23, M93, M92). One of the mounds, M93, was excluded because of an old logging route that had been cut between that mound and the other two. However, part of the surveyed region did include a portion of that logging road, which turned up some interesting anomalies to the research and better indications that the Maya were indeed modifying their environment. One plant collected in logging road area was *Cnidoscolus*, a tree whose leaves, sap, fruit and flowers all have a damaging effect on human skin. No common name was mentioned for this species. This plant was not found around temples or house mounds. The survey circle for this survey was begun approximately in the center of the two nearby mounds (M23 and M92) to get as much information about inter-mound flora, as well as the flora located on top of both mounds. These mounds were also located in close proximity to Yalbac, within 300 m.

The next mound group selected was excavated in 2002 (Lucero and Graebner 2003) Lucero labeled the mounds 94E22N-14 and 94E22N-18 while Kinkella called it M18 (he did not map 94E22N-14, which is located southeast of Yalbac near Yalbac Creek). The exact portion excavated was avoided because of the recent nature of the disturbance. The survey also included one other known mound and one I discovered before the plant survey began. This mound group was also in close proximity to the Yalbac mounds, within 200 m.

The final house mound survey region was located on the other side of the 400-meter wide transect from the previous two settlement selections (M73). In addition, it was located approximately 500 meters from the Yalbac center. The surveyed region included one known mound and one mound discovered before the plant survey began. The plant survey was begun in the center of the two mounds and encompassed both mounds and the flora between them. The survey provided a controlled region of house mounds outside of the close influence of the Yalbac center. One difference between the house mounds around Yalbac versus those in the rain forest that became evident was the number of gumbo-limbo (*Bursera simaruba*) trees. These trees are the natural antidote for the burning resin from the poisonwood tree. While they were almost non-existent near the center of Yalbac, settlements located the forest, where poisonwood is common, contained stands of gumbo-limbo. One property of the gumbo-limbo is its ability to propagate vegetatively from cut

branches. This property would have made for easy transportation and re-growth of this tree around Maya sites.

The third survey region was near Yalbac, where I surveyed two structures (Strs. 2D and 3C) in the site core. The plant data collected should provide a better picture of which plants were around the temples during the time of their use. At Structure 2D, a range building, the center of the collection circle was located directly on top of the mound and collections were made surrounding that central point. At Structure 3C on the northwest edge of Plaza 3 (see Figure 1.2), the center of the circle was located slightly off the mound and collections were made in the area directly behind the mound. Structure 3C was under excavation throughout the entire season.

Finally, I mapped Cleofo Choc's house garden and collected and identified plants in the Valley of Peace Village to compare to flora found within the transect. Cleofo's information about plants collected during the course of his garden survey and his rationale for constructing his house garden are important to determining more about the Maya plants and past forest garden composition.

One of the biases that had to be overcome in this research is that the collections took place over the summer, specifically the end of the dry season (and beginning of the rainy season). Although this is an ideal time to test for both plants that thrive in the dry season along with those in the rainy season, the plants, which will flourish during the middle of either one of those seasons, were not able to be collected. Portions of the plants could still be collected, but the fruits and flowers of some were not present during the season of collection.

The collection grid consisted of 20-meter circles, inside which all the known trees, vines and herbaceous plants were sampled; each sample was plotted to assess inter-species relationships. This method was devised by Dr. John Ebinger (UIUC), a botanical expert in regions similar to Belize. Where applicable, bark, leaves, fruit, flowers or portions of the stems of vines were collected. In a one-meter circle located at the center of most 20-meter plots, I collected samples of herbaceous plants less than 1 meter tall. In most cases, the complete plant was collected. The plants were collected either by hand, machete, or hand clippers. I collected the specimens and placed them in plastic bags for transport back to Banana Bank, using a permanent marker and flagging tape to label bags. A collection numbering system was devised, starting at 1, which encompassed all of the collected specimens. Plants known to be the same were given the same number. If a doubt arose, it was assigned a different collection number. After each plant collection, a photo was taken of the plant from which the specimen was taken to indicate the original condition of the plant and the habitat in which it grew. GPS locations were taken from the center of all survey circles and from the centers of each of the house mounds, especially if they were not on Kinkella's maps. All GPS locations were collected using a Garmin handheld GPS unit. Kinkella had previously mapped specific locations useful to his dissertation research, but his coordinates were recorded using NAD27, which I have converted to WGS84.

Throughout collecting, I took detailed notes of habitat and surrounding plants or features of the samples collected. Their useful properties, conveyed by Cleofo, were also noted as well as the common names given to the plant in English, Spanish, Mopan, and K'iche,' if known. Since I did not know how to spell all the words, I recorded Cleofo pronouncing the names. These names were compared with flora indexes to attempt to determine to which scientific name and classification the plant belonged. The leaves of the plants were pressed using a standard plant press; the fruit or flowers (if available) were dried using a lighting source using a cardboard triangle and metal racks (later a blow dryer was used).

I attempted to collect more than one specimen of the plants. If possible, one will be donated to the UIUC herbarium; one will be analyzed in the lab of my plant biology adviser, Dr. David Siegler and by Dr. James Dalling, an associate professor at UIUC of plant biology who specializes in tropical ecology; and one will be used as a backup sample. Still another group of specimens will be bound for the herbarium in Belize. The limitations of this method are the number of specimens that can be identified, time and space available for storage, and transport back to the US. Also, certain plant specimens, such as orchids and citrus fruits, cannot be exported from Belize.

