The 2015 Season of the Chan Chich Archaeological Project

EDITED BY

Brett A. Houk

Papers of the
Chan Chich Archaeological Project, Number 10
Department of Sociology, Anthropology, and
Social Work
Texas Tech University • Lubbock, Texas
2015

Chan Chich Archaeological Project
CCAP
Chan Chich, Belize - Central America

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EDITED BY

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WITH CONTRIBUTIONS BY

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AND
Sarah Van Oss

Belize Estates Archaeological Survey Team
BEAST
Gallon Jug ◆ Belize ◆ Laguna Seca

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Cover art: Photograph of spear point from Structure D-3 at Chan Chich. Photo by Brett A. Houk.

Acknowledgments

In 2015, the Chan Chich Archaeological Project (CCAP) and the Field School in Maya Archaeology (FSMA) offered two field school sessions for the second time since the 1998 season. There are many people and organizations to thank for making our summer successful. First, I would like to thank Dr. John Morris of the Institute of Archaeology (IA) for being supportive of our work and for issuing me a permit to conduct the research in 2015. As always, the other staff members at the IA helped us along the way, and they all deserve thanks. I would like to single out Brian Woodye, Delsia Marsden, Josue Ramos, and Melissa Badillo for special thanks. Melissa graciously assisted the project with passport extensions and our export permit. We would also like to thank the staff at the Belize Archives and Records Service for assisting us.

It takes both a permit from the IA and permission from the landowner to conduct excavations in Belize. Therefore, I am extremely grateful to the Bowen family for allowing us to work at Chan Chich. Alan Jeal, the general manager of Gallon Jug Ranch, supported the project in many ways and consulted on our logging-related artifacts at Qualm Hill camp. In addition to Alan, I would like to the staff of Gallon Jug Ranch for helping us with access, fuel, and many other matters. I would also like to thank Jeff Roberson, Alex Finkral, Thomas Kennerly, and everyone else associated with The Forestland Group who facilitated our access to work on Yalbac Ranch and Laguna Seca Ranch. I would also like to thank Mr. Steve Bryant in Texas Tech University's Office of Risk Management for assisting us.

My longtime friend Letty Martinez, the manager of Chan Chich Lodge, has thanks and appreciation from all of us for making our stay exceptional. The staff of Chan Chich Lodge never fails to make our stays pleasant and memorable. They are a wonderful group of people with whom to live and work for two months: Don Pedro Barahona, Teresa Cordova, Esmeralda de la Rosa, Emil Flota, Raul Martinez, Jose Luis (Chelis) Monroy, Migde Perdomo, Marvin Ramirez, Elias Romero, Luis Romero, Arlene Sanabria, Jeremias (Jerry) Serminia, Don Gilberto Vasquez, Rosario Vasquez, Josimar Magaña, Lorena Popper, Johny Ramirez, Oscar Lemus, and Navin Tillett. I would like to thank Jeffrey Magaña, Felipe Moh, Jr., Leonardo Moh, Victor Granados, Gary Romero, Roel Romero, Eric Galy, and Justin Gomez for working with us in the field and the lab. Abe Rempel once again supplied our project with a dependable field vehicle.

In 2015, a number of important consultants, visitors, and analysts aided our investigations. First, I would like to thank Dr. Fred Valdez and Dr. Lauren Sullivan, our project ceramicists, for analyzing most of our ceramics. Lori Phillips, our lab director in 2014, returned to visit for a day this summer and analyzed our faunal remains. US Ambassador to Belize, Carlos Moreno, and his wife Christine, visited the field school for a night and graciously interacted with our students and staff.

I would be negligent in my duties if I did not acknowledge the hard work and financial sacrifice of the project staff. Ashley Booher, Brooke Bonorden, and Briana Smith supervised the fieldwork and trained the students in

excavation methods, recording, and mapping. Valorie Aquino joined the project in its final two weeks and helped us in the field and the lab. Sarah Van Oss ran the field lab and exposed the students to the wonderful world of processing, cataloging, and analyzing artifacts. Returning students Alyssa Farmer, Gertrude Kilgore, and Paisley Palmer assisted with the excavations.

In 2015, part of our research depended on the generosity of friends and strangers who contributed financially to our crowd-sourced funding efforts or to TTU directly. Without their generosity we would have been forced to scale back our work. In particular, I would like to thank Joe Rose and Emily Phillips for their generous support. The CCAP depends on the FSMA, a program run through Study Abroad at TTU, for most of its funding. I would like to thank Elizabeth McDaniel and Rachel Jarnagin for dealing once again with our unique requirements. I have saved the greatest thanks, however, for the students on the first and second sessions that chose this project over all the other possible field schools out there. From Session 1, they are Laura Aiken, Seamus Anderson, Alexandra Carrillo, Whitney Davis, Raychel Durdin, Graig English, Emilee Hart, Mandi Holm, and Miles Kirkpatrick. From Session 2, they are Kelli Breeden, Courtney Carroll, Emily Caselman, Nicholas Dungey, Erik Pearl, Reese Ramsey, Danielle Ruffe, Rebecca Shultz, and Mallory Skains.

Guns up!

Brett A. Houk, December 2015

2015 CCAP staff and Session 1 students at Xunantunich. From left to right, front row: Brooke Bonorden, Graig English, Sarah Van Oss, Alexandra Carrillo, Laura Aiken, Miles Kirkpatrick, and Alyssa Farmer. From left to right, back row: Brett A. Houk, Ashley Booher, Raychel Durdin, Mandi Holm, Whitney Davis, Briana Smith, Emilee Hart, Seamus Anderson. Photo by Alyssa Farmer's camera.

2015 CCAP staff and Session 2 students at Chan Chich Lodge on Hawaiian Shirt Wednesday. From left to right: Courtney Carroll, Paisley Palmer, Brooke Bonorden, Danielle Ruffe, Reese Ramsey, Ashley Booher, Rebecca Shultz, Trudy Kilgore, Nicholas Dungey, Brett A. Houk, Erik Pearl, Kelli Breeden, Mallory Skains, and Emily Caselman. Not pictured: Valorie Aquino and Sarah Van Oss.

Brooke Bonorden, sitting atop the Castillo and admiring the architecture at Xunantunich, in a gratuitous Texas Tech publicity photo by Alyssa Farmer.

An Introduction to the 2015 Season of the Chan Chich Archaeological Project and the Belize Estates Archaeological Survey Team

Brett A. Houk

The Chan Chich Archaeological Project (CCAP), and its regional component, the Belize Estates Archaeological Survey Team (BEAST), operate alongside Texas Tech University's (TTU) Field School in Maya Archaeology (FSMA), a study abroad program in the tropical forest of northwestern Belize that offers students the opportunity to learn archaeological methods and techniques while contributing to an active research project. The CCAP completed its ninth season of research in 2015, and, for the second time since 1998, included two field school sessions.

This chapter includes relevant project minutia (dates, staff, permits, funding, and so on), summaries of the 2015 excavations, and an updated description of Chan Chich's site plan and chronology, based on the results of nine seasons of research at the site by the CCAP. Finally, the chapter closes with a preview of the rest of the volume. For information on project excavation and recording methods, refer to Houk and Zaro (2015a).

PERMIT AREA

As negotiated with the Institute of Archaeology (IA) in June 2014, the CCAP and BEAST operate on approximately 144,000 acres of land in northwestern Belize, with the official permit area encompassing Gallon Jug Ranch, Laguna Seca, and the northwestern corner of Yalbac Ranch (Figure 1.1). For a discussion of the rather complicated nature of the permit area and the recent history of land sales in the permit area, please see Houk and Zaro (2014). Sixteen numbered Belize Estate (BE) sites—BE numbers are assigned to large or important prehistoric and historic sites—are in or near the permit area (Table 1.1). CCAP and BEAST conducted work at three of the 16 sites in 2015: Chan Chich, Qualm Hill camp, and Kaxil Uinic village (Table 1.1).

PROJECT TIME LINE, STAFF, AND CONSULTANTS

The project began on May 12, 2015, with the arrival of the project director (Houk) and the two operation directors (Ashley Booher and Brooke Bonorden) in Belize (Table 1.2). On May 13 and 14, Bonorden, Booher, and Houk conducted archival research at the Belize Archives and Records Service in Belmopan. On May 15, Briana Smith, a suboperation director for the first field school session, arrived, and the staff traveled to Chan Chich Lodge that afternoon. Over the course of the next two days, the staff unpacked the lab and field equipment and made preliminary visits to the planned excavation areas. On May 18, the first group of 10 first-time field school students, one returning student, and the lab director, Sarah Van Oss, arrived. A returning student

Houk, Brett A.
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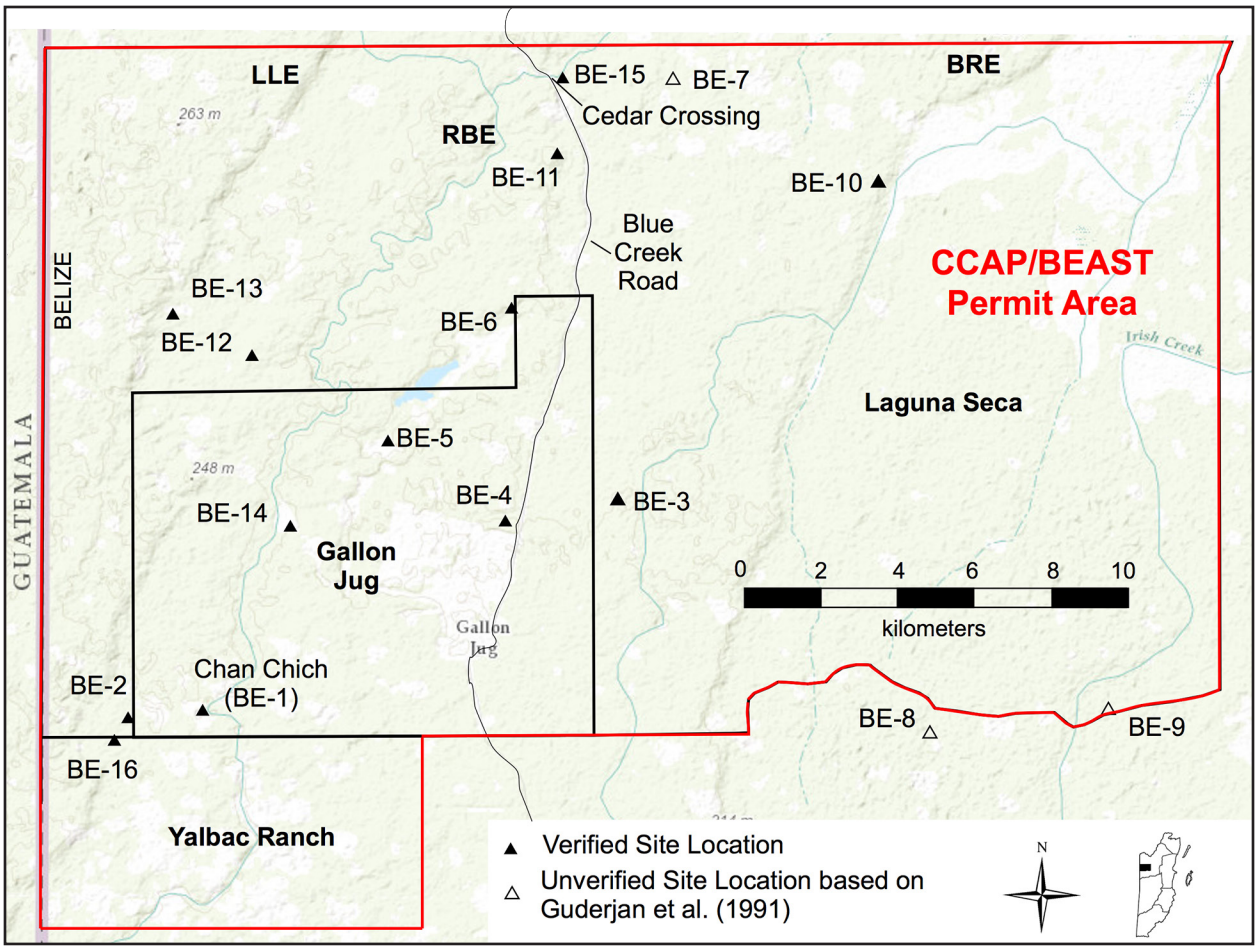

Figure 1.1. Map of the CCAP/BEAST permit area. See Table 1.1 for list of BE numbers. The three escarpments in the area are, from west to east, the La Lucha Escarpment (LLE), the Río Bravo Escarpment (RBE), and the Booth's River Escarpment (BRE).

Table 1.1. List of BE Sites Shown in Figure 1.1

BE #	Site Name	BE#	Site Name
1	Chan Chich	9	Sierra de Agua
2	Kaxil Uinic (E'kenha)	10	Gongora Ruin
3	Punta de Cacao	11	Ix Naab Witz
4	Gallon Jug	12	La Luchita
5	Laguna Verde	13	Montaña Chamaco
6	Laguna Seca	14	Sylvester Camp
7	Qualm Hill ruin	15	Qualm Hill camp
8	Wamil	16	Kaxil Uinic village

arrived June 1, halfway through the first session, which ran for 28 days and ended on June 15. Briana Smith departed at the end of Session 1. The second field school session began on June 15 with the arrival of nine first-time students and one returning student. Lori Phillips, a graduate student at Washington State University, spent the night of July 1 with the project and analyzed faunal remains. Valorie Aquino, a graduate student at the University of New

Table 1.2. Project Staff and Consultants, Sorted by Arrival Date

Name	Role	Affiliation	Arrival	Departure
Dr. Brett A. Houk	Project Director	TTU (Anthropology)	5-12-15	7-15-15
Brooke Bonorden	Operation Director	TTU (Anthropology graduate student)	5-12-15	7-15-15
Ashley Booher	Operation Director	TTU (Anthropology graduate student)	5-12-15	7-15-15
Briana N. Smith	Suboperation Director		5-15-15	6-15-15
Sara Van Oss	Lab Director	College of Wooster	5-18-15	7-15-15
Valorie V. Aquino	Suboperation Director	New Mexico (Anthropology graduate student)	7-4-15	7-13-15
Lori Phillips	Faunal Analyst	Washington State University (Anthropology graduate student)	7-1-15	7-2-15
Dr. Fred Valdez, Jr.	Project Ceramicist	UT-Austin (Anthropology)	--	--
Dr. Lauren A. Sullivan	Assistant Project Ceramicist	UMASS-Boston (Anthropology)	--	--

Mexico, joined the project for 10 days from July 4 to July 13 and assisted in the field and lab. Drs. Lauren Sullivan and Fred Valdez, Jr. spent a day in the field lab on July 7 analyzing ceramics. Session 2 ended on July 10 after 25 nights with the departure of all students. The project's remaining staff departed Chan Chich Lodge on July 15, marking the end of the 2015 field season.

PROJECT FUNDING

The TTU FSMA, a cost-sharing program run through Study Abroad, served as the primary source of funding for the 2015 season of the CCAP, and the Department of Sociology, Anthropology, and Social Work also provided a minor amount of financial support. A small grant through the crowd-sourced funding site Experiment.com supported the research at Kaxil Uinic village and Qualm Hill camp.

PROJECT PERMITTING

The IA, part of the Belizean National Institute of Culture and History, issued Permit No. IA/H/2/1/15(09) to Houk for the excavations at Chan Chich, Kaxil Uinic village, and Qualm Hill camp. At the time the permit was issued, Dr. John Morris served as Director of the IA. The landowners of Gallon Jug Ranch, Laguna Seca Ranch, and Yalbac Ranch also gave permission for the research.

AN OVERVIEW OF THE 2015 SEASON

During the 2015 season, our efforts targeted three specific objectives. Ashley Booher oversaw the excavations of the processional architecture at the site—two *sacbeob*, associated termini structures, and Courtyard D-1—as the second year of a two-year study (Figure 1.2). The other two objectives included the investigations of Qualm Hill camp, a historic logging camp near Cedar Crossing, and Kaxil Uinic village, a historic San Pedro Maya village approximately 2.6 km west/southwest of Chan Chich. Brooke Bonorden oversaw the excavations at Qualm Hill camp during the first field school session and the excavations at Kaxil Uinic village during the second session. The project afforded field school students opportunities to

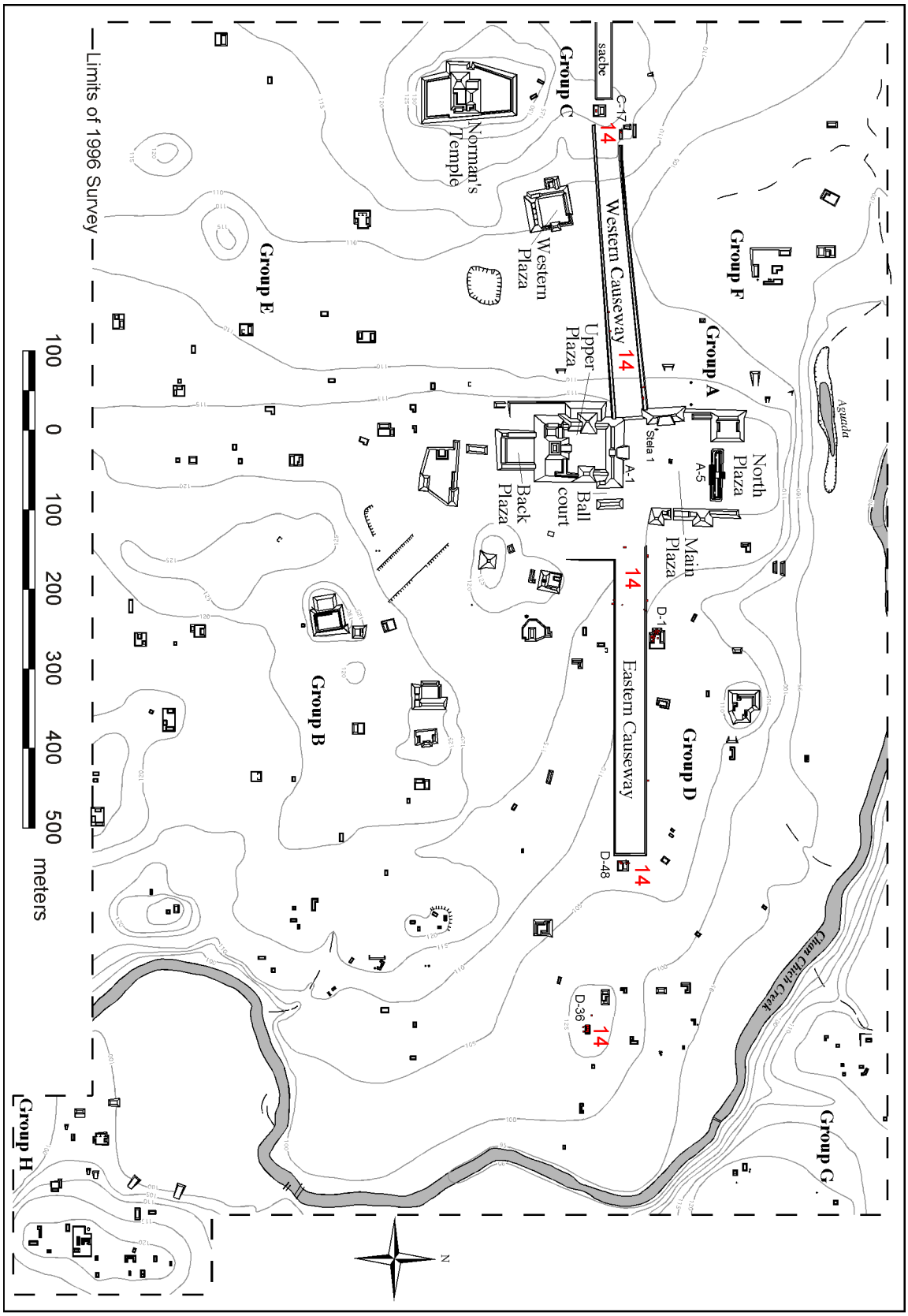

Figure 1.2. Map of 2014 and 2015 processional architecture excavations at Chan Chich. "14" refers to Operation CC-14.

participate in each area of research and work in the field lab to gain experience in artifact processing and analysis.

Year Two of the Processional Architecture Investigations

In 2014, Ashley Booher began her thesis research on processional architecture at Chan Chich as Operation CC-14; she completed that research in 2015 under the same operation number. Booher also excavated Structure D-36 in both seasons as part of an unrelated study. Her thesis topic explores the intersection of ancient Maya urban planning, ritual, and the roles of rulers as performers in public spectacles (Houk et al. 2015). In Maya art, kingly attire is most elaborate when kings are shown performing public rituals. As Takeshi Inomata (2006) argues, the massive headdresses and elaborate backracks worn by kings were designed to be highly visible during mass spectacles. Depictions of kings being carried on litters, bedecked with images of giants or animals, suggest that some mass spectacles involved processions in which the king was carried along a prescribed route in front of the spectators. Inomata (2006) suggests that the causeways at Tikal were built in part to allow for ritual processions involving thousands of spectators.

At Chan Chich, the Eastern and Western Causeways enter the Main Plaza in front of Structure A-1, a massive structure with a broad stairway. Both of these causeways are about 40 m wide, much wider than they need to be if they only functioned as walking corridors, and our hypothesis is that they were built in part to accommodate ritual processions. Attached to the eastern side of Structure A-1 is the site's ball court, which sits on the platform created by the Eastern Causeway. The large plaza would have provided space for thousands of people to witness processions, ball games, and other rituals taking place on the steps to Structure A-1. The proposed processional architecture includes the terminus structure associated with each of the causeways, and Courtyard D-1, a small courtyard immediately adjacent to the Eastern Causeway. Guderjan (1991) previously proposed that the courtyard had a functional relationship with the causeway.

Thanks to Booher's research, we now know that the two causeways were built in single construction phases during the Late Classic period. The Eastern Causeway is a 40-m wide, 1-m high, elevated platform, while the Western Causeway is a low-platform lined by parapets. As described by Booher and colleagues (Chapter 2), her investigations included clearing units along the edges of the causeways to look for debris that was possibly swept to the sides. Angela Keller (2006) had luck with this approach identifying likely ritual use of the *sacbeob* at Xunantunich. As Booher and colleagues report in Chapter 2, our results have been less spectacular, but the units closer to the Main Plaza have yielded many more artifacts than those farther away.

Similarly, the excavations at Structures C-17 and D-48, the two structures associated with the causeways' termini, failed to find conclusive evidence of ritual use, although both areas produced abundant artifacts. It is likely that more extensive excavations would yield more conclusive results.

Excavations at Courtyard D-1 have produced the greatest amount of data thus far from our causeway investigations. Two seasons of work at Structure D-1 on the western side of the courtyard revealed it to be an oddly configured room, complicated by multiple remodeling events. In its final form, it had a large, high bench covering most of the interior and likely had a vaulted entryway. Excavators encountered a ceramic drum base in this room at the foot of the bench. Most interesting are a couple of burials from two different phases of

benches in Structure D-1. The first burial was excavated in the 2014 season; the skeleton was found in the fill of a remodeled bench, in an extended position with the head to the west. A single small overturned Achote Black bowl was found on top of the skeleton's midsection. The bowl is fairly unremarkable except that has this quadripartite design incised in two places on its outside and in the center of the vessel. These designs are after-market additions to the vessel (Booher et al., this volume).

In 2015, Booher excavated a second burial (Figure 1.3). This one was found beneath an older bench in the same structure; excavations determined the individual, an adult female, was placed in a seated position facing northwest. The individual's hands were crossed and feet side by side. Deer antler, which was recovered near the skull, perhaps forming part of a headdress, a spindle whorl, a shell bead, and a few ceramic sherds accompanied the body.

Figure 1.3. Ashley Booher excavating Burial CC-B14 in Structure D-1.

Structure D-3 on the southern side of the courtyard also proved to be interesting. The building consists of two rooms divided by a small wall. The room located on the west end of the building contains a bench. The room located on the east side of the building contains a step up onto the floor surface of the room. Excavations exposed two architectural phases on Structure D-3. In the second phase, a western patio was added to the building and the northern wall of the building was raised.

Perhaps most importantly, the building's final phase may have been burned at or near the time it was abandoned. The floor and walls in the eastern room are heavily burned and fire cracked, and a dense deposit of ashy soil and artifacts was found outside the building on the western patio, up against the western wall. The deposit in many respects looks like a domestic midden with fire-fractured metate fragments, partially reconstructable vessels, broken bifaces, and burned chert. However, there were some unusual artifacts as well, including a West Indian chank shell, which may have been a musical instrument, and the bones of a human arm including a well-preserved humerus. The chank shell's lip is broken off, and its spire is lopped off, two modifications which would have allowed it to function as a trumpet. The same structure yielded a few shell tinklers that are likely bits of costume, a spear point that was found in front of the building, and a thin biface with some hafting adhesive still attached to its base. Although circumstantial, these discoveries suggest that Courtyard D-1 had a specialized ritual function related to the Eastern Causeway (Booher et al., this volume).

Colonial Investigations

BEAST, directed by Brooke Bonorden, investigated two colonial period sites in the permit

area in 2015. Both sites have ties to the Caste War, which was a decades long conflict between the Maya and the Mexican government in the Yucatan Peninsula. Fleeing the violence, a group of Maya split off and left their village of Icaiche and settled in northwestern and western Belize in the 1850s. This group is called the San Pedro Maya after their major village of San Pedro Sirís, which has been excavated (Church et al. 2011; Dornan 2004). After the San Pedro Maya moved into Belize, the Icaiche Maya began raiding settlements and camps in British Honduras in response to perceived violations of their territory, which they believed had been granted to them in an 1853 treaty signed by both the Mexicans and British. Raiding parties from Icaiche, led by Marcos Canul, attacked Qualm Hill camp in 1866, reportedly burning the saw mill, killing two men, and taking approximately 70 men, women, and children hostage (see Bonorden and Smith, this volume).

Shortly after that raid, the British began to mistrust the San Pedro Maya and decided to attack and burn their villages. This began a period of occasional resettlement and movement of San Pedro Maya, and Grant Jones (1977) speculates that migrants from a village named Holuitz, which was abandoned sometime after 1868, may have originally settled Kaxil Uinic village in the 1880s.

Our archaeological investigations at Qualm Hill discovered that the site continues to serve as a seasonal logging camp, much to our surprise. When we arrived to begin our excavations, we learned that loggers were camping there. It is clear that this spot on the landscape, near a long active road and river crossing, offers certain logistical advantages for loggers and others.

As a result, the site is a palimpsest of materials spanning over a century. Furthermore, we suspect that a great many artifacts have been surface collected over the years, as the scatter of material was not nearly as dense as we expected it to be. However, the artifacts remaining are rather informative. Firstly, as Bonorden and Smith report in Chapter 3, the only Maya artifacts we recovered were one proximal side-notched arrow point fragment, two sherds of pottery, and a mano fragment. The non-Maya materials include glass, historic ceramics, and metal in that order of frequency with lesser quantities of other artifact types. Among the more interesting artifacts are clay pipes, pieces of dolls, and a 1911 medallion commemorating the coronation of King Edward V.

Kaxil Uinic village, the second colonial site, appears on an 1887 map made by William Miller (1887:420), who was one of several surveyors who oversaw the survey and cutting of the border between the Belize and Guatemala (Figure 1.4). The map shows trails connecting Xaxe Venic, which is another name for Kaxil Uinic, to San José to the southeast, Yalloche in Guatemala to the southwest, Ycaiche in Mexico to the north, and the Peten to the west. Miller (1887:422–423) notes, "All the roads which I have marked are mere paths through the bush, the majority of them so bad that even a mule could not travel on them." It is unclear how accurately drawn the roads are, however, or if Miller followed them all while working in the area. He notes that the "villages shown on the map are inhabited by Indians...The Indians of these villages are not savages. They cultivate the soil and grow maize, rice, and beans, and raise pigs and fowls" (Miller 1887:422). He also mentions that the Indians in the towns on his map "are armed to a considerable extent with old Enfield rifles" and machetes (Miller 1887:422).

In contrast to Qualm Hill camp, where artifact collecting has apparently impacted the site, Kaxil Uinic village has a much more dense and rich artifact assemblage. Our initial work has revealed at least three midden-like artifact scatters with dozens of glass bottles as well as

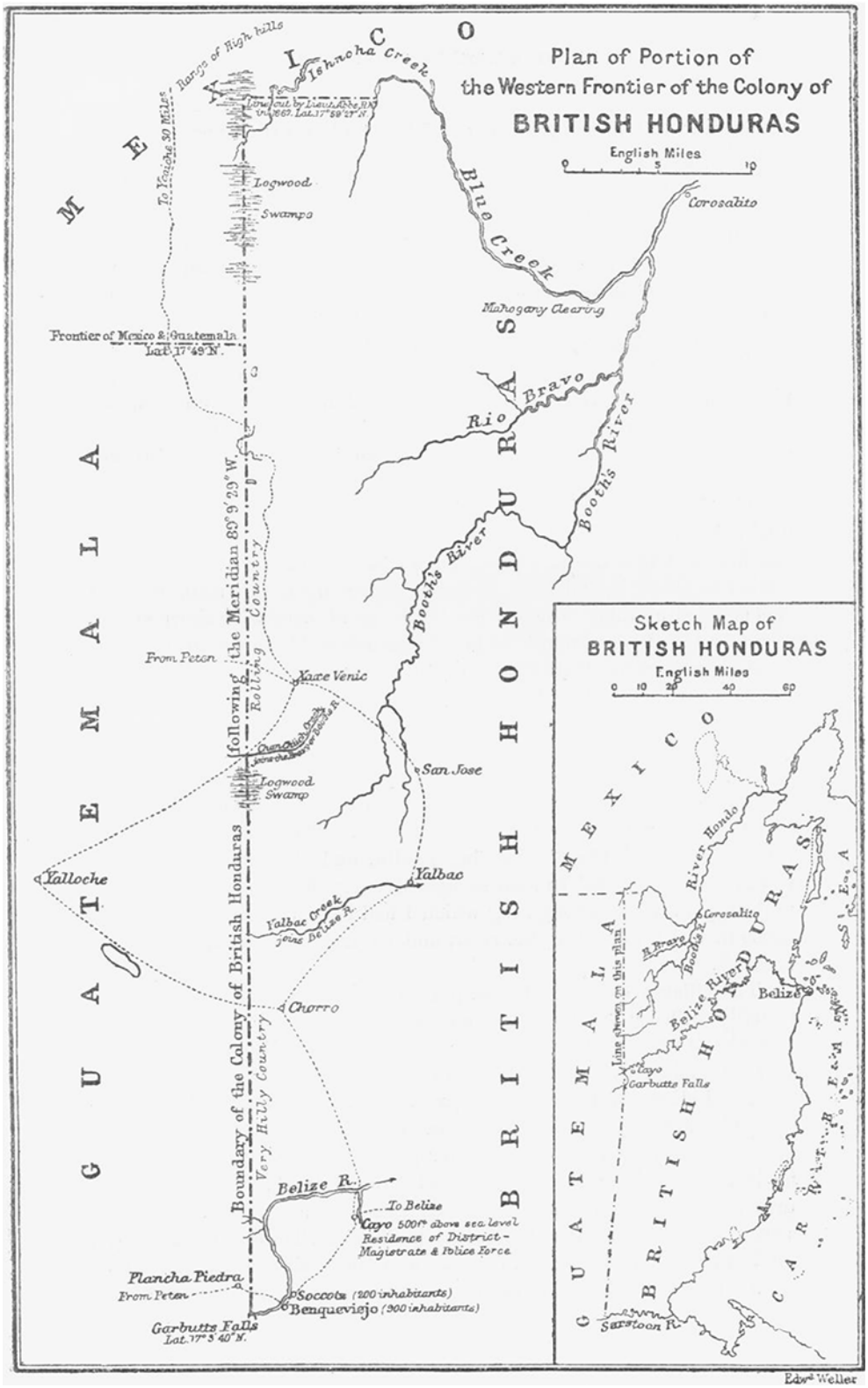

Figure 1.4. William Miller's (1887:421) map of the northern portion of the boundary between British Honduras and Guatemala showing the location of Xaxe Venic (aka Kaxil Uinic).

metal cups and bowls at each locale. Bonorden and Kilgore (Chapter 4) also report seven clusters of three large stones have been observed at the site, similar to the three-stone hearths that indicated historic houses at Tikal (Meierhoff 2015).

There is also some overprinting at the site from either *chicleros*, who likely re-used many of the three-stone hearth features present at the site, or from looters, who probably camped near the aguada when they looted the nearby prehistoric ruins of the same name in the 1980s. Despite that, the site has well-preserved remains that relate to the San Pedro Maya occupation.

AN UPDATED DESCRIPTION OF CHAN CHICH

The following section updates the description of Chan Chich published in last season's introductory chapter based on new data from 2015 (Houk and Zaro 2014). Chan Chich is in western Belize, approximately 4.25 km east of the border between Guatemala and Belize (Figure 1.5). The ruins are on the western bank of the northward flowing Chan Chich Creek, which joins Little Chan Chich Creek a few hundred meters north of the site to become the Río Bravo. The Río Bravo is one of three rivers from which the Three Rivers adaptive region draws its name. The site occupies a physiographic zone known as the Río Bravo Terrace

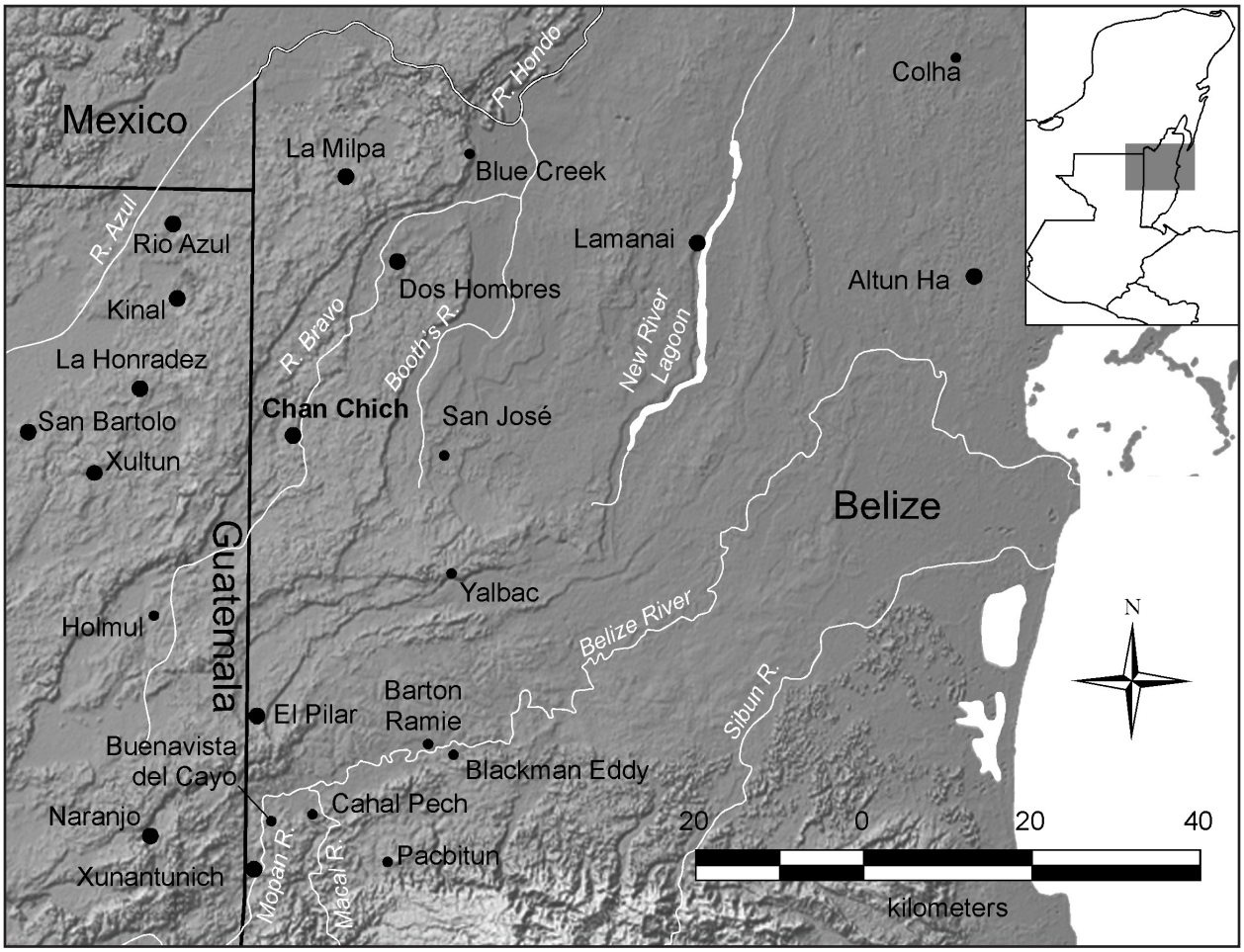

Figure 1.5. Map of north-central Belize showing the location of Chan Chich in relationship to other Maya sites.

Lowland. Irregular *bajos* and hemispherical hills characterize the area.

From the tops of the mounds in the Main Plaza at Chan Chich, the steep face of the La Lucha Escarpment is visible approximately 3.75 km to the west where it abruptly rises over 100 m. The prehistoric ruins of Kaxil Uinic sit near the base of this escarpment 2.6 km west of Chan Chich; the historic Kaxil Uinic village is approximately 500 m south of the prehistoric site of the same name. The Yalbac Hills are 18 km to the south, forming the divide between the Río Hondo and Belize River watersheds and marking the southern limit of the Three Rivers adaptive region according to Garrison and Dunning (2009).

The major architecture at the site (see Figure 1.2) is centered on the Main Plaza (Plaza A-1) and the Upper Plaza (Plaza A-2). The Main Plaza is square in plan and is the third largest plaza in the region, encompassing 13,080 m^2 (Garrison 2007:Table 6.3). Mounds border the plaza on all sides, but gaps between structures allowed formal and informal access points. With the North Plaza at one end and the smaller Back Plaza at the other, the contiguous series of plazas and buildings extends approximately 350 m from north to south.

Structure A-1 is the largest building at Chan Chich; it is a 70-m long tandem range building that divides the Main Plaza from the Upper Plaza. A central landing on the summit of the building allowed access into the enclosed and private Upper Plaza, which is 7 m higher in elevation than the Main Plaza. Excavations in 2014 determined that Structure A-1 has two once-vaulted buildings on its summit. Each is a tandem-range building with four rooms facing the Main Plaza and four rooms facing the Upper Plaza (Herndon et al. 2014).

The Upper Plaza is arguably the site's acropolis and was home to the tomb of an early king at the site (Houk et al. 2010). Structure A-15 is situated across the plaza from Structure A-1 and is the tallest building at the site. Similar to the western temple-pyramid (Structure A-21), it has multiple looters' trenches and tunnels that reveal older architectural phases of unknown ages beneath the Late Classic buildings.

Two causeways enter the Main Plaza from the east and west in front of Structure A-1. Curiously, the two have different architectural styles. The Eastern Causeway is an elevated sacbe that is 40 m wide. The Western Causeway is also elevated, at least near the Main Plaza, but it has parapets defining its northern and southern edges. The two causeways were constructed in single, Late Classic construction events (Booher et al., this volume). The two causeways terminate at similar structures (Structure C-17 on the west and Structure D-48 on the east), which are mapped as east-west oriented structures with low platforms extending to the south.

The site's ball court is at the southeastern corner of the Main Plaza, built on a level platform that extends off the Eastern Causeway. The ball court is atypical in that its western structure is physically attached to the base of Structure A-1, while its eastern structure is freestanding. The visible phase of the ball court was also constructed in the Late Classic period; Ford's (1998:56) excavations in 1997 did not penetrate the penultimate phase of either structure, but the alleyway yielded Late Preclassic ceramics from fill. When considered together, the two causeways with termini structures, Structure A-1, and the ball court must have been important architectural elements of ritual processions entering the Main Plaza, as noted above (Booher et al., this volume; Houk 2013).

Surrounding the core architecture are numerous smaller courtyards, the largest of which are the Western Plaza and Norman's Temple group. These two elite residential groups are

approximately 250 m west of the Main Plaza. The Western Plaza sits at the base of a large hill, which is crowned by the Norman's Temple group, a tightly enclosed courtyard with a small temple on its western edge and a range building on the north. Artificially leveled platforms extend north and south of the courtyard, and a low wall encircles the entire assemblage.

Another important group of architecture is Group H, which is located in the southeastern corner of the mapped portion of the site. Situated on the opposite bank of Chan Chich Creek over 1 km from the Main Plaza, Group H comprises small house mounds interspersed with lithic workshops, made evident by mounds of chert flakes (Houk and Zaro 2015b; Meadows and Hartnett 2000).

UPDATED SITE CHRONOLOGY

In 2012, students excavating a test pit at the base of Structure 3 at nearby Kaxil Uinic discovered an Early Preclassic sherd (ca. 1100–1000 BC) that is stylistically identical to Cunil ceramics, the earliest documented ceramics in Belize (Harris and Sisneros 2012:56; Valdez and Houk 2012:68). The deposit from which the sherd was recovered had a mixture of ceramics from the Middle and Late Preclassic periods, but the find suggests settlement began in the Chan Chich area by the end of the Early Preclassic period. Excavations in the Upper Plaza at Chan Chich discovered a buried Middle Preclassic period midden deposit, which was dated on the basis of ceramics and a calibrated 2-sigma radiocarbon age range of 800–415 BC with an intercept of cal 770 BC (Robichaux 1998:34). To date, this represents the oldest documented cultural material at Chan Chich itself.

Excavations show greater evidence of Late Preclassic occupation, as evidenced by floors and features in the Upper Plaza (Herndon et al. 2014; Kelley 2014; Kelley et al. 2012, 2013; Robichaux et al. 2000), the Main Plaza (Houk 1998, 2000), Structure C-8 in the Western Plaza (Guderjan 1991:41), and Norman's Temple group (Meadows 1998). Booher and colleagues (this volume) report Late Preclassic foundations for Courtyard D-1, east of the Main Plaza.

In the Terminal Preclassic period, the builders at the site cut through the floors of the Upper Plaza and into bedrock to construct Tomb 2 (Houk et al. 2010). Kelley et al. (2013) correlate the youngest floor cut through by the tomb with a 20-cm thick compact dirt surface that covers the southern and central portions of the plaza. The tomb itself measured 3.25 m long and 0.8 m wide. It was originally sealed by 12 large capstones. A low shrine platform covered the tomb and marked its location within the plaza until a final Late Classic construction episode buried it (Kelley et al. 2013). The tomb's occupant was interred with the trappings of an early Maya king, making Tomb 2 the oldest royal burial in the Belizean side of the Three Rivers adaptive region (Houk et al. 2010).

Although Early Classic architecture and discrete deposits continue to elude excavators, Guderjan (1991:45) found two broken Early Classic polychrome bowls in a looters' camp. It is possible that one of the construction phases exposed in looters' trenches in Structure A-15 and/or Structure A-21 is from the Early Classic period, but the CCAP has not yet excavated either structure to test that hypothesis.

It is clear that Chan Chich expanded greatly in the Late Classic period, and renovations to existing buildings and the construction of new buildings and features gave the site its final form ca. AD 700 or later. The architectural expansion included the final floors in the Upper Plaza and Main Plaza, where construction efforts completely buried older Late Preclassic features (Houk 1998, 2000; Kelley et al. 2013), and the final phase of the ball court (Ford 1998). Burial CC-B11 dates the penultimate phase of Structure A-1 to the Late Classic

period (see Novotny et al., this volume). The Western Plaza and Norman's Temple group were both expanded during the Late Classic period (Ford and Rush 2000), and Richard Meadows and Kristen Hartnett (2000) found that the Group H lithic workshops date to the Late Classic period, as well. The two *sacbeob*, which both represent single-phase constructions (see Booher et al., this volume), are Late Classic features. Courtyard D-1 underwent significant renovations and a possible change in function during the Late Classic period following the construction of the Eastern Causeway (Booher et al., this volume).

The site apparently went into decline during the Terminal Classic period around AD 800 before being abandoned around AD 850. Construction at the site at the end of the Late Classic was of noticeably inferior quality. At Structure A-5, the final phase of the southern stairs included robbed vault stones in the construction (Herndon et al. 2013), and the Terminal Classic occupants of Structure C-6 in the Western Plaza built a crude wall using robbed vault stones (Harrison 2000). That same structure included a Terminal Classic burial of a single adult male beneath a bench in the room. He was buried with a black-slipped anthropomorphic bowl and two shell discs (Harrison 2000:83). Vazquez et al. (2014) report numerous robbed vault stones used in the walls of structures in the Back Plaza, as well. Occupation continued into the Terminal Classic period in the Back Plaza, based on materials found on the final floor of Structure A-23 (Vazquez et al. 2014), and at Courtyard D-1 (Booher et al., this volume).

Deposits of elite artifacts left broken on the steps to the range building in the Norman's Temple group and on the steps of the largest structure in the Western Plaza are Terminal Classic in age, likely deposited at or shortly after the time of the site's abandonment (Houk 2011). Even though Chan Chich fell into ruin at that point, Postclassic pilgrims made periodic visits to leave offerings, including an incense burner on the stairs to Structure A-5 (Herndon et al. 2013) and another on the top of Structure A-4 (Guderjan 1991:45). At Kaxil Uinic, pilgrims propped up half of the broken stela and placed offerings of *incensarios* around its base, during either the Late Postclassic period or Colonial period (Houk et al. 2013). Based on Bonorden's and Kilgore's (this volume) work at the historic Kaxil Uinic village, the project ceramicists designated a new Postclassic ceramic complex called Vireo (Figure 1.6). This is not, at this stage, a functionally complete complex (Lauren Sullivan, personal communication, 2015).

ORGANIZATION OF THIS VOLUME

In Chapter 2, Ashley Booher and colleagues report on the processional architecture study, which began in 2014 and wrapped up in 2015. They also describe work at Structure D-36, a mound selected for study by the project director in 2014. Chapter 3 and 4 describe BEAST's investigations of two colonial sites. In Chapter 3, Brooke Bonorden and Briana Smith present the results of work at Qualm Hill camp, and, in Chapter 4, Bonorden and Gertrude Kilgore describe the preliminary work at Kaxil Uinic village. Valorie Aquino and Houk present a preliminary attempt at Bayesian chronology building in the Upper Plaza in Chapter 5 and outline a sampling strategy to improve the model in future seasons. Following the 2015 season, the project exported four burials to Texas for analysis; Anna Novotony and colleagues report on those analyses in Chapter 6. Sarah Van Oss updates the lab procedures in Chapter 7. Finally, the volume includes updated project lists in Chapter 8.

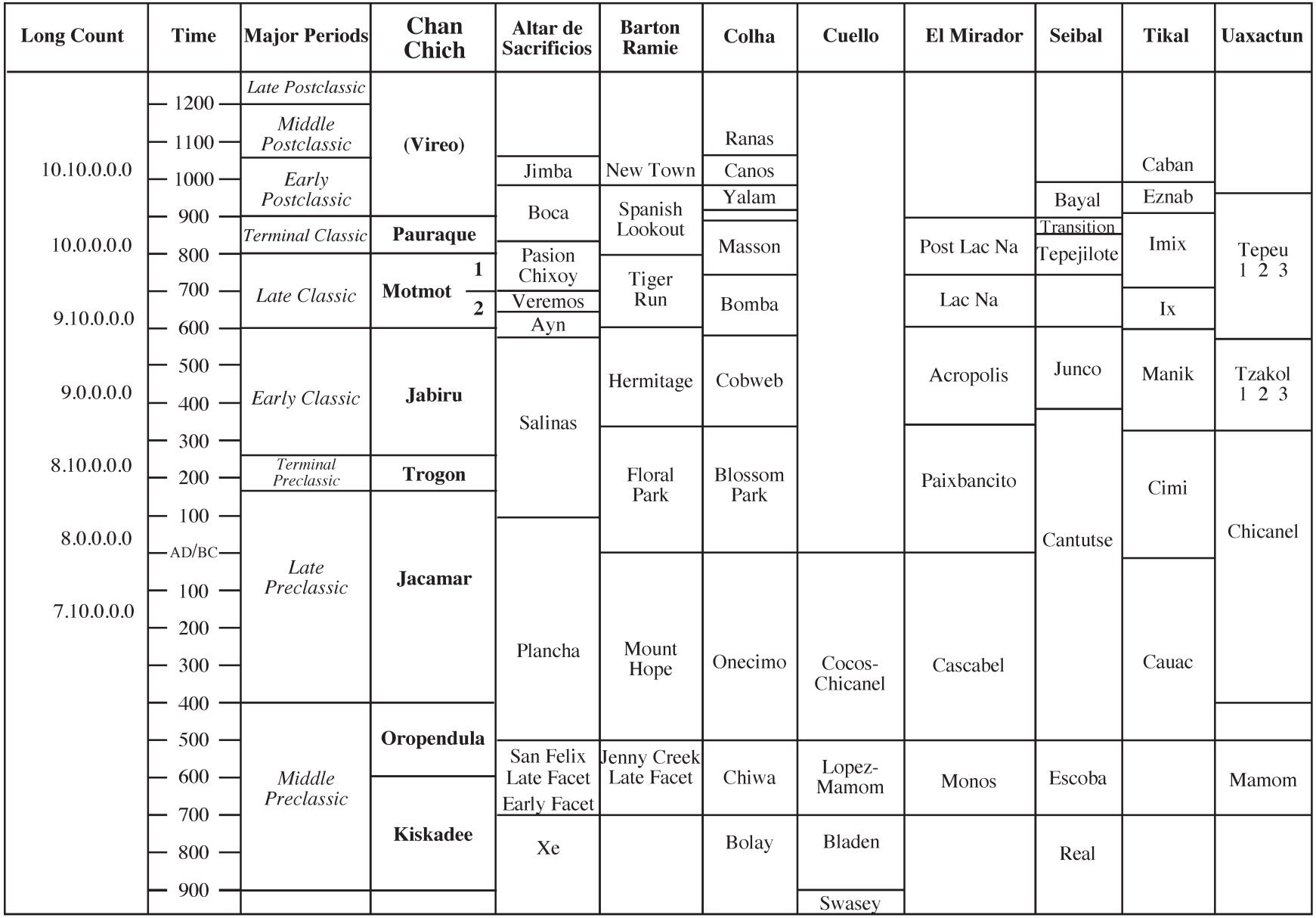

Figure 1.6. Chan Chich ceramic complexes and other ceramic sequences for the Maya lowlands (after Valdez and Sullivan 2014:Figure 9.1).

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Results of the Processional Architecture Excavations at Chan Chich

Ashley Booher, Alyssa Farmer, Paisley Palmer, and Valorie V. Aquino

The 2015 season of the Chan Chich Archaeological Project (CCAP) continued research conducted during the 2014 Chan Chich archaeological season (see Booher and Nettleton 2014). This two-year project investigating processional architecture conducted the first excavations of the site's Eastern and Western Causeways and associated buildings (Figure 2.1). The Eastern Causeway is approximately 435 m long, and the Western Causeway is approximately 380 m long, and both are 40 m wide. The two causeways converge in the Main Plaza in front of Structure A-1. The Eastern and Western Causeways each have a small terminus structure, Structures C-17 (west) and D-48 (east), located at their ends. The processional architecture research project endeavored to determine the form and construction history of the two causeways, to discern the possible functions the causeways through the placement of clearing units, to investigate the associated termini structures, and to study Courtyard D-1, which is adjacent to the Eastern Causeway. Ultimately, the investigations were designed to identify and collect artifacts associated with ritual processions.

SUMMARY OF 2014 INVESTIGATIONS

In 2014, the primary objective was to gather preliminary data on processional architecture that would guide the 2015 research design (see Booher and Nettleton 2014). The 2014 excavations addressed the construction phases, age, and architectural form of the causeways, and attempted to determine if there were any concentrations of artifacts along the edges of the causeways related to ritual processions. The 2014 excavations revealed several distinct differences between the Eastern and Western Causeways in terms of construction. The Western Causeway utilized parapets that were constructed from cut limestone blocks. The Eastern Causeway's margins were crudely built with unfaced stones stacked on top of one another to build coarse platform faces. The densities of artifacts collected were also not consistent between the Eastern and Western Causeways. During excavations, investigations on the Eastern Causeway encountered little to no artifacts, while there was an abundance of artifacts associated with the Western Causeway. The 2014 excavations did reveal that both causeways were elevated—although the Eastern Causeway is more elevated—and concluded that both causeways had only one surface, indicating only one construction event (Booher and Nettleton 2014:69).

Courtyard D-1 was not initially a part of the planned excavations but was excavated due to its close proximity to the Eastern Causeway. Guderjan (1991:44) first noted that Courtyard D-1, which he recorded as Structure 37, "clearly had a function related to the [Eastern] Causeway." Structure D-1 was targeted to gather preliminary data about the architecture

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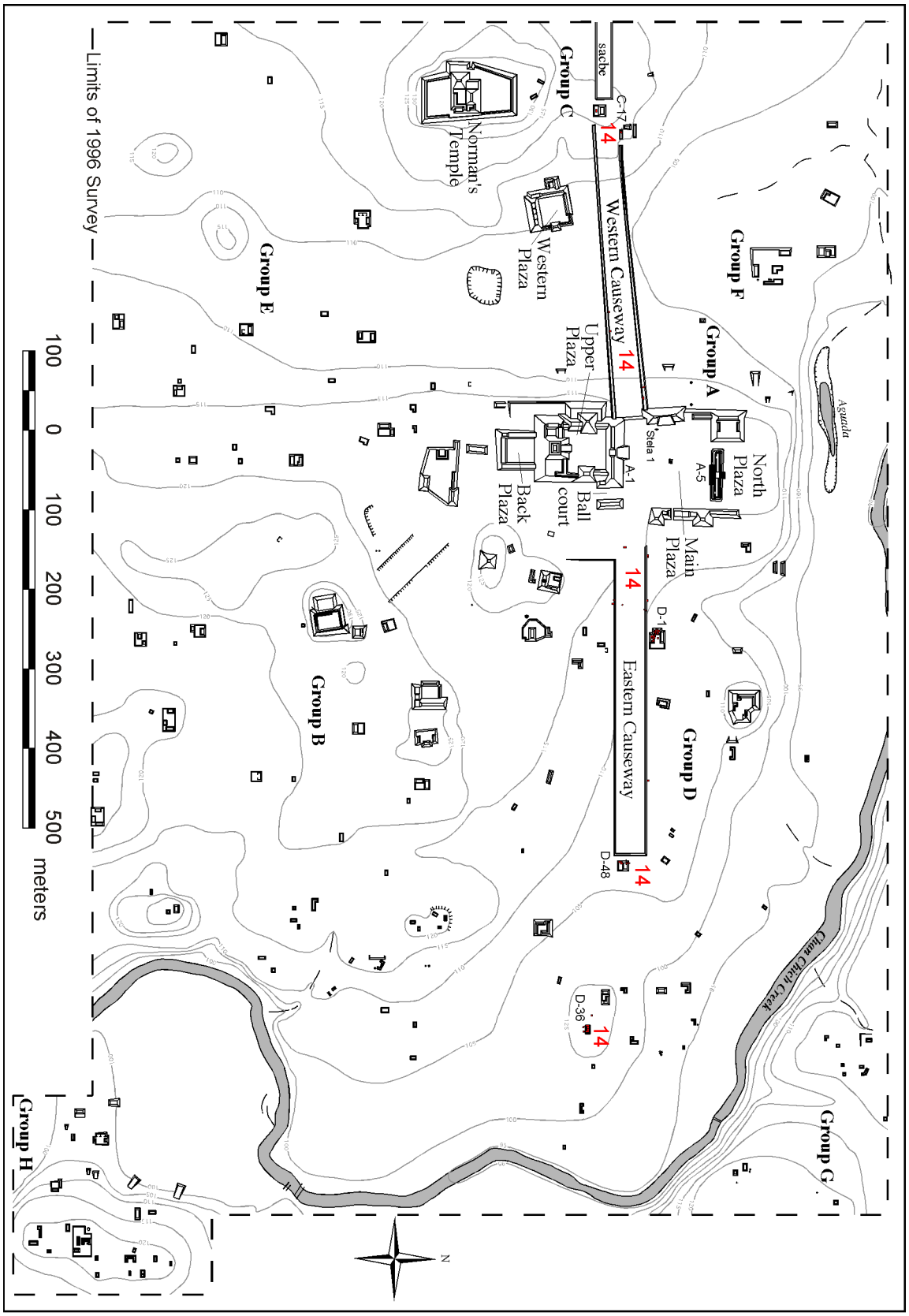

Figure 2.1. Map of Chan Chich showing the site core, two causeways, Courtyard D-1, and Structures C-17, D-48, and D-36. "14" refers to Operation CC-14.

of Courtyard D-1. Two construction phases were uncovered with earlier phases of the courtyard floors uncovered. The exterior eastern architecture of Structure D-1 consists of a low platform face that separates the courtyard surface from Structure D-1. Structure D-1 has a small patio located on the east side of the building that rolls up to the exterior wall of the building. To the west of the exterior wall is the interior floor. However, the interior room was not explored due to Burial CC-B12, which was encountered unexpectedly approximately 20 cm below ground surface. As discussed below, subsequent analysis and additional excavations have clarified our understanding of Burial CC-B12's age and context (see also Novotny et al., this volume).

One component of the processional architecture investigations was to excavate two possible shrine structures, Structures D-48 and C-17, located at the termini of the Eastern and Western Causeways, respectively. Due to time and unforeseeable weather conditions, Structure C-17 was not excavated. Structure D-48 was misidentified during the 2014 season, and Structure D-36 was excavated instead. Two suboperations were opened at Structure D-36, but, due to time constraints, the function and architecture of this structure were not defined. The 2015 season finished excavations at Structure D-36, and Structure D-48 was located and excavated.

The excavations conducted during the 2014 archaeological season raised multiple questions that guided our research design for 2015. Among these questions were the placement and nature of Burial CC-B12 and the interior architecture of Structure D-1. A platform face uncovered in Suboperation (Subop) CC-14-G that was presumably associated with Structure D-3 (see Booher and Nettleton 2014:74) further motivated our research design pertaining to the courtyard. Due to weather conditions and time constraints, we were unable to place any clearing units during the 2014 season or locate and excavate Structure C-17. We addressed these elements during the 2015 season.

RESEARCH DESIGN AND METHODOLOGY

The 2015 *sacbe* excavations took place over eight weeks from May 18 to July 15 and were carried out by students participating in two different field school sessions along with local workers from Chan Chich Lodge and local high school students. Project director Brett A. Houk and operation director Ashley Booher oversaw the excavations. Alyssa Farmer and Paisley Parmer served as suboperation directors during the first (May 18–June 15) and second sessions (June 15–July 10), respectively. Alyssa Farmer over saw the excavations conducted at Structure D-36, and Paisley Parmer over saw Subop CC-14-M at Structure C-17. Valorie Aquino oversaw excavations conducted at Structure C-18A during her 10-day stay (July 4–July 13).

The 2015 archaeological investigations culminated a two-year project that researched and explored processional architecture at the site of Chan Chich. The ultimate goal was to look at the role of ritual function within the development of urban planning at Chan Chich. Specifically, our research focused on the site's two causeways and related structures and the potential for artifact deposits pertaining to ritual processions. The 2015 research design expanded on the previous excavations and incorporated questions that were unanswered during the 2014 season. In 2015 we returned to Courtyard D-1 to continue excavations. Subop CC-14-F was revisited, and the interior of Structure D-1 was excavated. We also planned to determine the association between the platform face documented in Subop CC-14-G and Structure D-3. Lastly at Courtyard D-1, we proposed to place a test pit to obtain chronological data. The 2015 season also focused on the possi-

ble shrine structures: Structure D-48 located at the terminus of the Eastern Causeway and Structure C-17 located at the terminus of the Western Causeway. Both structures, which had been originally mapped in 1996 but not revisited since then, were re-located and excavated to determine if any artifacts collected on or near the structures were associated with ritual processions or activities. Structure C-18A was also tested due to its proximity to a cave and the Western Causeway.

Clearing units were also a part of the 2015 research design. Our methodology for the clearing units followed the work done by Angela Keller (2006) on the causeways at Xunantunich. Keller was successful in uncovering artifacts related to ritual processions along the margins of the causeways at Xunantunich. We proposed to excavate a minimum of two clearing units per causeway. Units were placed along the margins of the causeways in areas with the least overgrowth to collect any artifacts that would have been swept to the edges of the causeways following a procession.

The *sacbe* investigations were assigned Operation (Op) CC-14 during both seasons. All excavations conducted during the 2015 archaeological season followed the guidelines established in the *Chan Chich Archaeological Project Field Manual* (Houk and Zaro 2015). The senior author directed the placement of initial suboperations based on what was uncovered during the 2014 season or surface indications of potential architectural features. Crews screened the matrix from all clearing units to collect fragmented pieces of ceramics and other artifacts. Screening was also conducted on the patio surfaces of both Structure D-48 and Structure C-17. All artifacts collected were properly recorded and sent back to the lab for analysis and storage.

SUMMARY OF EXCAVATIONS

This section describes the suboperations opened over the course of the 2015 archaeological season. The excavations pertaining to Operation CC-14 focused on four distinct groupings: Courtyard D-1, at the causeway's termini structures (Structures D-48 and C-17, along with Structure C-18A), clearing units along the Eastern and Western Causeways, and Structure D-36. A total of 41 operations was opened over the span of 8 weeks.

Courtyard D-1

Preliminary excavations of Courtyard D-1 began during the 2014 archaeological season. In 2015, Structure D-1 was revisited, and the first excavations on Structure D-3 began. Courtyard D-1 is a small courtyard located to the north of the Eastern Causeway approximately 167 m east of the Main Plaza. The courtyard consists of three small buildings that share a common platform. The largest building, Structure D-1, is orientated north to south while Structures D-2 and D-3 are orientated east to west. The three structures all face a common courtyard that is opened to the east. Structure D-2 was unable to be excavated due to a large cedar tree growing from the summit of the building. A total of 19 suboperations was opened at Courtyard D-1 over the course of two seasons. Figure 2.2 shows the locations of each unit, and Table 2.1 presents the suboperations opened at each structure and corresponding lots with a brief description.

Structure D-1

Excavations that began in 2014 at Structure D-1 were expanded upon during the 2015 archaeological season. In total, excavators opened 10 suboperations: three in 2014 and seven this season. The excavations uncovered the main entrance into the building on the eastern side, exposed portions of a C-shaped bench, docu-

Figure 2.2. Location of suboperations at Courtyard D-1.

Table 2.1. Summary of Suboperations and Lots

Structure	Subop	Lot	Lot Description
Courtyard	K	01	Humus
		02	Floor
		03	Floor
		04	Bedrock
D-1	F	01	Humus
		02	Collapse Debris
		03	Burial CC-B12
		04	Backfill
		05	Construction Fill
		06	Bench
		07	Bench
	J	01	Humus
		02	Collapse Debris
		03	Ceramic Vessel
		04	Burial CC-B14
		05	Faunal Bone
		06	Floor Artifacts
		07	Interior Floor
		08	Wall/South Doorway Jamb
		09	Bench
		10	North Doorway Jamb
		11	Floor
		12	Construction Fill
	M	01	Humus
		02	Collapse Debris
		03	West Exterior Wall
		04	Terrace
	Q	01	Humus
		02	Collapse debris
		03	Construction Fill
		04	Surface
		05	Interior Floor
		06	East Exterior wall
		07	Wall
		08	Wall
	R	01	Humus
		02	Collapse Debris
		03	Exterior Surface

Table 2.1. (continued)

Structure	Subop	Lot	Lot Description
D-1 (cont)	T	01	Humus
		02	Collapse Debris
		03	Exterior Floor
		04	Step
		05	South Doorway Jamb
		06	North Doorway Jamb
	U	01	Humus
		02	Collapse Debris
		03	Bench
	Z	01	Humus
		02	Collapse Debris
		03	West Exterior Wall
D-3	L	01	Humus
		02	Collapse Debris
		03	Bench Surface
		04	Platform Face
		05	Exterior Surface
	O	01	Humus
		02	Collapse Debris
		03	Bench Surface
		04	South Exterior Wall
	S	01	Humus
		02	Collapse Debris
		03	Bench Surface
		04	South Exterior Wall
		05	West Exterior wall
		06	Artifact Deposit
		07	Exterior Floor
		08	Exterior Floor
	V	01	Humus
		02	Collapse Debris
		03	Artifact Deposit
		04	West Exterior Wall
		05	Exterior Surface
		06	Construction Fill
		07	Platform Face
		08	Exterior Floor
		09	Platform Face

Table 2.1. (continued)

Structure	Subop	Lot	Lot Description
D-3 (cont)	W	01	Humus
		02	Collapse Debris
		03	Floor
		04	East Exterior Wall
		05	North Exterior Wall
		06	Interior Wall
		07	Exterior Surface
		08	Collapse Debris
		09	Interior Floor
		10	Interior Floor
		11	Bench
		12	West Doorway Jamb
		13	Interior Step
	AA	01	Humus
		02	Collapse Debris
		03	Interior Floor
		04	Exterior East Wall
		05	Interior Wall
		06	South Exterior Wall
	AB	01	Humus
		02	Collapse Debris
		03	Artifact Deposit
		04	Exterior Floor Surface
		05	North Exterior Wall
		06	Interior Floor
		07	West Doorway Jamb
		08	Exterior Step

mented evidence of several renovations to the structure, and uncovered two burials (Figure 2.3). Preservation ranged from good (on sections of the eastern wall, interior floor, and patio floor) to extremely poor (on the southern end, western side, and bench surfaces). Table 2.2 depicts the suboperations and corresponding architecture opened at Structure D-1.

During the 2014 season Burial CC-B12 was discovered in Subop CC-14-F, which prevented any further excavations into the building's interior room. Consequently, we reopened Subop CC-14-F to continue excavations of the building's interior room and placed new excavation units based on the information gathered in 2014. Excavations also focused on exposing the 17-cm discrepancy between the exterior patio surface and the interior floor in the room of the building. Excavations began with removing the backfill from Subop CC-14-F and placing new suboperations on the summit of the building along with units on the east and west sides of the structure.

The excavations suggest Structure D-1's final form likely had a vaulted entrance, indicated by both the volume of collapse debris and the large amount of vault stones encountered in the collapse debris in and around the structure's doorway jambs and entrance, with the rest of the superstructure composed of perishable materials. Excavations further exposed the structure's eastern exterior wall (Lot CC-14-J-08) along with the north (Lot CC-14-J-08) and south (Lot CC-14-J-10) doorway jambs and entrance into the interior room. The southern doorway jamb (Lot CC-14-J-08) is associated with the east wall, which was preserved only one course high where it meets the bench (Lot CC-14-J-09). The face of the southern doorway jamb was preserved up to four courses and a height of 55 cm. The north doorway jamb (Lot CC-14-J-10) was visible only in profile, and its associated wall extends outside the limits of our excavations to the north. The two doorway jambs created a 1.35-m wide entryway into the building and would have supported a vaulted entry as noted above.

Found within the collapse debris of Subop CC-14-J were faunal long bones belonging to a deer along with three pieces of deer antler. Subop CC-14-T further exposed the structure's doorway jambs along with exposing a poorly preserved step (CC-14-T-04) that separated the interior floor (CC-14-J-07) from the

Figure 2.3. Overview orthophoto of Structure D-1 showing exposed architecture.

exterior patio surface (CC-14-T-03). This step accounted for the 17-cm discrepancy uncovered in 2014 between the interior and exterior surfaces (Figure 2.4). The patio surface in Lot CC-14-T-03 is well preserved, which is similar to the condition of the patio surface uncovered in Lot CC-14-D-06 in 2014.

Excavations exposed the west side of Structure D-1 and revealed that the west side of the structure's platform was terraced. Subops CC-14-M and -Z exposed the poorly preserved west exterior wall. The wall (Lots CC-14-M/Z-03) is 1.12 cm thick and is partially collapsed down the western face of the mound. Beneath the wall is a terrace face that would have rolled down onto another lower face, however the lower face was located just west of the limits of our unit.

Table 2.2. Lots by Op CC-14 Subops with Corresponding Architecture and Ages on Structure D-1

Context	F	J	M	Q	R	T	U	Z	Age
Topsoil	01	01	01	01	01	01	01	01	Tepeu 2-3 (Late Classic to Terminal Classic)
Collapse									
Debris	02	02	02	02	02	02	02	02	Tepeu 2-3 (Late Classic to Terminal Classic)
Patio Surface						03			
Interior Floor		07		05					
East wall		08		06					
South Doorjamb		08				05			
North Doorjamb		10				06			
Step						04			
Bench	06	09					03		
West wall			03					03	

Located within the collapse debris of Lot CC-14-M-02 was a smooth, roughly spherical stone that resembles the shape of a cannon ball (Figure 2.5; Spec. # CC1166-01). The artifact measures 24 cm in diameter. This type of stone has been recorded at other sites across the Maya region; examples range from smaller balls, which closely resemble the one found at Chan Chich, to larger and less imperfect spherical balls found at the sites of Xunantunich and Calakmul. Smaller stone balls closer in size to the Chan Chich ball have been recorded at different sites throughout Belize and Guatemala such as Bajo Del Lago, Cahal Pech, Lamanai, and Kinal (Jaime Awe, personal communication, 2015; Farrior 2003) to name a few. These

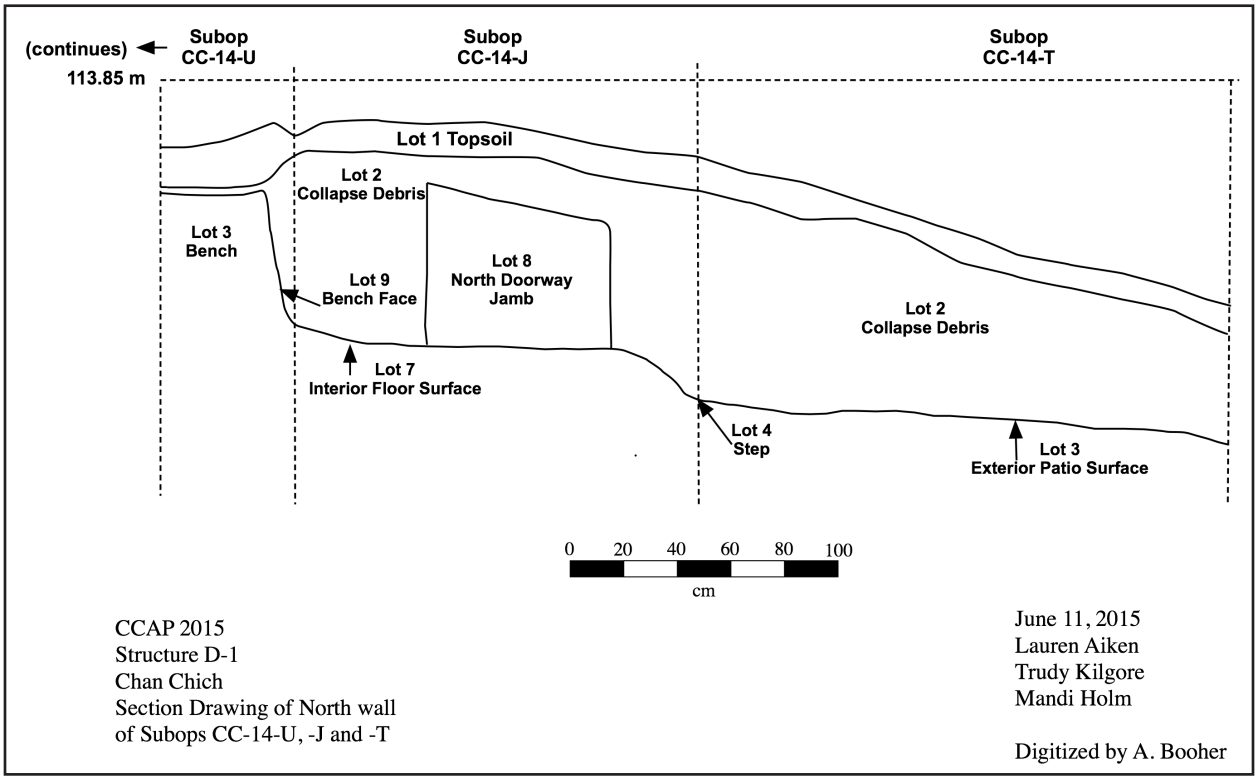

Figure 2.4. Cross-section drawing of the northern wall of Structure D-1.

Figure 2.5. Spherical stone ball from Structure D-1, *in situ* (Spec. # CC1166-01).

stone balls have been found in association with architectural groups such as the Tonina balls which Taube (1998) associates with hearth stones, or placed in small shrines as seen at Calakmul. Other, smaller stone balls have been found in close proximity to metates as seen at Lamanai and Caracol. The function of these stone balls is still unknown, and it is possible that there are several different functions given the varied locations where these stone balls are recorded.

Excavations atop Structure D-1 further exposed the interior room architecture and shed new light on Burial CC-B12. The interior floor (Lot CC-14-J-07) of Structure D-1 was well preserved and showed evidence of re-plastering. Because a bench takes up most of the floor plan of the central part of the building, the room contains very little useable floor space (see Figure 2.3). Located on the surface of the floor was a large, upturned metate fragment and fragments of a ceramic drum base (Figures 2.6 and 2.7; Spec. #s CC1125-01 and CC1134-01). The edges of the metate fragment had been chipped away but the middle remained smooth. Four sherds of a Middle Preclassic Mamom ceramic vessel were also found on the floor surface (Lot CC-14-J-06; Spec. # CC1138-01)

The interior floor rolled up onto the base of the bench from Lot CC-14-J-09. The architecture that was uncovered in Subops CC-14-F, -J, and -U revealed that the interior room of the building contained a poorly preserved C-shaped bench that would have rolled up onto the back exterior wall of the building, however the wall had completely collapsed away. The bench face was primarily located in Subop CC-14-J and is 60 cm in height. The face of the bench is poorly preserved, with only the base stones of the bench visible on the southern portion of the bench. The remainder of the bench is located in Subop CC-14-U and extends 1.44 to 1.64 m,

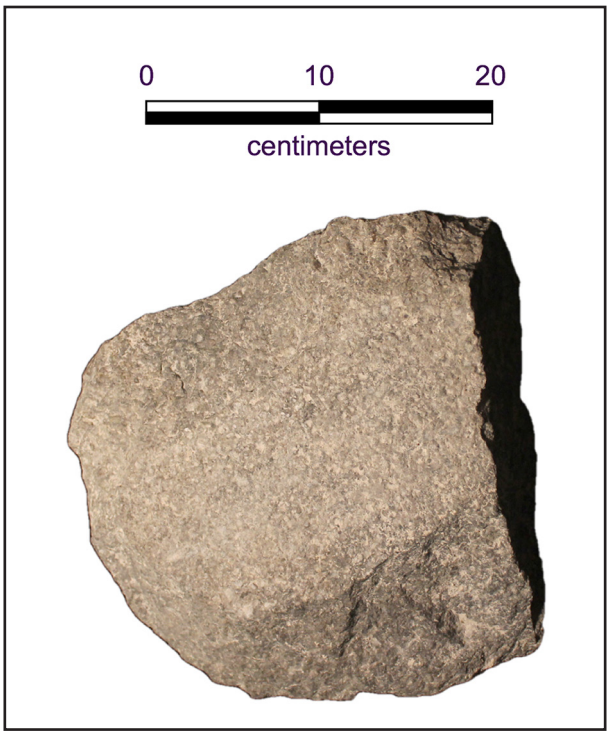

Figure 2.6. Metate fragment (Spec. # CC1125-01).

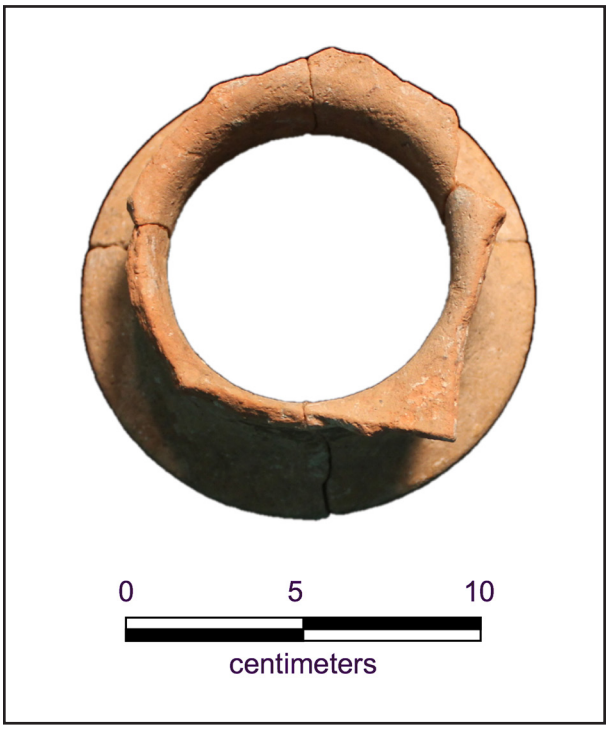

Figure 2.7. Base of the ceramic drum (Spec. # CC1134-01).

depending on preservation, to where the west exterior wall of the structure would be. The surface of the bench is poorly preserved due to the shallow nature of the bench. The northern portion of the bench lays outside the limits of our excavation unit, thus the exact north-to-south length of the bench is unknown. This bench was later expanded to the south, which is where Burial CC-B12 was located (see below). This later addition was partially excavated through in 2014 due to the location of Burial CC-B12.

The southern portion of Structure D-1 was excavated to determine the limits of the interior room, however time constraints limited the amount of excavations completed on the southern end of the structure. Excavations did reveal that at one point Structure D-1 had two entryways into the interior room of the building. Excavators followed the eastern exterior wall from 2014 and exposed the north doorway jamb (Lot CC-14-Q-06) for a second eastern facing doorway on the southern end of the structure; the doorway had been infilled at a later point in time, perhaps when the bench in the room was extended to the south (Figure 2.8). The western profile of Subop CC-14-Q contained pockets of construction fill that would have once been retained by an architectural feature. A poorly preserved plaster surface (CC-14-Q-04) was also exposed on the western edge of Subop CC-14-Q. It is possible that the plaster surface could be a part of the bench from Subops CC-14-F and -J due to the construction fill located in the south profile of Subop CC-14-F, although the interface between the architectural feature and the construction fill had completely eroded away.

Subop CC-14-R was opened adjacent to Subop CC-14-Q in an attempt to expose the southern limits of the structure. The south exterior surface (Lot CC-14-R-03) was exposed and was poorly preserved and eroded away in some areas. A large amount of ceramic sherds, shell, and bone (faunal and human) was collected

Figure 2.8. Orthophoto of southeast wall and infilled doorway jamb. View from west.

from the collapse debris (Lot CC-14-R-02) 1–3 cm above the floor surface. At least two vessels, one plate and the other a jar with a thick rim and punctation, were also collected within the collapse debris. While excavations did reveal the southern exterior surface and collected copious amounts of artifacts, excavators did not expose the southern wall of the structure due to poor preservation.

Burial CC-B12

Burial CC-B12 was excavated in 2014 and contained a single individual in an extended position. Initially Burial CC-B12 was thought to be an intrusive burial given its shallow depth and our initial interpretation that the structure had been completely infilled to create a platform to support a perishable superstructure (Booher and Nettleton 2014). At the time we proposed the occupants of the building had cut into the platform to bury this individual. The 2015 excavations revealed that the construction fill encountered around the individual was part of the bench uncovered in Lot CC-14-F-6. This new information indicates that the individual from Burial CC-B12 was actually buried inside the later addition to the bench (Lot CC-14-F-06) instead of cut into a platform and placed within the building.

Analysis of the burial in 2015 concluded that the individual was a male, and a radiocarbon date (Figure 2.9) of the bone dates his death to the Late Classic or Terminal Classic period. The uncalibrated radiocarbon age for Sample CC-14-S04 is 1220 ± 20 (UCAIMS-154712; bone; $\delta^{13}C$ = -10.5‰), and the calibrated age

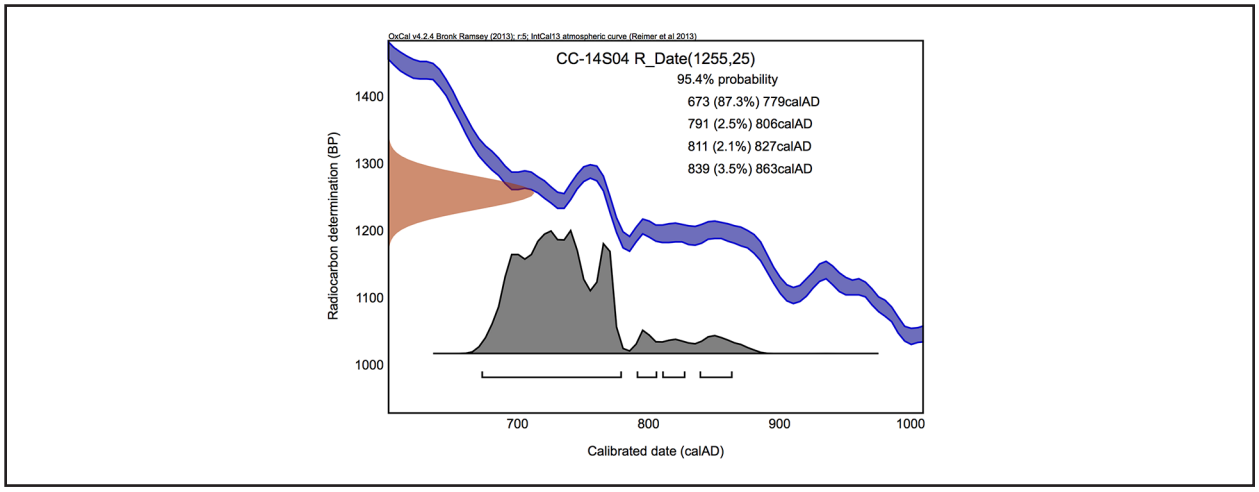

Figure 2.9. Calibrated ages for Sample CC-14-S04.

range is cal AD 713–885 (p = .954). As Figure 2.9 shows, the highest probable age for the sample, however, is cal AD 673 to 779 (p = .873). The single grave good was an Achote Black bowl (Spec. # CC0962-01) with post-firing graffiti—incised quadripartite designs—on two exterior sides and in the middle of the vessel's interior (Lauren Sullivan, personal communication, 2015). Excavators encountered the broken vessel in 2014, and we were unable to see the designs until the lab director pieced the bowl back together in 2015 as depicted in Figure 2.10. The radiocarbon date and Tepeu 2 ceramic type date the final phase of construction to the Late or Terminal Classic period. See Novotny and colleagues (this volume) for more discussion of Burial CC-B12.

Burial CC-B14

Excavators discovered Burial CC-B14 while excavating what was thought to be collapse debris. Once the burial was further exposed, we were able to determine that it was located within the bench exposed in Lot CC-14-J-09. Fig-

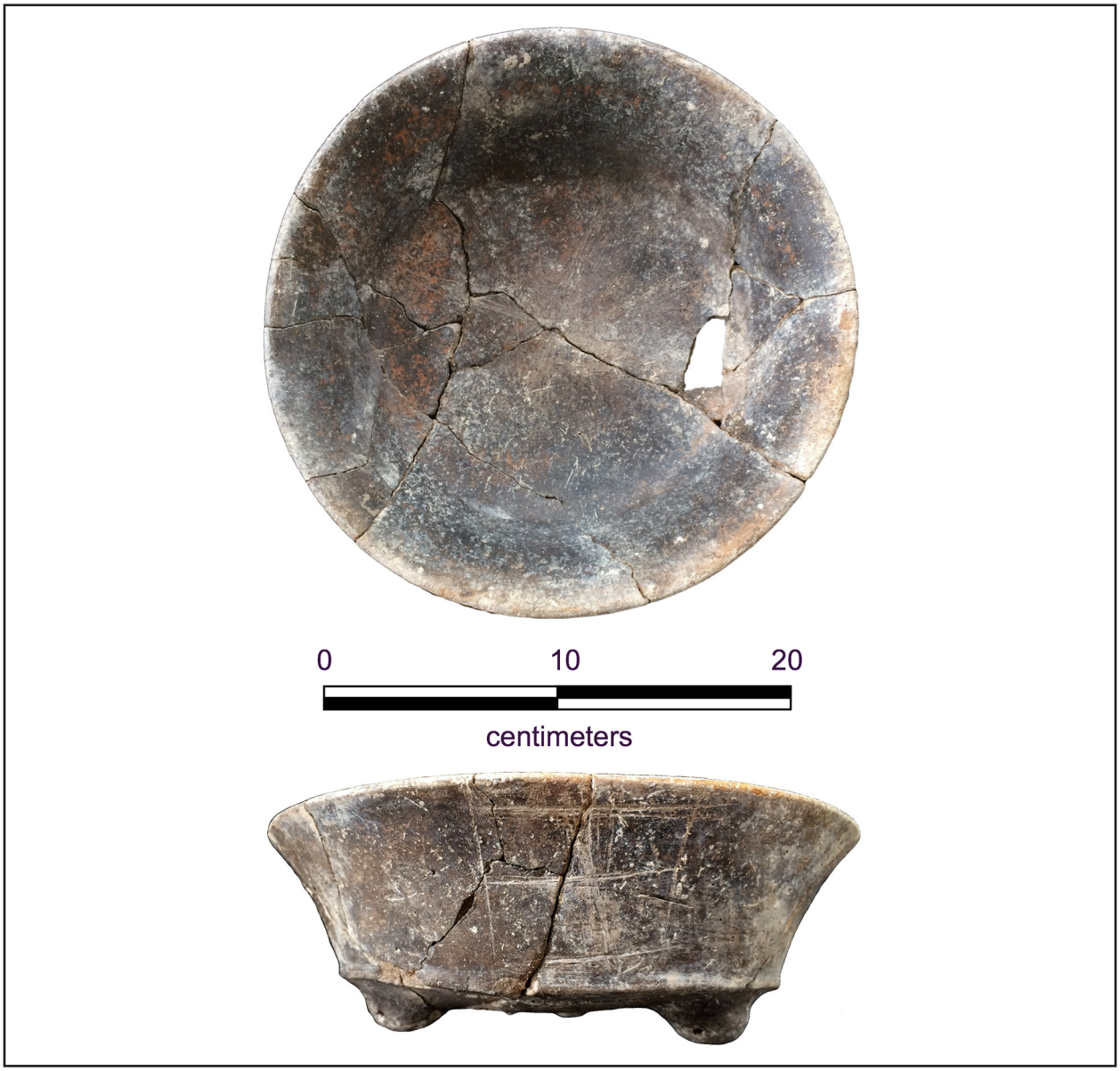

Figure 2.10. Photo of the Achote Black vessel from Burial CC-B12 (Spec. # CC0962-01).

ure 2.11 shows the location of Burial CC-B14 within Subop CC-14-J. Designated Burial CC-B14 and Lot CC-14-J-04, this feature contained a single female individual, interred in a seated position facing northwest. The body was orientated northwest to southeast, with the skull located northwest. The individual was placed on top of a plaster floor (Lot CC-14-J-11) that is 11 cm lower than the plaster floor in the room (Lot CC-14-J-07), suggesting the burial pit cut through the floor and stopped on an earlier floor surface. The burial itself had dry fill, small rocks, plaster, and limestone around the individual and measured 60 cm by 50 cm. The seated individual had her arms crossed over her chest, indicated by the location of the arm and hand bones. The individual's leg bones were in a vertical position and not fully complete. The feet were found articulated and not crossed. The bones were found in the correct anatom-

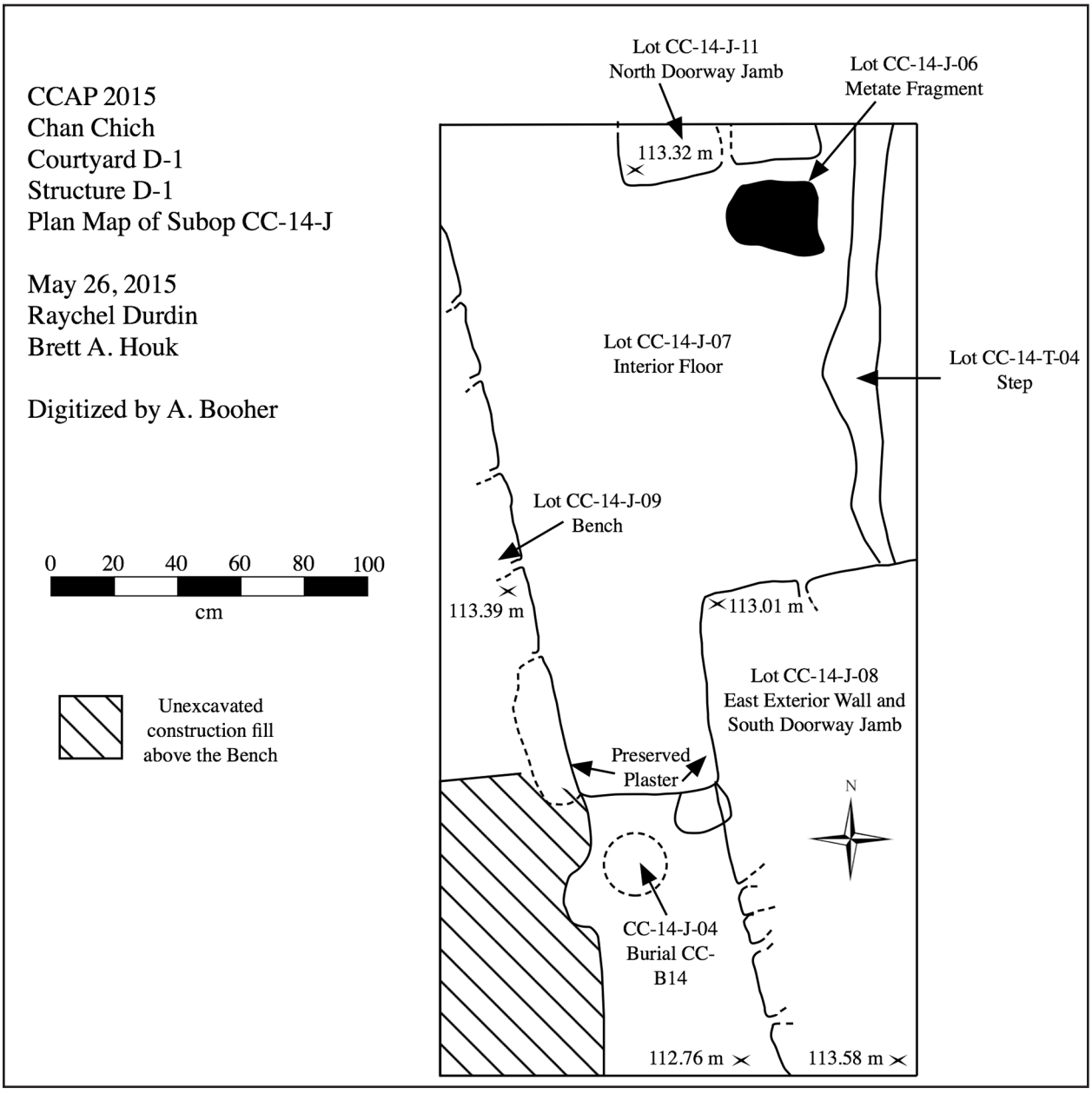

Figure 2.11. Plan Map of Subop CC-14-J with location of Burial CC-B14.

ical position, and the presence of small bones indicated this is the primary place of interment. The burial was remarkably well preserved with most of the long bones present. Figure 2.12 is a plan map of Burial CC-14-B and Figure 2.13 shows individual layers of exposed bones. The skull and pelvic girdle were in a relatively complete condition while *in situ*, but after the bones were mapped and then subsequently removed from the soil matrix the iliac blades deteriorated (Figure 2.14). A total of 276 pieces of bone was collected ranging from complete long bones to small, unidentifiable fragments. Twelve teeth were also recovered, with two still located in the sockets of the mandible and one in the maxilla. Of the teeth that were collected, the LC_1, LI_1 and RI_2 showed evidence of a B4 modification (Romero 1958), which Vera Teisler (2010:256) and Karl Mayer (1983:18) each identified as resembling the day name Ik' in the 260-day calendar. Mayer (1983) has proposed that the Ik'-shaped incisors were not intended as simple adornments but suggest a religious or esoteric significance. For a complete skeletal analysis of Burial CC-B14 see Novotny et al. (this volume).