During my pilot study, I collected over 200 plants from six locations over a one-kilometer-long by 400-meter-wide transect (see appendix). The preliminary results are exciting and indicate that certain plant species are more frequently found around living areas versus the forest. These results will be the basis for my master's thesis and the pilot study will serve as preliminary data for a longer field season to be conducted in 2012.

Plant Specimens Collection, May 25-June 17, 2010

In addition to Cleofo, crew consisted of 1-2 field school students. I used a four-step approach outlined by Seigler and Ebinger, which included constructing a 20-meter circle around a central point, in which I would collect specimens from tall trees. Within that 20-meter circle, centered around the central stake, I constructed a small circle of 10 meters in which I collected from trees over one-meter tall. Within those circles, I constructed a five-meter circle inside which I collected specimens from saplings under one meter in height. The last circle was one-meter, from which I collected herbaceous plants.

I began collecting on Str. 2D and this data point as waypoint 005. From traverse point YL, I walked 20 meters south toward Str. 2D and set up a point, which was located directly on top of Str. 2D, marked as waypoint 006. This waypoint was the center of my collection circles and stakes were set up at each of three points (south, east and west) around the 20-meter circle. Traverse point YL was also used as a corner of my 20-meter survey region. I also set up three points around each of the smaller circles. All of these points were recorded using the GPS.

I began recording plants observed within the 20-meter circle. The first observed plant, which was "horse ball" tree, was recorded as number 1. Subsequent specimens were numbered according to the order in which I observed them. Specimens were named using the common names given by Cleofo, as well as their uses. Photos of the plants in their native habitat were taken. Leaves and fruit were preferred, or bark samples in which the fruit and leaves were too high, and stem vine portions collected from any vines observed whose leaves and fruit could not be reached. If a neighboring tree of the same species contained a leaf or fruit specimens and the tree within my survey region was too mature to have access to these fruit and leaf specimens, I collected from the former and made note of it. Also, non-rotted fruit was sometimes collected from the ground.

When collecting around Str. 2D, only the south side was surveyed. The north side contained plants already collected from the south side and the terrain was not easily traversed. The total number of different specimens collected around Str. 2D was 30. We determined that the four-step method of collecting from 20, 10, 5 and 1-meter circles was not as effective as previously believed. I was able to collect all plants within the 20-meter circle, and did not need the small circles to assess smaller specimens. In most instances, the smaller plants were the seedlings of the trees. Therefore, I amended my earlier approach and began to collect everything in the entire region of survey, which was the 20-meter circle.

On May 26 I set out from traverse point YL attempting to go to the middle of the transect and begin my trip into the forest of Yalbac. To arrive at this point, I used Kinkella's heading of 41.5° and go toward the center of the transect, which would mean adding 90° to this heading. Therefore, I used the heading of 131.5° to go toward the middle of the transect from traverse point YL. Since YL is 50 meters into the transect, I needed to go an additional 150 meters to arrive at 200 meters, which is exactly in the center of the 400-meter wide transect. I planned to collect at this central location and then proceed 500 meters from this central point away from the main center of Yalbac toward the forest and collect at this location. For these central locations, I will use the 41.5° heading.

I collected at 150 meters from YL, which was near Str. 3C (see chapters 1, 8). I did not survey the excavated area. Nineteen additional plants were collected from this section of the survey. Our surveys were interrupted with rain, and we were unable to finish the 20-meter circle for the survey near Str. 3C. I eventually collected samples from specimens already collected and labeled them with their assigned number followed by the letter "B" to denote that I had already collected them previously. I collected repeat specimens to ensure that I had enough to analyze for my research, to document possible changes in the species from location to location, and to perhaps create a reference collection to give to either a botanical garden in the United States or to the Belize Herbarium.

Because of rain, we were only able to return to Yalbac on the 28 of May. I collected up to number 60, and I began creating maps of the regions surveyed to denote their relationships to plants around them and to any surrounding structures. Some plants not collected in my earlier surveys were located with collectable specimens within this plot. I mapped this region, but had to return at a later date to remap because the map that I drew was inaccurate and was not drawn correctly. After finishing the plot near Str. 3C, I went 500 meters into the forest on a 41.5° heading.

On the May 31, we mapped the plot I had previously surveyed around Str. 3C. We also started collecting plants, beginning with number 61 and ending with 108. We then proceeded toward the third plot, Plot 3, 500 meters from the center of the transect. Crew mapped 20 meters south, east

and west of the central stake set up 500 meters from the central point of the transect near Str. 2D. We did not finish mapping the entirety of Plot 3. There appeared to be an abundance of small plants in the forest; I thus elected to construct a smaller 5-meter circle and collect the small plants that only grow in the understory.

On June 1, we continued surveying the 20-meter region of Plot 3. We continued our survey by mapping a 5-meter region around the central stake of Plot 3; I labeled this region Plot 4. Five meters is too large of an area in which to map all the small plants. In future, I reduced this region, based on suggestions by Seigler and Ebinger, of one meter. At the day's end, we had collected up to 158. We mapped at a 41.5° heading toward 1-kilometer in from Str. 2D. We marked every 50 meters with a marker stating how far inland we were. We measured ahead 750 meters before we had to finish for the day. We were heading for another area without settlement.

On June 2, we finished plotting to one kilometer using a 41.5° heading. Using the GPS, we marked the location of the center point of this new plot, Plot 5. Pacaya, a staple of the ancient Maya diet and frequent plant at Maya sites was not found at this location. Pacaya plants likes hilly areas, and this location was in a swamp. During the mapping period of Plot 5, we lost track of the East marker and ended up in the northeast corner instead. We were about 13 meters beyond the East marker when we traced back to that point. Therefore, we had to return to mapping to correct this error. We plotted 20-meter radials from the center marker to points in the southeast region to determine where we started off the scheduled route. A miscommunication as to the shape of the map occurred and the map was begun in a square instead of in a circle. Therefore, most of the map was correct, except for the small portion in which we lost track of the East marker and extended mapping beyond the 20-meter circle. Instead of disregarding this data, we elected to map the extended portions in a small pull-out box also on the map of Plot 5 (labeled Plot 4). After we corrected this error, we again collected plants. We reached #171 at this stage.

On June 3, I photographed all collected specimens before press pressing and drying them. I had created a plant drier from three cardboard corrugates and a light bulb, but it did not dry the specimens as quickly as anticipated. Some of my fruit specimens had to be thrown out because they had rotted. I also began to put ethyl alcohol on all specimens that looked like they might rot; I also put it on all the dried specimens; all the pressed bark specimens, all the pressed fruit, and some of the larger pressed specimens that I was concerned would have trouble drying. I began to identify the plants I had collected based on the common names provided by Cleofo. These common names were mentioned in several Belize floral guides (e.g., Balick et al. 2000; Beletsky 2005; Harris 2009; Honychurch 1980; Schlesinger 2001). I checked the photos of collected specimens and checked against my field notes.

On June 6, I added to my plant list identification based on Balick et al.'s (2000) list of common names, which I compared to Cleofo's identification of each plant. Since I did not have spellings for these common names, I attempted to find the best fit for the names in the book.

On June 7, we finished the mapping and collecting from Plot 5 (still referred to as Plot 4) and the 20-meter collection zone one kilometer from Str. 3C. We reached the plot by walking one kilometer in from this structure using the 41.5° heading and stayed in the transect center. We also mapped a one-meter area around the center stake of Plot 5. We mapped and recorded small herbaceous plants under one-meter in height up to number 194. After finishing recording, we started mapping Plot 2 again. Since I was unsure of my redrawn map drawn on June 3, I decided to remap the area, labeled the map "Plot 2 Map B". The points mapped in Plot 2 were misidentified: northwest is correct, west is northeast, south is southeast and east is southwest.

On June 8, we finished mapping Plot 2. I attempted to locate two house mounds to survey around: M92 (Figure 9.3) and M93 (Figure 9.4) (Kinkella 2009).

M92



Figure 9.3 M92. Courtesy of Andrew Kinkella (2009:295)

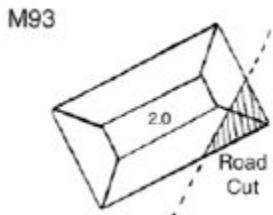


Figure 9.4 M93. Courtesy of Andrew Kinkella (2009:295)

The GPS was unable to be converted back to NAD27, so, the GPS location was noted in WGS84 and recorded to be later compared to the NAD27 coordinates previously recorded by Kinkella in 2007. We walked east and then straight north to a small mound group. Cleofo, however, knew the location of these mounds. We walked across what appeared to be Mound 23 (M23) (Figure 9.5) and then stopped on top of Mound 92 (M93). Cleofo checked for nearby mounds to determine our location.

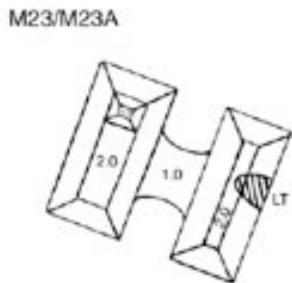


Figure 9.5 M23. Courtesy of Andrew Kinkella (2009:270)

Upon examining Kinkella's dissertation, we concluded that we were on M92 based upon the nearby Mound 93 (M93), which had been partially destroyed by an old logging road. We determined that since the area between M92 and M93 had been significantly altered, we would alter our previous goal of surveying between the M92 and M93 and instead survey between M92 and M23. M92's GPS location was taken near the center of the mound next to a copal tree (*Protium copal*), and M93 was taken in the center next to a *quebracho* tree. Cleofo explored east of our location and located M18 and M25. He located the mounds based on where VOPA crew had excavated in 2002 as well as a nearby creek (sites 94E22N-14 and 94E22N-18) (Lucero 2003). The GPS location was taken at the center of the mound next to a cohune Palm tree. We placed a center marker between M92 and M23 and measured 20 meters north, south, east and west of this central point, marking all locations with stakes and flagging tape. All stake locations were recorded using the GPS. We then began collecting and mapping plants of Plot 6. Poisonwood was only found in saplings in Plot 6. There were no adult poisonwood trees and only two saplings for the entire plot. We saw other unique plant distributions for this plot. The road that cut between M92 and M93 was a relatively recent addition to the landscape, and was probably cleared in the last 50 years. Plants found in this region were not located in any previous plot. We collected specimens through collection number 206.

On June 9, we mapped a one-meter central portion of Plot 6 and recollected previously collected plants in the entire 20-meter region. We also located M18 (Figure 9.6) via Cleofo's directions and recorded the location of the mound.