Several grave goods were found in association with the burial. Deer antler (Spec. # CC1384-01) was found behind (southeast of) the skull, which could indicate that the individual was wearing a headdress when buried. Several ceramic sherds with a black slip were collected from throughout the burial. A small,

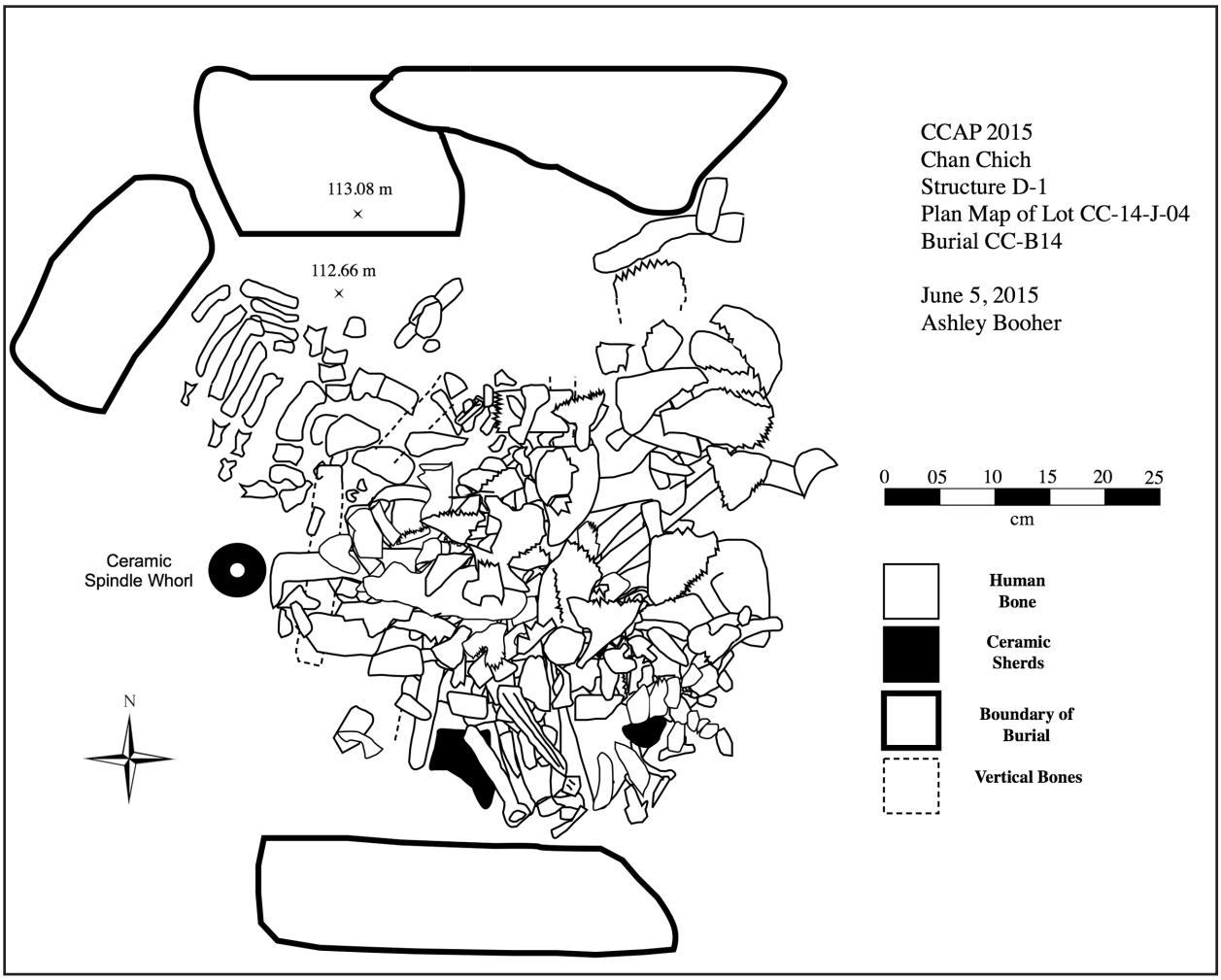

Figure 2.12. Plan Map of Burial CC-B14.

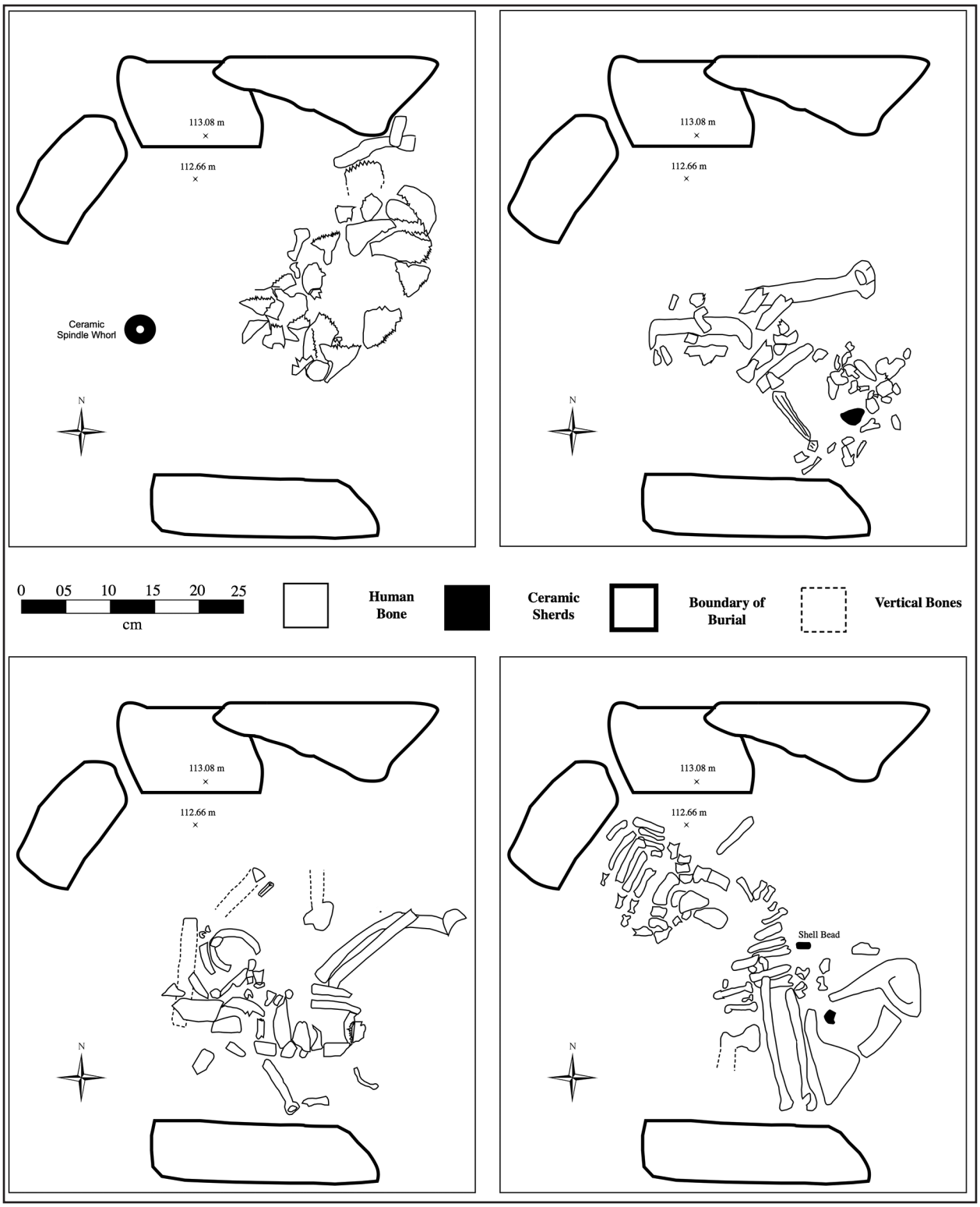

Figure 2.13. Plan Map of individual layers of excavated bones from Burial CC-B14. Top row, from left to right, are the first and third layers drawn during excavation. Bottom row, from left to right, are the fourth and sixth layers drawn during excavation.

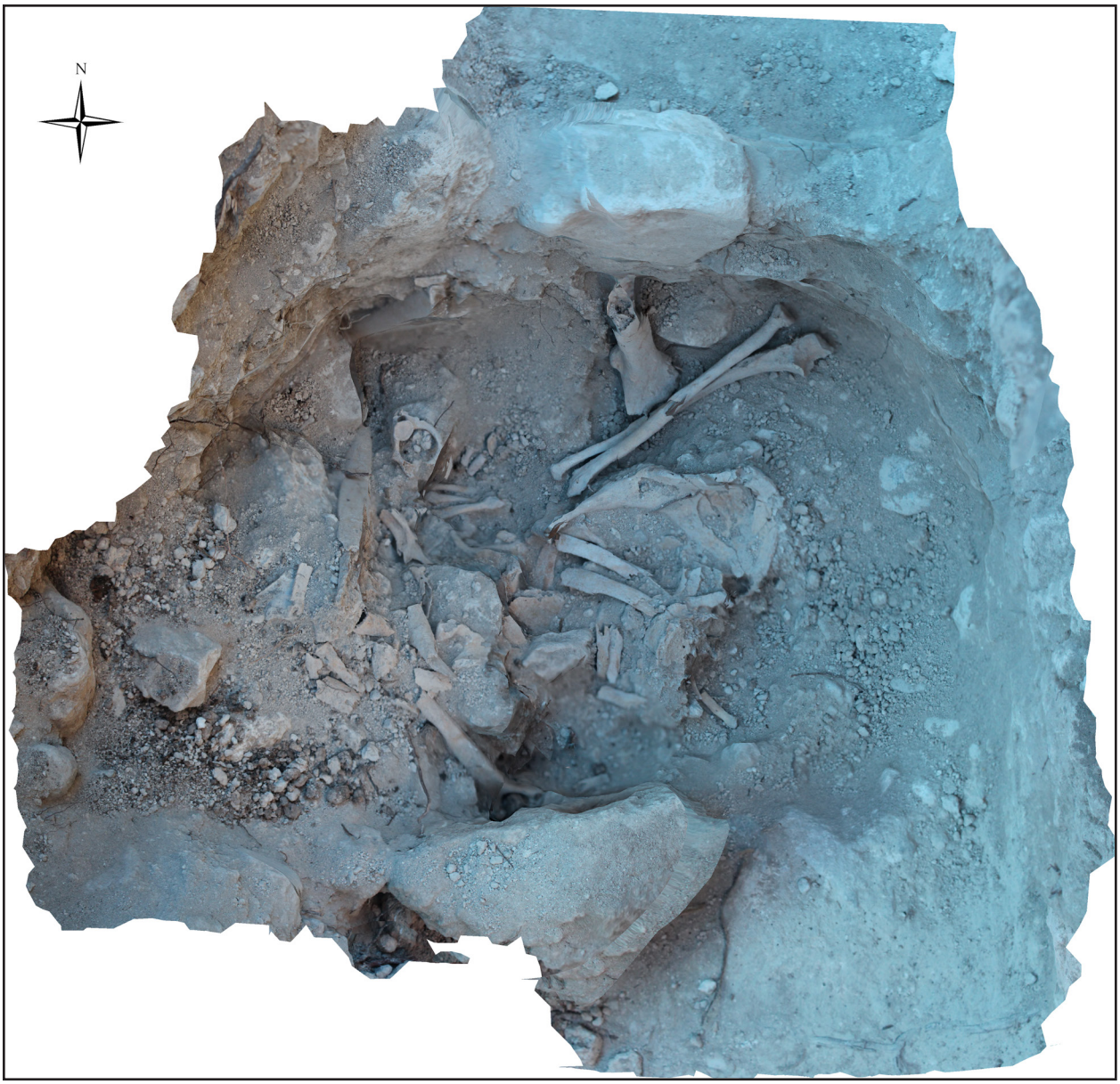

Figure 2.14. Orthophoto of pelvis *in situ* in Lot CC-14-J-04 (Burial CC-B14).

tubular red ceramic bead (Spec. # CC1379-01) was collected from beneath vertebrae and a spire-lopped *jute* shell (Spec. # 1401-01) was found near the left leg. The most notable grave good collected was a ceramic spindle whorl (Spec. # CC1375-01) with tan paste (Figure 2.15). An incised design presents the image of a bird on the less protruding face of the spindle whorl, while the opposing, steeper face displays a geometric design. On the image of the bird, the remains of blue and red pigments are present. The bird itself has a long beak and stylized wings that, along with the rest of the body, form to the circle of the spindle whole. Spindle whorls are not uncommon grave goods found in association with female burials, and may have been viewed has important tools for women in the afterlife. Spinning and weaving were primarily a craft specialization of women, and spindles could sometimes become imbued with the essence of their owner and therefore ritually destroyed upon death (Kamp et al.

Figure 2.15. Photo and illustration of the spindle whorl found in association with Burial CC-B14 (Spec. # CC1375-01), by Brett A. Houk.

2006). The combination of the B4 filing, the spindle whorl, and the location of the deer antler could suggest she was a ritual specialist, or at the very least an important spinner or craft specialist (Booher and Houk 2015). The ceramics collected from the burial date to the Late Classic (Tepeu 2) period.

Structure D-3

Structure D-3 was excavated for the first time this season. Structure D-3 is located on the southern side of Courtyard D-1 and is orientated east to west. The building faces the open courtyard and shares a common platform with Structure D-1. A total of eight suboperations was opened exposing two construction phases for Structure D-3 (Table 2.3). The final phase architecture of the structure consisted of a low platform with low masonry walls that would have supported a perishable structure. The building had two rooms, not equal in size, with the larger room containing a bench, and a single entrance on the north (Figure 2.16). Two dense artifact deposits were also discovered during excavations of Structure D-3.

The 2014 excavations revealed a platform face that was likely associated with Structure D-3 in Subop CC-14-G. Crews removed the backfill from the 2014 excavations and exposed this platform face in 2015; Subop CC-14-L was placed to the east to further expose the platform face. Excavations of Subops CC-14-L and -AF exposed the north facing platform face (Lots CC-14-L-04 and -AF-04) and associated exterior patio surface (Lots CC-14-L-05 and -AF-03). The platform face comprises two well-preserved courses of cut stones that extend west where it articulates with the platform face (Lot

Table 2.3. Lots by Op CC-14 Subop with Corresponding Architecture and Ages on Structure D-3

Context	L	O	S	V	W	AA	AB	AF	Age
Topsoil	01	01	01	01	01	01	01	01	Tepeu 2-3
Collapse Debris	02	02	02	02	02	02	02	02	Tepeu 2-3
North Exterior Surface	05		08	08			04	03	
North Platform face	04							04	
Earlier West Platform Face				07					
Later West Platform Face				09				05	
Earlier West Exterior Surface			08	08					Tepeu 2
Later West Exterior Surface			07	05					Tepeu 2
South Wall		04	04			06			
West Wall			05	04					
East Wall					04	04			
North Wall					05	05			
East Door Jamb					05		05		
West Door Jamb					12		07		
Exterior Step							08		
Bench			03						
Interior Floor					09/10	03	06		Tepeu 2
Interior Wall					06	05			
Interior Step					13				
Bench	03	03			11				

Figure 2.16. Orthophoto of Structure D-3 showing the exposed final architecture of the building. View to the southeast.

CC-14-AF-05) associated with Structure D-1. The eastern portion of the platform face was not exposed this year but presumably would have continued the entire length of the building. The associated exterior surface (Lots CC-14-L-05 and -AF-03) is well preserved. Located within the collapse debris (Lot CC-14-L-02) of Subop CC-14-L were several pieces of faunal bone that were found just above the exterior floor surface of Lot CC-14-L-05 and are likely associated with the faunal remains recovered from the 2014 excavations of Subop CC-14-G (see Booher and Nettleton 2014:73).

Subops CC-14-V and -S exposed the western exterior of Structure D-3 and identified two different construction phases. The earliest architecture discovered was a well-preserved exterior floor surface (Lots CC-14-V-08 and -S-08) that is associated with the west (Lots CC-14-V-04 and -S-05) and south exterior walls (Lots CC-14-O-04 and -S-04) of Structure D-3 and an earlier platform face (Lot CC-14-V-07) of Structure D-1. This exterior floor surface corresponds to the exterior surface uncovered in Lots CC-14-L-03 and -AF-03. The west wall (Lots CC-14-V-04 and -S-05) is four to five courses high depending on preservation and 60 cm thick. This wall extends to the south and meets the back (south) exterior wall (Lots CC-14-O-04 and -S-04) and forms the southwestern corner of the building. The wall also extends toward the north to align with the north facing platform face (Lot CC-14-L-04) to form the northwestern corner of the building. The south wall extended past the west wall and was four courses high, with the top course collapsing away. A construction event lengthened the north facing platform face (Lot CC-14-L-04) toward the west and created a new, higher exterior platform on the western side of the building. The new platform face (Lot CC-14-AF-04) articulated with the north/south platform face (Lot CC-14-AF-05) associated with Structure D-1 and was constructed on top of the original exterior surface of Lot CC-14-V-08. The original exterior floor (Lot CC-14-V-08) was covered in cobble fill, and a new exterior floor (Lots CC-14-V-05 and -S-07) was constructed. The platform associated with Structure D-1 was replaced with a later platform (Lot CC-14-V-09) that articulates with the platform discovered in Lot CC-14-AF-05. This new construction episode diminished the width of the western exterior surface by 20 cm and reduced the height of the west exterior wall from five courses to three courses.

The exterior surface of Lots CC-14-S-07 and -V-05 were heavily burned, indicated by the ashy, gray matrix the excavators encountered below the topsoil and collapse debris. Placed on top of the exterior surface and in front of the west wall was a dense artifact deposit (CC-14-S-06 and -V-03) as shown in Figure 2.17. Located above the artifact deposit in the collapse debris (CC-14-V-02) excavators collected obsidian, ground stone, *jute*, lithic tools, and faunal remains (Table 2.4). An *Oliva* shell bead was also collected that likely belonged to costume jewelry. The shell bead is a cylindrical barrel shell that narrows at one end where there is a perforation in the shell; this type of artifact is commonly called a shell tinkler (see Garber 1989).

The artifact deposit located below the collapse debris extended nearly the entire length of the west exterior wall, with a high concentration of the deposit located almost directly on the centerline of the west wall and toward the south. The deposit decreased in density to the north. Copious amounts of artifacts were collected from this deposit, including ground stone, smashed ceramic vessels, one piece of obsidian, and fire cracked rock (see Figure 2.17 and Table 2.5). Of the ceramic sherds that were collected from the deposit, 90 percent were from jars, 5 percent were from bowls or basins, and 5 percent belonged to a plate made from Belize Red. The most intriguing artifacts

Figure 2.17. Photo of artifact deposit located in Lots CC-14-S-06 and -V-03.

Table 2.4. Lot CC-14-V-02 Artifacts and Corresponding Catalog and Spec. #s

Artifact	Spec. #	#	Description
Metate	CC1406-01	1	Basin fragment
Lithic Tools	CC1408-01–07	7	Three bifaces, three unifaces, and one core
Ceramic Vessel	CC1443-01	1	Partial ceramic vessel piece
Shell	CC1501-01	12	Spire-lopped *jute*
Shell Tinkler	CC1584-01	1	Barrel cylindrical shell tinkler
Bone	CC1551-01	1	Faunal bone (large mammal, either deer or tapir)
Obsidian	CC1571-01	1	Blade

collected from this deposit were a West Indian chank shell and human long bones. The West Indian chank (*Turbinella angulate*) shell had the tip taken off and smoothed and was missing its outer lip (Figure 2.18). The artifact may have functioned as a trumpet given these intentional modifications. Out of the nine pieces of human bone collected, two were identifiable as the distal end and shaft of the humerus and the other as the shaft of a fibula. The remaining six bones are too shattered to accurately identify, but are fragmented long bones. For a more compressive description of the isolated bones, see Novotny et al. (this volume). As previously stated, the floor surface the artifact deposit was placed on had evidence of burning, however the artifacts themselves, aside from the fire-cracked rock and metate fragments, displayed no obvious signs of burning. This would suggest that the exterior floor was burned, either

Table 2.5. Artifacts collected from Lots CC-14-S-06 and -V-03

Artifact Type	Catalog-Spec #	Quantity	Discription
Ceramic Sherds	CC1330	141	
Debitage	CC1279	61	
West-Indian Chank	CC1312-01	1	2/3 of the shell's lip and the shell's tip removed
Obsidian	CC1277-01	1	Blade
Human Bone	NA	9	One humerus and one radius. Other seven bones fragmented
Metate	CC1278-01–04	24	Three metate basins, burned
Fire Cracked Rock	CC1276	6	
Ceramic Vessel (reconstructed)	CC1430-02	15	Dark red slipped serving plate
Ceramic Vessel (partial)	CC1430-01	2	Eroded red-slipped exterior with incised decoration
Biface	CC1425-01	1	Biface
Metate	CC1425-01–08	8	Granite basin form metate, burned

Figure 2.18. Photo of West Indian chank shell *in situ*.

intentionally or by accident, before most of the the artifacts were placed.

The northeast exterior superstructure is slightly different from the northwest. Unlike the northwest, the northeast exterior boasts an exterior

wall (Lot CC-14-AB-05). This wall is 2.11 m in length and 52 cm thick. The wall extends toward the east where it articulates with the east exterior wall (CC-14-W-04) forming the northeastern corner of the building. The wall is four to five courses high depending on preservation, with two distinct construction phases. The lower three courses of the wall are large, faced stones (Figure 2.19). In a separate construction phase, the wall extended upwards with another two courses that consisted of smaller, more irregular, cut stones. The wall extends toward the west and forms the structure's east doorway jamb and entrance into the building.

Directly to the north of the wall is the exterior surface (Lot CC-14-AB-04) that is the same exterior surface uncovered in Lot CC-14-L-03. Lying directly on top of the exterior surface was an artifact deposit (Lot CC-14-AB-03) similar to the deposit in Lots CC-14-S-06 and -V-03. The difference between the two artifact deposits is that the artifacts collected from Lot CC-14-AB-03 had evidence of burning, which is unlike those collected from Lots CC-14-S-06 and -V-03. Similarly, the associated exterior surface that the deposit was placed on had been burned as well, although not as severely as the surface from Lots CC-14-S-05 and V-04. The artifact deposit included ceramic sherds from three different vessels, faunal bone, and a thin laurel leaf biface (Table 2.6, Figures 2.20 and 2.21).

Structure D-3's entryway is 94 cm wide, framed by the northeast exterior wall forming the east doorway jamb (Lot CC-14-AB-05) and the west doorway jamb (Lot CC-14-AB-07). The east doorway jamb is four courses high and three courses thick (67 cm) and is associated with the northeast exterior wall. Unlike the east doorway jamb, the west doorway jamb (Lot

Figure 2.19. Orthophoto of Structure D-3, orientated north showing the northeast wall's two construction episodes.

Table 2.6. Artifacts Collected from Lot CC-14-AB-03

Artifacts	Spec. #	Quantity	Description
Partial Vessel Base	CC1435-01	2	Partial vessel base
Partial Ceramic Vessel Rim	CC1439-01	8	Partially reconstructed rim from a large red slipped jar
Partial Ceramic Vessel	CC1534-01	2	
Faunal Bone	CC1567-01	7	Large mammal (unknown). Six belong to a long bone (possibly femur) that refit
Thin Laural Leaf Biface	CC1380-01	1	Remnants of hafting material on proximal end

Figure 2.20. Artifact deposit from Lot CC-14-AB-03. Note the thin biface in the top center of the photograph.

CC-14-AB-07) is not attached to an exterior wall—it is only attached to the platform face since there is no exterior wall in the northwest section of the building—and is three courses high. Located to the north of the doorway jamb is an elevated surface (Lot CC-14-AB-06) that is 13 cm higher than the exterior surface in Lot CC-14-AB-04, thus creating a small step (CC-14-AB-08) up from the exterior surface to the interior surface of the building.

While excavating through collapse debris, excavators noticed several vault stones positioned near the structure's entrance and on top of the bench surface in the western room, although the structure does not appear to have supported a vaulted building. It is likely that the vault stones were robbed from other buildings and repurposed, as documented at the Back Plaza (Vasquez et al. 2014) and Structure A-5 (Herndon et al. 2013). Located in the collapse debris (Lot CC-14-AB-02) between the doorway jambs, excavators collected a fragmented burned mano (Spec # CC1435-01), an obsidian blade (Spec. # CC1719-01), and an *Oliva* shell tinkler (Spec. # CC1552-01).

Located directly inside the structure's entryway is one of the two interior rooms on Structure D-3. This room is the larger of the two, extending 5.4 m east to west and 4.5 m north to south. The room primarily consists of a C-shaped bench that extends south to the back wall of the structure. The bench face (Lot CC-14-W-11) comprises four courses of well-preserved cut stones with the top course of stone slightly outset, creating a lip that extends about 5 cm over the bench face (Figure 2.22). Benches with this type of overhang have not been previously recorded at Chan Chich. The bench surface continues westward into Subops CC-14-L and -O, which are largely composed of the

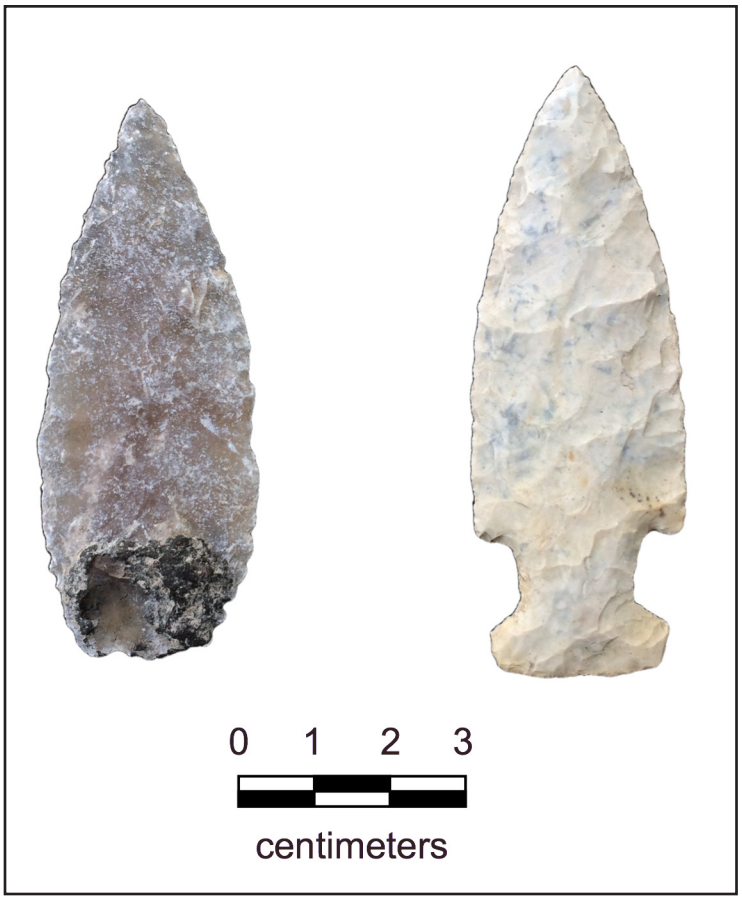

Figure 2.21. Thin biface (Spec. # CC1425-01) with asphaltum on base from Lot CC-14-AB-03 (left) and side-notched spear point (Spec. # CC1089-01) from Lot CC-14-L-02 (right).

bench surface (Lots CC-14-L-05 and -O-3). The overall preservation of the bench surface is variable, with the best preservation in Subop CC-14-W, directly over the stone facade of the bench. The bench surface begins to deteriorate to the south and is poorly preserved near the back wall of the room. Above the bench surface in the collapse debris (Lot CC-14-L-02 and –O-02), excavators collected three ground stone artifacts—two of which were later determined to be refitting pieces of a mano, approximately 120 *jute* shells (concentrated in the northwest area), a side-notched stemmed spear point (see Figure 2.21), approximately 11 sherds from a large ceramic vessel with incised decoration and brown slip, an obsidian blade fragment, two bifaces, and a shell tinkler (Table 2.7). The shell tinkler has a barrel form with perforation through the center.

The interior floor (Lots CC-14-AB-06 and -W-10) of the room is very small, but is well preserved. A cross-wall (Lots CC-14-W-06 and -AA-05) orientated north-south divides the larger room from the smaller room. The cross-wall is two courses high and two courses wide. The wall exhibited evidence of burning at the base, as did the interior floor along the edges of the wall. Excavations did not completely uncover the cross-wall, but presumably it would have extended south to the back wall.

The second, smaller room is accessed via the large room by a step (Lot CC-14-W-13) on the

Figure 2.22. Orthophoto of the bench from Lot CC-14-W-11 displaying the overhang. View to the south.

Table 2.7. Artifacts Collected from Lots CC-14-L-02 and CC-14-O-02

Lot CC-14-	Artifact	Spec. #	#	Description
L-02	*Jute*	CC111-01	98	Spire-lopped *Pachychilus* sp.; concentrated in NE portion of Subop
	Side-Notched Stemmed Point	CC1089-01	1	Fine grained with a white patina and gray veins of the raw material's color
	Plano-Convex Mano	CC1113-01	1	Evidence of wear on all faces.
	Square Mano	CC1102-01	2	Two pieces that refit back together
O-02	Ceramic Vessel	CC1127-01	11	Large partial vessel with brown paste and incised decoration.
	Shell Tinkler	CC1163-01	1	Small barrel formed tinkler with perforation through center
	Obsidian	CC1344-01	1	Blade
	Lithic Tools	CC14221-01–03	3	Two bifaces and one core
	Jute	CC1147-01	14	Spire-lopped *Pachychilus* sp.

east edge of the large room. Two cut stones form the one-course, 12-cm-high step. This step and along with the cross-wall (Lot CC-14-W-06) separate the two rooms. The interior floor of the smaller room (Lots CC-14-W-09 and -AA-03) is 20 cm higher than the interior floor of the larger room. The interior floor appears to have been burned in some areas, especially in areas along the walls defining the room. The floor extends to the east (Lots CC-14-W-04 and -AA-04) and south walls (Lot CC-14-AA-06), creating a 1.60-m (east to west) by 1.40-m (north to south) room. The east wall of the room is four to five courses high and articulates with the south wall forming the southeastern corner of the structure. The preservation of the east wall is variable; the north section is well preserved, but preservation gradually decreased to the south. The southeast portion of the wall is heavily burned. The south wall is equivalent to the wall in Subops CC-14-O and -S. The north face of the south wall had completely collapsed away; the wall core was the only remaining indication of the wall's location.

Excavations in Courtyard D-1

In an effort to collect chronological data for Courtyard D-1, a 2-x-2-m suboperation (Subop CC-14-K) was placed approximately in the center of Courtyard D-1. Excavations exposed three different construction phases and revealed that the courtyard was heavily modified throughout its occupation period (Figure 2.23). A large construction event, employing small boulders and large cobbles as fill, substantially raised the earliest courtyard surface from the original ground surface by 75 cm. Unfortunately, the excavators did not recognize this floor and they excavated through it; it was only noticeable in the profile. For that reason, the artifacts collected from below the floor were commingled with younger artifacts from above the floor, leading to large date ranges from the Middle Preclassic to the Terminal Classic period for the mixed lot. However, the ceramic assemblage collected in 2014 from Lot CC-14-D-10, which is the same floor, dates the earliest construction event to the Late Preclassic period. A second construction event during the Late Classic raised the courtyard surface another 12 cm. This surface (Lot CC-14-K-03) was highly eroded in most places. A final Late Classic renovation raised the surface an additional 28 cm, creating the final courtyard surface (Lot CC-14-K-02). The final courtyard surface corresponds to the exterior surfaces previously recorded in 2014 as well as the

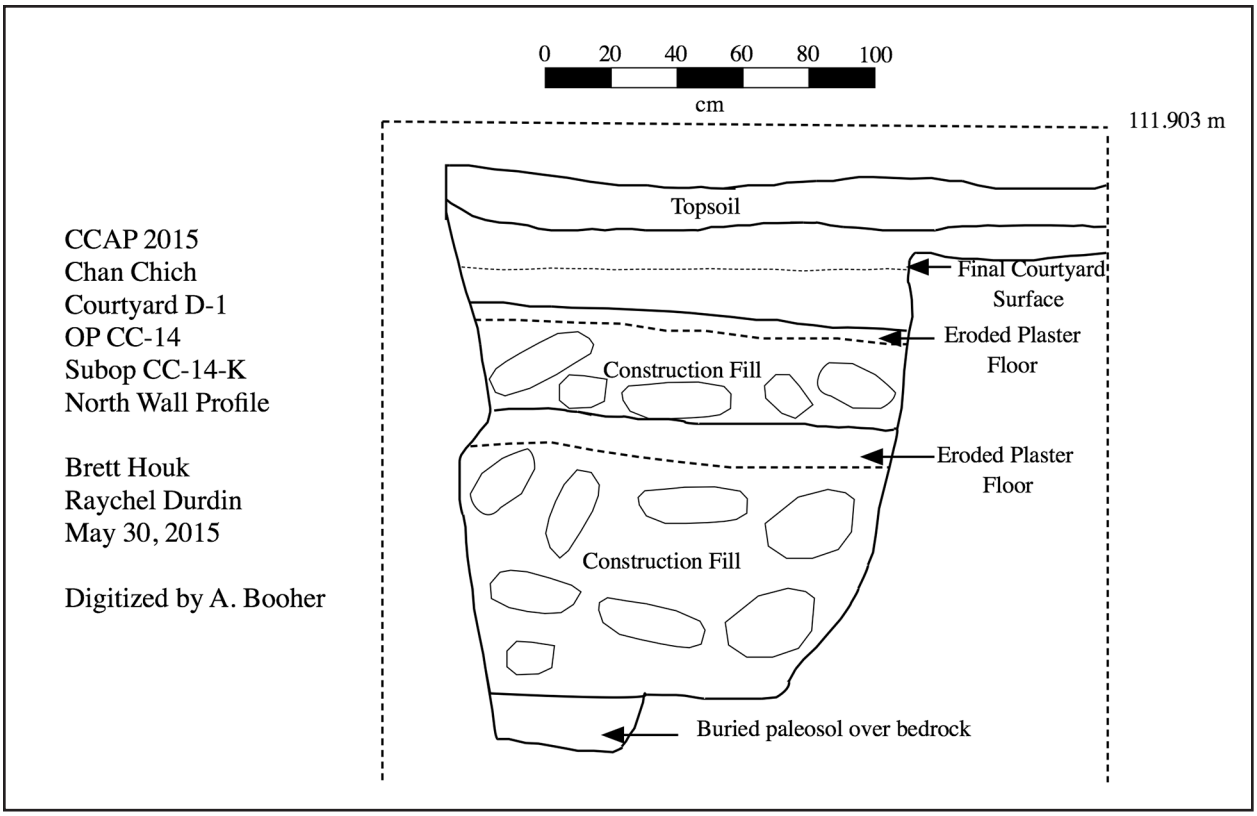

Figure 2.23. Profile of the north wall of Subop CC-14-K.

surfaces from Lots CC-14-L-05 and -AF-03 recorded this year.

Interpretations of Courtyard D-1

Courtyard D-1 was highly modified throughout its use and demonstrated evidence of occupation from the Late Preclassic period to the Late-to-Terminal Classic period. Structures D-1 and D-3 had evidence of at least two construction episodes with the final architectural form of both structures coinciding with the Late Classic period, with use into the Terminal Classic period. The final architectural form of Structure D-1 was uncovered over the course of two excavation seasons. Structure D-1 had a vaulted entryway with the remainder of the building comprising a perishable superstructure. A C-shaped bench with its subsequent extension to the south dominated the interior of Structure D-1. Two burials were uncovered in the bench, each containing one individual. The exterior of Structure D-1 had a series of steps and platforms representing different construction episodes, with the earliest step and associated patio structure dated to the Late Preclassic period that separated the exterior patio surface from the courtyard surface. The east exterior wall of the building had a footer at the base, and excavations on the back of the building determined the substructure was a terraced platform.

The final architectural form of Structure D-3 had a superstructure composed of a perishable materials with an exterior platform face separating the building from Structure D-1 and the courtyard surface. The interior comprised two rooms of unequal size, with the larger room primarily consisting of a bench. Structure D-3 had indications of heavy burning throughout the exterior and interior of the building.

The primary function of Courtyard D-1 was likely residential in nature given the architecture encountered and the burials discovered. It

is possible that the courtyard took on a second function during the Late Classic with the construction of the Eastern Causeway. The artifacts recovered from the courtyard, including the possible West Indian chank trumpet, a ceramic drum base, two thin bifaces, and several pieces of costume jewelry are items possibly utilized during processions, and all came from apparent Late-to-Terminal Classic contexts. The close proximity to the Eastern Causeway, the unusual apparent vaulted entrance to Structure D-1, and the artifacts possibly related to processions suggest that Courtyard D-1 was somehow related to ritual processions that presumably took place on the causeway.

Structures D-48, C-17, and C-18A

Structures D-48 and C-17 are located at the termini of the Eastern and Western Causeways, respectively, and we targeted them for excavation to determine if they were shrines related to ritual processions on the causeways. The two structures are similar in form, face south, and have patio structures extending off their southern faces. Structures D-48's and C-17's patio platforms were both excavated to bedrock to gather chronological data pertaining to construction episodes. Structure C-17 was unable to be excavated due to large trees encompassing the summit of the building, prohibiting any excavations of the structure. Excavations of Structure D-48 were not finished due to time constraints, thus limiting any definitive architectural conclusion of the structure itself. Table 2.8 presents the suboperations and corresponding lots with a brief description that were opened on the termini structures.

Structure D-48

Structure D-48 is located at the terminus of the Eastern Causeway and is approximately 450 m from the Main Plaza. Structure D-48 is approximately 16 m long and 9 m in width (Figure 2.24). The mound itself is relatively

Table 2.8. Suboperations and Lot Descriptions for Structures D-48 and C-17

	Subop	Lot	Description
Structure D-48	CC-14-AN	01	Humus
		02	Collapse Debris
		03	Patio Surface
		04	West Platform Face
		05	Construction Fill
		06	Exterior Surface
	CC-14-AP	01	Humus
		02	Collapse Debris
		03	Patio Surface
		04	Core Face
		05	Wall Backing
		06	Construction Fill
		07	Bedrock
	CC-14-AS	01	Humus
		02	Collapse Debris
		03	Patio Surface
		04	West Platform Face
		05	Exterior Surface
	CC-14-AR	01	Humus
		02	Collapse Debris
		03	Floor
	CC-14-ARx	01	Humus
		02	Construction Fill
	CC-14-AV	01	Humus
		02	Collapse Debris
		03	Platform Face
	CC-14-AW	01	Humus
		02	Collapse Debris
		03	Platform Face
Structure C-17	CC-14-AM	01	Humus
		02	Collapse Debris
		03	Patio Surface
		04	Platform Face
		05	Construction Fill
		06	Patio Surface
		07	Platform Face
		08	Artifact Concentration
		09	Bedrock
		10	Floor

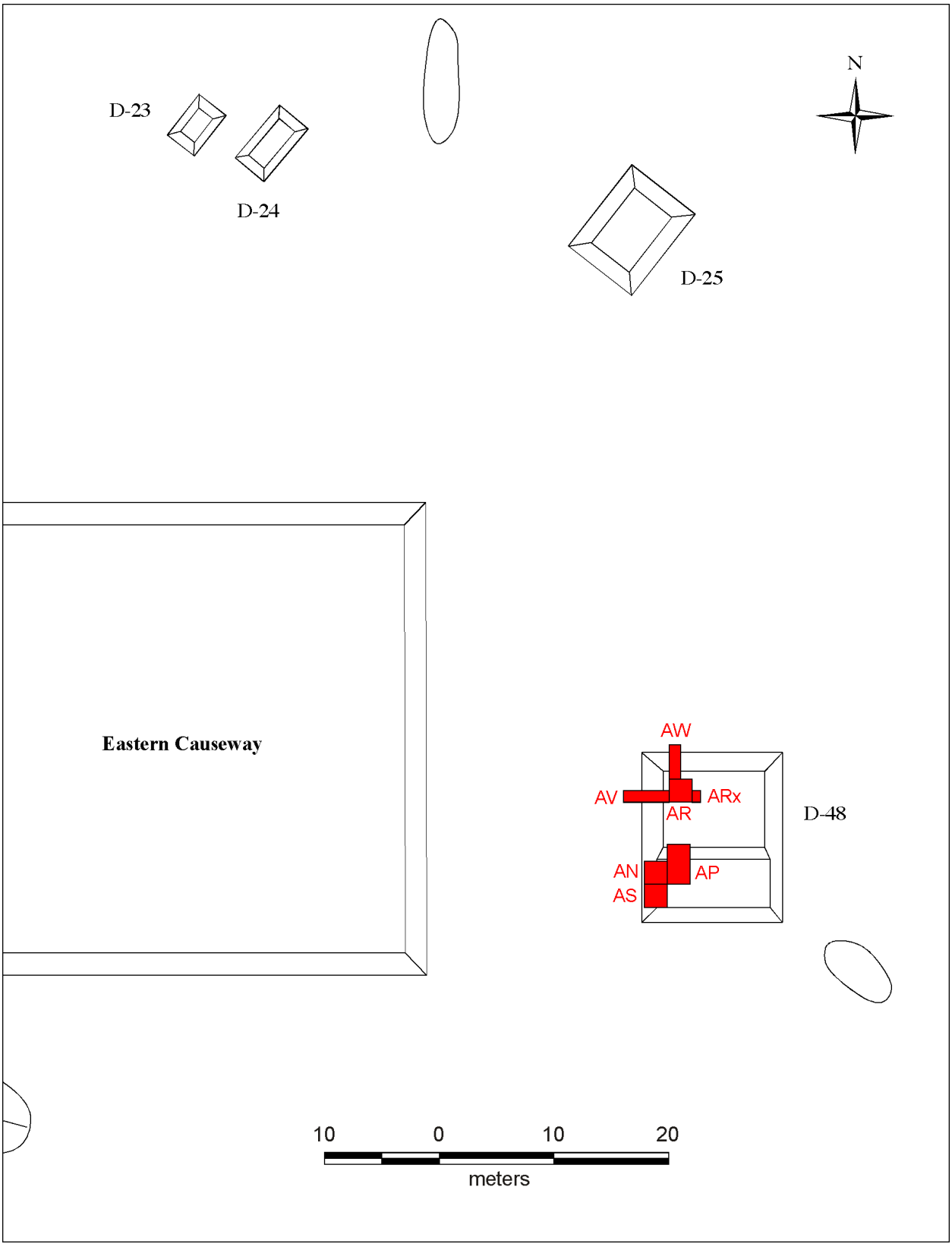

Figure 2.24. Map of Structure D-48 with suboperations.

low, especially compared to Structure C-17, measuring approximately 1.5 m in height. The adjacent patio structure is approximately 5 by 8 m. A total of six suboperations was opened on Structure D-48 (see Figure 2.24). Subops CC-14-AN and -AS targeted Structure D-48's patio structure to uncover any artifacts related to the patio's function. A third suboperation, Subop CC-14-AP, was opened on the patio surface that extended north onto the structure in an attempt to find the interface between the patio and the building. Three suboperations were opened on Structure D-48 to tie in the patio structure with the architecture of the building. Subop CC-14-AR was opened on the summit of the building, while Subops CC-14-AV and -AW were placed on the north and west side of the structure, respectively. Crews screened 50 percent of the matrix from the patio suboperations along with the topsoil for the suboperations placed on the structure.