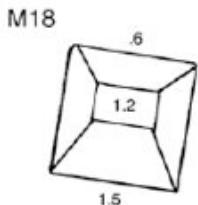


Figure 9.6 M18. Courtesy of Andrew Kinkella (2009:268)

I began to use neon yellow flagging tape as a result of extinguishing my supply of blue flagging tape. Cleofo pointed out where the corners of the old excavation unit were, which had been marked with pink flagging tape. I used the GPS to record the coordinates of these old stakes. We set up a 20-meter circle plot around M18, but did not include the old excavation unit. To create this center point, we measured northeast 20 meters from the center of M18 and called the new plot Plot 7. Cleofo also located another pink-flagging taped stake, which had

been marked “NORTE” and recorded it. Since we covered a small portion of M25 (Figure 9.7), I recorded its location next to a ramon tree (*Brosimim alicastrum*) in the center. Next to that tree, we found a small tree with flagging tape around it.

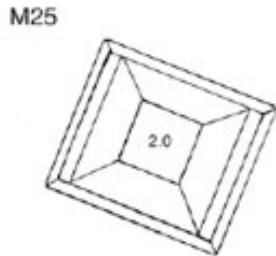


Figure 9.7 M25. Courtesy of Andrew Kinkella (2009:270)

We determined that an area northeast of M18 and parallel to M25 was possibly a small mound. Therefore, I took a GPS location of the center of it and labeled it M9710. This number was selected to coincide with the day, month and year of collection, although a slight error led to the month being coded incorrectly. I scraped around the surface near the stake we had placed and noted cobbles, indicating a mound. We continued to explore the surface in about a 25-centimeter area but did not find any artifacts. After finishing collecting specimens within the 20-meter plot, we set up stakes around a one-meter region in the center of the plot. We recorded plants through collection number 214.

On June 10, we set out to locate M73. This mound was located at some distance from the main center of Yalbac. After hiking for one hour, we found M73 (Figure 9.8) and another mound closer to the northwest side of Kinkella’s transect.

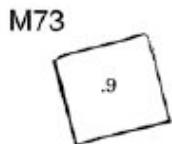


Figure 9.8 M73. Courtesy of Andrew Kinkella (2009:285)

I took the GPS coordinates for both of these mounds and put the center stake between the two mounds so that the resulting 20-meter circle encompassed both mounds. Cleofo found a grinding stone. We had finished both the 20-meter and the one-meter regions shortly after noon. We finished the day by mapping the one-meter portion of Plot 7 and recording the locations of the stakes around this one-meter portion using the GPS. We finished collecting on collection number 216.

Discussion

The preliminary results indicate that plant compositions around settlement differ significantly than those in uninhabited areas, regardless of the type of settlement or proximity to Yalbac. Ancient Maya farmers may have modified their landscape in significant ways. One example is poisonwood; this tree was found in uninhabited areas, in both large trees as well as small saplings. However, it was not found in its adult form near any Maya mounds. In fact, the only examples of poisonwood found around sites were two small saplings near one of the house mounds. It is worth noting that this mound was also located near a recent logging road, where recent disturbance impacted the plant community and introduced different plant species.

Another point of comparison between the house mounds and uninhabited areas is that there were distinctive differences in the intensity of the plant populations. In uninhabited areas, and even behind Str. 3C (Figure 9.9), the trees were close together and many of the areas were intensely overgrown. In contrast, the areas around the house mounds were not as dense and were more open.