Subops CC-14-AN and -AS were placed on the west edge of the patio, combining to create a 2-x-4-m long trench. The topsoil (Lots CC-14-AN-01 and -AS-01) and the collapse debris (Lots CC-14-AN-02 and -AS-02) directly below the topsoil of both suboperations yielded a substantially large amount of artifacts. Table 2.9 depicts the various artifacts collected from both units. The artifacts that were collected were on top of the final patio surface (Lots CC-14-AN-03 and -AS-03) and date to Tepeu 2 and 3. The final patio surface was completely deteriorated, with the subfloor fill being the only indication of the surface. The two units also encountered the west platform face (Lots CC-14-AN-04 and -AS-04) of the patio structure. The platform face is composed of two, crudely constructed courses of faced stones that are poorly preserved. Associated with the platform face is the exterior surface (Lots CC-14-AN-05 and -AS-05) on which the platform is sitting. Similar to the patio surface, the exterior surface was severely deteriorated with only sub-floor fill remaining (Figure 2.25).

Subop CC-14-AP was a 3.5-x-2-m unit placed adjacent to Subop CC-14-AN on the southeast corner and on the incline of the structure on the north. Subop CC-14-AP was opened to further expose the patio surface east of Subops C-14-AN and -AS and expose the interface between the patio and the building. The south portion of the unit exposed the patio surface. The topsoil (CC-14-AP-1) and collapse debris (CC-14-AP-02) contained a generous amount of artifacts including a thin leaf laurel biface (Spec. # CC1781-01), three fragmented pieces of obsidian, a fragmented mano and metate, and a flat, circular piece of jewelry (Spec. # CC1868-01) made from stone with a hole in the center that associated ceramics date to Tepeu 3. Unlike Subops CC-14-AN and -AS, the majority of the artifacts collected came from collapse debris (Lot CC-14-AP-02). The topsoil produced very few artifacts, however the amount of artifacts collected from Subop CC-14-AP pales in comparison to the large number of artifacts from Subops CC-14-AN and -AS.

Table 2.9. Artifact Counts for Subops CC-14-AN, CC-14-AP, and CC-14-AS

Lot	Description	Ceramic Sherds	Lithic Tools	Debitage	Obsidian Fragments	Ground Stone	Shell
CC-14-AN-01	Topsoil	1371	14	291	2	2	0
CC-14-AN-02	Collapse Debris	1861	18	169	0	5	1
CC-14-AP-01	Topsoil	137	1	21	2	0	0
CC-14-AP-02	Collapse Debris	855	5	203	1	3	0
CC-14-AS-01	Topsoil	675	2	86	0	2	0
CC-14-AS-01	Collapse Debris	958	12	87	0	2	0

Figure 2.25. Photo of Subops CC-14-AN and CC-14-AS depicting the platform face of the patio structure associated with Structure D-48.

The final patio surface (Lot CC-14-AP-03) was in similar condition to the patio surfaces from Subops CC-14-AN and -AS. The patio surface was followed toward the north until excavators came across a rock alignment (Lot CC-14-AP-04) that was orientated east to west and composed of very crude, faced stones. Given the location of this alignment on the mound, it was probable that this alignment was the interface between the structure and patio. However, given the rudimentary construction of the interface, the northeast portion of the alignment was excavated through after being mapped. Immediately behind the alignment was a second rock alignment (Lot CC-14-AP-05) that consisted of unfaced stones. This second rock alignment was orientated east to west, similar to the first rock alignment (CC-14-AP-04). Given the location of both rock alignments, excavators determined that the first rock alignment (Lot CC-14-AP-04) encountered was the face to the building's platform and the second rock alignment (Lot CC-14-AP-05) was the core face of the platform, following Loten's and Pendergast's (1984) terminology.

To obtain chronological data for the patio of Structure D-48, a 1-x-2-m sub-unit (Lot CC-14-AP-06) was excavated in the southern portion of Subop CC-14-AP. Lot CC-14-AP-06 excavated through the final patio surface to bedrock, which was 20 cm below the patio surface (Figure 2.26). No other surfaces were encountered, which denotes that the patio structure was built in one single construction event. The ceramics from this lot have not yet been analyzed, so the age of this construction is unknown but presumed to be Late Classic.

Subop CC-14-AR was placed on the summit of Structure D-48. Within the topsoil (Lot

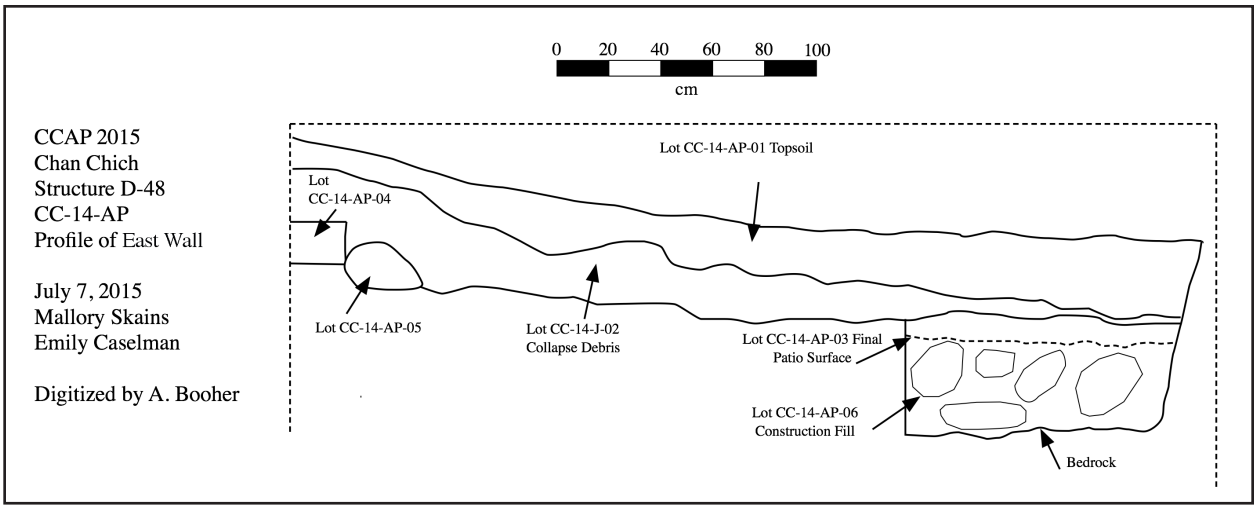

Figure 2.26. Profile Drawing of the east wall of Subop CC-14-AP.

CC-14-AR-01), fire cracked rock and burned limestone were observed. The final floor surface (CC-14-AR-03) of the structure was uncovered roughly 36 cm below topsoil. The floor encompassed the entire area of the suboperation. Located on the southeast edge of the unit, the floor appeared to roll upward onto what was assumed to be an architectural feature beyond the limits of the excavations. The operation director placed a 1-x-0.75-m extension (Subop CC-14-ARx) adjacent to the east edge of Subop C-14-AR to follow the floor and expose the architectural feature onto which the floor was rolling. Unfortunately, the architectural feature was not preserved, and due to time constraints we were unable to further explore this part of the structure.

Subops CC-14-AV and -AW were placed on the west and north face of Structure D-48 to simultaneously follow the final floor surface and to expose the final phase architecture. Subop CC-14-AV was a 1-x-4-m trench on the west face of Structure D-48. A poorly preserved platform face or step (Lot CC-14-AV-03) was uncovered at the base of the building. The platform or step is in poor condition, with only one stone remaining. Excavations were also able to determine that the floor uncovered in Lot CC-14-AR-03 continued into Subop CC-14-AV, however it was more poorly preserved the farther west it was followed. Similar results were encountered in Subop CC-14-AW, a 1-x-3-m trench on the north face of Structure D-48. A poorly preserved limestone platform face (CC-14-AW-03) was discovered at the north base of the structure. Excavations of the north and west facade of the structure did not uncover the exterior floor surface associated with the platform/step from Lots CC-14-AV-03 and -AW-03, nor did they determine if the west and north face of Structure D-48 were composed of a series of terraces or a platform face with low walls before the season came to an end. Likewise, excavators did not find any architecture in Subops CC-14-AV and -AW associated with the floor from CC-14-AR-03. Due to poor preservation and time constraints, no definitive architectural conclusions can be drawn from Structure D-48.

Structure C-17

Structure C-17 is located at the terminus of the Western Causeway approximately 400 m from the Main Plaza. Structure C-17 is approximately 16 m by 18 m and 2–3 m tall, much taller than Structure D-48 (Figure 2.27). Three large trees located on the summit of Structure C-17 prohibited any excavations of the architecture of the building. Consequently, only one subop-

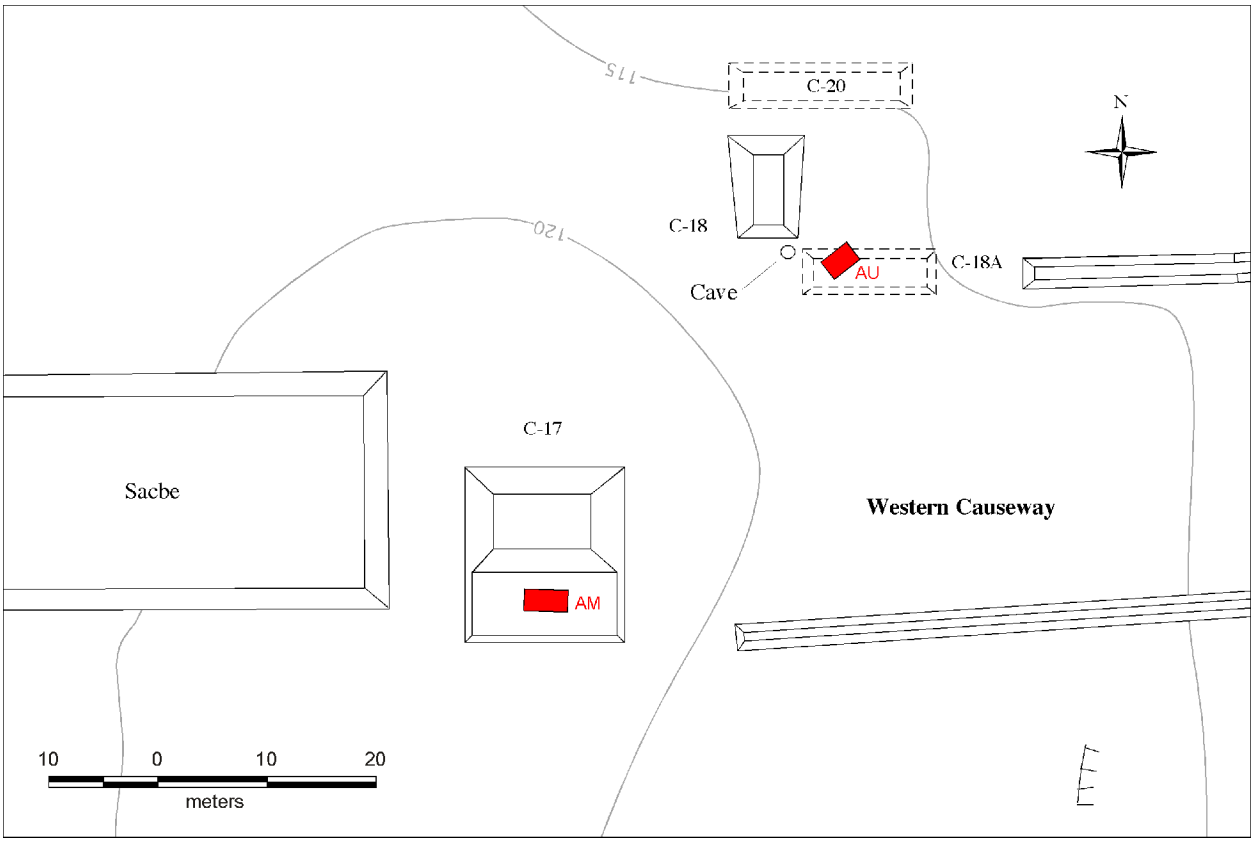

Figure 2.27. Map of Structures C-17, C-18, and C-18A with corresponding suboperations.

eration was opened at Structure C-17. Subop CC-14-AM was a 2-x-4-m unit placed in the middle of the patio structure and was excavated to bedrock to obtain chronological information. Excavations of the patio structure revealed two construction episodes. Figure 2.27 shows the suboperation opened at Structure C-17.

After excavating through 25–30 cm of collapse debris (Lot CC-14-AM-02) that contained copious amount of artifacts including seven lithic tools, three ground stone fragments, four pieces of obsidian, shell, and faunal remains (Table 2.10), two different rock alignments were exposed. The alignment (Lot CC-14-AM-07) located at the northeast edge of the suboperation is the earliest platform face and possible interface between the patio and Structure C-17. The platform face is one course of limestone rocks and is severely deteriorated. The platform is orientated east/west, with the

Table 2.10. Artifact Counts from Lot CC-14-AM-02

Artifact Type	Count	Description
Ceramic Sherds	976	Analysis pending
Lithic Tools	5	Three bifaces, one blade, and one core
Obsidian	5	All blade fragments; four concentrated in NE corner of the subop.
Debitage	183	
Ground Stone	3	One square fragmented mano and one rectangular fragmented mano
Shell	1	Spire-lopped *jute*
Faunal Bone	1	Unknown

northwest portion located outside the limits of the suboperation. A small 2-x-0.50-m extension (Subop CC-14-AMx) was placed adjacent to the northwest edge of Subop CC-14-AM to further expose the platform face. The platform face is sitting on top of the earliest patio surface (Lot CC-14-AM-06). The surface is well preserved with a small concentration of artifacts (Lot CC-14-AM-08) found in the southwest corner of the subop. The artifact deposit consisted of five ceramic sherds that appeared to be from the same vessel. Artifact analysis is still pending, preventing any accurate dating of the earlier architecture.

A second construction episode replaced the earlier platform face and raised the patio surface 20 cm as a new surface (Lot CC-14-AM-03) and platform face (Lot CC-14-AM-04) were constructed. To construct the new platform face, 40 cm of construction fill (CC-14-AM-05) was placed in front (south) of the earlier platform face, thus reducing the overall area of the patio. This later platform face is one course high and crudely constructed. The associated patio surface (Lot CC-14-AM-03) was entirely eroded away with only sub-floor fill remaining. The later patio surface and associated platform face would have been the final phase architecture of the patio to Structure C-17. As mentioned earlier, both platform faces were exposed simultaneously (Figure 2.28). To further expose the earlier phase architecture, the later platform face (Lot CC-14-AM-04) was mapped and subsequently removed.

To obtain chronological data a 2-x-1-m subunit (Lot CC-14-AM-09) located on the east end of the suboperation was excavated. Bedrock was 30 cm below Lot CC-14-AM-06, with no other floor surfaces encountered. The fill between bedrock and Lot CC-14-AM-06 con-

Figure 2.28. Photo of Subop CC-14-AM with both platform alignments partially exposed.

tained a large amount of ceramic sherds, which will aid in dating the earliest floor surface. Lot CC-14-AM-10 was placed in the middle of the unit toward the north edge to excavate what appeared to be a cut in the floor surface that had been infilled with small rocks and fill. Once the small rocks and fill were removed, excavators encountered bedrock 20 cm below Lot CC-14-AM-06 without finding anything of significance.

Interpretations of Structure D-48 and Structure C-17

Structure D-48 and C-17 share several commonalities between the patio structures associated with the building, however there are distinct differences between the two in terms of construction. Excavations and ceramic data revealed that Structure D-48 had only one construction phase during the Late Classic unlike Structure C-17, which had two construction events, with the earlier phase yet to be dated, and the final phase being contemporaneous with the presumed Late Classic construction of Structure D-48. Similarly, the final phase construction for both patio structures consisted of crude masonry platforms and deteriorated surfaces, partly due to the shallow nature of the final phase architecture. Both patio structures had copious amounts of artifacts associated with the final patio surface. Structure D-48 had virtually no collapse from the structure itself while Structure C-17 had approximately 25 cm of collapse debris above the final surface. The difference of collapse, or lack thereof, may be due to the heights of the buildings, how they were affected by overgrowth, and how they collapsed. Structure C-17 was much taller than Structure D-48, thus resulting in a large degree of collapse. Furthermore, the location of Subop CC-14-AM was close to the base of Structure C-17, while Subops CC-14-AN and -AS were placed farther away from the base of Structure D-48. Unfortunately, Structure C-17 was not excavated, and Structure D-48's architectural excavations were not completed, thus preventing any definitive comparisons or conclusions between the two.

Structures C-17 and D-48 had copious amounts of artifacts collected above and on the final patio surface. The ceramic assemblage collected from both Structure C-17 and D-48 date the final use of the patios on Structures C-17 and D-48 to the Late Classic, contemporaneous with the construction of the Eastern and Western Causeways. The analysis of the artifacts associated with the earlier phase architecture of Structure C-17 is still pending, thus preventing any definitive conclusions on date ranges for the earliest occupation period.

Structure C-18A

Structure C-18 was originally mapped as a low platform adjacent to the opening of the cave and located approximately 25 m east of Structure C-17 (Houk et al. 1996). For safety reasons, the project did not investigate the cave, but it has a circular, vertical opening that is approximately 2 m in diameter. The cave appears to extend to the south of the opening approximately 5 m, and the feature is roughly 5 m wide, as well. The ceiling of the cave is less than 1 m above the feature's floor.

Once the cave, platform, and surrounding area were cleared of debris and overgrowth, it was evident that other structures were present (see Figure 2.27). Aside from the platform adjacent to the cave, two other potential structures or features were found to be associated with the cave and subsequently labeled. Structure C-18A is a small structure orientated east to west and is located 2.5 m east of the cave and Structure C-18. It is possible that Structure C-18 is associated with Structure C-18A, but further excavations will need to be completed to determine that. Located to the northwest of the cave and Structure C-18 is an elongated, low mound orientated east to west. Labeled Structure C-20 as

of this season, it has yet to be mapped and further testing will need to be completed to determine its relation to the cave and surrounding structures as well as its function.

Originally, the platform adjacent to the cave was to be excavated to look for evidence of ritual use associated with the small cave, however the growth of a tree prevented any excavations of the platform, and Structure C-18A was assessed. Visual survey of the structure revealed possible alignments on the northeast facade prompting the placement of Subop CC-14-AU. Subop CC-14-AU was a 2-x-3-m unit placed on the summit and extending down the northeast face of the structure. While excavating through collapse debris (Lot CC-14-AU-02), excavators encountered a concentration of artifacts (Lot CC-14-AU-03) in one area and surrounded by rocks, but whether those rocks delineate the boundary of the deposit or are happenstance is unknown (Figure 2.29). The deposit consisted of numerous ceramic sherds from several different vessels that were broken in antiquity. Analysis of the ceramic sherds shows that 90 percent were jars and 10 percent belonged to bowls or basins. The ceramics and surrounding rocks had evidence of burning, however the soil lacked any signs of burning and charcoal. The lack of charcoal and burned soil indicates that the ceramics were burned elsewhere before being placed at Structure C-18A. Analysis of the ceramic deposit determined it dates to the Late Classic period (Tepeu 2), however this does not accurately date the building itself. The deposit was mapped and subsequently removed to continue excavations. To the west of the artifact deposit the final floor surface (Lot CC-14-AU-05) to the structure was uncovered. The floor is well preserved, and excavations discovered a complete mano (Spec. # CC1779-01) on its floor surface; the floor extended west

Figure 2.29. Artifact deposit discovered in Subop CC-14-AU.

outside the limits of the suboperation. The east portion of the floor was not preserved, but the profile of the subop indicates that the floor did not extend past the artifact deposit.

The final phase architecture of Structure C-18A was not fully exposed during this season, and further excavations will need to be completed to expose the final phase architecture and assess the function of the building. This season's excavations were able to reveal the final phase floor surface on the summit of the structure, however further excavations will need to be completed to determine the architecture of the northeast facade of the building. The age of the structure remains unknown, as well, because we did not conduct penetrating excavations.

Clearing Units

As a part of the processional architecture research project at Chan Chich, clearing units were placed along the causeways to look for artifacts associated with ritual processions. The clearing units were placed along the edges of the causeways where artifacts would be deposited after being swept off the causeways following a procession (see Keller 2006). Only the topsoil of the clearing units was excavated, but all of the matrix was screened through ¼-inch mesh. A total of nine clearing units was excavated along the Eastern and Western Causeway.

Eastern Causeway Clearing Units

Six clearing units were placed along the Eastern Causeway, with three (Subops CC-14-AE, -AG, and -AH) units located near the Main Plaza and three (Subops CC-14-N, -P, and -AL) located near Courtyard D-1. Originally the clearing unit size varied depending on access and vegetation, however we eventually used a standardized 2-x-2-m unit size. If the clearing unit produced significant artifacts, it was expanded to a 2-x-4-m unit. Figure 2.30 depicts the clearing units opened along the Eastern Causeway.

Subops CC-14-N, -P, and -AL

Subop C-14-N was a 2-x-3-m clearing unit located on the north side of the Eastern Causeway, directly west of Courtyard D-1. A few Tepeu 2 ceramics sherds and pieces of debitage were collected. Subop CC-14-P was a 2-x-3-m unit placed on the south edge of the Eastern Causeway. It yielded the same results as Subop CC-14-N. Subop CC-14-AL was placed on the north side of the Eastern Causeway, between Courtyard D-1 and Structure D-48. This suboperation generated a larger sample of ceramics; approximately 25 sherds from the topsoil were collected and correlated to the Tepeu 3 ceramic phase.

Subops CC-14-AE, -AH, and -AG.

Subop CC-14-AE was a 2-x-2-m clearing unit placed on the north side of the Eastern Causeway near the site's ball court and the Main Plaza. This suboperation yielded a larger amount of artifacts compared to the clearing units near Courtyard D-1. Approximately 90 ceramic sherds and 250 pieces of debitage were collected from the topsoil. Given the large amount of artifacts, Subop CC-14-AG was placed adjacent to the east edge of Subop CC-14-AE. Subop CC-14-AG was a mirror image to Subop CC-14-AE in terms of size, however the quantity of ceramic sherds was slightly less compared to Subop CC-14-AE. Approximately 40 ceramic sherds, 200 pieces of debitage, and an obsidian blade fragment were collected from the topsoil of Subop CC-14-AG. The ceramics from the two suboperations were a mix of Tepeu 2 and 3 types with the forms being consistent with jars and bowls.

A third clearing unit, Subop CC-14-AH, was placed south of Subops CC-14-AE and -AG, closer to the site's ball court. Unlike the previous clearing units that were placed along the edges of the Eastern Causeway, Subop CC-14-AH was placed on the Eastern Causeway itself. Subop CC-14-AH was a 2-x-2-m

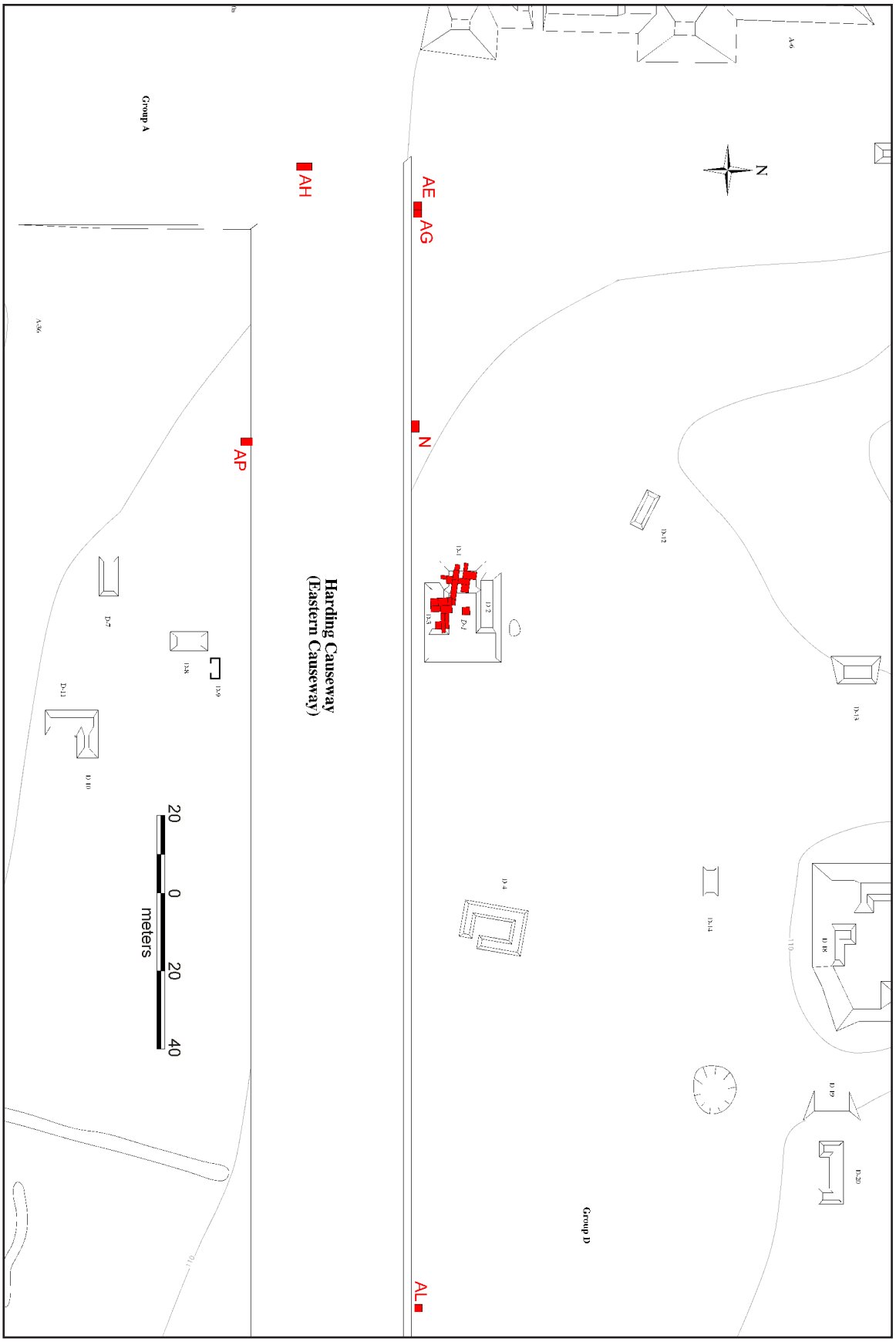

Figure 2.30. Map of the Eastern Causeways clearing units.

unit that was expanded to 2 x 4 m due to the large amount of artifacts that was encountered. Subop CC-14-AH was excavated to the final causeway surface with approximately 100 ceramic sherds and 200 pieces of debitage collected. Similar to Subops CC-14-AE and -AH, the ceramic assemblage was a mix between Tepeu 2 and 3 types.

Western Causeway Clearing Units

Subops CC-14-AO, -AQ, and -AT

Three clearing units were placed along the edges of the Western Causeways near the Main Plaza. Unlike the Eastern Causeway, the Western Causeway was constructed with parapets along the edges, requiring us to modify the original methodology of placing the clearing units along the edges of the causeway. The Western Causeway clearing units were placed inside the parapet's walls on the causeway itself and excavated to the final causeway surface. Figure 2.31 shows the location of the Western Causeway clearing units.

Subops CC-14-AO and -AQ were 2-x-2-m units placed on the south edge of the Western Causeway. Both suboperations produced very few artifacts, approximately 10–15 ceramic sherds. Subop CC-14-AT was placed closer to the Main Plaza, on the north side of the Western Causeway. It started as a 2-x-2-m unit that was expanded to at 2-x-4-m unit due the amount of artifacts that were collected. Approximately 50 ceramic sherds and pieces of debitage were collected above the final causeway surface. Ceramic analysis from the clearing units along the Western Causeway is still pending.

Interpretations of the Eastern and Western Causeways

The 2014 excavations of the Eastern and Western Causeways reveled the construction form of the causeways and determined that the causeways were built during one construction episode. The ceramic assemblage gathered from the 2014 season was analyzed, and dates the construction of the causeways to the Late Classic period with use into the Terminal Classic period. Additionally, the clearing units from this year's excavations produced artifacts that are consistent with the Late Classic and Terminal Classic date ranges. A test pit (Subop CC-14-B) placed on the Eastern Causeway in 2014 was excavated to bedrock to gather chronological data of the causeway. The topsoil (CC-14-B-01) provided dates consistent with Late Classic, however the construction fill used to elevate the Eastern Causeway produced ceramics that dated to the Late Preclassic and Early Classic periods. While the ceramic assemblage from the test pit shows discrepancies in date ranges, we are rather certain that the causeways date to the Late Classic period. Further testing of both causeways will need to be completed to further explain the date range discrepancy.

The Eastern and Western Causeways likely had several different functions. The clearing units placed along the causeways this season did not provide definitive conclusions as to whether or not the causeways were used for ritual processions. However, it would be an unfair assessment to completely rule out the possibility of processions taking place on the causeways. Further, extensive testing of the site's causeways will need to be completed to get a more comprehensive understanding of the function of the Eastern and Western Causeways.

Structure D-36

Structure D-36 is located within Group D and is approximately 575 m east of the Main Plaza. Structure D-36 is a small, south facing structure with an attached patio platform on the south face of the structure. Preliminary excavations of the structure and associated platform began in 2014, but yielded minimal data regarding the

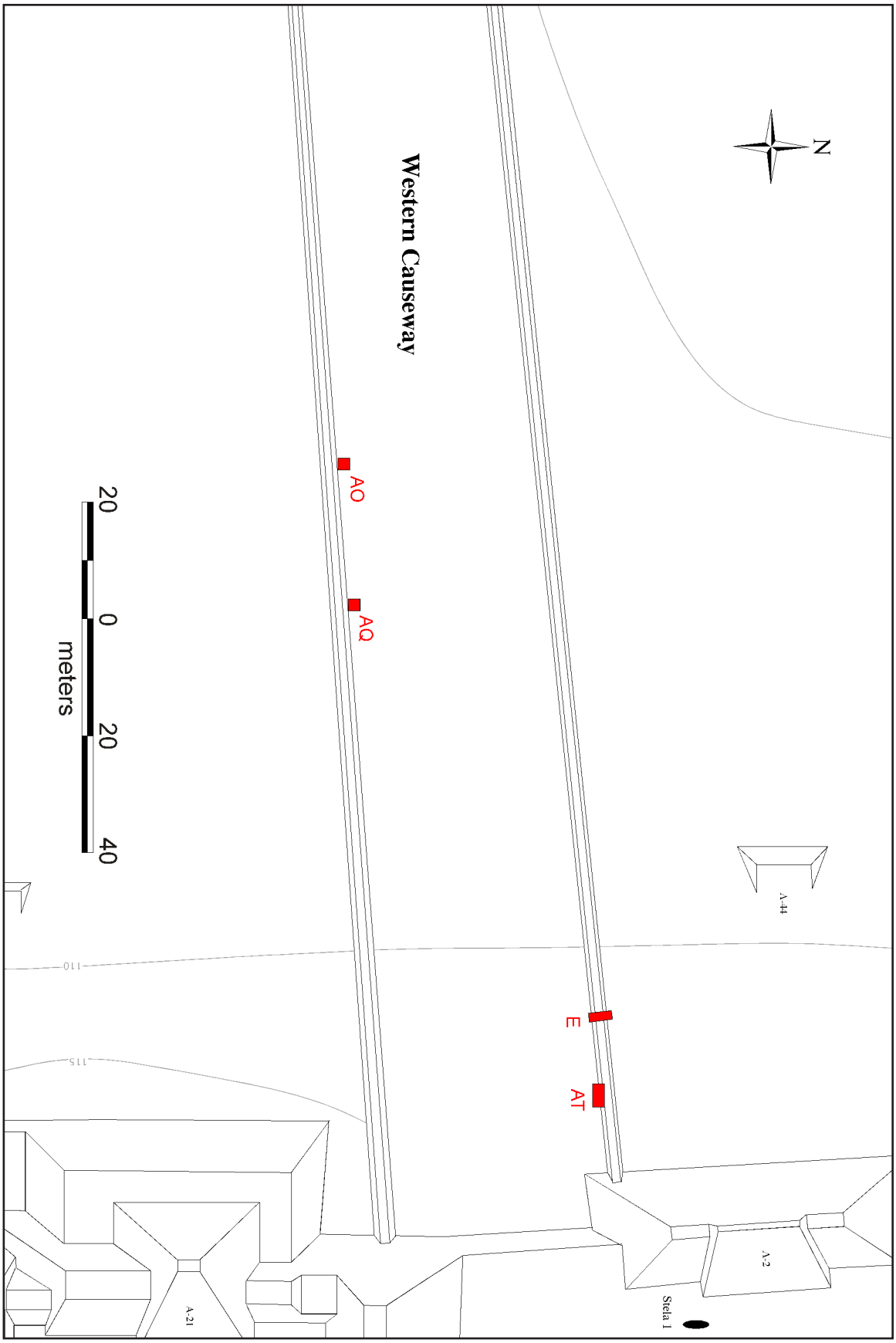

Figure 2.31. Map of the Western Causeway clearing units.

function or architecture of the structure. Two suboperations were opened in 2014, Subop CC-14-H located on the east end of the south face of the structure and Subop CC-14-I placed to the south of Subop CC-14-H on the platform (see Booher and Nettleton 2014). Subop CC-14-I exposed the final platform surface and contained a remarkably high concentration of material culture. Excavations of Subop CC-14-H were not completed before the end of the season, prompting us to reopen the unit in 2015 to continue excavations. Table 2.11 presents the suboperations and corresponding lots opened on Structure D-36.

Table 2.11. Suboperations and Lot Descriptions for Structure D-36

Suboperation	Lot	Description
CC-14-H	01	Humus
	02	Collapse Debris
	03	Exterior Floor Surface
	04	Step
	05	Step
	06	Collapse Debris
	07	Interior Floor
	08	South Exterior Wall
	09	Bench
CC-14-Hx	01	Humus
	02	Collapse Debris
	03	Exterior Floor
	04	Platform Face
	05	Interior Floor
	06	East Doorway Jamb
CC-14-X	01	Humus
	02	Collapse Debris
CC-14-Y	01	Humus
	02	Collapse
	03	Patio Surface
CC-14-AC	01	Humus
	02	Collapse Debris
	03	Exterior Surface
	04	Exterior Wall
	05	Surface

Table 2.11. (continued)

Suboperation	Lot	Description
CC-14-AD	01	Humus
	02	Collapse
	03	Exterior Floor
	04	South Exterior Wall
	05	Interior Wall
	06	Interior Floor
	07	Bench
	08	Platform Face
CC-14-AI	01	Humus
	02	Collapse Debris
	03	North Exterior Wall
CC-14-AJ	01	Humus
	02	Collapse Debris
	03	Exterior Floor
	04	South Exterior Wall
	05	West Exterior Wall
	06	Interior Floor
	07	Bench
	08	Platform Face

The 2015 season opened a total of eight suboperations at Structure D-36, including the reopening of Subop CC-14-H. Excavations revealed the final architectural form and indicated that the structure likely had vaulted entranceways, similar to Structure D-1, with the remaining superstructure composed of mid-height masonry walls that would have supported a perishable structure. The interior of the structure was composed of two rooms: the east room, referred to has Room A and the west room as Room B throughout the text. Each room contained a C-shaped bench. The overall preservation of the building is variable, with the west portion of the structure exhibiting better preservation than the east. In addition to the suboperations opened on Structure D-36, an additional two subops were opened on the west portion of the platform adjacent to the structure. Figure 2.32 shows the location of the

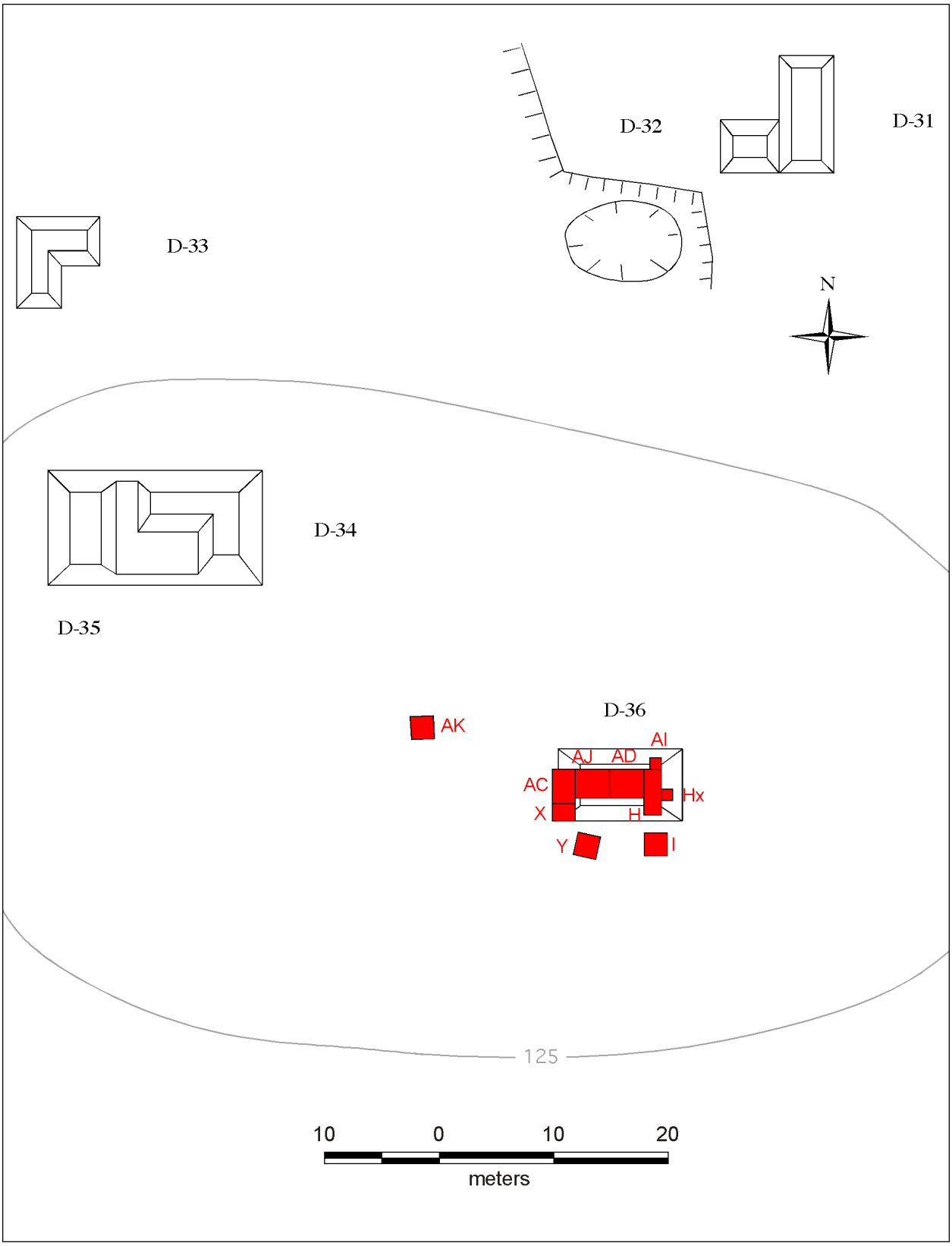

Figure 2.32. Map of excavations on Structure D-36.

suboperations opened on Structure D-36 over the course of the 2014 and 2015 seasons.

The south facade of Structure D-36 was composed of an exterior floor (Lots CC-14-H-03, -AC-03, -AD-03, and -AJ-03) that rolled up onto the platform and south exterior wall of the structure. Excavators had to excavate through approximately 50 cm of collapse debris (Lots CC-14-H-02, -AD-02, and AJ-02) that contained large stones from the south wall along with vault stones before the exterior floor was exposed. Throughout the collapse debris, burned limestone and soil were observed. The exterior floor was well preserved, especially on the west end of the structure. A complete mano was found on the exterior floor located in front of the south exterior wall, near the door to Room B.

The exterior floor rolls onto the south exterior wall (Lots CC-14-AC-04, -AD-04, and -AJ-04) of Structure D-36. The preservation of the south exterior wall is variable. The west portion of the south exterior wall is well preserved and is 61 cm high and 77 cm thick, and it extends 1.71 m from the west corner of the building to the entrance of Room B. The west portion of the south wall is five to six courses high depending on preservation. The east portion of the south wall had completely collapsed away with only the footer preserved at the base. This portion of the south wall extends 2.12 m from the entrance of Room B on the west to the entrance of Room A on the east. The base of the south wall has a footer that is two courses high, a trait documented at other parts of the site including Norman's Temple Courtyard (Ford and Rush 2000), the Western Plaza (Harrison 2000), Courtyard D-1 (Booher and Nettleton 2014), and the Upper Plaza (Herndon et al. 2014). The footer extends across the entrances of Room A and B forming a platform face and step up into the rooms (Lots CC-14-H-05, -AD-08, and -AJ-08) that is one course high. The platform face separates the exterior floor from the interior floor of each room. Figure 2.33 shows the exposed architecture of Structure D-36 and Figure 2.34 shows variability of preservation of the south exterior wall.

The west portion of the south wall continues west to form the southwest corner (CC-14-AC-04) of the structure. The west facing exterior wall (CC-14-AC-06) to the building has collapsed with only the corner stones preserved as one row of rocks, two courses high. To the west of

Figure 2.33. Overhead orthophoto of Structure D-36 showing the exposed architecture.

Figure 2.34. Orthophoto of south wall of Structure D-36. View to the north.

Lot CC-14-AC-06 we encountered the eroded exterior surface (Lot CC-14-AC-05), marked only by its sub-floor fill. Presumably, the exterior surface would have continued outside the west limits of Subop CC-14-AC and ended on the platform face associated with the west face of the structure. The portion of the south exterior wall located in Subop CC-14-AC is not as well preserved as the portion located in Subop CC-14-AJ. This could be attributed to a construction episode that diminished the length of the south exterior wall with the construction of a cross-wall (Lot CC-14-AJ-05). This cross-wall forms the new southwest corner of the structure and extended toward the south past the south exterior wall. The actual length of the cross-wall is undetermined due to preservation. The purpose of the cross-wall is unknown but it may have been built to make the exterior patio a more private space.

Room A

Room A is one of two rooms uncovered on Structure D-36 and is located on the eastern end of the structure (see Figure 2.32). The entrance of Room A was likely vaulted given the amount of vault stones encountered in the collapse debris in and around the doorway jambs. Found in the collapse debris (Lot CC-14-AD-02) was a domed-shaped, stone spindle whorl (Spec. # CC1690-01). The spindle whorl has one smooth, flat face and a rounded opposite face. The east and west doorway jambs frame the entrance into Room A and create a 1.56-m wide entryway. The west doorway jamb (Lot CC-14-H-08) was composed of large, cut limestone blocks, preserved up to two courses high, and measured 80 cm in width. The east doorway jamb (Lot CC-14-Hx-06) consisted of two courses of smaller, less well-preserved limestone rocks. Within the collapse debris above the east doorway jamb, a tooth bead (Spec. #CC1376-01) was collected. The tooth is faunal, likely peccary, with a perforation at one end. The east doorway jamb continued outside the limits of our excavation unit, preventing further exposure of the width of the doorway jamb.

The interior floor (Lot CC-14-H-07) of Room A rolls up onto the face of the C-shaped bench located at the north end of the room. A spindle whorl (Spec. #1377-01) with a domed form and made from sandstone was collected roughly 4 cm above the bench. The spindle whorl has small impressions of two lines on either side and a decorative line around the entire circumference of its base. The bench's (Lot CC-14-H-10) facade is composed of five thin courses of faced stones and is 42 cm tall. The surface of the bench uncovered in Subop CC-14-H still retains most of the plaster with only a few portions degraded. The bench surface was followed toward the north to expose the width of the bench, however the plaster surface was found to be heavily eroded as excavations moved north, and the back wall of the room had collapsed away and is no longer preserved. However, we estimate that the room was 1.7 m deep (north to south). The west portion of the bench rolled up onto the west wall (Lot CC-14-AD-05) of Room A. This wall runs

north to south and articulates with the south exterior wall creating a divide between Room A and Room B. The wall is 1.06 m thick and 30 cm high and retains some plaster in a few areas. The east portion of the bench and Room A were not exposed this season, precluding any accurate dimensions of the bench and the room.

Room B

Room B is the west room within Structure D-36 and also contains a C-shaped bench. Approximately 50–60 cm of collapse debris (CC-14-AJ-02) had to be excavated through to reveal the architecture of Room B, especially within the doorway. Large stones from the south exterior wall and doorway jamb, along with vault stones, were found throughout the collapse debris located in or near the entrance to Room B. Due to the amount of collapse and vault stones, it is likely that the entrance into the room was vaulted, similar to the entrance of Room A. The east and west doorway jambs frame the entrance into the room, creating a 1.51-m wide doorway. The west doorway jamb is well preserved with three rows of cut, faced limestone rocks that are preserved two courses high. The east doorway jamb follows similar preservation of that of the south exterior wall. The base of the east doorway jamb remains with one row of two highly eroded limestone rocks. The interior floor (Lot CC-14-AJ-06) was well preserved in the entry, but was eroded closer to the bench. A large amount of ceramic sherds was found in the entrance to the room on the floor surface, however analysis is still pending.