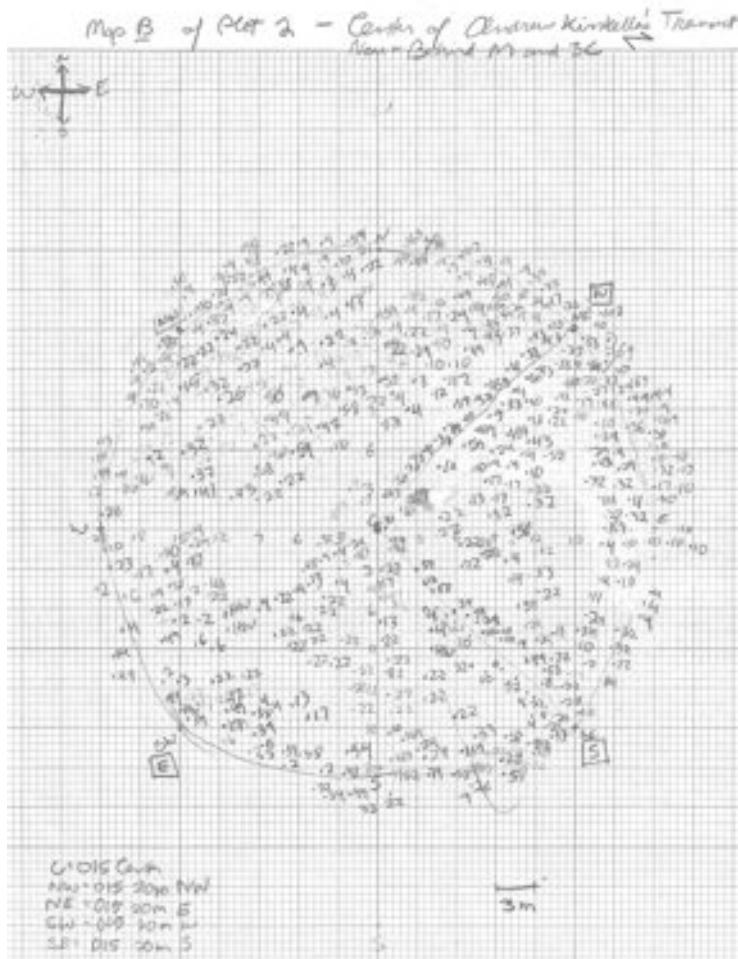


Figure 9.9 Area north of Structure 3C that was mapped and plants collected

Plants and trees near logging road were different as well. One tree, with a milky sap that causes skin to peel, was identified by Cleofo; even breaking off a leaf or touching one of its spines can cause this reaction. Today the Maya cut down this tree wherever they find it, which might explain its scarcity in surveyed areas. However, it is found in areas that have been disturbed by people, but not recently visited. An interesting point about this tree is that it was not even found in uninhabited survey areas. One implication of this patterning is that the Maya could have modified and maintained even areas distant from their residences.

One difference of plants between the house mounds around Yalbac versus those in uninhabited areas was the number of gumbo limbo (*Bursera simaruba*) trees. Its sap is the antidote for the rash and welts caused by poisonwood sap. There were several trees in uninhabited areas, but they were almost non-existent near Yalbac. This differential distribution may indicate that the Maya living outside of the center needed to have more access to poisonwood antidote. However, there were no small gumbo limbo trees found around the area, indicating a lack of easy propagation in recent years, unlike the poisonwood whose saplings are found densely surrounding grown poisonwood trees. One property of the gumbo limbo is its ability to propagate from cut branches. This property could have made for easy transportation and re-growth of this tree around Maya sites.

Another comparison exists between Cleofo's garden (Figure 9.10) and the settlement areas. In the settlement areas, the trees were mainly Cohune Palm, which is useful for some forms of thatch roof construction. Other trees present that were also important to the Maya included ramón trees, whose fruit is edible. In Cleofo's garden, the majority of the plants were those that are useful today, such as peppers, oregano, apple-bananas, sweet potatoes, cassava, orange and mango trees. These differences could possibly relate to a change on reliance from native plant species to

domesticated and imported ones. However, with the time difference, it could also have been purely a case of the jungle taking over the domesticated species once the farmer left.

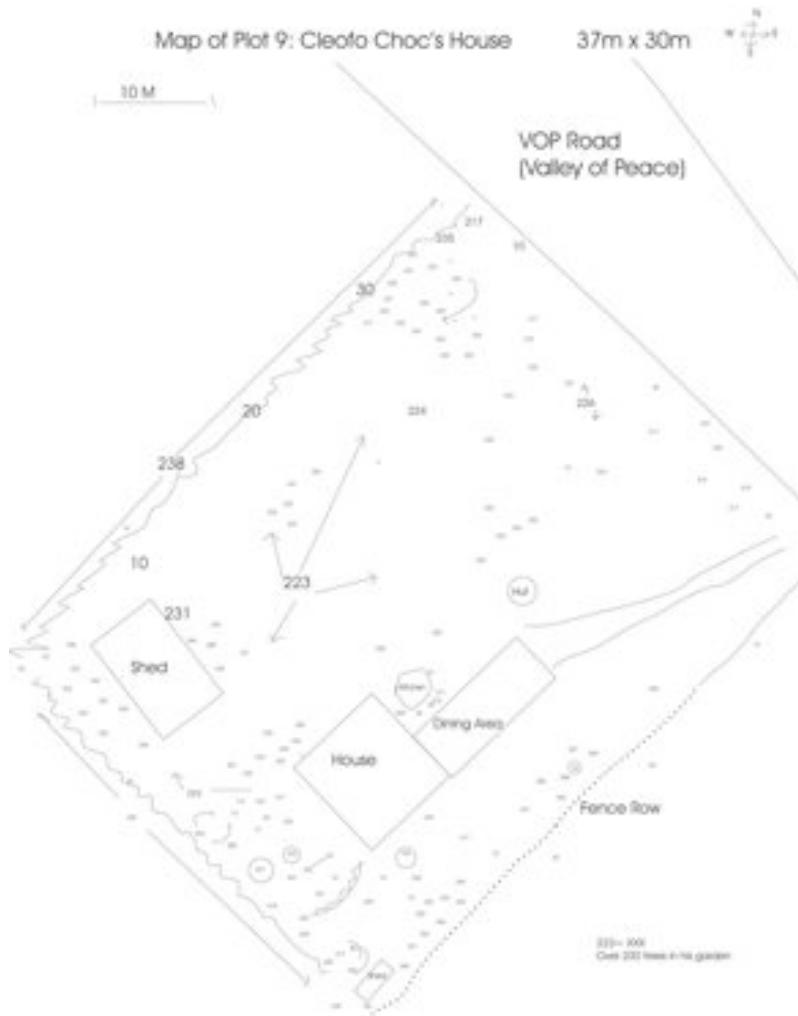


Figure 9.10 Cleofo Choc's Home Garden

Cleofo has identified over 200 plants around Yalbac; many of them have vital uses today, and likely in the past. The overwhelming majority of the plants near undisturbed Maya habitations would have been useful to the Classic Maya; these include ones that were used in ceremonies, including the copal tree (*Protium copal*); those used for food, the pacaya, ramón, wild plum, mamey, and so forth; those used for household items including brooms, ties and thatch, such as the bayleaf palm, cohune palm, the give-and-take, tie-ties and others; and some medicinal plants, including various fungi and vines. Many other plants had uses, and these plants are most prevalent around areas that were previously inhabited by the Maya.