The interior floor rolls up onto the C-shaped bench (Lots CC-14-AD-07 and -AJ-07) located at the north edge of the suboperation. The bench is composed of three courses of stones and is 42 cm high, and the east and west ends of the bench are 50 cm wide. The bench extended to the north outside the limits of the suboperation, presumably to the back wall of the room. The surface of the bench was poorly preserved, especially the west portion, where it had completely eroded away. The west portion of the bench would have rolled up onto a wall that would have delineated the western limits for Room B. Unfortunately this wall is no longer preserved aside from one faced rock that represents the location of the west wall. The east edge of the bench rolls up onto the dividing wall (Lot CC-14-AD-05) between Room A and Room B. The room is approximately 2.95-m wide (east to west).

Patio Excavations

The 2014 archaeological excavations exposed part of the small platform adjacent to the south face of Structure D-36 (Booher and Nettleton 2014). The platform excavations produced copious amounts of artifacts, including a large amount of stone stools. The 2015 excavations further exposed the platform with the placement of Subops CC-14-Y and -X. Table 2.12 presents the artifact assemblage collected from both suboperations.

Subop CC-14-X was a 1.5-x-2-m unit on the west side of the platform structure. The topsoil (Lot CC-14-X-01) did not yield as large an amount of artifacts as Subop CC-14-I did

Table 2.12. Artifact Counts for Subops CC-14-X and CC-14-Y

Lot	Lot Description	Ceramic Sherds	Debitage	Lithic Tools	Obsidian	Ground Stone
CC-14-X-01	Topsoil	20	5	1	0	0
CC-14-X-02	Collapse Debris	348	16	5	0	0
CC-14-Y-02	Topsoil	177	36	0	2	1
CC-14-Y-02	Collaspe Debris	430	99	9	3	1

in 2014. Students excavating Lot CC-14-X-02 excavated through architectural features, commingling the artifacts collected, preventing any further excavations of the suboperation. In an attempt to understand the architecture that was inadvertently excavated, Subop CC-14-AC was placed to the north and adjacent to Subop CC-14-X, subsequently exposing the western architecture of Structure D-36.

Subop CC-14-Y was a 2-x-2-m unit located to the east of Subop CC-14-X. A large amount of ceramic sherds was collected from the topsoil (Lot CC-14-Y-01) along with two pieces of obsidian and ground stone. Lot CC-14-Y-02 was excavated to the final platform surface. A significant amount of artifacts was collected from above the final surface. Approximately 150 ceramic sherds, 100 pieces of lithic debitage, one obsidian blade fragment, and five stone tools were collected, however ceramic analysis is still pending. The final platform surface had completely deteriorated with only subfloor fill left as any indication of the surface. To obtain chronological information of the platform, the western half of Subop CC-14-X was excavated to bedrock. Excavators did not encounter another floor surface, indicating only one construction event for the platform.

Subop CC-14-AK

Subop C-14-AK was a 2-x-2-m control unit placed to the west of Structure D-36. Similar to the clearing units, only the topsoil was excavated to collect any material remains that may be associated with the function of Structure D-36. Approximately 75 ceramic sherds were collected, and ceramic analysis is still pending.

CONCLUSIONS

The 2014 and 2015 excavations of Chan Chich's causeways and associated structures answered many of the research questions previously proposed in 2014 and additional questions raised in 2015. A total of 51 suboperations was opened over the span of the two-year project and provided information on the form, age, and chronology of the Eastern and Western Causeways and associated structures.

Both the Eastern and Western Causeways were elevated although their forms were different in terms of construction. The Western Causeway had parapets constructed from limestone blocks, while the Eastern Causeway walls were crudely built with unfaced stones used to create a coarse retaining wall. The Eastern and Western Causeways were constructed during one construction event during the Late Classic period with evidence of use through the Terminal Classic, which coincides with the rest of the site as well as the final architectural phase of Courtyard D-1 and Structures C-17 and D-48. The causeways likely had several functions, although this research specifically looked at the role of processions taking place on the causeways. The evidence collected this season from the clearing units placed alongside the causeways does not definitively point toward processions taking place on the causeway, although only a small portion of the Eastern and Western Causeways were excavated, limiting the scope of material collected. However, it would be unfair to eliminate the possibility of processions taking place on the causeways due to the artifacts collected from Courtyard D-1. The West Indian chank shell, which possibly functioned as a trumpet, the ceramic drum base, and shell costume jewelry could all be items utilized during a procession. The musical instruments and costume jewelry, which could have ritual functions, along with the close proximity of Courtyard D-1 to the Eastern Causeway are circumstantial evidence for processions taking place on the causeways. Further extensive testing of the sites Eastern and Western Causeways will need to be completed to conclusively determine if ritual processions were taking place.

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Results of the 2015 Excavations at Qualm Hill Camp

Brooke Bonorden and Briana N. Smith

The Belize Estates Archaeological Survey Team (BEAST), working as the regional component of the Chan Chich Archaeological Project (CCAP), conducted the first full season of investigations at Qualm Hill camp in the summer of 2015 (Figure 3.1). Qualm Hill was the seasonal headquarters of the British Honduras Company (BHC, later the Belize Estate and Produce Company [BEC]) during the mid-1800s, the largest logging firm in British Honduras (Cackler et al. 2007:124; Ng 2007:67). The historic site is located approximately 5 km west of a prehistoric site of the same name, in a wooded area roughly 100 m east of Cedar

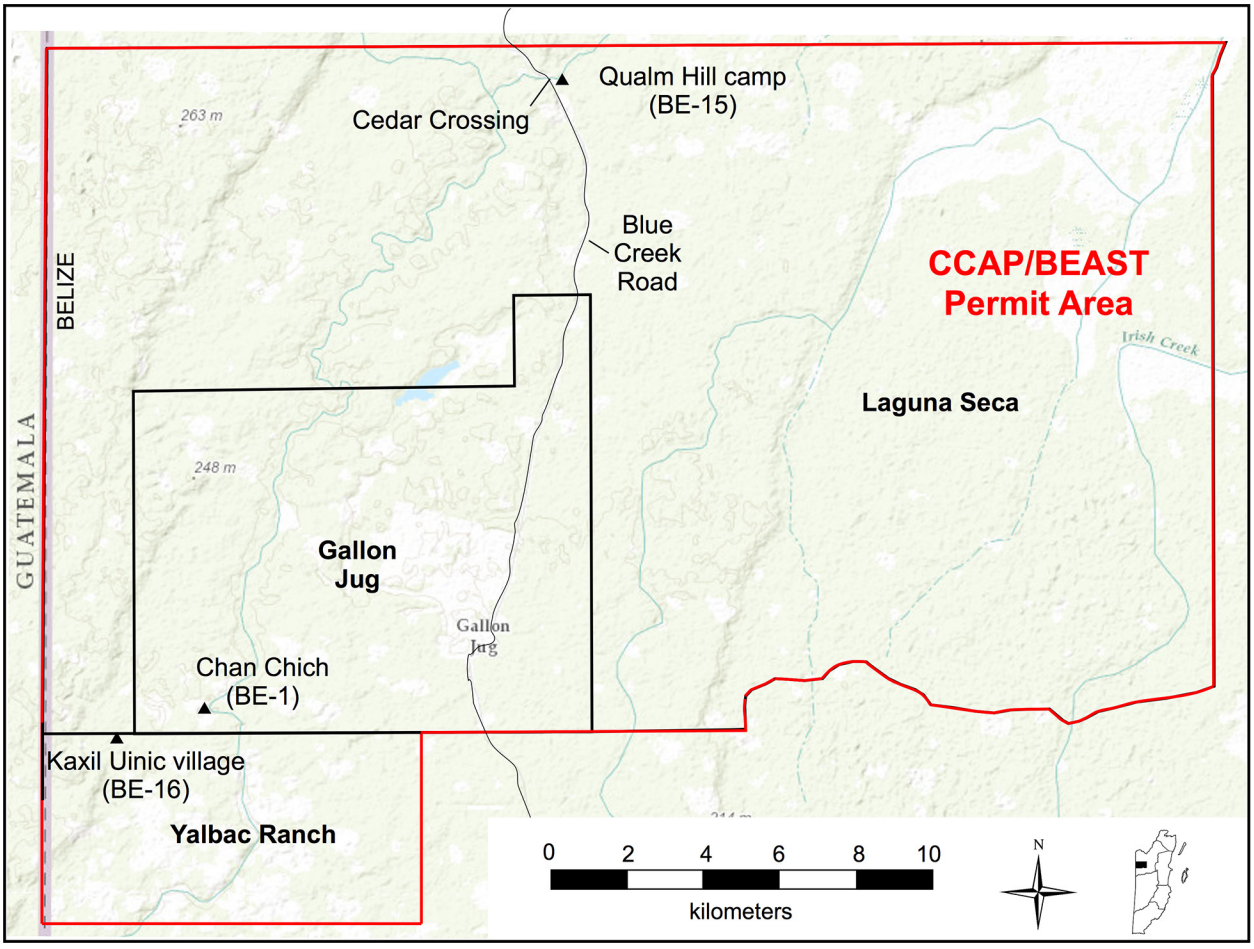

Figure 3.1. CCAP/BEAST permit area with the locations of historic sites and Chan Chich.

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Crossing on the right bank of the Rio Bravo (Sandrock and Willis 2014:125). The purpose of the 2015 investigations was to elucidate the nature of British-Maya interactions in Belize (formerly British Honduras) at the turn of the century through a synthesis of archival and archaeological data. The senior author served as operation director, and the junior author assisted with supervising a crew of approximately eight students and workers. The fieldwork took place over 19 days between May 16, 2015, and June 3, 2015, and the authors analyzed artifacts collected from the site from June 4, 2015, to June 24, 2015.

HISTORICAL BACKGROUND

Though the British logging enterprise in Belize began as early as the seventeenth century with the exportation of logwood (Cal 1991:88), mahogany cutting in the colony was not officially sanctioned until 1786 (Boland 2003:22). Used in the manufacturing of ships, luxury furniture, and railway carriages (Ng 2007:6; Cal 1991:116), the mahogany export market in Belize experienced a boom from 1835 to 1847 (Bolland 1977a:174), and remained a major element in Belize's economy until the mid-twentieth century (Bolland 2003:51).

In 1846, James Hyde & Company was formed as a partnership between the local landowning Hyde family in Belize and merchant James Hodge in London (Bolland 1977a:183). The company, which ultimately owned over half of the privately owned land in Belize (Ng 2007:76), became BHC in 1859 as part of a scheme to accumulate more capital to invest in mahogany production (Bolland 1977a:186). The company changed its name in 1875, becoming BEC. BHC/BEC, which operated the camp at Qualm Hill, was directly involved in mahogany extraction throughout northwestern Belize (Cal 1991:221). Qualm Hill was established sometime before 1852, as the camp is noted by Luke Smythe O'Connor (1852:516) in his travelogue produced that same year.

As mahogany reserves along the coast of Belize were largely depleted in the late eighteenth century (Bolland 1977b:74), loggers began moving farther inland in search of new stands. They often found themselves at odds with San Pedro Maya refugees, who had resettled in a series of villages located in northwestern Belize following the Caste War in the Yucatán (1847–1901). Logging firms frequently set up land rental agreements with the San Pedro Maya to log areas under their (oftentimes disputed) ownership with no intention of ever paying the rent (Ng 2007:10).

Delinquencies in rental payments by logging firms repeatedly led to raids on mahogany works by a combination of Icaiche and San Pedro Maya forces, who demanded back payments on rent. One such raid took place at Qualm Hill, though various sources provide contradictory accounts of the event. Cal (1991:353–354) states that the raid on Qualm Hill took place on April 27, 1866, shortly before breakfast, when Icaiche troops led by Marcus Canul took 85 prisoners and 175 head of cattle hostage, marching the prisoners to Icaiche. He also says that BHC ransomed the prisoners at the authorization of the British Lieutenant Governor, paying $4,750 for land rent that was eight years overdue (Cal 1991:354). Setzekorn (1981:172), however, states that the Icaiche successfully demanded ransom for 70 woodcutters after destroying their mill at Qualm Hill. According to Ng (2007:10), the raid occurred in May 1865 after BEC refused to pay $300 in back rent, causing Marcus Canul and 125 armed men to march on the camp (Ng 2007:67). Canul claimed he only went to Qualm Hill to collect the rent owed to the Maya, but the loggers fired first (Ng 2007:67). Ng (2007:67) elaborates that the raid occurred on a day when most workers were out in the bush, so the Maya captured the men, numbering about 50, upon

their return to the camp at the end of the day. The hostages were then marched to Santa Clara de Icaiche along with 175 head of cattle and held captive until a $3,000 ransom was paid by the British government for their release in July 1866. Jones (1977a:149) states that the raid occurred on April 27, 1866, and that the foreman and about 80 workers were kidnapped. Jones (1977a:149) also says that the hostages were held until June 30, 1866, when a ransom of $3,000 was paid for their release. What is perhaps the most detailed account of the raid is summarized in Sir John Alder Burdon's (1935) compilation of official colonial correspondence in Belize. In a letter dated May 2, 1866, an attorney representing BHC wrote to Lieutenant Governor John Gardiner Austin that 125 armed "Indians" abducted 50 men (including an English foreman and a Canadian), 14 women, and 8 children from Qualm Hill after shooting and killing one laborer at the camp (Burdon 1935:269). According to a report from Austin to the governor of Jamaica dated August 14, 1866, Marcus Canul claimed that he had gone to Qualm Hill with the intention of reaching an amicable settlement with Mr. Robateau, the foreman of the camp (Burdon 1935:272). After three shots were fired on his party by an African pensioner who kept the company store at the mahogany camp, however, Canul and his troops responded with force (Burdon 1935:272). Another letter from the BHC manager to Lieutenant Governor Austin dated August 3, 1866, estimates that approximately $42,510 in damages resulted from the raid on Qualm Hill (Burdon 1935:271). The manager of BHC wrote another letter to Austin on May 3, 1866, requesting military or police protection for their laborers against further raids. In the event that his initial request is refused, the manager further pressed for the colony to allow some Texas Rangers to assist the company with security (Burdon 1935:269). It is unclear if his requests were met, but on July 1, 1866, a Mr. Von Ohlahfen wrote to the Colonial Secretary of British Honduras, stating that the Qualm Hill captives were delivered to him at Corozalito after a $3,000 ransom was paid to the Icaiche (Burdon 1935:271). Mr. Von Ohlahfen elaborates that the amount paid was much lower than the original $12,000 demanded by the Icaiche because bribes had been paid to various Maya chiefs, who were able to sway their troops to accept less than they had originally demanded (Burdon 1935:271).

In response to raids like those on Qualm Hill, the British sent a punitive expedition to northwestern Belize. This initiated a series of clashes known as the Battle of San Pedro in 1867 (Ng 2007:11). Historical sociologist O. Nigel Bolland (2003:112) subsequently describes the period between 1867 and 1872 in Belize as "characterized by periodic and violent military activity throughout the western and northern parts of the colony," which resulted in the "decisive defeats of the San Pedro Maya." Bolland (2003:112) states that this lead to the "consolidation of British jurisdiction over the Maya within Belize and the incorporation of these Maya into the colonial social structure" from 1872 to 1900.

Apart from the contradictory accounts of the raid on Qualm Hill, virtually nothing was known of the logging enterprise there or the relationship between the presumably Creole loggers and the Maya in the aftermath of the raid to corroborate Bolland's (2003:112) assertions. Archaeological excavations conducted at the site by BEAST were consequently able to provide additional clues of British-Maya relations at Qualm Hill in lieu of historical documentation.

PREVIOUS INVESTIGATIONS

The site of Qualm Hill was identified in 2006 by archaeologists with the Programme for Belize Archaeological Project, who noted the presence of a historical bottle scatter near Cedar Cross-

ing on Gallon Jug property en route to visit the prehistoric ruins of the same name (Cackler et al. 2007). In 2014, BEAST re-located the site while surveying seismic lines cut within the CCAP permit area (Sandrock and Willis 2014:121). A surface collection of GPS-referenced bottles, ceramic fragments, and metal pots was conducted at this time, and a sample of the collection was later analyzed (Phillips and Sandrock 2014; Sandrock and Willis 2014:126). Preliminary analysis of several historic bottles collected by BEAST in 2014 determined that the site was generally occupied from the late 1800s to the early 1900s, seeming to correspond with the 1860s raid on the camp by Marcus Canul and the Icaiche Maya (Phillips and Sandrock 2014:134). The results of this analysis are summarized in Table 3.1. These bottles were reanalyzed in 2015, with the results detailed in the "Artifact Analysis" section of this chapter.

PROPOSED RESEARCH DESIGN AND METHODOLOGY

BEAST proposed to combine archival and archaeological data to critically evaluate the nature of British-Maya relations at Qualm Hill. We planned to examine archival records held in the Belize Archives and Records Service in Belmopan, as well as the Gallon Jug Ranch headquarters in the Orange Walk District. The Belize Archives and Records Service is the national repository for archival documents in Belize, housing maps and official correspondence relevant to the British colonial governance of Belize. Gallon Jug Ranch is currently owned by Bowen & Bowen, Ltd., which purchased BEC in 1983 (Belize Estate Co, Ltd. 2011; Houk 2013:1). Since BEC (formerly BHC) ran the logging operation at Qualm Hill during the late nineteenth century (Cackler et al. 2007), it is likely that many records of BEC/BHC's interactions with the San Pedro Maya are now in the possession of Gallon Jug Ranch and/or Bowen & Bowen, Ltd.

Prior to the 2015 CCAP field season, BEAST proposed to visit these repositories to conduct initial archival research. We expected that documents housed in these facilities would provide a more detailed description of Qualm Hill Camp, including its exact years of operation, accounts of the raid, and land rental agreements made with the San Pedro Maya.

In the field, BEAST intended to establish a 25-x-25-m grid encompassing the predicted core activity area of the camp. We planned to systematically survey the delineated grid for artifacts and architectural features visible on the ground surface, walking transects and demarcating (with pin flags) areas of interest, with the additional assistance of metal detectors. As the known extent of artifact scatters, architectural features, and boundaries of the site were refined, we planned to use a GPS unit to map the findings.

Where dense artifact concentrations were encountered, crews would perform test excavations following the methods outlined by Houk and Zaro (2015) for the CCAP, excavating a

Table 3.1. Surface Collected Artifacts from Qualm Hill Camp in 2014 (based on Phillips and Sandrock 2014)

Lot No.	Spec. #	Artifact Type	Description	Manufacture Date Range
QHC-01-SF-02	QHC0592-01	Glass bottle	A.B.C.M. Co.	1893–1920
QHC-01-SF-03	QHC0620-01	Glass bottle	Elliman's Embrocation	1865–1870
QHC-01-SF-04	QHC0594-01	Glass bottle	Barry's Pain Relief	1860–1865
QHC-01-SF-05	QHC0601-01	Glass bottle	Parker-Blake Co. LTD	Early 1900s

minimum of two shallow strip trenches (50 cm wide x 10–40 m long) in areas promising an abundance or variety of cultural materials. If extensive midden deposits were encountered during the excavation of a strip trench, broad exposure excavations would be conducted to recover a larger sample of artifacts. Where architectural features were identified topographically or encountered archaeologically, additional excavations were to be conducted to expose and document each feature.

MODIFIED RESEARCH DESIGN AND METHODOLOGY

Efforts to contact Gallon Jug Ranch via email regarding access to archival documents in their possession both prior to and during the 2015 CCAP field season received no response. As a result, primary source archival data on Qualm Hill was sought solely from the Belize Archives and Records Service. BEAST additionally reviewed secondary accounts of historical documents cited in scholarly works to glean information about Qualm Hill.

Similarly, our survey and excavation methodology had to be modified upon the discovery of modern loggers camped in the middle of the historic logging camp (Figure 3.2). Our approach was subsequently modified to more closely reflect testing methods employed in the field of Cultural Resource Management to determine the significance of a site by assessing its integrity and data yield potential. Pedestrian survey of the site was primarily conducted by workers hired from Chan Chich Lodge, who systematically walked transects radiating outward from the modern logging campsite and along the terrace of the river bank that bounds the site to the west. The staff used flagging tape to mark cultural materials present on the ground surface, which were later assigned Surface Find numbers by BEAST staff and

Figure 3.2. Modern loggers camped in the middle of the historic Qualm Hill logging camp.

recorded using a GPS unit. Artifacts collected from these surface finds are detailed in the "Survey Summary" section of this chapter. Surface finds representing dense artifact concentrations were selected for the placement of test units. Based on observations by Olivia Ng (2007:111) during excavations at the San Pedro Maya village-turned-logging-camp at Holotunich, surface artifact density often correlated with denser sub-surface artifact concentrations. We anticipated that the assemblage at Qualm Hill would be similarly patterned.

Field methods utilized during the course of excavation were modeled after the Site-Op-Subop-Lot system detailed by Houk and Zaro (2015) for the CCAP. All fieldwork conducted during the 2015 season was considered Operation (Op) QHC-02. Test units (ranging in size from 1-x-1-m to 3-x-3-m) were excavated by students participating in the Texas Tech Field School in Maya Archaeology with the additional assistance of workers hired from Chan Chich Lodge. Each test unit was designated as a suboperation (subop). Surface finds additionally constituted a subop (Subop SF), with each geographically distinct artifact scatter representing a separate lot. Surface materials within the boundaries of a test unit and surrounding the periphery of the test unit were designated as a lot within the surface find subop, rather than within the test unit subop. Each test unit, unless otherwise stated in the following descriptions, was excavated to an arbitrary depth of approximately 5–10 cm below the ground surface. In total, BEAST opened 20 subops and 89 lots during the 2015 season at Qualm Hill. All excavated matrix was screened through ¼-inch mesh. Glass and metal fragments smaller than a dime in size were not collected.

Project Director Brett A. Houk used a Total Data Station (TDS) to establish an arbitrary grid at the site, oriented on magnetic north, and recorded the locations of all excavation units. The primary mapping datum occupies N 5000 E 5000 in the grid and has an elevation of 35 m. Houk also recorded the elevation of the associated vertical datums.

NATURAL SETTING

The historic site of Qualm Hill camp is located approximately 5 km west of a prehistoric site of the same name, in a wooded area roughly 100 m east of Cedar Crossing on the right bank of the Rio Bravo (Figure 3.3; Sandrock and Willis 2014:125). The Rio Bravo overlays a geological formation known as the Yucatán platform, which was formed during the early Eocene (47–58 million years ago) when accumulated marine sediments consolidated into limestone (Brokaw and Mallory 1993:12). The Rio Bravo occasionally floods as the result of heavy rains in Guatemala (Brokaw and Mallory 1993:13).

The area is considered a riparian forest due to its location within the temporarily flooded margins of the Rio Bravo (Brokaw and Mallory 1993:6). Riparian forests typically line the perennial watercourse of the Rio Bravo, with many trees leaning, as their roots do not hold well in the generally wet soil (Brokaw and Mallory 1993:26-27). Riparian forests are thus characterized by generally low main canopies with gaps filled by tangly undergrowth and lianas (Brokaw and Mallory 1993:27).

Historically, loggers have taken mahogany from the area, reducing the numbers of large canopy trees (Brokaw and Mallory 1993:15). Despite these circumstances, Brokaw and Mallory (1993:15) assert that the application of the term "secondary forest" to northwestern Belize exaggerates the degree of past disturbance.

SURVEY SUMMARY

Using the survey methods previously detailed, BEAST identified 60 artifact scatters visible on the ground surface (both within and outside the boundaries of the modern logger

Figure 3.3. The Rio Bravo as seen from Qualm Hill camp.

camp) at Qualm Hill. Each of these scatters was assigned a lot number within Subop QHC-02-SF. Table 3.2 details the location of each lot as recorded with a GPS unit (Zone 16Q, WGS 1984 datum), as well as a brief description of the artifact assemblage. These artifacts are discussed in greater detail in the "Artifact Analysis" section of this chapter.

Figure 3.4 illustrates the distribution of surface artifacts at Qualm Hill identified during survey. Based on their initial survey of the site, Sandrock and Willis (2014:126) estimated that the surface scatter of artifacts constituting the remains of the historic logging camp spanned 5 to 55 m from the west bank of the Rio Bravo for approximately 160 m northeast along the stream. The more intensive survey of the site conducted by BEAST in 2015 revealed that the surface scatter actually spans approximately 20 to 90 m from the west bank of the river, running approximately 215 m northeast along the stream. Though artifacts are present in dense concentrations along the river terrace, our survey indicates that artifacts are equally distributed in the wooded area to the east of the Rio Bravo.

It is worth noting that prior to our investigations, the loggers camped at the site collected a number of bottles and metal artifacts, which Jeff Roberson (personal communication, 2015), the manager of Yalbac Ranch, turned over to the Institute of Archaeology. The authors examined those artifacts, but, because their context is unknown, they are not included in this report.

The majority of surface artifacts were present in the area northeast of the modern logger camp. This area was subsequently the focus of excavations during the 2015 field season. Manufacturing dates of bottles present along the river bank immediately north and west of

Table 3.2. GPS Coordinates of Surface Finds Identified During Survey and Brief Artifact Descriptions

Lot	Easting	Northing	Description
QHC-02-SF-01	285177	1957155	Bottle scatter
QHC-02-SF-02	285189	1957157	Bottle and glass scatter
QHC-02-SF-03	285200	1957174	Isolated bottle
QHC-02-SF-04	285196	1957176	Isolated bottle
QHC-02-SF-05	285195	1957160	Isolated bottle
QHC-02-SF-06	285231	1957188	Isolated bottle
QHC-02-SF-07	285227	1957205	Barrel hoop, metal bowl
QHC-02-SF-08	285224	1957203	Isolated bottle fragment
QHC-02-SF-09	285230	1957193	Isolated bottle
QHC-02-SF-10	285222	1957197	Barrel hoop, bottles, ceramics, *jute*
QHC-02-SF-11	285199	1957107	Isolated ceramic sherd
QHC-02-SF-12	285229 (approximation)	1957139 (approximation)	Ceramic scatter, *jute*
QHC-02-SF-13	285259	1957171	Metal chains and machine parts
QHC-02-SF-14	285265	1957170	Metal logging equipment
QHC-02-SF-15	285266	1957171	Metal lid
QHC-02-SF-16	285271	1957161	Metal logging equipment
QHC-02-SF-17	285284	1957154	Isolated bottle
QHC-02-SF-18	285280	1957165	Metal fragment
QHC-02-SF-19	285266	1957178	Perfume/cologne bottle fragment, ceramics, metal fragments
QHC-02-SF-20	285261	1957176	Metal saw blade
QHC-02-SF-21	285267	1957187	Barrel hoop, glass, metal fragments
QHC-02-SF-22	285269	1957188	Metal logging equipment
QHC-02-SF-23	285264	1957190	Barrel hoop, ceramic sherds
QHC-02-SF-24	285243	1957195	Ceramic sherds, metal fragments
QHC-02-SF-25	285251	1957192	Brick fragment
QHC-02-SF-26	285262	1957196	Ceramic sherd, metal lid
QHC-02-SF-27	285281	1957205	Ceramic sherds, glass, shotgun shell
QHC-02-SF-28	285287	1957208	Glass, metal fragment, clay pipe
QHC-02-SF-29	285293	1957199	Glass, debitage
QHC-02-SF-30	285294	1957198	Barrel hoop, glass
QHC-02-SF-31	285291	1957193	Ceramic scatter
QHC-02-SF-32	285306	1957185	Stoneware jar, bottle, glass, ceramic sherds, clay pipe
QHC-02-SF-33	285308	1957164	Isolated bottle
QHC-02-SF-34	285334	1957182	Bottles, ceramic sherds, clay pipe, chamber pot
QHC-02-SF-35	285333	1957233	Glass, ceramic sherds, metal handle
QHC-02-SF-36	285332	1957245	Bottle, glass, ceramic sherds, *jute*
QHC-02-SF-37	285327	1957250	Glass, ceramic sherds, *jute*

Table 3.2. (continued)

Lot	Easting	Northing	Description
QHC-02-SF-38	285324	1957257	Glass, *jute*
QHC-02-SF-39	285327	1957282	Metal pot
QHC-02-SF-40	285307	1957245	Bottle, ceramic sherds, clay pipe
QHC-02-SF-41	285293	1957241	Glass, ceramic sherd
QHC-02-SF-42	285286	1957230	Barrel hoop, bottle, glass
QHC-02-SF-43	285290	1957225	Metal logging equipment
QHC-02-SF-44	286379 (approximation)	1950734 (approximation)	Metal pot, glass, nail
QHC-02-SF-45	285304	1957228	Ceramic sherds, glass, doll parts, clay pipe
QHC-02-SF-46	285312	1957228	Ceramic sherds, glass
QHC-02-SF-47	285319	1957248	Mounded area, bullet casings, ceramic sherds, glass
QHC-02-SF-48	285332	1957242	Bottles, drinking glass, measuring cup, ceramic sherds
QHC-02-SF-49	285332 (approximation)	1957218 (approximation)	Bottle, glass
QHC-02-SF-50	285333	1957194	Barrel hoop, glass, ceramic sherds
QHC-02-SF-51	285316	1957216	Bottle, glass, ceramic sherds, *jute*
QHC-02-SF-52	285317	1957213	Barrel hoop, bottle, glass, *jute*
QHC-02-SF-53	285317	1957199	Bottle, glass
QHC-02-SF-54	285254	1957185	Barrel hoop, ceramic sherds, pot lid, glass
QHC-02-SF-55	285214	1957185	Battery, ceramic sherds, glass
QHC-02-SF-56	285215	1957189	Metal fragments, glass, ceramic sherds
QHC-02-SF-57	285214	1957108	Ceramic sherds, *jute*, clay pipe
QHC-02-SF-58	285321	1957295	Isolated bottle
QHC-02-SF-59	285329	1957295	Isolated bottle
QHC-02-SF-60	285319	1957299	Glass, *jute*

the modern logging camp range from 1905 to 2010. Due to the relatively recent production of these items in contrast to the period of interest for our study (1860–1900), this area was not selected for further investigation.

Lots QHC-02-SF-11 and -57 are notable for their relative distance and isolation from other surface finds identified during survey. Lot QHC-02-SF-11 consisted of an isolated ceramic sherd, and Lot QHC-02-SF-57 contained three ceramic sherds and a clay tobacco pipe bowl fragment. The low density of artifacts identified within these surface finds lots could indicate that these items do not represent the southwestern most extent of the site. Rather, these items could have been deposited in these locales by loggers traversing back and forth to the camp. There also appears to be a random distribution of barrel hoops throughout the site, providing no indication of a centralized storage area.

Clearing efforts by the modern loggers camped within the historic site appeared to have dispersed artifacts that were located within their campground. Artifacts were found stacked up against the bases of trees and mixed within brush

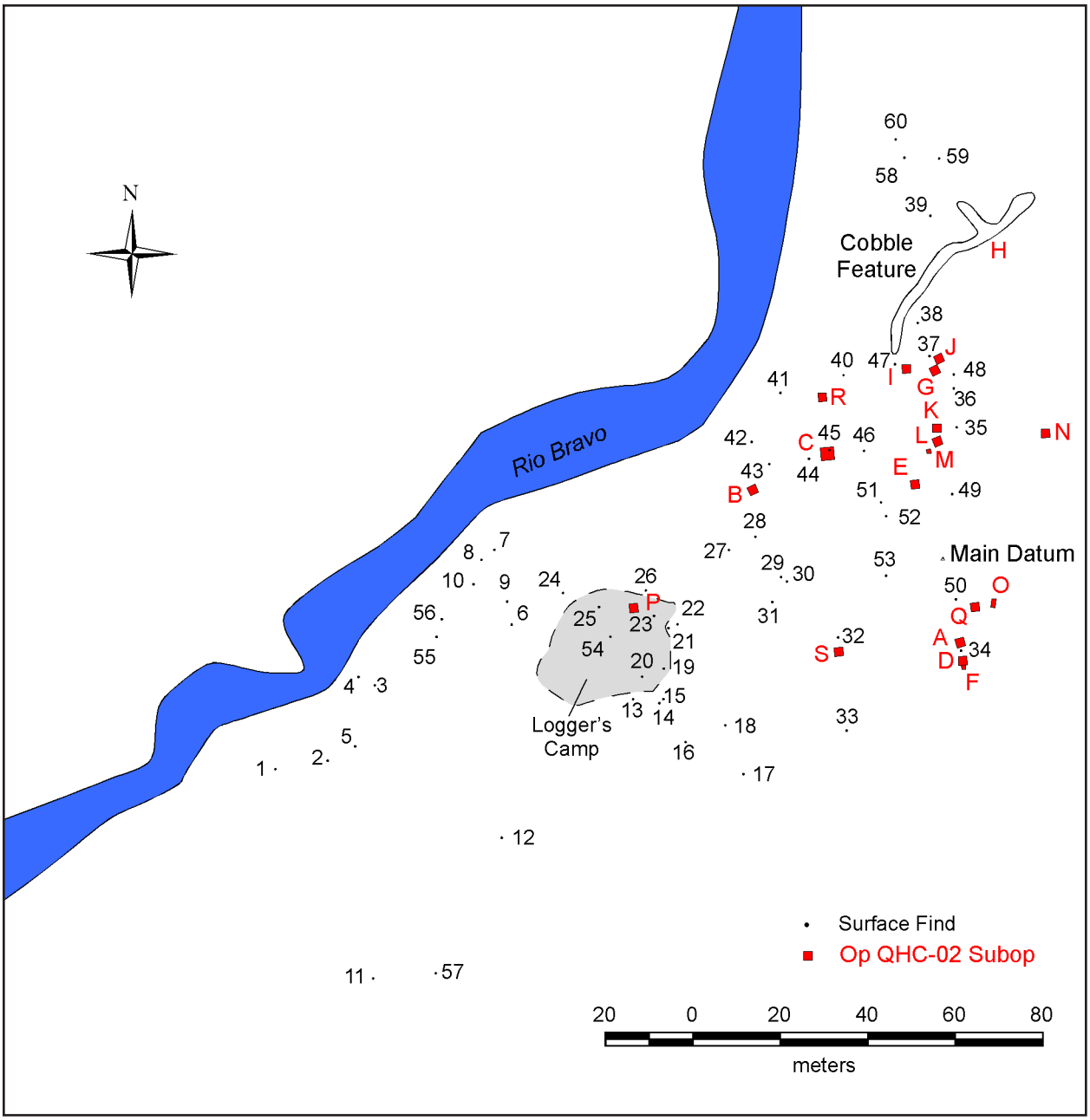

Figure 3.4. Op QHC-02 surface finds and subops.

piles along the periphery of their camp. Artifacts within the modern logger camp included ceramic sherds, glass bottles, axe heads, and large metal pieces (Figure 3.5). These artifacts constitute the dense concentration of artifacts visible in a linear pattern along the western margin of the site (generally including Lots QHC-02-SF-13 to -26). Alan Jeal (personal communication, 2015), a former logger and current manager of Gallon Jug Ranch, identified many of the large metal pieces found on the periphery of the modern logger camp as pieces of historic logging equipment, including cart parts used to transport logs from their felling location to the river (where they would be floated down stream to another location for further preparation). Jeal (personal communication, 2015) speculates that more logging equipment was left at the site at the time of its abandonment, but was later salvaged by Mennonites between

Figure 3.5. Scatter of historic artifacts along the periphery of the modern logging camp (Lot QHC-02-SF-14).

1970 and 1990. Although out of context, the concentration of larger metal equipment along the periphery of the modern logger camp leads us to believe that the modern loggers may have been camped in the center of the historic logging operations area at Qualm Hill. According to Cal (1991), logging enterprises maintained a 9-month field season and small hamlets were created along the river banks at locations likely to yield mahogany for several years. Considering that Qualm Hill is described as the seasonal headquarters of BHC (Cackler et al. 2007), it is implied that the area was revisited over a span of several years. BEAST consequently focused the 2015 excavations on areas north and east of the modern logger camp, where it was presumed that such hamlets as described by Cal (1991) would have existed.

EXCAVATION SUMMARY

This section describes the individual excavation units opened at Qualm Hill grouped by proximity. A total of 19 excavation units was opened during the 2015 season, with each unit designated as its own subop (see Figure 3.4). Areas with dense artifact concentrations visible on the ground surface were selected for excavation. Table 3.3 provides the size of each subop, as well as a brief description of artifacts recovered from the subop. These artifacts are described in greater detail in the "Artifact Analysis" section of this chapter.

Subops QHC-02-A, -D, and -F formed a cluster of excavation units placed in the vicinity of surface find Lot QHC-02-SF-44. This area was chosen for excavation due to the presence of a tall metal pot associated with Lot QHC-02-SF-44, which indicated that the area might

Table 3.3. Summary of Excavations from Op QHC-02

Subop	Size (m)	Description
QHC-02-A	2 x 2	Rock alignment, bullet casings, clay pipe, shotgun shell, glass
QHC-02-B	2 x 2	Metal logging equipment, ceramic sherds, clay pipes, bottles, glass
QHC-02-C	3 x 3	Glass, ceramic sherds, arrow point, faunal bone, metal fragments, shell, clay pipes, doll parts
QHC-02-D	2 x 2	Rock alignment, metal pot, ceramic sherds, vial, glass, barrel hoop
QHC-02-E	2 x 2	Medallion, *jute*, ceramic sherds, glass
QHC-02-F	1 x 1	Basin-shaped rock concentration, hurricane lamp glass, glass, ceramic sherds, metal fragments
QHC-02-G	2 x 2	Nails, chain links, clay pipes, ceramic sherds, glass
QHC-02-H	n/a	Ceramic sherds, bullet casings, metal pin, glass, metal container
QHC-02-I	2 x 2	Glass, ceramic sherds, machete blade
QHC-02-J	2 x 2	Rock alignment, relatively sterile
QHC-02-K	2 x 2	Metal hardware, glass, ceramic sherds, clay pipe, ceramic button
QHC-02-L	2 x 2	Glass, ceramic sherds, nails, metal hardware, metal handle
QHC-02-M	1 x 1	Axe head, mano
QHC-02-N	2 x 2	Glass, clay pipe, gun part, nail
QHC-02-O	1 x 2	Glass, ceramic sherds, metal buttons, debitage, *jute*
QHC-02-P	2 x 2	Barrel hoop, shotgun shell, nails, sardine-style cans, ceramic sherds
QHC-02-Q	2 x 2	Glass, ceramic sherds, drinking glass, metal fragments, clay pipes
QHC-02-R	2 x 2	Glass, ceramic sherds, *jute*, clay pipes
QHC-02-S	2 x 2	Glass, ceramic sherds, debitage, nails

have been used for domestic purposes. Subops QHC-02-A, -D, and -F each contained one lot, which constituted the first 10 cm of topsoil below the ground surface. Subop QHC-02-A (a 2-x-2-m unit) contained an alignment of limestone rocks approximately 5 cm below the surface, which ran diagonally across the unit southwest to northeast. Only one stone appeared to have been shaped culturally, and we initially speculated the alignment might have been a foundation for a structure (Figure 3.6). A void in the center of the stone alignment was originally speculated to have represented a doorway, but this theory was disregarded because the rock-free area was determined to be too narrow. The alignment could still possibly represent foundation stones, however, as Subop QHC-02-D (another 2-x-2-m unit) also contained a limestone rock alignment running parallel to the arrangement found in Subop QHC-02-A. The rock alignment present in Subop QHC-02-D was only one course thick, and none of the stones appeared to have been shaped as masonry stones. Subop QHC-02-F was a 1-x-1-m unit placed immediately south of Subop QHC-02-D. This subop was placed directly over the metal pot found in Lot QHC-02-SF-44. A circular arrangement of limestone rocks was present immediately beneath the pot, and historic ceramic sherds were found lying on top of the rocks. The rock arrangement in Subop QHC-02-F was not only circular, but basin-shaped as well. Based on this information, it is possible that the arrangement of stones represents the remains of a cooking feature (Figure 3.7), although the rocks did not appear to be burned.

Subop QHC-02-B was an isolated 2-x-2-m subop placed in the area where surface find

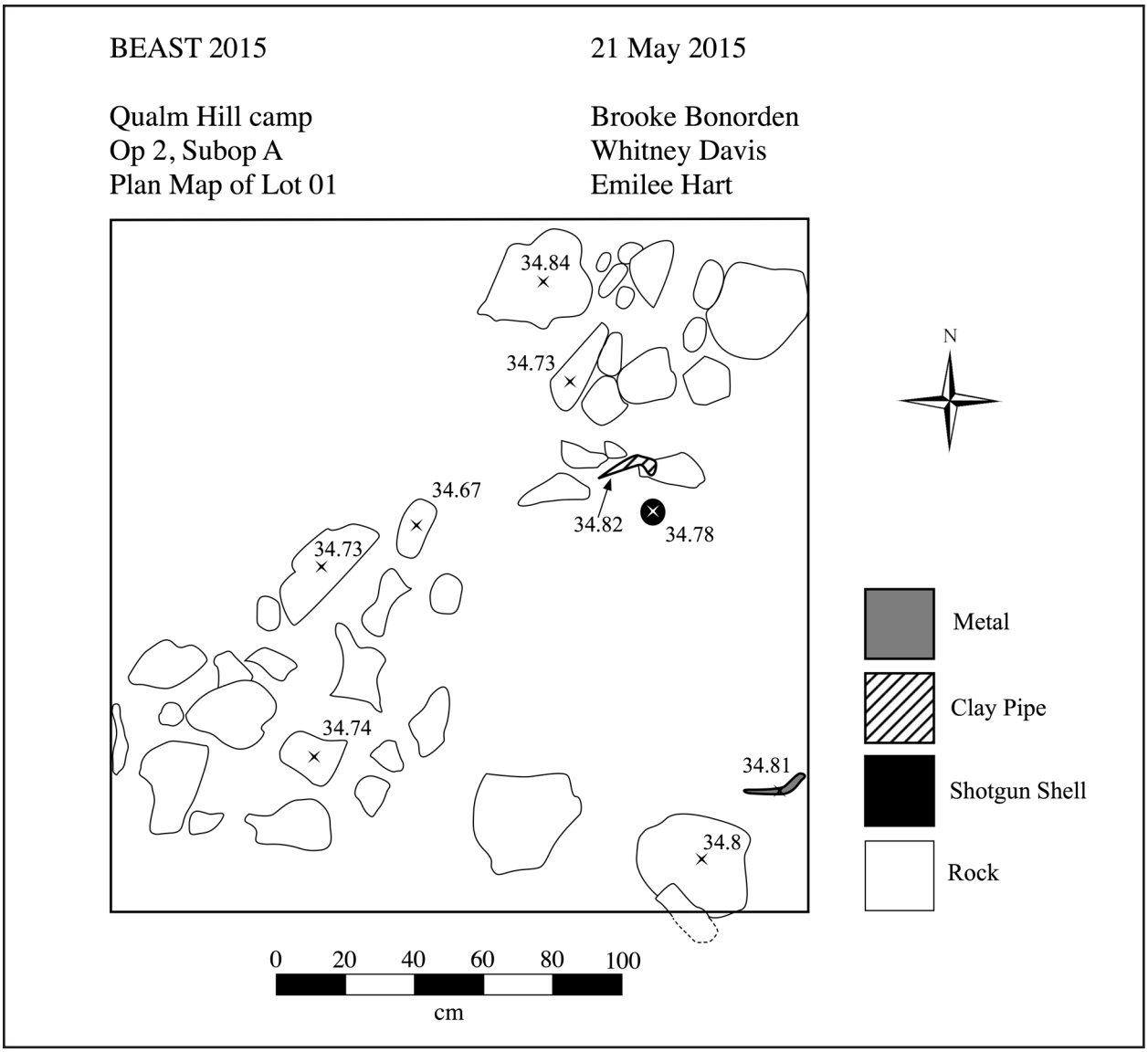

Figure 3.6. Plan map of Subop QHC-02-A.

Lot QHC-02-SF-43 was located. A U-shaped metal object and long rod with metal washers observed as part of Lot QHC-02-SF-43 were removed as part of Lot 1 of Subop QHC-02-B because, though partially visible on the ground surface, they were actually deeply buried. These metal objects were generally characterized as "logging equipment," though they were more specifically used for attaching oxen to carts, which carried logs to the river for further transport. These artifacts were located approximately 30 m from the Rio Bravo, a relatively close distance in comparison to other artifact scatters, further supporting our rationale. The metal rod visible from the ground surface was curiously oriented vertically in the ground, and we are unsure what circumstances led to this unusual deposition (Figure 3.8). An additional metal rod was recovered within the first 5 cm below the ground surface of the subop.

Subop QHC-02-C was also an isolated suboperation. Measuring 3 x 3 m, the location for Subop QHC-02-C was chosen based on artifacts observed on the ground surface, identified as Lot QHC-02-SF-45. Subop QHC-02-C con-

Figure 3.7. Rock alignment in Subops QHC-02-D and -F.

sisted of one lot containing the first 10 cm of topsoil within the unit. Though it had no architectural features were encountered within this unit, this unit contained a number of notable artifacts, including a chert arrow point base, a large concentration of spire-lopped *jute* shells, several clay pipe stems, a ceramic doll arm, and a burned faunal tooth. These artifacts are discussed in more detail in the "Artifact Analysis" section of this chapter.

Subop QHC-02-E was a 2-x-2-m unit placed in the vicinity of surface find Lot QHC-02-SF-46. Artifact densities in previously excavated suboperations indicated that almost all cultural material dating to the historic occupation of the site was present within the first 5 cm of topsoil, and deeper excavations encountered sterile, compact clay. For this reason, Subop QHC-02-E contained only one 5-cm lot. Aside from a medallion found in this subop approximately 3 cm below the ground surface, the unit was relatively devoid of cultural material (Figure 3.9).

Subops QHC-02-G and -J were adjacent 2-x-2-m units located in the vicinity of surface find Lot QHC-02-SF-36. Each unit contained one 5-cm lot. A concentration of nails was noted along the eastern wall of Subop QHC-02-G, possibly indicating the presence of a structure. We theorized that these nails were associated with an alignment of limestone rocks present to the east of the suboperation, and consequently placed Subop QHC-02-J in this area to explore the feature. The limestone rocks present within Subop QHC-02-J were slightly mounded and aligned northwest to southeast across the unit. Curiously though, almost no artifacts were recovered from this suboperation, and no additional nails were found. Based on this information, it is unlikely that the rock alignment is historic, if it is even an anthropogenic construction (Figure 3.10).

Subop QHC-02-H was not a formal excavation unit. Rather, the suboperation consisted of a series of metal detector hits on top of the mounded area identified as surface find Lot QHC-02-SF-47. This surface find was a Y-shaped, slightly mounded area of limestone rocks measuring approximately 11.4 x 32.4 m (Figure 3.11). The area was metal detected to determine if the mound was prehistoric or historic in nature. Eleven hits were identified during metal detection, and each one was informally excavated as a separate lot to determine the source of the hit. The material culture recovered from these lots is detailed in Table 3.4.

It should be noted that the false positives detailed in the table below are likely the results of operating the metal detector on the highest level of sensitivity. Additionally, all bullet casings recovered from this subop date to the

Figure 3.8. Metal equipment in Subop QHC-02-B.

Figure 3.9. Field school students from Session I and Subop Director Briana Smith pose with the medallion recovered from Subop QHC-02-E.

Figure 3.10. Rock alignment in Subop QHC-02-J.

Figure 3.11. Subop QHC-02-H.

1980s and represent overprinting of the historic site by members of the British military conducting training exercises in the area. This information is explained in further detail in the "Artifact Analysis" section of this chapter. Furthermore, all other artifacts recovered from Subop QHC-02-H were located on the periphery of the mounded area rather than within or on the mound itself. Due to its proximity (13 m) to the Rio Bravo, this "mound" could potentially be a pathway constructed to ease the process of transporting felled logs to the river. Ng and Cackler (2006:297), however, note that historic logging roads in Belize are generally characterized as cleared, unsurfaced trails with minimal grading, and swampy areas were covered with logs to render them passable. Based on this description, it does not seem likely that the mounded rock feature was a road, though it is not impossible.

Subop QHC-02-I was an isolated 2-x-2-m excavation unit placed in the vicinity of surface find Lot QHC-02-SF-37. This area was chosen for excavation based on the presence of a concentration of limestone rocks mounded immediately north of the unit. Excavations were conducted to determine if this feature represented the foundation of a structure or was possibly associated with the rock alignment present in Subop QHC-02-J to the west. One 5-cm lot was excavated in Subop QHC-02-I. No rocks were observed within the perimeter of the unit, though a large concentration of glass shards and ceramic sherds was encountered.

Subops QHC-02-K, -L, and -M constituted a cluster of excavation units placed near surface find Lot QHC-02-SF-35. Subops QHC-02-K and -L were 2-x-2-m units each containing one 5-cm lot. Subop QHC-02-M was a 1-x-1-m unit also containing one 5-cm lot. Subops QHC-02-K and -L were both relatively devoid of cultural material despite the abundance of artifacts observed on the surface (collected as part of Lot QHC-02-SF-35). Subop QHC-02-M, however, contained two notable artifacts: a large metal axe head located approximately 5 cm below the ground surface and a basalt mano (Figure 3.12). These artifacts are described in greater detail in the "Artifact Analysis" section of this chapter.

Subop QHC-02-N was an isolated 2-x-2-m excavation unit placed approximately where surface find Lot QHC-02-SF-49 was located. The subop had one 5 cm lot, which contained a large concentration of limestone rocks. These rocks did not appear to have any sort of distinct patterning, and were probably deposited

Table 3.4. Description of Artifacts Recovered from Subop QHC-02-H

Lot	Description	Easting	Northing
QHC-02-H-01	False positive. Only ceramic sherds recovered.	285322	1957273
QHC-02-H-02	Bullet casing.	285326	1957269
QHC-02-H-03	False positive.	285321	1957270
QHC-02-H-04	Metal pin.	285325	1957270
QHC-02-H-05	Bullet casing.	285324	1957269
QHC-02-H-06	False positive. Only ceramic sherds recovered.	285324	1957269
QHC-02-H-07	Bullet casing.	285331	1957279
QHC-02-H-08	Bullet casing.	285325	1957272
QHC-02-H-09	False positive. No artifacts recovered.	285328	1957271
QHC-02-H-10	False positive. Only ceramic sherds recovered.	285324	1957267
QHC-02-H-11	Metal container, glass shards.	285330	1957270

Figure 3.12. Large axe head *in situ* in Subop QHC-02-M.

in the area naturally. This subop also contained numerous glass shards, metal fragments, a nail, and a clay pipe bowl. Modern trash observed near the subop indicates the area may have been disturbed by more recent visitors.

Subops QHC-02-O and -Q were placed near the location of surface find Lot QHC-02-SF-48. Subop QHC-02-O was a 1-x-2-m unit, while Subop QHC-02-Q was a 2-x-2-m unit. Each excavation unit contained one 5-cm lot. Subop QHC-02-O contained a mound of rocks visible on the ground surface that we initially speculated might represent a feature, but excavations revealed the rocks were actually sporadically distributed and probably not culturally deposited. A large concentration of unidentifiable metal fragments was present within this unit, as well as a number of glass shards. Subop QHC-02-Q was relatively devoid of cultural material, and the presence of a plastic button within the unit indicates the area has been disturbed in more recent decades. The lack of cultural material within Subop QHC-02-Q may be attributed to this disturbance.

Subop QHC-02-P was a 2-x-2-m excavation unit placed in the northwestern portion of the modern logger camp at the location of QHC-02-SF-23. The subop was placed here to determine the density of subsurface cultural deposits present within the cleared modern logger camp. Subop QHC-02-P consisted of one lot, which contained a barrel hoop, shotgun shell, nails, sardine-style cans, and ceramic sherds. No features were present within this subop.

Subop QHC-02-R was a 2-x-2-m excavation unit placed in the vicinity of surface find Lot QHC-02-SF-40. The subop constituted one 5-cm lot, which contained numerous clay pipe fragments, *jute* shells, and ceramic sherds. No features were present within this suboperation.

Subop QHC-02-S was a 2-x-2-m unit located approximately where surface find Lot QHC-02-SF-32 was recovered. This suboperation contained one 5-cm lot, which produced a small amount of debitage and metal fragments. No architectural features were identified in this suboperation, and it is likely that the majority of cultural material present at this location was collected from the surface as part of Lot QHC-02-SF-32.

ARTIFACT ANALYSIS

Due to Belizean restrictions on artifact exportation, all 1,602 artifacts were processed, cataloged, and analyzed within a two-week period in the field laboratory at Chan Chich Lodge. A modified version of the catalog system used by the CCAP for prehistoric sites was adapted to suit historic artifacts recovered from the site. Under this system, artifacts are organized by material type, followed by industry (function), form, and subform. Tables 3.5 and 3.6 summarize the artifacts collected from Qualm Hill camp by material type. With the exception of Subop QHC-02-H, only one lot was excavated within each subop. Surface find lots were also combined for this analysis. Counts for certain artifacts (glass, ceramics, and metal) are undoubtedly high due to the fragmentation of these objects resulting from soil acidity and depositional processes.

Table 3.5. Site-Wide Percentages of Material Types by Count

Subop	Glass (%) n=699	Ceramic (%) n=336	Metal (%) n=477	Shell (%) n=62	Faunal (%) n=2	Lithic (%) n=24	Misc. (%) n=2	All Material Types (%) n=1,602
QHC-02-A	2.3	0.9	1.5	0.0	0.0	0.0	0.0	1.6
QHC-02-B	2.3	9.8	1.0	0.0	0.0	0.0	0.0	3.4
QHC-02-C	10.3	10.7	8.4	33.9	100.0	4.2	0.0	10.7
QHC-02-D	1.3	6.8	7.5	0.0	0.0	0.0	0.0	4.2
QHC-02-E	1.2	1.5	0.2	8.1	0.0	0.0	0.0	1.3
QHC-02-F	9.4	0.9	0.8	0.0	0.0	0.0	0.0	4.6
QHC-02-G	1.4	1.5	9.4	1.6	0.0	0.0	0.0	3.8
QHC-02-H	0.6	4.1	9.4	0.0	0.0	0.0	0.0	3.9
QHC-02-I	8.6	5.6	3.1	0.0	0.0	0.0	0.0	5.9
QHC-02-J	0.4	0.3	0.0	4.8	0.0	0.0	0.0	0.5
QHC-02-K	0.7	1.8	0.8	0.0	0.0	4.2	0.0	1.0
QHC-02-L	0.7	0.6	1.9	0.0	0.0	0.0	0.0	0.7
QHC-02-M	0.0	0.0	6.0	0.0	0.0	4.2	0.0	2.1
QHC-02-N	5.9	0.9	4.2	0.0	0.0	8.3	0.0	4.1
QHC-02-O	4.4	0.6	25.2	13.0	0.0	33.3	0.0	10.5
QHC-02-P	0.0	4.1	5.9	0.0	0.0	4.2	0.0	2.7
QHC-02-Q	2.1	1.8	2.3	3.2	0.0	4.2	50.0	2.2
QHC-02-R	1.2	3.6	0.0	29.0	0.0	8.2	0.0	2.5
QHC-02-S	0.3	0.9	2.1	1.6	0.0	25.0	0.0	1.4
QHC-02-SF	46.9	43.6	10.3	4.8	0.0	4.2	50.0	32.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 3.6. Percentages of Material Types by Count from Excavation Units

Subop	Glass (%) n=371	Ceramic (%) n=190	Metal (%) n=428	Shell (%) n=60	Faunal (%) n=2	Lithic (%) n=23	Misc. (%) n=1	All Material Types (%) n=1075
QHC-02-B	4.3	17.4	1.2	0.0	0.0	0.0	0.0	5.0
QHC-02-C	19.4	18.9	9.4	35.0	100.0	4.3	0.0	16.0
QHC-02-D	2.4	12.1	8.4	0.0	0.0	0.0	0.0	6.3
QHC-02-E	2.2	2.6	0.2	10.0	0.0	0.0	0.0	1.9
QHC-02-F	17.8	1.6	0.9	0.0	0.0	0.0	0.0	6.8
QHC-02-G	2.7	2.6	10.5	1.7	0.0	0.0	0.0	5.7
QHC-02-H	1.1	7.4	10.5	0.0	0.0	0.0	0.0	5.9
QHC-02-I	16.2	10.0	3.5	0.0	0.0	0.0	0.0	8.7
QHC-02-J	0.8	0.5	0.0	5.0	0.0	0.0	0.0	.7
QHC-02-K	1.3	3.2	0.9	0.0	0.0	4.3	0.0	1.5
QHC-02-L	0.0	1.0	2.1	0.0	0.0	0.0	0.0	1.0
QHC-02-M	1.3	0.0	6.6	0.0	0.0	4.3	0.0	3.2
QHC-02-N	11.1	1.6	4.7	0.0	0.0	8.7	0.0	6.1
QHC-02-O	8.4	1.0	28.0	13.3	0.0	34.9	0.0	15.7
QHC-02-P	0.0	7.4	6.6	0.0	0.0	4.3	100.0	4.1
QHC-02-Q	4.0	3.2	2.6	3.3	0.0	4.3	0.0	3.3
QHC-02-R	2.2	6.3	0.0	30.0	0.0	8.7	0.0	3.7
QHC-02-S	0.5	1.6	2.3	1.7	0.0	26.2	0.0	2.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

The largest overall percentages of artifacts came from Subops QHC-02-SF and QHC-02-C, while Subop QHC-02-J appears to be the most sterile. As evidenced from Table 3.5, the majority of artifacts recovered from Qualm Hill were present on the ground surface (as part of Subop QHC-02-SF). The large percentage of artifacts recovered from subop QHC-02-C may be due to its size (3 x 3 m), but the variety and abundance of artifacts recovered from this subop also indicate that the area may have been associated with the camp foreman's residence. The lack of cultural material observed in Subop QHC-02-J may be attributed to the fact that the majority of this suboperation's matrix consisted of large limestone rocks. The artifacts recovered from each suboperation are discussed in greater detail below.

Glass

Glass was the most abundant material type preserved in the archaeological assemblage at Qualm Hill. Lindsey's (2015) Bureau of Land Management/Society for Historical Archaeology Historic Glass Bottle Identification and Information website, Polak's (2007) field guide to bottle identification, and the Parks Canada Lighting Devices guide (Woodhead et al. 1984) were used during analysis to determine the manufacture date range and initial function of each object or vessel. A total of 699 glass pieces was cataloged and analyzed during the 2015 field season. Table 3.7 details the distribution of glass artifacts throughout the site. The Minimum Number of Vessels/Objects (MNV/MNO) was calculated by rim or finish counts.

Table 3.7. Glass Overview

Subop	% Site Total (n=699)	Mean Artifact Weight (g)	MNV/ MNO
QHC-02-A	2.3	3.4	0
QHC-02-B	2.3	1.9	1
QHC-02-C	10.3	4.0	2
QHC-02-D	1.3	25.4	1
QHC-02-E	1.2	57.4	0
QHC-02-F	9.4	6.5	1
QHC-02-G	1.4	14.7	0
QHC-02-H	0.6	93.8	1
QHC-02-I	8.6	2.8	1
QHC-02-J	0.4	0.7	0
QHC-02-K	0.7	0.8	0
QHC-02-L	0.7	16.0	0
QHC-02-M	0.0	0.0	0
QHC-02-N	5.9	6.2	2
QHC-02-O	4.4	3.6	2
QHC-02-P	0.0	0.0	0
QHC-02-Q	2.1	3.9	0
QHC-02-R	1.2	9.8	0
QHC-02-S	0.3	2.0	0
QHC-02-SF	46.9	57.9	48
Total	100.0	31.2 (Overall Mean Weight)	59

Glass artifacts were most abundant on the surface of the site, and the majority of whole bottles were also consequently present on the ground surface. Of the excavation units opened at Qualm Hill, Subops QHC-02-C, -F, and -I contained the most glass shards. Subop QHC-02-C may have contained a larger count of glass shards due to its size (3 x 3 m). Conversely, Subop QHC-02-F was only a 1-x-1-m unit, but the high glass shard count in this subop can be attributed to a broken lamp chimney, which had shattered into 52 pieces. The area where Subop QHC-02-I was placed was chosen for excavation due to a concentration of glass on the surface, and the area may actually constitute a midden deposit.

Unidentifiable body shards constituted 39.5 percent of the glass assemblage, or 276 of the 699 glass pieces recovered from the site. Identifiable glass items included beer, soda, wine, mineral water, condiment, medicinal, and perfume or cologne bottles, bottle stoppers, drinking glasses, a lamp chimney, a vial, and bottles with unknown contents. Table 3.8 details the discernible forms present in the Qualm Hill glass assemblage. In this instance, the MNV/ MNO includes both vessels and fragments whose form was recognizable.

Beverage bottles represented the largest count of the glass assemblage. Of these bottles, 11 were characterized as beer bottles, based on their dark green or brown color, crown finishes, and export shapes. These features overlap with other bottle types, though, so it is likely that some may have been misidentified in the absence of more distinct labeling. None of the beer bottles exhibited brand names to confirm our designations.

Seven bottles were categorized as wine bottles because of their dark green color, push-up bases, and long necks. Again, none of these bottles exhibited brand names to confirm our designations.

Table 3.8. Glass Vessel or Item Type

Object	MNV/ MNO
Beverage	40
Condiment bottle/food container	1
Pharmaceutical/patent medicine bottles	27
Hygiene/cosmetic/grooming	1
Lamp or lantern Part	1
Bottle, unidentified contents	36
Bottle stopper	1
Tableware	3

Three soda bottles were identified in the glass assemblage based on their aqua or clear color, crown cap finishes, and champagne or export shapes. No markings indicating the product manufacturers were present on these bottles.

Four mineral water bottles, all produced by the same glass making company, were identified in the glass assemblage. These bottles were aqua colored and exhibited beveling or vertical ribbing around the body of each vessel to form decagonal bases (Figure 3.13). They were relatively larger than all other glass vessels recovered from the site, and their bases indicate they contained 20 ounces of liquid. The lips were curiously broken off of each mineral water bottle specimen. The remaining bottles termed "beverage bottles" could not be further identified to determine their contents.

Cal (1991:217, 253) notes that mahogany loggers were paid half goods/half cash for their labor, and that the same companies oftentimes paid Maya planters with rum in lieu of wages. It is therefore not surprising that beer and wine bottles dominate the glass assemblage at Qualm Hill. Whether loggers purchased these items as part of the advance system or were given alcohol in lieu of wages is unknown, but either scenario fits securely within the historical context of colonial British Honduras.

The remains of at least three drinking glasses were identified in the Qualm Hill glass assemblage. Two of these drinking glasses were amethyst-colored from solarization, while one was still clear. One glass demonstrated an etched floral design (Figure 3.14), and another was vertically ribbed. A base fragment included in this assemblage had a starburst design. No other tableware was found at the site. Finamore (1994:199) associates tableware with elevated social status and economic stability amongst nineteenth-century logging camps, so it is not unreasonable to assume that these items were possessions of the camp foreman.

Only one condiment bottle was collected at Qualm Hill. This "sauce" bottle exhibited geometric designs on the shoulder of the vessel and vertical ribbing on the body.

One bottle stopper was recovered from the site. It exhibited a flat top with a tapered cylindrical shank, which is commonly used on club sauce bottles (Ng 2007:171). An "E" maker mark was present on the underside of the stopper's finial.

Twenty-seven patent medicine or pharmaceutical bottles were identified in the glass assemblage at Qualm Hill. Brands identified on these bottles included: Elliman's Embrocation, Eno's Fruit Salt, C. H. Wintersmith, Barry's Pain Relief, Parker-Blake Co. Ltd., Dr. Kilmer's Swamp Root Kidney Liver and Bladder Cure (Figure 3.15), and Hamlin's Wizard Oil. Elliman's Embrocation was a lotion for muscles that was marketed for use on both humans and animals (Ng 2007:182). Eno's Fruit Salt, which is still sold today, was marketed as an antacid that could clear the body of "all foul secretions" (The Penny Illustrated Paper and Illustrated Times [PIPIT] Date Unknown, 1890). C. H. Wintersmith, Barry's Pain Relief, and Hamlin's Wizard Oil were all sold as cure-all pain relievers. Cal (1991:142) describes logwood cutting, chipping, and hauling as extremely arduous and unhealthy activities, so perhaps these products speak to the aches and pains of physical labor in the mahogany industry.

One cologne or perfume bottle fragment was recovered from Qualm Hill. The fragment indicates that the bottle contained "Aqua Divina" made by E. Coudray Paris. According to Ng (2007:194), Aqua Divina, which purported to prevent the plague and cholera while simultaneously preserving an individual's freshness and youth, was similar to Florida Water perfumed water. This item may indicate the presence of women (or at least *a* woman) in the camp.

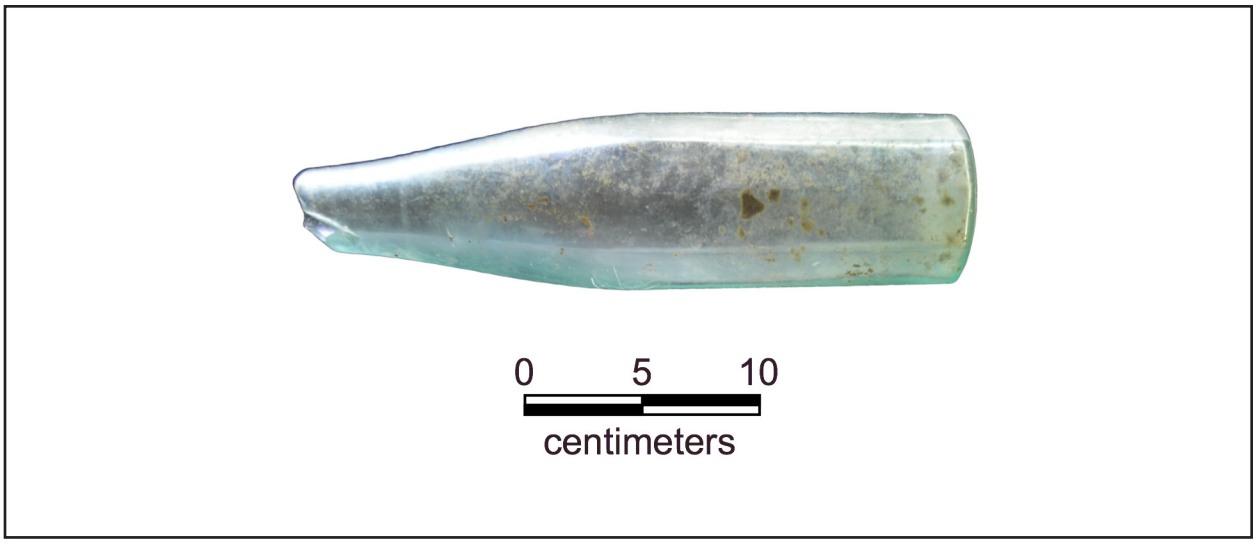

Figure 3.13. Typical mineral water style bottle (Spec. # QHC1109-01) found at Qualm Hill.

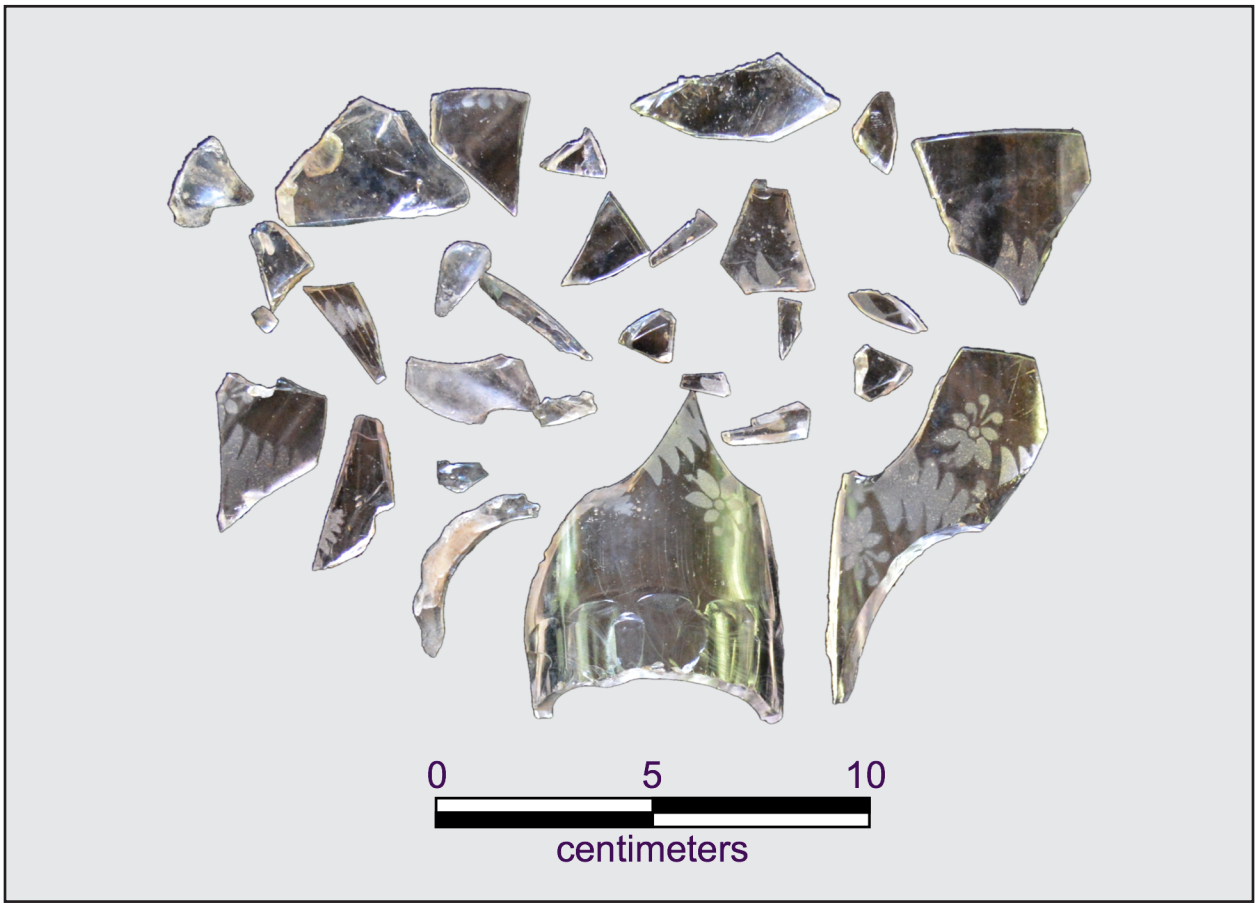

Figure 3.14. Drinking glass (Spec. # QHC1174-01) recovered from Qualm Hill. Note that the shards were photographed against a black background, which was digitally removed, causing the shards to appear dark when in reality they are clear.

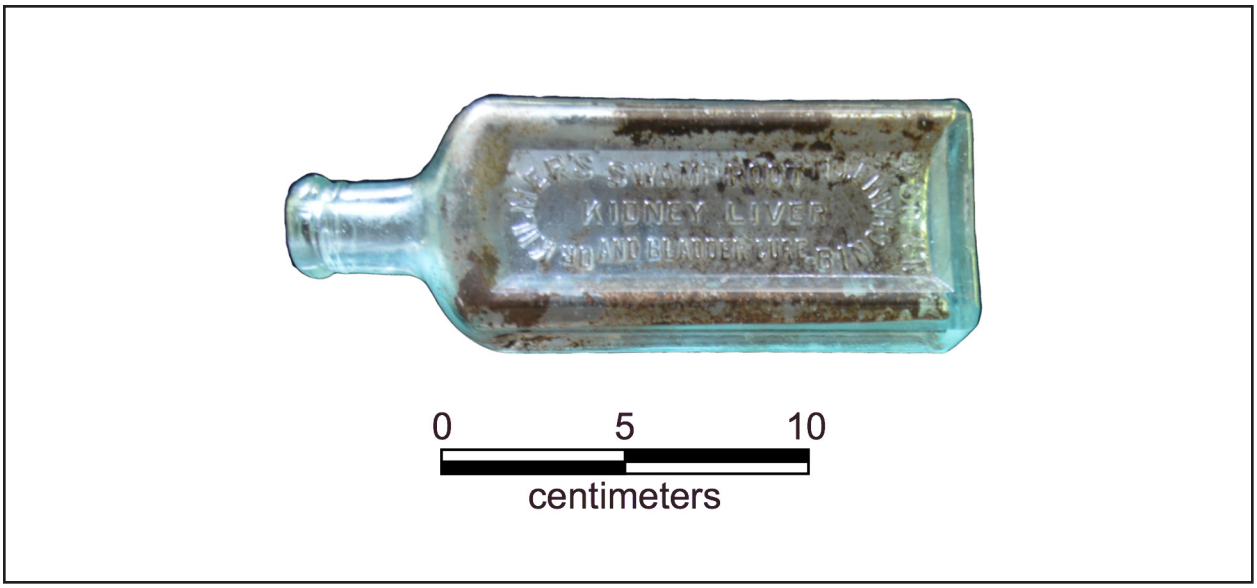

Figure 3.15. Dr. Kilmer's Swamp Root Kidney Liver and Bladder Cure bottle (Spec. # QHC1084-01).

One lamp chimney, which exhibited a crimped decorative rim, was identified in the Qualm Hill glass assemblage (Figure 3.16). Though this lamp part appears to have been found in a domestic context (near a basin-shaped arrangement of stones with a pot on top), it is important to note that logging work was typically conducted at night when it was cooler (Cal 1991). Lamps and lanterns would have obviously been instrumental to loggers working in such conditions. The decorative style of this lamp, as opposed to a utilitarian lamp, further implies that it was not used during logging activities, however.

One "long-style" vial with a tapered-down finish was recovered from the site, and we spec-

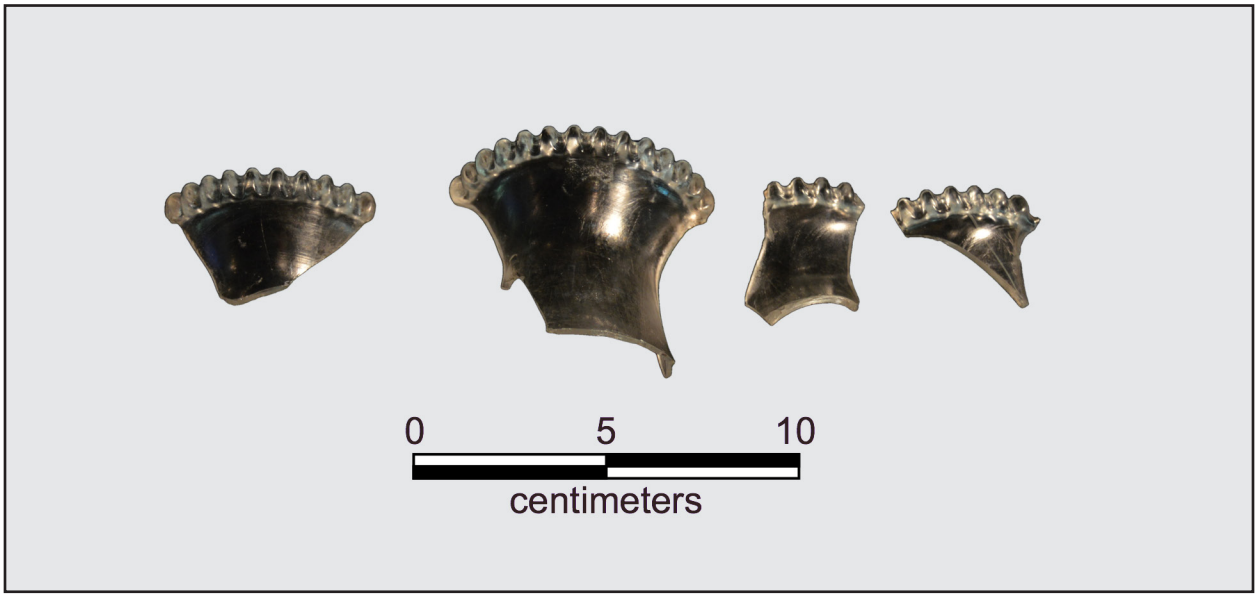

Figure 3.16. Lamp chimney (Spec. # QHC1135-03) recovered from Qualm Hill. Note that the shards were photographed against a black background, which was digitally removed, causing the shards to appear dark when in reality they are clear.

ulate that it may have contained homeopathic medicine. No inkwells were identified in the Qualm Hill glass assemblage.

The manufacture date range of glass artifacts is presented in the graphic (Figure 3.17) below. Following the method outlined by Ng (2007:203), the given time period is divided into five-year intervals to consider how many artifacts could have been manufactured within a given five-year interval. Objects with long manufacture date ranges appear in many of the intervals depicted. Spikes in production are evident in Figure 3.17. Machine-made bottles proved to be problematic in this endeavor, as those lacking maker marks could potentially date anywhere from 1905 to present day. For this reason, bottles with such a broad production range were excluded from consideration in the graph.

A peak in production appears between 1875 and 1880, with a second peak in 1910. The cause of these two peaks is subject to further investigation. The majority of glass identified at the site was broadly produced between 1870 and 1920, which post-dates the raid on Qualm Hill by the Icaiche Maya in 1866. We speculate that the sawmill could have been relocated after its original location was burned during the raid.

Bottles collected as part of Subop QHC-01-SF in 2014 (Phillips and Sandrock 2014) were reanalyzed in 2015 to ensure that consistent analytical methods were employed in determining the manufacture date range of glass artifacts recovered from the site. Table 3.9 illustrates the adjusted manufacture date ranges for these bottles, which are generally a decade or so later than originally thought. These bottles

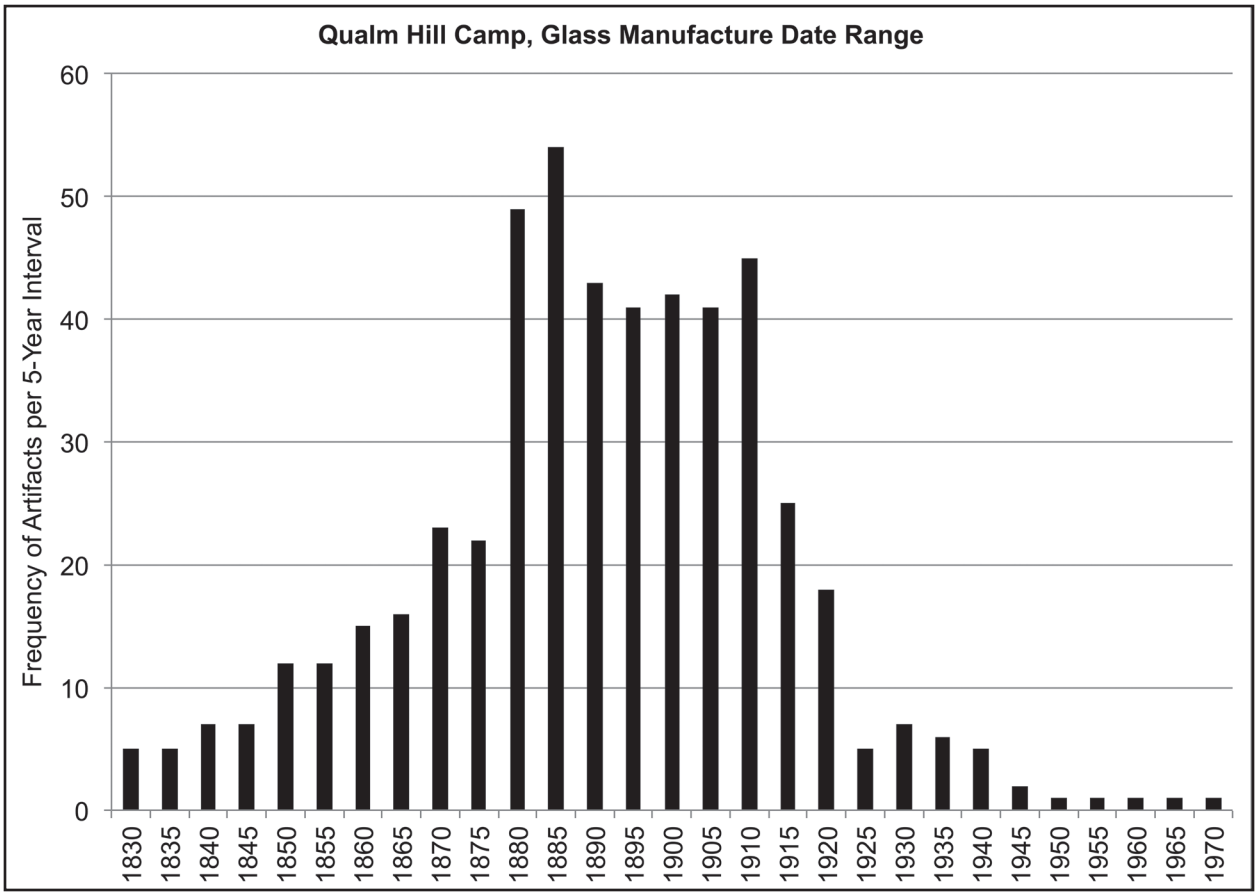

Figure 3.17. Manufacture date range of glass artifacts.

were included in the glass analysis presented in Figure 3.17.

Ceramics

A total of 336 ceramic sherds was collected from Qualm Hill, mostly in the form of unidentifiable body sherds from unknown vessel types. Two locally produced "Maya" sherds are included in the assemblage, but were too small to identify further. The majority of the ceramic assemblage comprises imported items from Europe. Table 3.10 illustrates the distribution of ceramics within the site.

Subops QHC-02-B, -C, and -SF contained the largest concentrations of ceramic objects. The large percentage of ceramics from QHC-02-SF may be attributed to sampling bias as the majority of ceramic material recovered from the site was present on the ground surface as opposed to buried deposits. It is interesting that a large concentration of ceramic material was present in Subop QHC-02-B, as this unit also contained several large metal objects associated with log transportation. It is currently unclear why ceramic objects would have been concentrated in an industrial activity area. Subop QHC-02-C was a larger excavation unit (3 x 3 m) compared to other suboperations at Qualm Hill (generally 2 x 2 m), which may account for the large percentage of ceramic items present in this unit. No ceramic material was recovered from Subop QHC-02-M, probably due to its relatively small (1 x 1 m) size. Table 3.11 details the ceramic object forms observed at Qualm Hill. Rather than assigning MNV/MNO counts to these items, the number of specimens is listed because most sherds were too small to constitute more than 50 percent of an object rim. Specimen numbers were assigned

Table 3.10. Summary of Qualm Hill Ceramics

Subop	% Site Total (n=336)	Mean Artifact Weight (g)	MNV/ MNO
QHC-02-A	0.9	7.0	1
QHC-02-B	9.8	2.5	0
QHC-02-C	10.7	2.9	1
QHC-02-D	6.8	2.2	1
QHC-02-E	1.5	1.2	0
QHC-02-F	0.9	22.7	1
QHC-02-G	1.5	1.0	0
QHC-02-H	4.1	6.8	1
QHC-02-I	5.6	10.8	1
QHC-02-J	0.3	1	0
QHC-02-K	1.8	1.8	1
QHC-02-L	0.6	3.5	0
QHC-02-M	0.0	0.0	0
QHC-02-N	0.9	7	1
QHC-02-O	0.6	17.5	1
QHC-02-P	4.1	2.4	0
QHC-02-Q	1.8	3.3	0
QHC-02-R	3.6	1.7	0
QHC-02-S	0.9	1.3	0
QHC-02-SF	43.6	12.9	10
Total	100.0	8.1 (Overall Mean Weight)	19

Table 3.9. Adjusted Manufacture Date Ranges for Bottles from Subop QHC-01-SF.

Lot	Spec. #	Description	Phillips and Sandrock (2014) Manufacture Date Range	Adjusted Manufacture Date Range
QHC-01-SF-02	QHC0592-01	A.B.C.M. Co.	1893–1920	1905–1915
QHC-01-SF-03	QHC0620-01	Elliman's Embrocation	1865–1870	1870–1885
QHC-01-SF-04	QHC0594-01	Barry's Pain Relief	1860–1865	1880–1910
QHC-01-SF-05	QHC0601-01	Parker-Blake Co. LTD	Early 1900s	1880–1920

Table 3.11. Ceramic Object Types from Qualm Hill

Object	Specimens
Locally produced vessels	1
Clay tobacco pipes	21
Plates	10
Saucers	4
Cups and mugs	6
Storage vessel	1
Buttons	1
Doll parts	2

based on decoration, form, thickness, etc. noted within each suboperation.

Tobacco pipes constitute the most numerous ceramic object type collected from Qualm Hill. All of the pipes appear to have been made of kaolin clay (Rhodes 1973). Maker's marks visible on pipe stems included: M&T 483, "…ur…" bracketed by double lines, E. Roach London, and "E. Ba…don." "M&T" likely stands for Müllenbach & Thewald (Figure 3.18), a German company in operation from 1803 to present day (Pipedia 2008). "E. Roach" is probably Edmund Roach, who worked as a pipe maker in London from 1859 to 1899 (Elverson 2013:29). As noted by Ng (2007:216), the use life of a pipe was only several days to two weeks, which may explain the large number of broken pipes present at Qualm Hill. Ng (2007:216) also notes that smoking was considered a working-class activity in the late nineteenth century, which is consistent with the status of logging occupations in the economy of British Honduras.

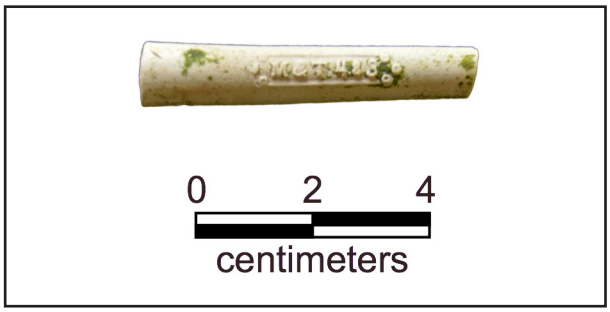

Figure 3.18. Clay pipe stem (Spec. # QHC1315-01) recovered from Qualm Hill.

Plates were the second-most abundant ceramic item type identified at Qualm Hill. Two maker's marks were observed on plate sherds: Warranted Wheeling Pottery Co. White Granite (Figure 3.19) and "Spring-...England …enry Bu…" The first marking dates from 1880–1886 (Jervis 1897:96), but efforts to identify the second marking have not been successful. These markings may be both maker's and importer's marks. The large number of plates identified in the Qualm Hill assemblage reflects an emphasis on individual serving vessels similar to trends observed in early-twentieth century Anglo-American dining habits (Deetz 1977). Finamore (1994:185) conversely notes that communal vessels dominated seventeenth- and eighteenth-century ceramic assemblages in British Honduras, echoing the maritime social organization of the colony's earliest immigrants (known as Baymen). Considering that Baymen and their descendants constituted a major demographic of the logging workforce, this behavioral shift is interesting to note.

Both doll parts were recovered from the vicinity of Subop QHC-02-C. One piece is unquestionably a doll arm (Figure 3.20). The other piece is likely a limb as well, but it is too fragmented to identify further. Based on the doll parts recovered from Holotunich by Ng (2007:241), however, it is also likely an arm because it was numbered (with a "3") like the doll arm described in Ng's (2007) dissertation. These items may represent the presence of at least one child in the camp, possibly indicating that the foreman's family resided with him during the logging season. Table 3.12 details the imported ceramic vessel types collected from Qualm Hill by decoration style.

Many ceramic sherds collected from Qualm Hill were such tiny fragments that no design

Figure 3.19. Plate produced by Wheeling Pottery Co. (Spec. # QHC1144-01).

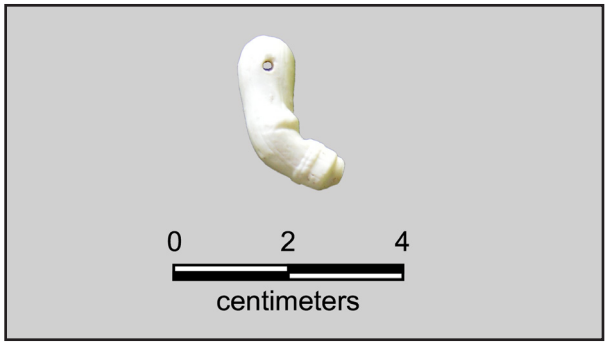

Figure 3.20. Doll arm (Spec. # QHC1044-01) recovered from Qualm Hill.

was visible on them. For those ceramic sherds that exhibited some form of decoration, transfer whiteware seems to have been the most common form, followed by ironstone. The relatively low density of porcelain vessels recovered from the site may attest to class distinctions present in the camp, particularly between the loggers and the foreman. The ceramic manufacture date range for Qualm Hill artifacts was calculated based on the production date ranges of these ceramic types and maker markings present on some artifacts. This information is displayed in Figure 3.21.

As illustrated in the figure above, ceramic artifacts recovered from Qualm Hill generally date from 1830 to 1900, with a peak in production from approximately 1840 to 1860. The earlier manufacture date range for ceramics versus glass may be attributed to the fact that glass containers were discarded after consumption of the contents, while ceramic vessels were intended for reuse. Though the glass artifacts recovered from Qualm Hill typically postdate the 1865/1866 raid by the Icaiche Maya,

Table 3.12. Qualm Hill Ceramics by Decoration

Decoration	Sherds
Whiteware – Undecorated	94
Dipped Annular Whiteware	8
Hand Painted Whiteware	12
Sponged Whiteware	14
Flow Blue Whiteware	5
Transfer Whiteware	91
Shell Edge Whiteware	1
Variegated Whiteware	6
Coarse Earthenware	14
Ironstone	67
Porcelain	3
Miscellaneous	3
Total	318

ceramics recovered from the site do not, and it is important to note that many ceramic sherds were obviously burned. It is currently unclear whether the burning observed on these artifacts is associated with the raid or exposure to fire in a more domestic setting, or even through a post-depositional event. Ng (2007:144) states that refuse in logging camps was often placed in trash pits and burned, so perhaps these ceramics were even discarded and intentionally burned. Ng (2007:248) also asserts that loggers may have taken older or lower quality objects with less personal investment for use in the field, which could also potentially explain the age disparity between ceramics and glass observed at the site, as well as the lack of a consistent china pattern among the vessels.