This research has many implications for future studies on the Classic and contemporary Maya. Whereas Ford (2008) analyzed the modern Maya gardens and Gómez-Pompa (1987) the Classic ones, this research bridges the gap between the two by combining past and present distribution and uses. Future goals for this region include further botanical surveys along the entire 11 km transect.

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References Cited

- Arvigo, Rosita
1994 *Sastun: My Apprenticeship with a Maya Healer*. Harper, San Francisco.
- Balick, Michael J., Michael H. Nee, and Daniel E. Atha
2000 *Checklist of the Vascular Plants of Belize: With Common Names and Uses*. New York Botanical Garden Press, Bronx, New York.
- Beletsky, Les
2005 *Belize and Northern Guatemala*. Interlink Publishing Group. Northampton, Massachusetts.
- Bronson, Bennet
1966 Roots and the Subsistence of the Ancient Maya. *Southwestern Journal of Anthropology* 22(3):251-279
- Fedick, Scott L.
2010 The Maya Forest: Destroyed or Cultivated by the Ancient Maya? *PNAS* 107(3):953-954
- Ford, Anabel
2008 Dominant Plants of the Maya Forest and Gardens of El Pilar: Implications for Paleoenvironmental Reconstructions. *Journal of Ethnobiology* 28(2):179-199.
- Freidel, David A.
1992 The Trees of Life: Ahau as Idea and Artifact in Classic Lowland Maya Civilization. In *Ideology*, edited by A. A. Demarest and G. W. Conrad, pp. 115-133. School of American Research Press, Santa Fe, New Mexico.
- Gómez-Pompa, A.
1987 On Maya Silviculture. *Mexican Studies/ Estudios Mexicanos* 3(1):1-17.
- Harris, Kate
2009 *Trees of Belize*. BRC Printing. Benque, Belize.
- Honychurch, Penelope N.
1980 *Caribbean Wild Plants and their Uses*. Macmillan Education, Oxford.
- Kinkella, Andrew
2009 Over the Bajo and Through the Pools: The 2007 Settlement Survey Transect from Yalbac to the Cara Blanca Pools. In *Results of the 2007 Valley of Peace Archaeology Project: Yalbac's Settlement*, edited by L. J. Lucero, pp. 43-57. Report submitted to Institute of Archaeology.
- Lentz, David L., Jason Yaeger, Cynthia Robin, and Wendy Ashmore
2005 Pine, Prestige and Politics of the Late Classic Maya at Xunantunich, Belize. *Antiquity* 79:573-585.
- Lucero, Lisa J., and Sean M. Graebner.
2003 Residential Yalbac: Site 94N22N-18. In *Results of the 2002 Valley of Peace Archaeology Project: Yalbac*, edited by L. J. Lucero, pp. 42-50. Report submitted to the Department of Archaeology, Ministry of Tourism and Culture, Belize.
- Morehart, Christopher T., David L. Lentz, and Keith Prufer
2005 Wood of the Gods: The Ritual Use of Pine (*Pinus SPP.*) by the Ancient Lowland Maya. *Latin American Antiquity* 16(3):255-274.
- Pope, Kevin O., Mary E. D. Pohl, John G. Jones, David Lentz L, Christopher von Nagy, Francisco J. Vega, and Irvy R. Quitmyer
2001 Origin and Environmental Setting of Ancient Agriculture in the Lowlands of Mesoamerica. *Science* 292:1370-1373.
- Rico-Gray, V. and A. Chemás
1991 Uses of Tropical Deciduous Forest Species by the Yucatecan Maya. *Agroforestry Systems* 14:149-161.
- Schlesinger, Victoria
2001 *Animals and Plants of the Ancient Maya: A Guide*. University of Texas Press, Austin.

Appendix: Plant Specimens, Yalbac, Belize

Plant specimens collected from the area around Yalbac, Belize during the summer of 2010 by **Error! Contact not defined.** with the help of the field school students for the Belize Field School from UIUC and Cleofo. Types of specimens collected: bark, leaves, fruit, flowers, stems, roots. All transported specimens were dried and therefore non-viable samples.

All below specimens were collected at Plot 1, around traverse point YL, surrounding or on Structure 2D, in a 20m circle, Yalbac, Belize.

1. Horseball tree (Horseballs Apocynaceae *Stemmadenia donnell-smithii*) Harris/ Balick (Apocynaceae *Tabernaemontana arborea*) Balick
2. Ramon (Ramon Moraceae *Brosimim alicastrum*) Harris
3. White Sasperilla
4. Choohoon tree (Cohune Palm Arecaceae *Cocos nucifera*) Harris (cohune Arecaceae *Astrocaryum mexicanum*, *Attalea cohune*) Balick
5. Hardwood
6. Copal (Burseraceae *Protium copal*) Harris (Burseraceae *Protium copal*) Balick
7. White Malady (Apocynaceae *Aspidosperma spp.*) Balick (white m'lady Asteraceae *Montanoa atriplicifolia*) Balick
8. Hardwood
9. Trumpet Tree (Cecropiaceae *Cecropia peltata*) Harris
10. Piciya Palm (Warree palm (pacaya) Arecaceae *Astrocaryum mexicanum*) Harris/ Balick (Arecaceae *Chamaedora spp.*/ *Geonomia interrupta*) Balick
11. Wild Plum (??Hog Plum Anacardiaceae *Spondia mombin*/ *S. purpurea*) Harris (wild plum Violaceae *Rinorea hummelii* Sprague) Balick (wild plum Euphorbiaceae *Phyllanthus acuminatus*) Balick (Rhamnaceae *Sisiphus mauritiana*) Balick (Anacardiaceae *Spondias spp.*) Balick
12. Rubber Tree
13. Broom tree (Give-and-Take Cryosophila stauracantha (syn. *C. argentea*) Arecaceae) Harris
14. Redwood (Euphorbiaceae *Hieronima oblonga*) Balick (Rubiaceae *Simira salvadorensis*) Balick
15. Pimiento Vine
16. Cedar Tree (Bay Cedar Sterculiaceae *Guazuma ulmifolia*) or (Cedar Meliaceae *Cedrela odorata* (Syn. *C. Mexicana*) Harris (cedar Meliaceae *Cedrela odorata*) Balick
17. Beer Leaf (??Bayleaf palm Arecaceae *Sabal mauritiiformis* (syn. *S. morrisiana*)) Harris
18. Cross Prickle Vine
19. Unknown
20. Unknown
21. La
22. Poochooch (pu-chùch Piperaceae *Piper aduncum* L. or pu-chu-ch Piperaceae *Piper pseudofuligineum* C. DC. or puchuuch Piperaceae *Piper tuerckheimii* C. DC. ex. Donn. Sm.) Balick
23. Blackstick var. 1
24. Shoshot (Xate Arecaceae *Chamaedorea spp.*) Harris
25. Stinky Bush
26. Sobeen (Acacia) (Cockspur Fabaceae *Acacia cornigeria*) Harris (subin Fabaceae: Mimosoideae *Acacia cookii/collinsii zubin* Fabaceae *Acacia cornigera/gentlei/ globulifera*) Balick
27. Choobac
28. Vine with a prickle
29. Blackstick var. 2
30. Flower

All below specimens were collected at Plot 2, 150 m east of YL on a 191.5° heading, surrounding and on Structure 3C, in a 20m circle, Yalbac, Belize

31. Spice Tree
32. Capicolo

- 33. Granny Walking Stick (old woman's walking stick Asteraceae *Koanophyllum galeottii*) Balick
- 34. Pulil
- 35. Blackstick var. 3
- 36. Arichmuch
- 37. Nagrieta (Negrito Simaroubaceae *Simarouba glauca*) Harris/ Balick
- 38. Water vine (Water tie-tie *Vitis tiliifolia*) Harris (Dilleniaceae *Pizona coriacea* Mart. & Zucc.)
Balick (Vitaceae *Vitis tiliifolia*) Balick
- 39. Foul Cat Tree
- 40. Grass
- 41. Basket Ti-Tie (Basket tie-tie Arecaceae *Desmoncus schippii*) Harris/ Balick
- 42. Grass
- 43. White Ti-Tie
- 44. Pecary Vein
- 45. Koonshonunc
- 46. Matipalo (Strangler Fig (matapalo) Moraceae *Ficus* spp.) Harris (Moraceae *Ficus americana/donell-smithii/ obtusifolia/ ovalis/ pertusa/ popenoei*) Balick (Loranthaceae pg. 104/ Viscaceae pg. 105) Balick (Araliaceae pg. 120 Balick)
- 47. Yellow prickle (??Prickly Yellow Rutaceae *Zanthoxylum kellermanii*) Harris (prickly yellow Fabaceae: Mimosoideae pg.82) Balick (prickly yellow Rutaceae *Zanthoxylum* spp.) Balick
- 48. Cabracko (quebracho Rhamnaceae *Krugiodendron ferreum*) Balick
- 49. Sapitillo (White Sapitillo) (Sapotaceae *Pouteria* spp.) Balick
- 50. Pulachoch
- 51. Vine with prickle
- 52. Wild Yam
- 53. Hardwood
- 54. Flower in the jungle
- 55. Mooth
- 56. Tree easy to break
- 57. Mushroom
- 58. Capulchee (pg.92 Balick) (copalche macho Olacaceae *Heisteria media*) Balick
- 59. Harkstick
- 60. Unknown
- 61. Sol

All below specimens were taken at Plot 3, 500 m from the center point of Plot 2, going North on a 41.5° heading, 20 m circle, Yalbac, Belize.

- 62. Poisonwood (Anacardiaceae *Metopium brownei*) Harris (Euphorbiaceae *Sebastiania* spp.)
Balick
- 63. Supwe / Webotochuco
- 64. Red tie
- 65. Gumbolimbo (Burseraceae *Bursera simaruba*) Harris/ Balick
- 66. Red Malady (Apocynaceae *Aspidosperma* spp.) Balick
- 67. Sotsmas
- 68. Hardwood
- 69. Bitterwood (bitter wood Fabaceae: Papilionoideae *Swartzia cubensis*) Balick (Anacardiaceae *Moquitoxylum jamaicense*) Balick
- 70. Bollowhob (bullyhob Flacourtiaceae *Laetia thamnia*) Balick (bullhoof? Pg. 56 Balick)
- 71. Hardwood
- 72. Small fern
- 73. Samwood (Boraginaceae *Cordia alliodora*) Balick
- 74. Hardwood
- 75. Santa Maria (Clusiaceae *Calophyllum brasiliense* var. *rekoi*) Harris (Piperaceae *Piper schiedeanum* Steud.) Balick (Acanthaceae *Aphelandra aurantiaca*) Balick
- 76. Blackstick var. 4
- 77. Grass
- 78. Huachump / Wahal leaf
- 79. Siciya