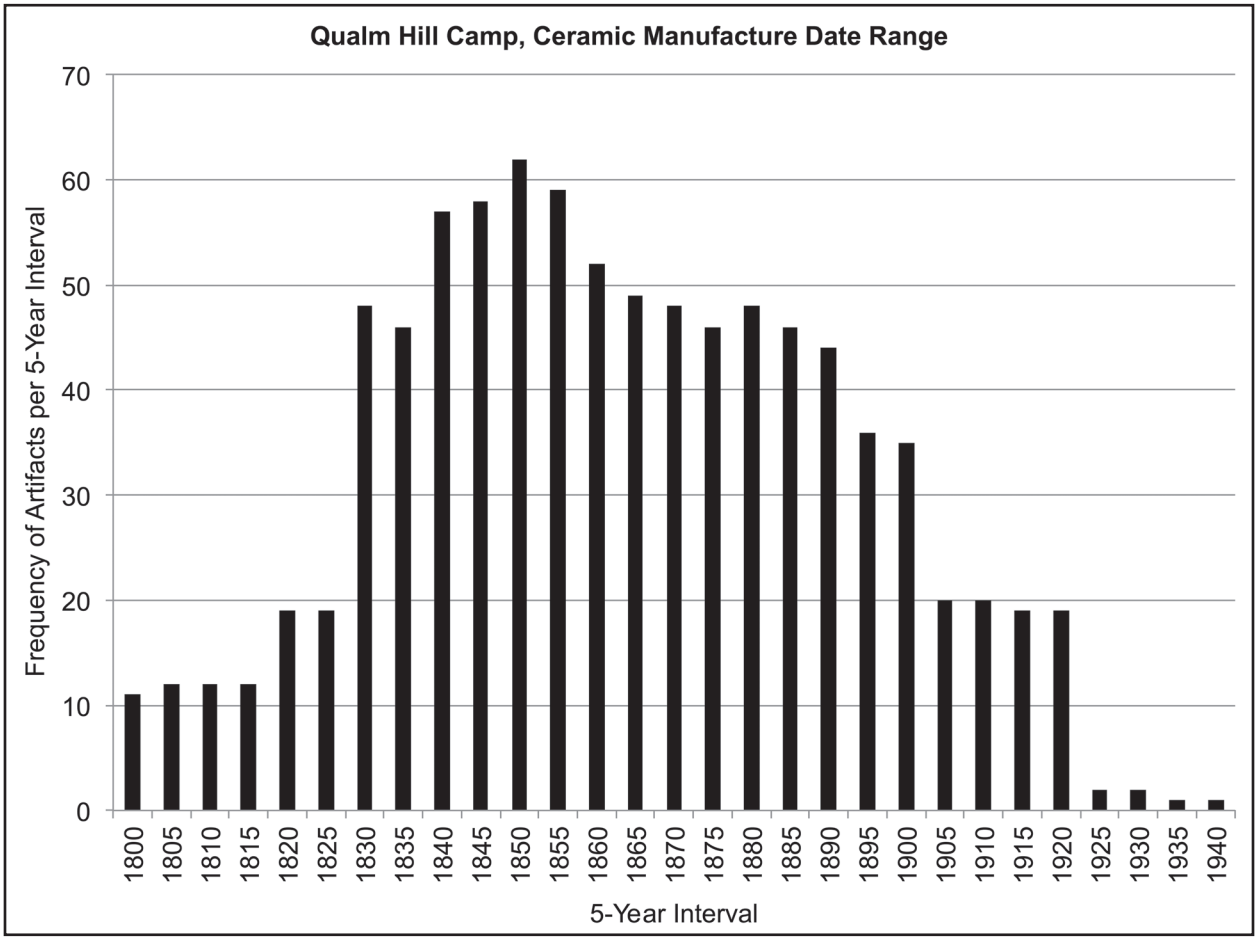

Figure 3.21. Ceramic manufacture date range for Qualm Hill artifacts.

Metal

Although 477 metal artifacts were recovered from Qualm Hill, most were in the form of unidentifiable metal flakes. As described in Table 3.13, only 66 objects were discernible in the metal assemblage. Metal objects collected as part of Subop QHC-01-SF were included with Subop QHC-02-SF in this table.

The largest and most complete metal objects were generally surface collections. As illustrated in Table 3.14, nails/staples, gun parts, and ammunition were the most abundant metal forms present at Qualm Hill, followed by barrel hoops. Barrel hoops were not consistently collected from surface artifact scatters due to their fragile state and may therefore be underrepresented in this table. Similarly, larger pieces of logging equipment were also observed rather than collected, and are also underrepresented in the table.

Can fragments were generally rectangular in shape, or identified by the winding keys (Figure 3.22) used to open them (like sardine cans). According to Ng (2007:270), metal cans became common in logging camps after 1890. The small amount of cans collected from the site is surprising, considering that most food consumed by the loggers should have been pre-packaged items sold through the truck system.

Gun parts and ammunition included numerous shotgun shells and bullet casings from two distinct time periods. Shotgun shells present at the site all had Winchester New Rival 16-gauge headstamps (Figure 3.23), which were manufactured from 1897 to 1920 (Ng 2007:258). Bullet casings all contained the headstamp "RG 86 L1A1," a 7.62 mm rifle grenade manufactured after 1955 by Radway Green (Figure 3.24), who made small arms and ammunition for the British armed forces (Ficenec 2014). It is assumed that these bullets, which appear

Table 3.13. Summary of Metal Artifacts from Qualm Hill

Subop	% Site Total (n=477)	Mean Artifact Weight (g)	MNV/ MNO
QHC-02-A	1.5	6.3	4
QHC-02-B	1.0	211	4
QHC-02-C	8.4	1.2	3
QHC-02-D	7.5	5.8	0
QHC-02-E	0.2	24	1
QHC-02-F	0.8	24.8	1
QHC-02-G	9.4	2.2	13
QHC-02-H	9.4	8.2	7
QHC-02-I	3.1	2.5	0
QHC-02-K	0.8	8.0	1
QHC-02-L	1.9	4.6	3
QHC-02-M	6.0	46.0	1
QHC-02-N	4.2	3.3	2
QHC-02-O	25.2	0.6	2
QHC-02-P	5.9	4.4	6
QHC-02-Q	2.3	0.6	1
QHC-02-S	2.1	0.6	5
QHC-02-SF	10.3	134.6	18
Total	100.0	18.5 (Overall Average Weight)	66

Table 3.14. Metal Overview

Object	Count
Cans (food storage)	9
Chamber pots	1
Gun parts and ammunition	16
Hardware parts	5
Cutting	2
Nails/staples	24
Chain links	1
Personal adornment	7
Logging equipment/transportation	4
Barrel hoops	14
Food preparation	9

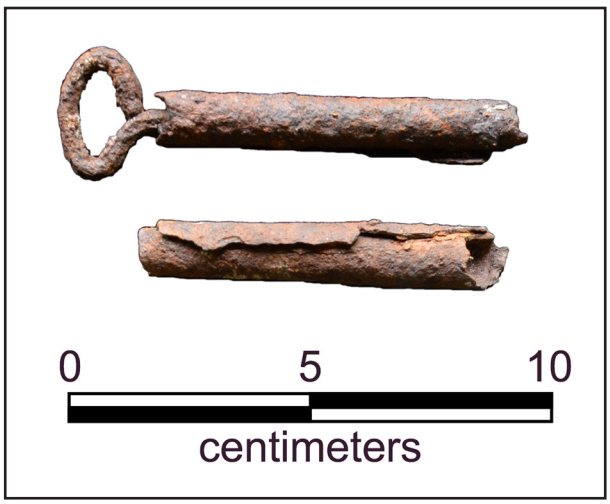

Figure 3.22. Winding keys from sardine-style cans (Catalog # QHC1253).

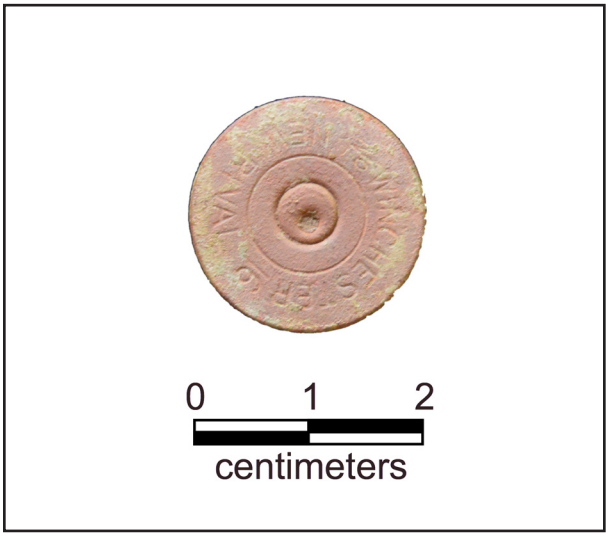

Figure 3.23. Winchester New Rival shotgun shell (Spec. # QHC1063-02).

to be blanks, were deposited at the site in the 1980s during a training exercise for the British military. The majority of these bullets were found in Subop QHC-02-H.

One axe head, which appears to be the head of a felling axe, was recovered from Subop QHC-02-M (Figure 3.25). Nails recovered from Qualm Hill were generally either common nails or finishing nails, with the majority concentrated in Subops QHC-02-G and -P. Nails

Figure 3.24. Radway Green L1A1 fired blank (left) and unfired blank (right) from Subop QHC-02-H.

were both square cut and wire drawn. The concentration of nails within these two subops may indicate that structures were once present in those areas.

Items considered to be "personal adornment" included both buttons and a medallion. Most buttons had four holes, though one appears to have been machine pressed. Ng (2007:271) asserts that metal buttons similar to those recovered from Qualm Hill were likely sewn on work dungarees or overalls. A medallion was recovered from Subop QHC-02-E. Its obverse face displays King George V and Queen Mary in profile, with the words "King George V Queen Mary" (Figure 3.26). The reverse side shows two hands shaking in front of an olive branch with the words "Union is Strength" and "One Destiny" printed in scrolls (see Figure 3.26). King George V was crowned on June 22, 1911, though it is unclear who the owner of this medallion would have been. Ng (2007:140) found a similar item associated with the BEC occupation of Holotunich, in the

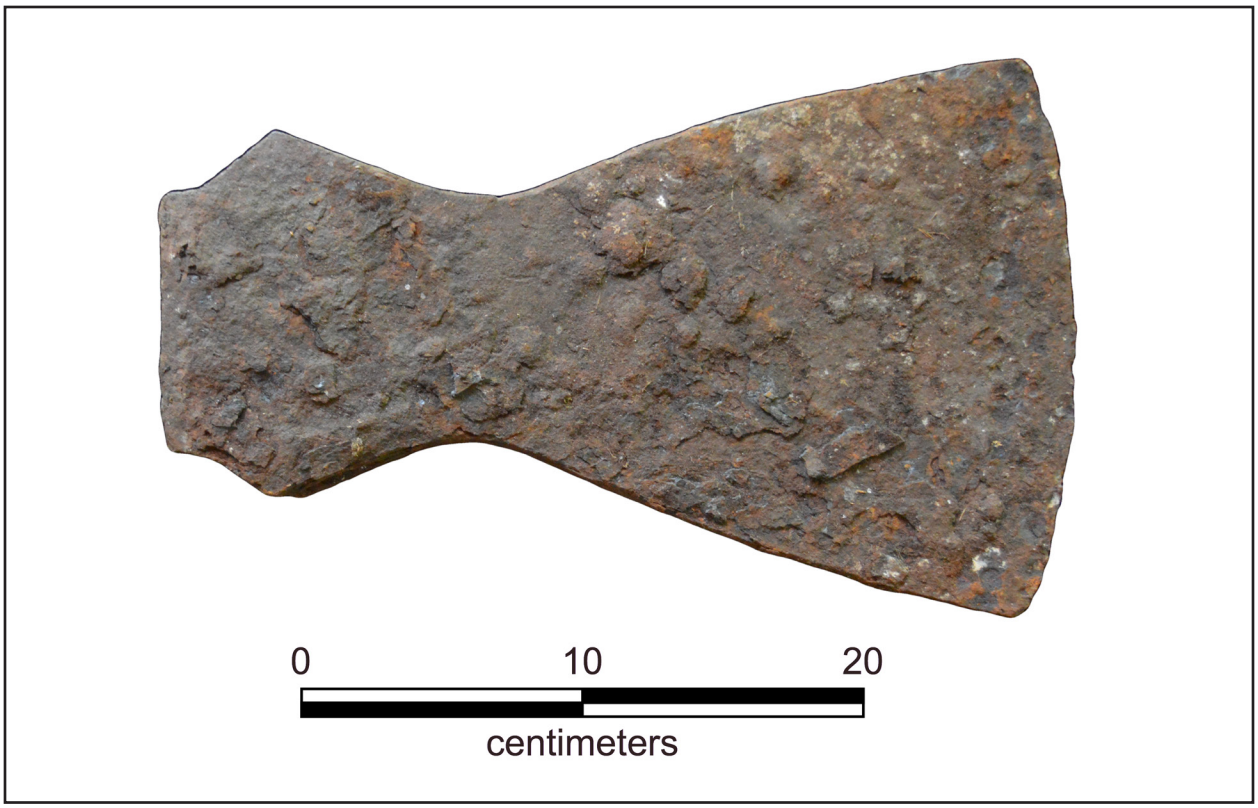

Figure 3.25. Felling axe head (Spec. # QHC1291-01).

form of a plate commemorating the coronation of King Edward VII (ca. 1902).

Food preparation items included multiple cast iron tripod pots. These items were not necessarily found in association with concentrations of *jute* or faunal bone. The lack of food service items (specifically utensils) is a puzzling observation of the Qualm Hill metal assemblage.

Ng (2007:252) suggests that barrel hoops at Holotunich were likely used as storage or trash receptacles based on the amount and variety of artifacts found in association with them. This pattern was not replicated at Qualm Hill, where barrel hoops were generally isolated finds.

Shell

A total of 62 pieces of shell was collected from Qualm Hill. Land snails were not collected from the site due to their natural occurrence on the landscape. Of the 62 shell pieces, almost all were identified as *Pachychilus glaphyrus* (*jute*). *Pachychilus glaphyrus* is a freshwater snail species, and its occurrence in the archaeological assemblage at Qualm Hill is not surprising, considering the close proximity of the site to the Rio Bravo. It is also important to note that *jute* shells were not consistently collected from surface find lots. One unidentifiable shell fragment and a shell button were also recovered from the site. Table 3.15 provides an overview of the distribution of shell artifacts recovered during the 2015 field season.

As evidenced in Table 3.15, Subops QHC-02-C and -R contained the largest concentrations of shell. Subop QHC-02-C was a larger suboperation (3 x 3 m) than any other excavation unit, which may explain the higher number of *jute* shells in the unit. Shell artifacts dominated the assemblage recovered from Subop QHC-02-R, which contained relatively little else.

Figure 3.26. Obverse face (left) and reverse face (right) of coronation medallion (Spec. # QHC1087-01).

Table 3.15. Shell Overview

Subop	% Site Total (n=62)	Mean Artifact Weight (g)	MNI
QHC-02-C	33.9	8.7	21
QHC-02-E	8.1	1.2	1
QHC-02-G	1.6	1.0	0
QHC-02-J	4.8	4.7	3
QHC-02-O	13.0	2.25	5
QHC-02-Q	3.2	2.5	2
QHC-02-R	29.0	5	14
QHC-02-S	1.6	3	1
QHC-02-SF	4.8	7.7	3
Total	100.0	5.5	50

The shell button recovered from Qualm Hill was found in Lot 36 of Subop QHC-02-SF. The button was 1.07 cm in diameter, with four holes. Based on its small size, this button was likely a shirt or dress button (Ng 2007:283).

The majority of shell items collected from Qualm Hill exhibit evidence of modification for consumption. The ancient and historic Maya alike used to lop the spires from *jute* shells to extract the snail meat for soups (Healy et al. 1990:179; Ng 2007:284), and it appears that the loggers at Qualm Hill also adopted this subsistence strategy. Cal (1991:124) notes that woodcutters "labored five days a week and hunted wild cattle and hogs in the weekend for their meat supply" to supplement the items sold to them at exorbitant prices by logging firms through the "truck system." As logging gangs moved farther into the forest seeking new mahogany stands, they became increasingly isolated. Under the truck system, a company store was set up in these remote areas to sell necessities to the loggers at high markups on credit, aiming to keep the workers indebted and assuring their availability as a labor force (Ng

2007:314). To combat the perpetual debt-servitude created under this system, it is likely that the loggers at Qualm Hill supplemented their diet with *jute* soup.

Faunal

The only two fragments of faunal bone recovered from Qualm Hill came from Subop QHC-02-C. This unit also contained a large concentration of *jute*, implying that the area may have been a designated consumption area or midden. One mammalian premolar and turtle carapace were recovered from Subop QHC-02-C. These specimens are described in Table 3.16.

The overall lack of faunal material recovered from Qualm Hill is surprising, considering Cal's (1991:124) assertion that woodcutters "hunted wild cattle and hogs in the weekend for their meat supply." Perhaps the lack of faunal material present at Qualm Hill is a reflection of the generally poor preservation of organic material observed throughout Belize due to the acidic soil and continuously moist environmental conditions or is due to sampling bias.

Lithics

The distribution of lithic artifacts collected from Qualm Hill is illustrated in Table 3.17. Lithic artifacts were concentrated most densely in Subops QHC-02-O and -S, though no large amount of lithic material was actually recovered from any excavation unit. The total count of lithic artifacts collected from Qualm Hill is only 24.

Table 3.17. Overview of Lithic Artifacts

Subop	% Site Total (n=24)	Mean Artifact Weight (g)
QHC-02-C	4.2	2.0
QHC-02-K	4.2	32.0
QHC-02-M	4.2	406.0
QHC-02-N	8.3	0.7
QHC-02-O	33.3	10.1
QHC-02-P	4.2	5.0
QHC-02-Q	4.2	1.0
QHC-02-R	8.2	3.5
QHC-02-S	25.0	2.0
QHC-02-SF	4.2	14.0
Total	100.0	23.5 (Overall Mean Weight)

Lithic artifacts collected from Qualm Hill included debitage, an arrow point, and a mano. Debitage was produced from both chalcedony and chert, while the projectile point was made of chert, and the mano is basalt. The lithic assemblage is illustrated in greater detail in Table 3.18.

Flakes associated with lithic tool production (i.e., debitage) were the most common stone artifacts recovered from the site. The projectile point recovered from Subop QHC-02-C was

Table 3.16. Summary of Faunal Remains

Subop	Spec. #	n	Taxa	Element	Comments
QHC-02-C	QHC1050-01	1	Turtle (River)	Carapace	1 small fragment of turtle carapace. Burned.
QHC-02-C	QHC1050-02	1	Mammal	Premolar	1 fragmented premolar. Appears to be secodont dentition and small so likely a small carnivorous mammal.

Table 3.18. Lithic Artifacts by Category

Description	Count
Debitage	22
Lithic Tools	1
Groundstone	1
Total	24

the proximal fragment of a side-notched point made from a tertiary flake (Figure 3.27), similar to those found at Lamanai (Tracie Mayfield, personal communication, 2015). It is unclear if this arrow point style is prehistoric or historic in nature. The basalt mano fragment found in Subop QHC-02-M is plano-convex in shape. The low density of lithic artifacts stands in stark contrast to the historic artifact assemblage observed at Kaxil Uinic (see Bonorden and Kilgore, this volume), implying that stone tool technology was not readily adopted from the San Pedro Maya by the loggers at Qualm Hill who would have had easy access to metal tools.

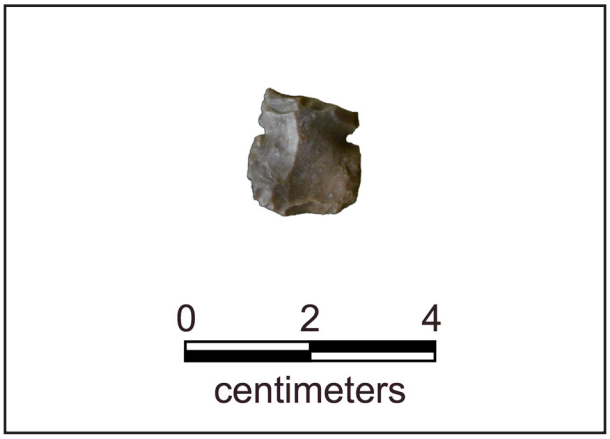

Figure 3.27. Proximal arrow point fragment (Spec. # QHC1046-01) recovered from Qualm Hill.

Miscellaneous

Two miscellaneous artifacts were recovered from Qualm Hill. These items included a plastic four-hole button found in Subop QHC-02-Q and a nickel-cadmium battery found in association with Lot QHC-02-SF-55. The button is probably modern, and the battery dates to the turn of the twentieth century.

Additional artifacts collected by the modern loggers from within their camp were sent to the Belize Institute of Archaeology (Jeff Roberson, personal communication, 2015). Although these items have no provenience, they were also analyzed by BEAST. A summary of the analysis of these items will be included in the senior author's thesis.

CONCLUSIONS

Artifacts collected from Qualm Hill indicate that the site was occupied from approximately 1830 to 1920, yet there is no concrete archaeological evidence of the1866 Icaiche raid on the site. Houk et al. (2015) speculated that the paucity of Maya artifacts may in large part be due to the geomorphology of the site; the landform may be too young for prehistoric materials to be present. Military troops, loggers, and possibly Mennonites also apparently visited the area more recently, compromising the integrity of surface deposits at the site, which unfortunately constitute the majority of the historic artifact assemblage. Despite these circumstances, we were able to make several observations about the diet, social status, and activities of Creole loggers in nineteenth-century British Honduras that are absent from historical documentation.

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Results of the 2015 Excavations at Kaxil Uinic Village

Brooke Bonorden and Gertrude Kilgore

The Belize Estates Archaeological Survey Team (BEAST), operating as the regional component of the Chan Chich Archaeological Project (CCAP), conducted the first season of excavations at Kaxil Uinic village in 2015 (Figure 4.1). The senior author served as operation director, and the junior author assisted with supervising a crew of approximately eight students and workers. The fieldwork took place over 16 days between 16 June 2015 and 1 July 2015, and the authors analyzed artifacts collected from the site from June 24, 2015, to July 11, 2015. Kaxil Uinic was one of the last San Pedro Maya villages settled in Belize during the nineteenth century (Cal 1991:337). The village was clustered around a small *aguada* in northwestern Belize, approximately 0.5 km from the prehistoric Maya site of the same name, near

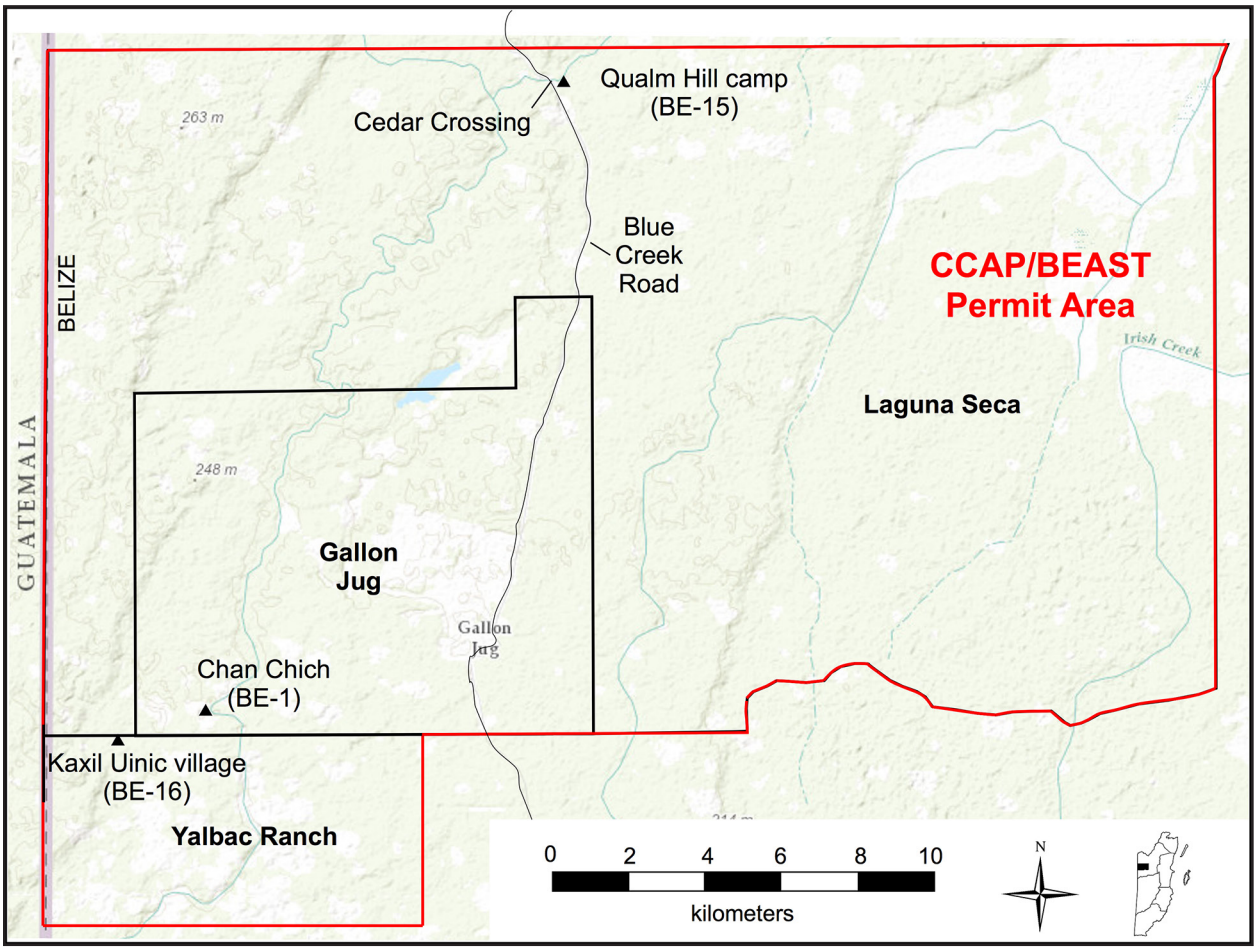

Figure 4.1. CCAP/BEAST permit area with the locations of historic sites and Chan Chich.

Bonorden, Brooke, and Gertrude Kilgore
2015 Results of the 2015 Excavations at Kaxil Uinic Village. In *The 2015 Season of the Chan Chich Archaeological Project*, edited by Brett A. Houk, pp. 105–144. Papers of the Chan Chich Archaeological Project, Number 10. Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock.

the Guatemalan border (Houk 2012:32; Jones 1977:161). While the *aguada* is on property owned by Yalbac Ranch, artifact scatters associated with the site are also found on Laguna Seca Ranch. The purpose of the 2015 investigations was to better interpret the nature of the varied social, political, and economic interactions that occurred between British colonists in Belize (formerly British Honduras) and their Maya counterparts at the turn of the century.

HISTORICAL BACKGROUND

The inhabitants of Kaxil Uinic village were a group of San Pedro Maya seeking refuge in Belize from the Caste War in the Yucatán (1847–1901). Grant Jones (1977:162) speculates that the village was settled in the 1880s by migrants from Holuitz, another San Pedro Maya village southwest of Kaxil Uinic. Holuitz was abandoned sometime after 1868, most likely due to a series of epidemics that severely reduced the population of the settlement (Jones 1977:168). Both villages were located on a direct path from Icaiche—with whom the San Pedro Maya collected rents from logging firms—to San José Yalbac, a larger San Pedro Maya village in the region (Jones 1977:170; Ng 2007:10). The Belize Estate & Produce Company (BEC) ultimately forced the inhabitants of Kaxil Unic to relocate to San José Yalbac in 1931, citing rumors of illegal *chicle* harvesting in the village (Thompson 1963).

Though there are few mentions of Kaxil Uinic in historical records, a general sketch of the village emerges when synthesizing anecdotes. J. Eric S. Thompson (1963:233) described the settlement in 1931 as a "score of huts scattered around a dirty water hole," indicating the presence of about 20 huts around the *aguada* at the site (Figure 4.2). Additionally, Thompson (1963:238) notes that the *aguada* was the only source of drinking water for the villagers at Kaxil Uinic. Thompson's descriptions provide some sense of the size and layout of the village. Hints of San Pedro Maya identity are also evidenced through historical documentation. As cited by O. Nigel Bolland (2003:149), Governor Roger Tucksfield Goldsworthy stated in 1886 that the *alcalde* (mayor) of Kaxil Uinic, one Antonio Baños, considered his village to be in Mexican territory. Yet correspondence to Thompson from the Office of the Conservator of the Forests in British Honduras (Telegram to Thompson, September 15, 1930, Field Museum Archives, Chicago [FM]) indicates that the village was included in BEC's land holdings and the inhabitants actually paid rent to the company for use of the land. The *alcalde*'s assertion that his village was in Mexican territory resonates with the strong Icaiche sympathies displayed at Kaxil Uinic (Jones 1977:166). The fact that the village had an *alcalde* and a "court house" (Telegram, FM) further demonstrates the adoption of a modified traditional Maya political institution (derived from the Postclassic *batab*/town chief and concept of a town council) into colonial bureaucracy (Bolland 2003:135). The inhabitants of Kaxil Uinic likely rented the land from BEC for their *milpas* (subsistence plots), selling surplus crops to logging works or at markets in Orange Walk (Cal 1991:229). As reported by William Miller (1887:422), Kaxil Uinic villagers grew maize, rice, and beans and raised pigs and fowls.

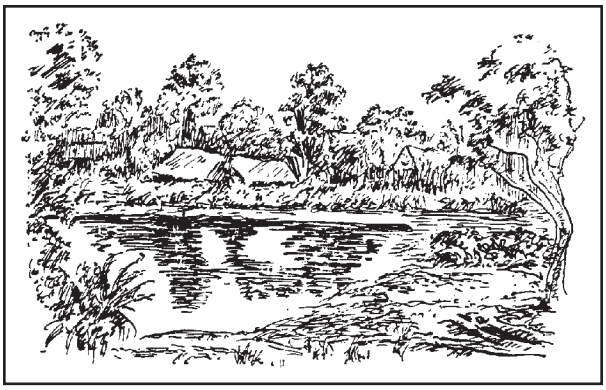

Figure 4.2. Thompson's (1963:Fig. 22) 1931 sketch of Kaxil Uinic.

As evidenced by the excerpts above, virtually all knowledge of the San Pedro Maya living at Kaxil Uinic comes from colonial accounts, which undoubtedly reflect the politically and socially biased British perspective of circumstances. Archaeological excavations conducted by BEAST were able to provide supplementary data to increase our understanding of the Maya colonial experience in lieu of more thorough and objective historical documentation.

PREVIOUS INVESTIGATIONS

Kaxil Uinic village was initially rediscovered in the 1980s by Chan Chich Lodge staff, who maintained a trail to the site into the late 1990s (Houk 2012:36). Staff members interviewed by Houk (2012:36) recalled finding "the big stones the Maya women used to wash clothes" at the edge of the *aguada* when visiting the site.

In 2012, CCAP crew members working at the nearby prehistoric ruins of Kaxil Uinic successfully re-located the village and recorded several historic artifact scatters (Houk 2012:36). Surface collections included three beer bottles and a hair tonic bottle (Table 4.1). In 2014, BEAST assigned the site a BE number (BE-16) based on these data (Sandrock and Willis 2014:127), but no formal excavations occurred at the village site prior to the 2015 season.

PROPOSED RESEARCH DESIGN AND METHODOLOGY

Historical sociologist O. Nigel Bolland (1977:80) divides Maya-British colonial relations in Belize into four phases: a period of Maya resistance to colonial logging activities (1788–1817), a period of relative isolation from British contact (1817–1847), a period of revived anticolonial activity among the Maya and retaliatory military action (1847–1872), and a final period (1872–1900) that witnessed the consolidation of British jurisdiction "over the Maya within Belize and the incorporation of these Maya into the colonial social structure." Almost all knowledge of these phases of cultural contact comes from British accounts, and such interpretations of events, actions, and motives undoubtedly reflect a biased perspective of circumstances. BEAST intended, therefore, to combine archival and archaeological data collected during the 2015 season of the CCAP to critically analyze Maya-British relations at Kaxil Uinic village during the nineteenth century, building on the previous work of Dornan (2004) at San Pedro Sirís and Ng (2007) at Holotunich. Specifically, we were interested in determining how San Pedro Maya participation in the colonial economy of Belize changed through the duration and conclusion of the Caste War in the Yucatán, if the San Pedro Maya maintained religious autonomy in Belize or adopted elements of Protestant Christianity from exposure to missionaries and colonists, and whether or not the San Pedro Maya were "[incorporated]…into the colonial social structure" as alleged by Bolland (1977:80).

To address these questions, we planned to examine pertinent archival records scattered among the Belize Archives and Records Service in Belmopan, the Gallon Jug Ranch headquar-

Table 4.1. Select List of Bottles Observed at Kaxil Uinic Village by Houk (2012:37)

Product	Color	Embossing
Beer	Clear	Jacob Ruppert Brewer New York
Beer	Clear	Eichler New York Registered
Beer	Clear	Pure Food Goebel Beer Registered Detroit
Hair Tonic	Clear	Barry's Tricopherous New York, USA

ters in the Orange Walk District, and the Yalbac Ranch and Cattle Corporation headquarters in the Cayo District. The Belize Archives and Records Service is the national repository for archival documents in Belize, housing census records, maps, official correspondence, and so forth relevant to the British colonial governance of Belize. Gallon Jug Ranch owned a portion of the land on which Kaxil Uinic sits until 2013 and is a subsidiary of Bowen & Bowen, Ltd., which purchased BEC in 1983 (Belize Estate Co, Ltd. 2011; Houk 2013:1). Yalbac Ranch, the property immediately south of Gallon Jug Ranch, is also part of the former BEC holdings. Since BEC owned the parcel of land where Kaxil Uinic village was settled (Telegram, FM) during the late nineteenth century, it was considered likely that many records of BEC's interactions with the villagers at Kaxil Uinic would be in the possession of Gallon Jug Ranch or Yalbac Ranch. For more detail on landownership within the BEAST permit area, see Houk (this volume).

Prior to the 2015 CCAP field season, BEAST proposed to visit each of these locales to conduct initial archival research over a period of several days. We expected that documents housed among these facilities would aid in establishing the approximate locations and sizes of structures within the known site area. Such information would be crucial to the excavation planning process by guiding the placement of excavation units, allowing us to maximize the potential for data recovery within the time constraints of the field season.

With the information from archival documentation, BEAST intended to have field crews establish a 25-x-25-m grid encompassing the predicted core activity area of the village. Houk (2012:38) noted that thick vegetation and debris resulting from the passage of Hurricane Richard in 2010 had rendered Kaxil Uinic village virtually inaccessible without extensive brush clearing, so we anticipated the necessity of hand-clearing vegetation within the established grid prior to mapping or conducting a surface survey. With improved surface visibility at the site, we planned to systematically survey the delineated grid for artifacts and architectural features visible on the ground surface. BEAST proposed to walk transects and demarcate (with flagging pins) areas of interest with the additional assistance of metal detectors. Based on the results of investigations at Tikal (James Meierhoff, personal communication 2015), we suspected that three-stone hearths characteristic of Maya households during the nineteenth century would be present at Kaxil Uinic. We reasoned that identifying hearths at the site would aid in determining the likely location of houses in the village. As these methods refined the known extent of artifact scatters, architectural features, and boundaries of the site, we planned to use a GPS unit to map the findings.

Where dense artifact concentrations were discovered, crews would perform test excavations following the methods outlined by Houk and Zaro (2015) for the CCAP. BEAST intended to excavate a minimum of two shallow strip trenches (50 cm wide x 10–40 m long) in areas promising an abundance or variety of cultural materials. According to Yaeger and colleagues (2004), this method has proven to be an effective means of identifying colonial-period Maya occupations at the major settlement of San Pedro Sirís. If extensive midden deposits were encountered during the excavation of a strip trench, broad exposure excavations would be conducted to recover a larger representative sample of artifacts. Where architectural features were identified topographically or encountered archaeologically, additional excavations were to be conducted to expose and document each feature.

MODIFIED RESEARCH DESIGN AND METHODOLOGY

Efforts to contact Gallon Jug Ranch and Yalbac Ranch and Cattle Corporation via email regarding access to archival documents in their possession both prior to and during the 2015 CCAP field season received no response. As a result, primary source archival data on Kaxil Uinic village was sought solely from the Belize Archives and Records Service. BEAST additionally reviewed secondary accounts of historical documents cited in scholarly works (Cal 1991; Dornan 2004; Jones 1977; Ng 2007) to glean information about Kaxil Uinic.

Similarly, our survey and excavation methodology proved to be unfeasible given the overwhelming quantity of cultural material visible on the ground surface and the dense vegetation and massive tree falls at the site noted previously by Houk (2012:36) and Harris and Sisneros (2012:46–47). Our approach was subsequently modified to more closely reflect testing methods employed in the field of Cultural Resource Management to determine the significance of a site by assessing its integrity and data yield potential. Thompson (1963:233) described Kaxil Uinic village as seen in 1931 as surrounding an *aguada*. As a result, pedestrian survey of the site was focused on the area immediately surrounding the *aguada* to determine the locations of surface deposits. Survey was primarily conducted by workers hired from Chan Chich Lodge, who systematically walked the perimeter of the *aguada* in a series of concentric circles radiating outward. The workers used flagging tape to mark cultural materials present on the ground surface, which were later assigned Surface Find numbers by BEAST staff and recorded using a GPS unit. Artifacts were collected from a representative sample of Surface finds as detailed below. Surface finds representing dense artifact concentrations (such as middens) and architectural features (such as three-stone hearths or artificial mounds) were selected for the placement of test units. Based on observations by Olivia Ng (2007:111) during excavations at the San Pedro Maya village of Holotunich, surface artifact density often correlated with denser sub-surface artifact concentrations. We anticipated that the assemblage at Kaxil Uinic would be patterned similarly.

Field methods utilized during the course of excavation were modeled after the Site-Op-Subop-Lot system detailed by Houk and Zaro (2015) for the CCAP. All fieldwork conducted during the 2015 season was considered Operation (Op) KUV-01. Students participating in the Texas Tech University Field School in Maya Archaeology, with the additional assistance of workers hired from Chan Chich Lodge, excavated test units (ranging in size from 1 x 2 m to 2 x 6 m). Each test unit was designated as a suboperation (subop). Surface finds additionally constituted a subop (Subop KUV-01-SF), with each geographically distinct artifact scatter or architectural feature representing a separate lot. To maintain tighter horizontal control of the site in areas with dense artifact concentrations, surface materials within the boundaries of a test unit were considered to be Lot 1 of that subop, and the surface artifacts surrounding the periphery of the test unit were designated as a lot within the surface find subop. Artifacts visible on the ground surface but partially buried were not collected as surface finds. Each test unit, unless otherwise stated in the following descriptions, was excavated to an arbitrary depth of approximately 10 cm below the ground surface. In total, BEAST opened 13 subops and 55 lots during the 2015 season. All excavated matrices were screened through ¼-inch mesh. Glass and metal fragments smaller than a dime in size were not collected.

Houk used a Total Data Station (TDS) to establish an arbitrary grid at the site, oriented on magnetic north, and recorded the locations of most of our excavation units. The primary map-

ping datum occupies N 5000 E 5000 in the grid and has an elevation of 110 m. Several units could not be mapped with the TDS given difficulties in shooting through the dense undergrowth. These units were mapped using tape and compass. For units that could be mapped with the TDS, Houk also recorded the elevation of the associated vertical datums.

NATURAL SETTING

In present times, Kaxil Uinic village is represented by a scattering of glass bottles, metal objects, and curious rock clusters around a lush *aguada* (Figure 4.3). The site is located in a dense tropical forest in the Orange Walk District of northwestern Belize, approximately 1.85 km east of the Belize-Guatemala border (Harris 2013:1). The *aguada*, with a radius of approximately 44 m, presently functions as a watering hole for various animals inhabiting the jungle around the village site.

This area, known as the Three Rivers region, contains an old logging road that connects the nearby Kaxil Uinic ruins to the prehistoric site of Chan Chich 2.45 km to the east (Figure 4.4; Harris 2013:1). This road was also used to access Kaxil Uinic village, with an additional path cut between the prehistoric ruins of Kaxil Uinic and the historic site. A *bajo*, or wide depression, located between Kaxil Uinic and Chan Chich frequently flooded during the second session of the CCAP field season (Figure 4.5).

The village site is located west of the *bajo*; approximately 500 m south of the prehistoric Kaxil Uinic ruins (Harris 2013:4). The area surrounding Kaxil Uinic is characterized as an upland forest with canopy cover ranging from 15 to 30 m in height, although the area near the *aguada* transitions to cohune palm forest (Houk 1996:5). Species included in this forest type include zapotillo (*Pouteria reticidala*), sapodilla (*Martilkara zapola*), cherry (*Pseudolmedia* sp), male buliboof (*Drypetes brownii*), pigeon plum (*Hirtella americana*), and silión (*Pouteria amygthilina*) following Brokaw and Mallory (1993:5). This type of forest occurs in areas with deep, well drained soils and is the dominant forest type in the area surrounding Kaxil Uinic (Harris 2013:7). The La Lucha Escarpment is located approximately 900 m west of the site (Harris 2013:4). The site is situated approximately 110 m above sea level based on available topographic maps and GPS data.

Figure 4.3. The *aguada* at Kaxil Uinic village.

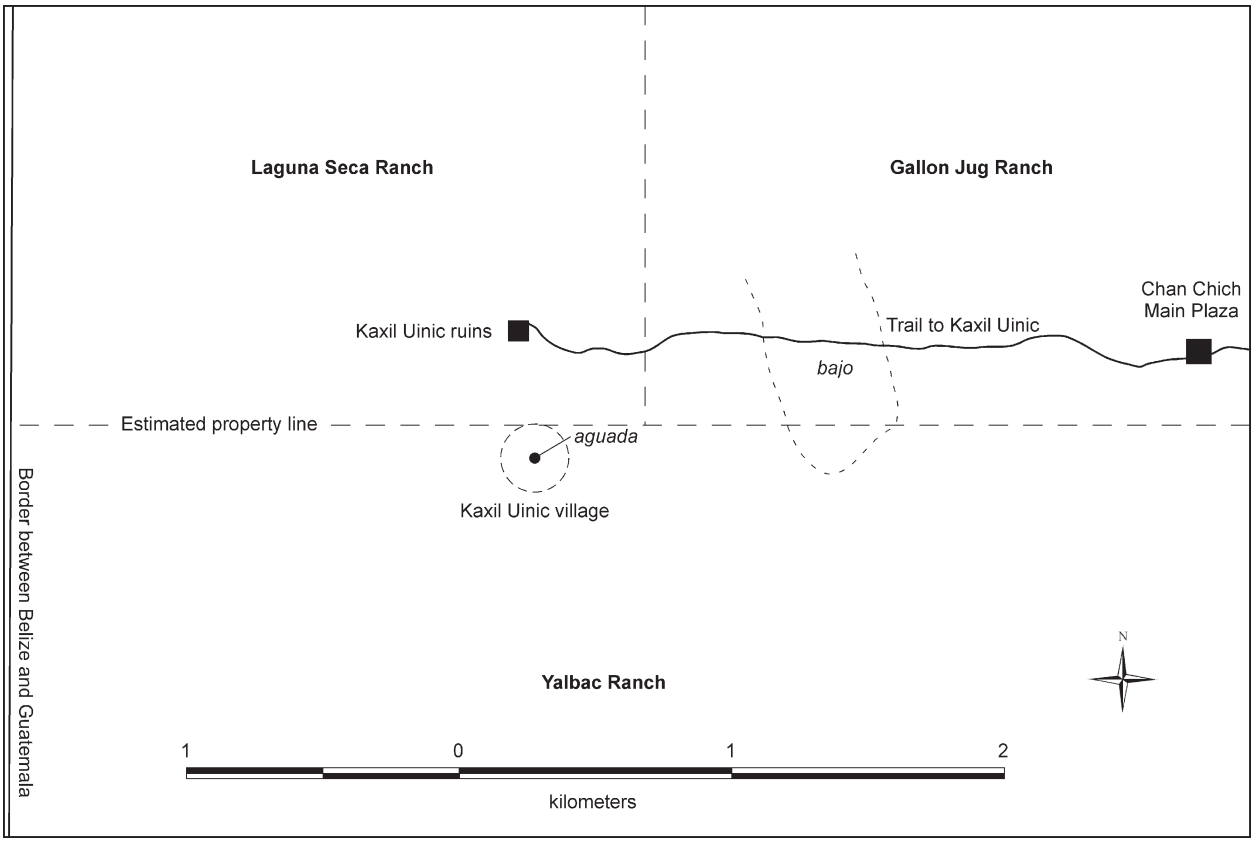

Figure 4.4. Kaxil Uinic village in relation to the prehistoric Kaxil Uinic ruins and Chan Chich (after Houk 2012:Figure 4.4.).