80. Bolongyuck
 81. Anato (Annatto Bixaceae *Bixa orellana*) Harris/ Balick
 82. Wete (w'eh-te Costaceae *Costus guanaiensis*) Balick
 83. Hardwood
 84. Hardwood
 85. Small plant
 86. Little tree
 87. Hardwood
 88. Blackstick var. 5
 89. Hardwood
 90. Small vine
 91. Square vine
 92. Wya Ti-Tie
 93. Pasass (pa-sas Melastomataceae *Clidemia novemnervia*) Balick
 94. Green prickle
 95. Little flower vine
 96. Banana tree (Banana Musaceae *Musa sapientum*/ M. *Paradisiaca*) Harris
 97. Nargosta (white nargosta Combretaceae *Terminalia amazonica*) Balick
 98. Moho (momo? Sterculiaceae pg 67-68 Balick) (moho Malvaceae *Hampea* spp.)
 (Euphorbiaceae *Acalypha*) Balick
 99. Sol (Duplicate)
 100. Unodigato (uea de gato Fabaceae: Caesalpinoideae *Senna peralteana*) Balick
 101. Small plant
 102. Sanette (Bamboo)
 103. Small plant
 104. Hardwood with white flower
 105. Cocomeca
 106. Vine with big prickles
 107. Mahogany (Meliaceae *Swietenia macrophylla*) Harris (Meliaceae *Guarea glabra*/
 Swietenia macrophylla)
 108. Amaree
 109. Cabbage bark (cabbage-bark Fabaceae: Papilionoideae *Andira inermis*/
 Lonchocarpus castilloi) Balick
 110. Cutting Grass (cutting-grass Cyperaceae *Cyperus ligularis*/ *Scleria ciliata*) Balick
 111. Guava tree (Myrtaceae *Psidium guajava*) Harris (wild guava Myrtaceae *Chamguava schippii*) Balick
 112. Jungle plant
 113. Hardwood
 114. Red vine to kill fish with
 115. Breebree (bri-bri Inga edulis) Beletsky (Fabaceae: Mimosoideae *Inga* spp.) Balick
 116. Cartoon tree (cotton tree? Bombacaceae or Malvaceae pg 68-69) Balick
 117. Palosangre (Palo de sangre Myristicaceae *Virola koschnyi*) Balick (palo sangre
 Fabaceae: Papilionoideae *Andira inermis*) Balick
 118. Flower in the jungle tree
 119. Asnic
 120. Hardwood
 121. Pallood
 122. Vine with a prickle
 123. Small plant
 124. Small plant
 125. Small plant
 126. Small plant
 127. Vine
 128. Small plant
 129. Small plant
 130. Small plant
 131. Small plant

132.	Small plant
133.	Small tree
134.	Small vine
135.	Little hardwood
136.	Little forest flower
137.	Little plant
138.	Small vine
139.	Small plant
140.	Small tree
141.	Little tree
142.	Little tree
143.	Small tree
144.	Small vine
145.	Poisonwood- omitted this number- changed to #62
146.	Small plant
147.	Small plant
148.	Small plant
149.	Small plant
150.	Small plant
151.	Small plant
152.	Small plant
153.	Small plant
154.	Small plant
155.	Small plant
156.	Small plant
157.	Little hardwood tree
158.	Small tree

All below specimens were collected 1KM from Plot 2, North of the center point of this plot on a 41.5° heading, 20m circle, Yalbac, Belize

159.	Hardwood
160.	Bob (Polygonaceae <i>Coccoloba belizensis</i> Standl.) Balick
161.	All Spice (Myrtaceae <i>Pimenta dioica</i>) Harris/ Balick
162.	Parasitic plant (epiphyte)
163.	Spice Ti-Tie
164.	Hardwood
165.	Hardwood
166.	Monach
167.	Red Sapodilla (Sapotaceae <i>Manilkara zapota</i>) Harris/ Balick
168.	Parasitic plant (epiphyte)
169.	Poochooch var. 2 (pu-chùch Piperaceae <i>Piper aduncum</i> L. or pu-chu-ch Piperaceae <i>Piper pseudofuligineum</i> C. DC. or puchuuch Piperaceae <i>Piper tuerckheimii</i> C. DC. ex. Donn. Sm.) Balick
170.	
171.	Tami (tamai ta mai tamay Flacourtiaceae <i>Zuelania guidonia</i>) Balick
172.	Small tree

Note: specimens from #96 and #9 were collected outside of the plot they were assigned to, but still within the general area of Yalbac, Belize.

Note: all blackstick varieties may be Adiantaceae *Adiantum tenerum*. Balick

Note: bloody tie tie is Fabaceae: Papilioideae *Machaerium kegelii* Balick

Note: fish poison vine is Sapindaceae *Pullinia pinnata* Balick or poison fish tie tie Boraginaceae *Tournefortia maculata*

All specimens were transported back to the United States via luggage