Figure 4.5. Texas Tech University field school students attempting to push our equipment cart through the *bajo*.

SURVEY SUMMARY

Using the survey methods previously detailed, BEAST identified 36 artifact scatters visible on the ground surface surrounding the *aguada* at Kaxil Uinic. Each of these scatters was assigned a lot number within Subop KUV-01-SF. Table 4.2 details the location of each lot as recorded with a GPS unit (Zone 16 Q, WGS 84 datum), as well as a brief description of the artifact assemblage. These artifacts are discussed in greater detail in the "Artifact Analysis" section of this chapter.

Figure 4.6 illustrates the distribution of artifacts at Kaxil Uinic village identified during survey. True to Thompson's (1963:233) description, artifacts were scattered around all sides of the *aguada*. Though current survey data appear to show that surface scatters are concentrated in an almost linear pattern along the east and west

Table 4.2. GPS Coordinates and Descriptions of Surface Finds Identified During Survey

Lot KUV-01-	Easting	Northing	Description
SF-01	273432	1940188	Bottle scatter, machete handle on trail cut to site
SF-02	273461	1940103	Three-stone hearth, jar
SF-03	273456	1940100	Bottle scatter
SF-04	273446	1940095	Bottle, metal food grinder
SF-05	273460	1940110	Bottle glass
SF-06	273481	1940141	Bottle scatter, metal plate
SF-07	273484	1940139	Bottle scatter, metal pot, metal cups
SF-08	273485	1940148	Metal food grinder
SF-09	273487	1940157	Bottle scatter, machete blade
SF-10	273475	1940047	Isolated bottle
SF-11	273516	1940095	Lantern glass, bottle
SF-12	273513	1940112	Metal cup
SF-13	273525	1940118	Isolated bottle
SF-14	273523	1940164	Bottle scatter, lantern base, metal pot
SF-15	273561	1940151	Bottle scatter, metal pot
SF-16	273484	1940036	Metal wheel hubs, bottle
SF-17	273452	1940022	Three-stone hearth with metal pot on top
SF-18	273420	1939993	Colonial ceramics, metal fragment, glass shard
SF-19	273406	1939991	Local ceramics, metate fragment on top of mound
SF-20	273405	1940069	Concrete boundary marker
SF-21	273381	1940054	Bottle scatter, metal cups and bowls
SF-22	273464	1940170	Bottle scatter surrounding Subop KUV-01-A
SF-23	273454	1940164	Bottle scatter surrounding Subop KUV-01-B
SF-24	273494	1940162	Bottle scatter surrounding Subop KUV-01-D
SF-25	273494	1940163	Bottle scatter surrounding Subop KUV-01-C
SF-26	273534	1940153	Bottle scatter
SF-27	273550	1940144	Isolated bottle
SF-28	273558	1940154	Isolated bottle
SF-29	273561	1940150	Bottle scatter surrounding Subop KUV-01-F
SF-30	273560	1940145	Isolated bottle
SF-31	273454	1940141	Isolated jar
SF-32	273452	1940024	Three-stone hearth, metal pot on top, *chiclero* spur, modern trash
SF-33	273453	1940004	Three-stone hearth with metal pot on top
SF-34	273450	1940150	Bottle scatter surrounding Subop KUV-01-G
SF-35	273432	1940054	Isolated bottle
SF-36	273417	1940055	Bottle scatter

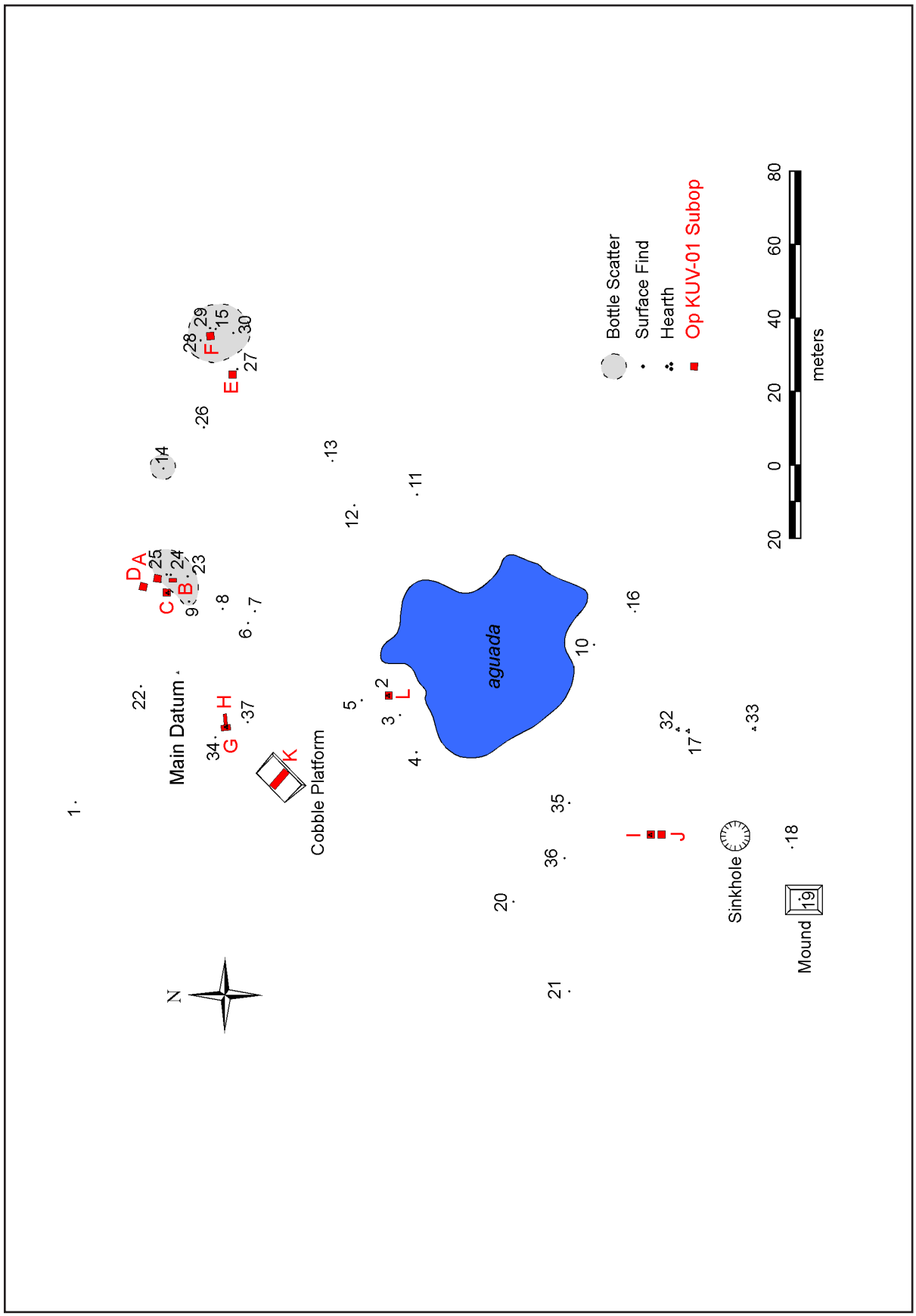

Figure 4.6. Map of surface finds, features, and excavation units at Op KUV-01.

sides of the *aguada*, this patterning could be the result of a sampling bias created during survey. Crewmembers were more likely to spot surface scatters in areas with less vegetation, and it is possible that the aftermath of the 2010 hurricane obscured visibility in areas that appear to be "barren" based on our survey data.

Through the course of our survey, it became apparent that there was obvious overprinting of the historical site by later occupants. Several pairs of *burritos* (rubber boots with the tops cut off) were observed near the *aguada* (Figures 4.7, 4.8, and 4.9). According to Chan Chich Lodge staff (Jeremias Serminia, personal communication, 2015), these modified shoes are regularly sold in Mexico today. Lot KUV-01-SF-32, which exhibited a three-stone hearth characteristic of historic Maya households, also contained modern items. Specifically, Styrofoam, burlap, a plastic lid, and a modern battery were present in the immediate vicinity of the hearth. A plastic military-issue talc powder bottle dating to the 1980s was also recovered. Houk (personal communication, 2015) speculates that these items are remnants of a looters' camp, and that the talc powder was sold by the British military (following Belizean independence in 1981) as surplus to the general population (Alan Jeal, personal communication, 2015). The looters targeted the nearby prehistoric Kaxil Uinic ruins, but likely chose to camp at the historic village site due to its proximity to the *aguada*.

Lot KUV-01-SF-19, which appears relatively distant from other surface finds identified during survey, may possibly represent a previously unidentified mound associated with the prehistoric ruins of Kaxil Uinic. The presence of colonial ceramics at nearby Lot KUV-

Figure 4.7. Talc dusting powder bottle from a looters' camp at Kaxil Uinic (Lot KUV-01-SF-32).

Figure 4.8. *Burritos* from a looters' camp at Kaxil Uinic (near Lot KUV-01-SF-32).

Figure 4.9. Lot KUV-01-SF-32, a three-stone hearth with modern trash and historic artifacts around it.

01-SF-18 implies that the feature was not unknown to the San Pedro Maya in later times.

It is also important to note the large spatial distances between Lots KUV-01-SF-02, -32, and -33, which all contain three-stone hearths. The San Pedro Maya households at Kaxil Uinic were obviously spread over a large portion of the site.

EXCAVATION SUMMARY

This section describes the individual excavation units opened at Kaxil Uinic grouped by proximity. A total of 12 excavation units was opened during the 2015 season, with each unit designated as its own subop. The operation director selected areas with dense artifact concentrations and features visible on the ground surface for excavation. Table 4.3 details the size of each subop. Artifacts collected from each subop are described in greater detail in the "Artifact Analysis" section of this chapter.

Lot 9 of Subop KUV-01-SF, located northeast of the *aguada*, demarcated a large scatter of 70 or more historic bottles generally dating from 1880 to 1940. Due to the large spatial extent of this dense artifact scatter, Subops KUV-01-A, -C, and -D were excavated to sample the midden area. To establish greater horizontal control of the midden for artifact analysis, artifacts within a reasonable distance of each unit were mapped and collected as separate lots of Subop KUV-01-SF (Figure 4.10). Lots KUV-01-SF-22, -24, and -25 are therefore part of the same artifact scatter as Lot KUV-01-SF-09 and correspond with the general proximities of Subops KUV-01-A, -C, and -D. Subop KUV-01-A was a 2-x-2-m unit with two lots. Lot KUV-01-A-01 was the surface collection of bottles present within the perimeter of the unit. Lot KUV-01-A-02 consisted of the excavation the first 10 cm of topsoil. A concentration of gravelly limestone within this lot ran diagonally across the unit from the northwest corner to the southeast corner, possibly representing a prepared surface

Table 4.3. Summary of Excavations from KUV-01

Subop	Size (m)	Description
KUV-01-A	2 x 2	Bottles, faunal bone, debitage, mano, tin can, local ceramics
KUV-01-B	1 x 2	Metal cups, faunal bone, debitage, glass, local ceramics, whiteware, coin
KUV-01-C	2 x 2	Three-stone hearth, faunal bone, glass, metal grinder crank, metate, obsidian, local ceramics, whiteware
KUV-01-D	2 x 2	Bottles, faunal bone, shell, debitage, metal cup, metal pot, chain link, nails, local ceramics
KUV-01-E	2 x 2	Metate, faunal bone, debitage, glass, shotgun shell, knife, local ceramics, whiteware
KUV-01-F	2 x 2	Bottles, faunal bone, debitage, shell, local ceramics, whiteware
KUV-01-G	1.5 x 2.5	Three-stone hearth, faunal bone, debitage, shell, local ceramics, whiteware, obsidian, clay pipe, nail, shotgun shells
KUV-01-H	1 x 3	Faunal bone, debitage, shell, glass, decorative glass bead
KUV-01-I	2 x 2	Faunal bone, debitage, shell, glass, local ceramics, whiteware, obsidian, clay pipe, shotgun shell
KUV-01-J	2.5 x 2	Faunal bone, debitage, glass, local ceramics, whiteware, tin can, clay pipe, shotgun shell
KUV-01-K	2 x 6	Faunal bone, bifaces, uniface, debitage, cores, metate, glass, local ceramics, whiteware
KUV-01-L	2 x 2	Three-stone hearth, modern trash, faunal bone, glass, local ceramics, metal fragments

Figure 4.10. Rebecca Schultz collecting artifacts immediately outside of a subop as part of a surface find lot.

or floor. Subop KUV-01-C was a 2-x-2-m unit also containing two lots. The surface of this unit was drastically sloping in the southern end, so the first lot consisted of the first 10 cm below the ground surface in this half of the unit. A more substantial plaster surface than that present in Subop KUV-01-A was encountered in the southern half of this subop. A three-stone hearth (visible on the ground surface) was present in the northeastern portion of the unit, with the cranking mechanism to a food grinder and metate fragment located in its center. Lot KUV-01-C-02 consisted of a 1-x-0.5-m area in the southeastern corner of the unit excavated to further explore the plaster surface uncovered in the first lot. We excavated through 20 cm of the plaster concentration in an attempt to determine its vertical extent, but did not encounter a new stratum (Figure 4.11). We subsequently decided to focus our efforts elsewhere, rather than excavating a monolith of plaster that could potentially be meters deep. Though the plaster surface did not extend across the entire subop, it is likely that we clipped the edge of a platform constructed for a house. Subop KUV-01-D was also a 2-x-2-m unit with two lots. Lot KUV-01-D-01 was the surface collection of metal fragments and bottles present within the boundaries of the unit. Lot KUV-01-D-02 consisted of the first 10 cm of topsoil, which was relatively sterile in comparison to the topsoil in Subops KUV-01-A and -C. No prepared surface was present in this subop.

Subop KUV-01-B was a 1-x-2-m unit placed in an area south of Subops KUV-01-A, -C, and -D, with KUV-01-SF-23 representing surface artifacts collected from the area immediately surrounding the unit. The presence of two metal cups on the ground surface prompted us to choose this location for Subop KUV-01-B. Lot KUV-01-B-01 consisted of the collection of these cups. Lot KUV-01-B-02 was the first 10 cm of topsoil. A gravelly limestone surface was discovered in this lot running southwest to northeast across the unit. The linear location of Subops KUV-01-A and -B and the parallel ori-

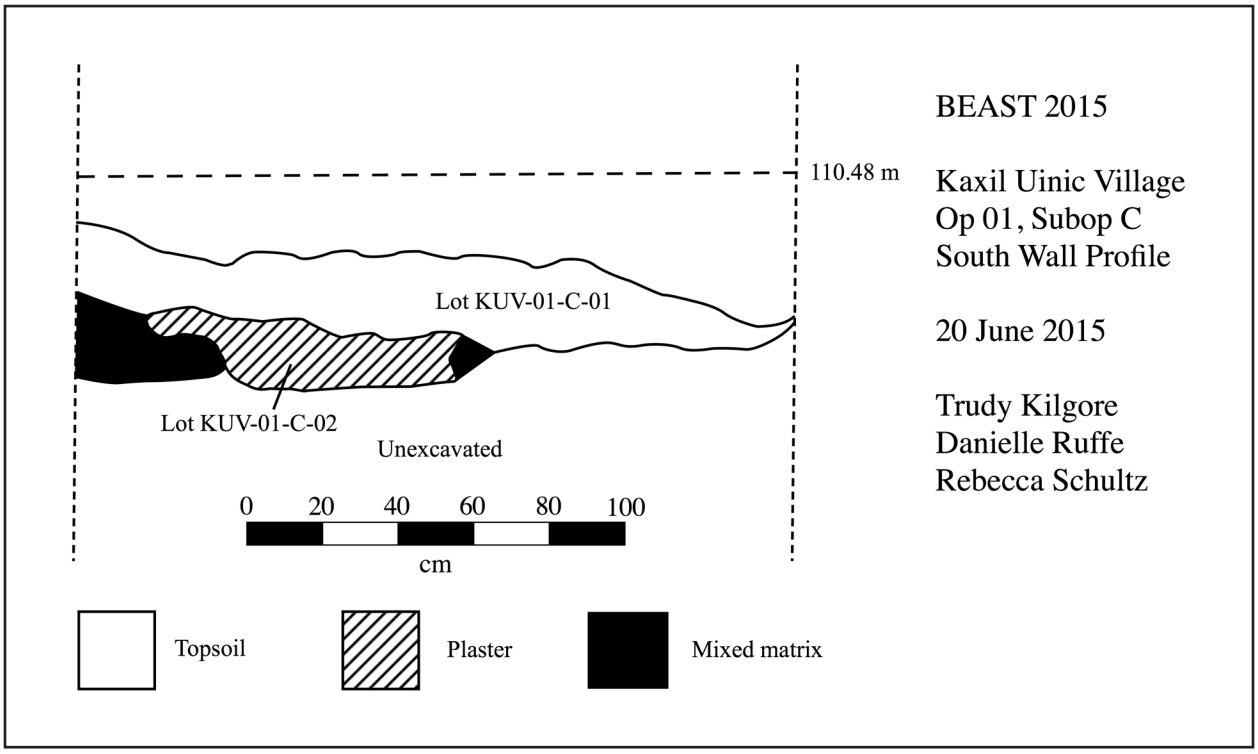

Figure 4.11. Plaster anomaly encountered in Subop KUV-01-C.

entation of the gravelly plaster concentrations found in both units could represent a continuous plaster floor.

Subops KUV-01-E and -F were placed in a second concentrated midden area east of KUV-01-A, -C, and -D. Subop KUV-01-E was a 2-x-2-m unit containing two lots. Lot KUV-01-E-01 constituted the surface collection of a metate, and Lot KUV-01-E-02 was the first 10 cm of topsoil. The artifact assemblage of this unit largely consisted of debitage and bone. Subop KUV-01-F was a 2-x-2-m unit placed over a concentration of bottles. Lot KUV-01-F-01 was the surface collection of bottles and broken glass within the bounds of the subop and lot. Lot KUV-01-SF-29 contains additional artifacts from the surface of the midden area immediately surrounding Subop KUV-01-F (Figure 4.12). Lot KUV-01-F-02 consisted of the first 10 cm of topsoil within the unit. A wide variety of cultural material was recovered from this unit, which is discussed in the "Artifact Analysis" section of this chapter. No architectural features were observed.

Subops KUV-01-G and -H created a T-shaped trench centered on a three-stone hearth northwest of the *aguada*. Subop KUV-01-G was a 1.5-x-2.5-m unit, while KUV-01-H was a 1-x-3-m unit. Aside from the three-stone hearth, no cultural material was present on the surface within the boundaries of these units, so each subop contained one lot consisting of the first 10 cm of topsoil. A bottle scatter near Subop KUV-01-G was assigned Lot 34 of Subop KUV-01-SF. Lot 1 of Subop KUV-01-G encompassed the three-stone hearth. Fire cracked rock and shell fragments were present in the center of the hearth. Large limestone rocks encountered at the bottom of the lot were probably a prepared surface. Lot 1 of Subop KUV-01-H did not encounter a continuation of this surface, but did recover an abundance of debitage, shell, and bone.

Subop KUV-01-K was a 2-x-6-m trench placed southwest of Subops KUV-01-G and -H (Figure 4.13). This area was chosen for excavation based upon the observation of a cobble platform approximately 8 x 12 m in size. Due to its centralized location within the historic village site (and relatively far distance from the ancient Kaxil Uinic ruins), we assumed that this platform was not constructed prehistorically. We speculated that it might represent the remains of the "court house" mentioned to Thompson (Telegram, FM) prior to his visit to Kaxil Uinic in 1931. Only one lot, aimed to take the topsoil off of the raised platform, was excavated. Removal of the topsoil exposed a concentration of cobbles (including many chert cores) running diagonally northwest to southeast across the subop. We proceeded to remove the first layer of cobbles to determine if historic artifacts were present beneath them and encountered several whiteware ceramic sherds and glass fragments. Approximately 30 cm below the ground surface cobbles were still present in dense concentration, yet the majority of artifacts recovered (debitage, locally produced ceramics, etc.) could not be definitively attributed to the historic occupation of the site based on field identification. Lot KUV-01-K-01 was subsequently closed with the possibility of revisiting the platform at a later date.

Subops KUV-01-I and -J were placed over two adjacent rock features south of the *aguada* and beyond the limits of the TDS mapping. Subop KUV-01-I was a 2-x-2-m unit containing a three-stone hearth. No artifacts were visible on the ground surface, so this subop only contained one lot. Lot KUV-01-I-01 consisted of the first 10 cm of topsoil. This unit yielded relatively little cultural material in comparison to other subops. Subop KUV-01-J was a 2.5-x-2-m unit placed over a large circular arrangement of rocks aligned vertically (Figure 4.14). Lot KUV-01-J-01 was the collection of an isolated tin can within the subop, and Lot

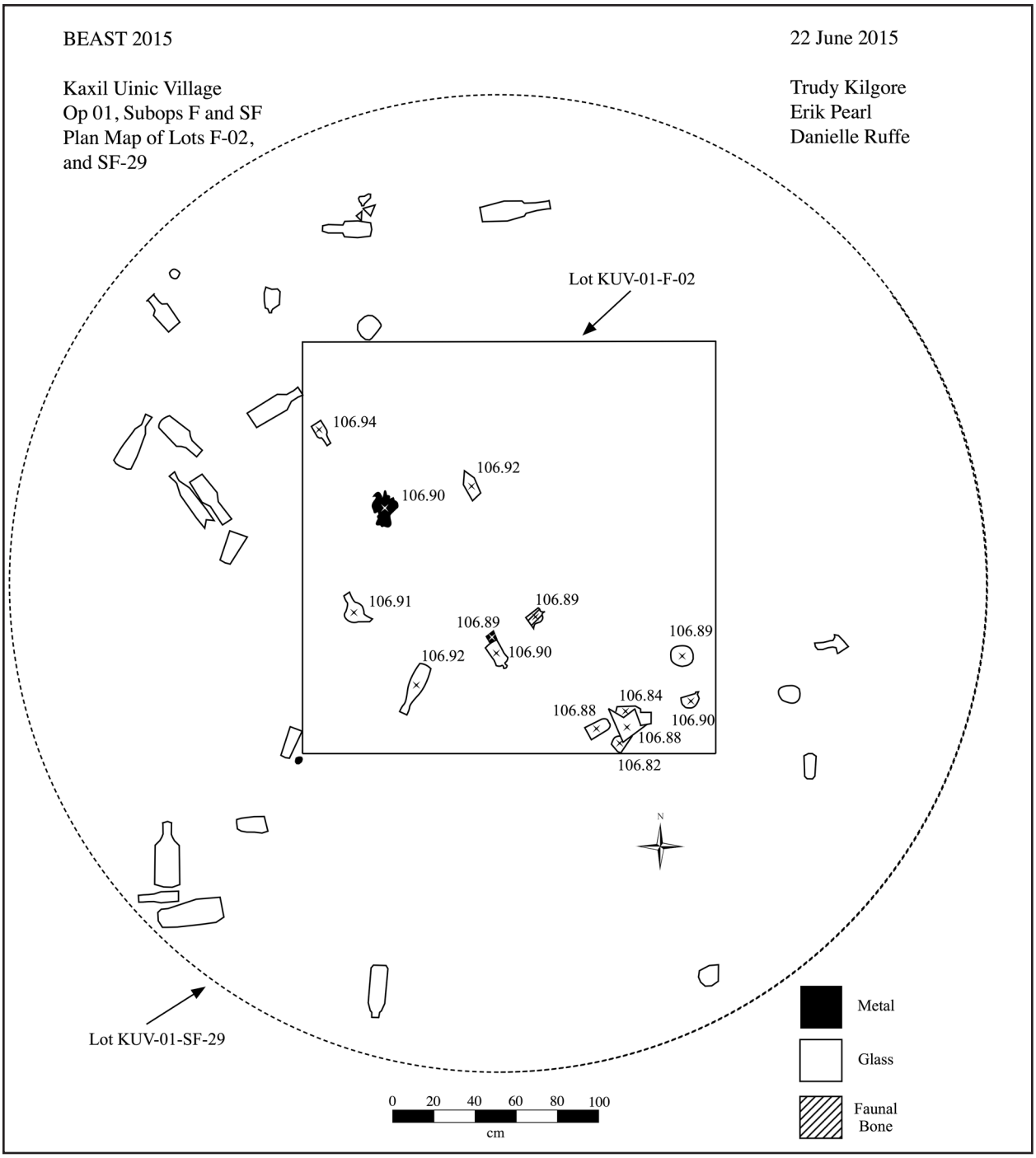

Figure 4.12. Plan Map of Lots KUV-01-F-02 and -SF-29.

KUV-01-J-02 included the first 10 cm of topsoil within the unit. This suboperation was also relatively devoid of cultural material in comparison to other units. It is possible that these features were constructed or reused by looters camped in the area and cleared of most historic artifacts.

Subop KUV-01-L was a 2-x-2-m unit placed over the three-stone hearth identified as KUV-01-SF-02, located immediately north of the *aguada* in a low-lying area less than a meter

Figure 4.13. Subop KUV-01-K.

Figure 4.14. Stone alignment in Subop KUV-01-J.

above the water line's elevation. The jar found on the surface of this area was collected as part of Lot KUV-01-SF-02, so only one lot was excavated in Subop KUV-01-L to remove the first 10 cm of topsoil. Due to its close proximity to the *aguada*, Subop KUV-01-L encountered dense clay soil unlike any other subop excavated at the site. It is likely that this area is seasonally submerged during periods of increased rainfall, causing the disparity in soil composition. Several observations of Lot KUV-01-L-01 lead us to believe this area was also reused in later times by looters. The abundance of charcoal preserved in this unit, despite its proximity to the *aguada*, indicates more recent deposition. Additionally, a plastic lid, bag, and toothpaste cap recovered from Lot KUV-01-L-01 are probably items left behind by more recent visitors to the site. The lack of colonial-period cultural material within the lot could be due to clearing of the area by later occupants; alternatively, the three-stone hearth may be a more recent feature, as the investigations did not recover any other occupation debris associated with the historic Maya village as close to the *aguada*.

ARTIFACT ANALYSIS

Due to Belizean restrictions on artifact exportation, a total of 2,267 artifacts was processed, cataloged, and analyzed within a two-week period in the field laboratory at Chan Chich Lodge. A modified version of the catalog system used by the CCAP for prehistoric sites was adapted to suit historic artifacts. Under this system, artifacts are organized by material type, followed by industry (function), form, and subform. Table 4.4 summarizes the artifacts collected from Kaxil Uinic village by material type. Lots within each subop were combined to reconstitute the single stratum (topsoil) encountered within each excavation unit. Surface find lots were also combined for this analysis.

Table 4.5 shows the distribution of material types within excavation units. The largest overall percentages of artifacts came from Subops KUV-01-C, -G, and -K, while the fewest artifacts came from Subops KUV-01-I and -L. Subops KUV-01-C and -G were placed over areas containing three-stone hearths, so it is not surprising that these presumably residential settings contained the largest percentages of cultural material. The high percentage of cultural material present within Subop KUV-01-K could be attributed to its size (2 x 6 m), or the possibility that it also contains prehistoric materials, including an abundance of lithic and locally produced ceramic artifacts. Subops KUV-01-I and KUV-01-L were located in areas presumed to have been disturbed by a relatively recent occupation, yet the lack of colonial-period artifacts both above and below the ground implies that perhaps the three-stone hearths present in these units are modern constructions.

Glass

As evidenced by Subop KUV-01-SF in Table 4.4, glass artifacts were the most abundant material type visible on the surface of the site. Glass was also the easiest artifact category to date in terms of production. We relied on Lindsey's (2015) Bureau of Land Management/ Society for Historical Archaeology Historic Glass Bottle Identification and Information website in addition to Polak's (2007) field guide to bottle identification to conduct our analyses. Of the 461 glass pieces collected from Kaxil Uinic, the majority was found in Subops KUV-01-C, -F, -G, and -SF (due to its sampling size). Again Subops KUV-01-C and -G were located over domestic areas containing three-stone hearths, but Subop KUV-01-F was in a place where no domestic features were encountered. Our preliminary observation of the area around subop KUV-01-F is that the location served as a midden. Although Subop KUV-01-A only

Table 4.4. Site-Wide Percentages of Material Types by Count

Subop	Glass (n=461) (%)	Ceramic (n=321) (%)	Metal (n=504) (%)	Shell (n=8) (%)	Faunal (n=122) (%)	Lithic (n=849) (%)	Misc. (n=2) (%)	All Material Types (n=2,267) (%)
KUV-01-A	7.6	3.1	3.6	0.0	4.1	5.2	0.0	4.9
KUV-01-B	5.2	2.2	1.4	0.0	16.4	8.0	0.0	5.6
KUV-01-C	13.9	5.6	29.9	0.0	0.8	11.8	0.0	14.7
KUV-01-D	4.5	6.8	17.6	25.0	0.8	3.9	0.0	7.4
KUV-01-E	0.6	0.6	10.1	0.0	27.0	8.0	0.0	7.0
KUV-01-F	13.0	10.6	5.1	12.5	5.7	1.0	100.0	6.1
KUV-01-G	11.7	9.3	14.7	0.0	4.9	23.9	0.0	16.2
KUV-01-H	10.4	0.0	1.6	50.0	2.5	8.5	0.0	6.0
KUV-01-I	2.0	1.9	5.0	12.5	2.5	3.2	0.0	3.1
KUV-01-J	0.9	4.4	1.2	0.0	7.4	9.4	0.0	5.0
KUV-01-K	4.8	53.0	1.6	0.0	18.9	17.0	0.0	16.2
KUV-01-L	0.7	2.2	5.0	0.0	9.0	0.0	0.0	2.0
KUV-01-SF	24.7	0.3	3.2	0.0	0.0	0.1	0.0	5.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 4.5. Percentages of Material Types by Count within Excavation Units

Subop	Glass (n=347) (%)	Ceramic (n=320) (%)	Metal (n=488) (%)	Shell (n=8) (%)	Faunal (n=122) (%)	Lithic (n=848) (%)	Misc. (n=2) (%)	All Material Types (n=2,135) (%)
KUV-01-A	10.1	3.1	3.7	0.0	4.1	5.2	0.0	5.2
KUV-01-B	6.9	2.2	1.4	0.0	16.4	8.0	0.0	5.9
KUV-01-C	18.4	5.6	30.9	0.0	0.8	11.8	0.0	15.6
KUV-01-D	6.0	6.9	18.2	25.0	0.8	3.9	0.0	7.9
KUV-01-E	0.9	0.6	10.5	0.0	27.0	8.0	0.0	7.4
KUV-01-F	17.3	10.6	5.3	12.5	5.7	1.1	100.0	6.5
KUV-01-G	15.6	9.4	15.2	0.0	4.9	23.9	0.0	17.2
KUV-01-H	13.8	1.9	1.6	50.0	2.5	8.5	0.0	6.6
KUV-01-I	2.6	4.4	5.2	12.5	2.5	3.2	0.0	3.7
KUV-01-J	1.2	53.1	1.2	0.0	7.4	9.4	0.0	12.6
KUV-01-K	6.3	2.2	1.7	0.0	18.9	17.0	0.0	9.6
KUV-01-L	0.9	0.0	5.1	0.0	9.0	0.0	0.0	1.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

contained 7.6 percent of the glass collected from the site, the minimum number of distinct vessels from this subop is curiously high (Table 4.6). The minimum number of vessels/objects (MNV/MNO) was determined by rim or finish counts.

Unidentifiable shards accounted for 39.3 percent of the glass assemblage, constituting 181 out of the 461 total pieces. Identifiable glass items included wine, champagne, liquor, soda, and beer bottles; patent medicine or other pharmaceutical bottles; condiment bottles; lighting devices; cosmetic and perfume or cologne bottles and jars; and bottles with unknown contents. Identification of these objects is limited to their initial function, though Church and colleagues (2011:187–188) and Dornan (2004:112) note that bottle reuse among the San Pedro Maya likely occurred. Table 4.7 details the discernable forms (though not necessarily functions) present within the Kaxil Uinic glass assemblage. In this instance, the MNV includes vessels and fragments whose form was recognizable.

Beverage bottles (including wine, champagne, liquor, soda, beer, etc.) represent the largest count of the glass assemblage. Twenty-three bottles were identified as beer bottles, which were commonly dark green or brown in color and exhibited crown finishes and export shapes. These features often overlap with other bottle types, so it is likely that some may have been misidentified in the absence of distinct labeling. Of the 23 bottles identified as originally containing beer, four displayed brewery names on the bottle body. These breweries included: Independent Brewing Co. of Pittsburgh, C. H. Evans & Sons Ale, Eichler New York, and Jacob Ruppert Brewer New York (Figure 4.15). Three bottles were further identified as malt extracts based on bottle shape.

Only one bottle was definitively identified as a champagne bottle based on its finish and

Table 4.6. Glass Overview

Subop	% Site Total (n=461)	Mean Artifact Weight (g)	MNV/ MNO
KUV-01-A	7.6	138.7	11
KUV-01-B	5.2	16.5	1
KUV-01-C	13.9	10.2	6
KUV-01-D	4.5	67.0	3
KUV-01-E	0.6	2.3	1
KUV-01-F	13.0	91.1	17
KUV-01-G	11.7	92.3	10
KUV-01-H	10.4	5.5	5
KUV-01-I	2.0	8.1	0
KUV-01-J	0.9	1.25	0
KUV-01-K	4.8	2.6	0
KUV-01-L	0.7	9.0	0
KUV-01-SF	24.7	262.4	74
Total	100.0	104.4 (Overall Mean Weight)	128

Table 4.7. Glass Vessel or Item Type

Object	MNV/ MNO
Beverage (alcoholic and soda)	74
Condiment bottle/food container	4
Pharmaceutical/patent medicine bottles	27
Hygiene/cosmetic/grooming	11
Lamp or lantern part	1
Bottle/jar, unidentified contents	59
Bottle stopper	3
Household/decorative glass	1

Figure 4.15. Jacob Ruppert bottle (Spec. # KUV1596-02).

push-up base. Eight bottles were categorized as wine bottles because of their dark green color, push-up bases, and long necks. Two bottles included brand names on either the body or base. These brands were: Hall's Wine Tonic and Crispin-Koto kola wine (Figure 4.16). Though termed a "wine," Hall's Wine Tonic was marketed as a treatment for influenza (*The Speaker*, 12 March 1898:i). Similarly, kola wine was also sold as a wine tonic. These bottles, though labeled as "wine," are actually more akin to patent medicines.

Five bottles were classified as liquor bottles in our analysis. One with a plastic label that read, "Cuello's Distillery, Ltd. Belize, C.A." was discarded as looter trash, due to the fact that its earliest manufacture date is 1986 (Cuello's Distillery Ltd. 2015). Another bottle in this category had "1/5 GAL" printed on the heel, indicative of a "fifth" of liquor. Other bottles included in this category exhibited brandy and mineral finishes indicative of liquor contents.

Figure 4.16. Koto Crispin Wine advertisement, ca. 1953 (eBay 2015).

Six soda bottles were identified based on their aqua color, crown cap finishes, and champagne or export shapes. No markings indicating the product manufacturer were present on these bottles.

Four condiment or food container bottles were collected at Kaxil Uinic. These included two "sauce" bottles with geometric designs and "2 1/2" printed on the bases (possibly indicating their total ounces). A small bottle labeled "Royal Flavoring Extract" with a crown symbol printed on one face was also found (Figure 4.17). A coffee jar labeled "13 P Nescafe 76" on the base was also recovered from the site, but could potentially date anywhere from 1938 to present day and may possibly represent looter trash (Nestlé 2013).

Three bottle stoppers were recovered from the site. Each exhibited a flat top with a tapered cylindrical shank, which is commonly used on club sauce bottles (Ng 2007:171). No distinctive markings were present on any of the stoppers.

Figure 4.17. Royal Flavoring Extract bottle (Spec. # KUV1612-01).

Twenty-seven patent medicine and/or pharmaceutical bottles were identified in the glass assemblage. Markings identified on these bottles included: Davis Pain Killer, Vegetable; Barry's Pain Relief; C. H. Wintersmith Louisville, KY U.S.A.; Cardui, The Woman's Tonic, Chattanooga; Elliman's Embrocation; Kepler Wellcome Chemical Company; Liebig's Malt Tonic; The Name St. Joseph's Assures Purity; and Scott's Emulsion Trade Mark Cod Liver Oil with Lime & Soda. Davis Pain Killer claimed to cure ailments such as "bruises, cuts, burns, dysentery, cholera, 'bowel complaints,' coughs, colds, cankers, asthma, and 'rheumatic difficulties'" with a vegetable remedy, but in actuality pain relief likely came from the opium and alcohol included among the ingredients (Ng 2007:176). C. H. Wintersmith, Liebig's Malt Tonic, and Scott's Emulsion (Figure 4.18) were also cure-all pain relievers, while Cardui was specifically intended to relieve menstrual pain. Elliman's Embrocation was a lotion for muscles that was marketed for use on both humans and animals (Ng 2007:182). The contents of the Kepler and St. Joseph's bottles are currently unknown.

Thirteen glass containers in the assemblage originally contained cosmetic products. Among these are two Robert A. Chesebrough Vaseline jars; five Barry's Tricopherous hair tonic bottles; two Florida Water bottles; a Bay Rum bottle; and two VapoRub jars (Figure 4.19). Tricopherous supposedly unclogged hair follicles and stimulated the scalp (Ng 2007:194). Florida Water and Bay Rum were both either cologne or perfume waters.

One lantern glass bulb was recovered from the site, as well as a small black decorative crystal that likely hung from a lamp. The lantern glass bulb (pictured in Figure 4.20) fit a metal base found in a distinctly different part of the site.

The manufacture date range of glass artifacts is presented in Figure 4.21. Following the

Figure 4.18. Scott's Emulsion Trade Mark Cod Liver Oil bottle (Spec. # KUV1706-01).

method outlined by Ng (2007:203), the given time period was divided into five-year intervals to consider how many artifacts could have been manufactured within a specific five-year interval. Objects with long manufacture date ranges appear in many of the intervals depicted. Spikes in production are evident in Figure 4.21. Machine made bottles proved to be problematic in this endeavor, as those lacking maker marks or other labeling could potentially date anywhere from 1905 to present day. For this reason, bottles with such a broad production

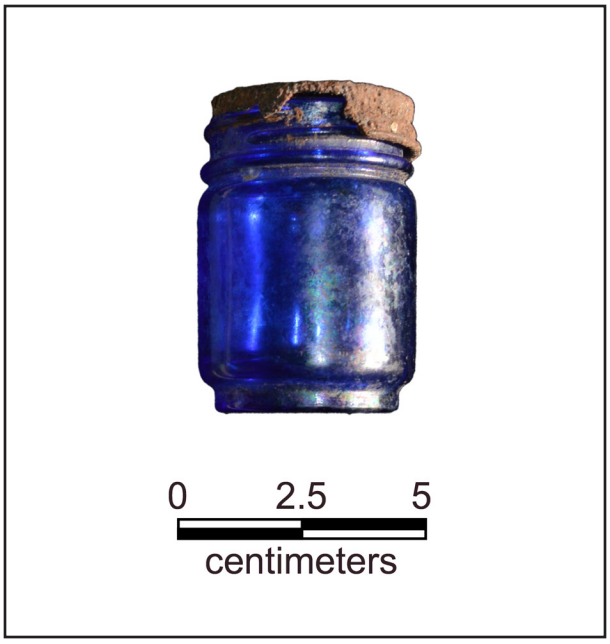

Figure 4.19. VapoRub jar (Spec. # KUV1633-01) collected from Kaxil Uinic.

range were excluded from consideration in this graphic.

Two peaks in production are visible in Figure 4.21: one from 1885 to 1890, and the other from 1905 to 1915. The cause of these two peaks is subject to further investigation. The majority of glass was broadly produced between 1880 and 1930, which precisely corresponds with historical documentation of the site's occupation (Jones 1977).

Ceramics

A total of 321 ceramic objects was collected from Kaxil Uinic, mostly in the form of vessel sherds. Vessel sherds were from both locally produced "Maya" vessels and imported items from Europe. Of the 321 ceramic sherds recovered from Kaxil Uinic, 251 were locally produced, and 68 were imported. Due to techniques employed during artifact analysis, weights of locally produced sherds were not recorded. Table 4.8 illustrates the distribution of ceramics within the site. It should be noted that ceramic sherds were generally too small in

Figure 4.20. Lantern glass (Spec. # KUV1479-01) placed in metal base (Spec. # KUV1518-01). The base has a diameter of 19.3 cm.

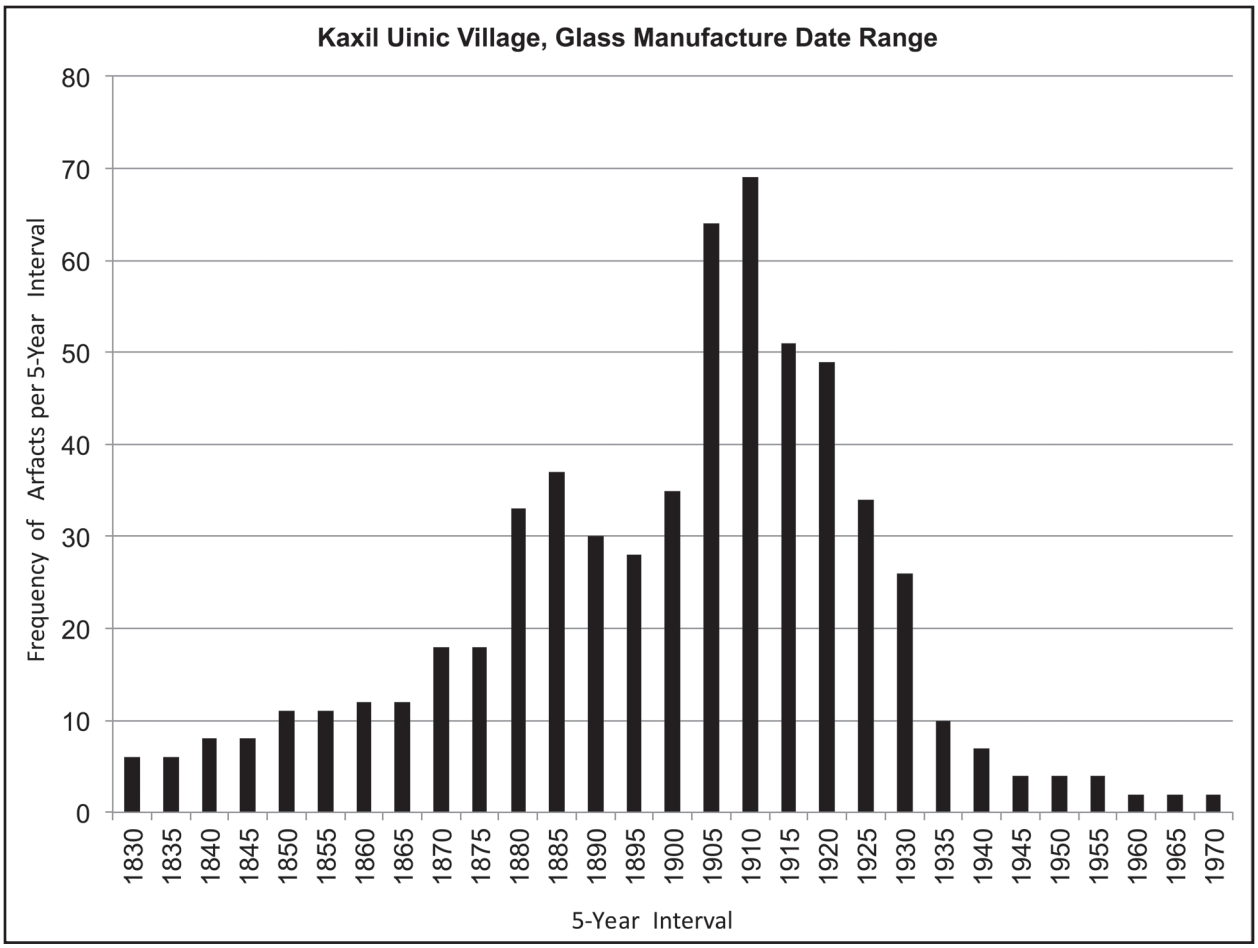

Figure 4.21. Manufacture date range of glass artifacts.

size to identify the vessel or object type, and the MNV/MNO was not calculable due to the lack of any diagnostic vessel features.

Subops KUV-01-F, -G, and -K contained the largest percentage of ceramic material collected from Kaxil Uinic, while Subops KUV-01-E, -H, and -SF were relatively devoid of ceramics. The high percentage of ceramics from Subop KUV-01-K can be attributed to the size of the unit (2 x 6 m). Identifiable vessel types included: jars, bowls or basins, plates, cups, saucers, and pipes; yet these forms could have again been used for multiple functions and in various contexts. No maker's marks were observed on any ceramic sherds recovered from the site, which made dating the production of the assemblage difficult. In addition, dating locally produced ceramics is problematic because of the continuity in styles from the Postclassic through the colonial period. Descriptions of the ceramic types observed at Kaxil Uinic are itemized in Table 4.9.

The locally-produced ceramic sherds were generally from jars, bowls, or basins. Dating from the Late Classic period to the Early Postclassic period (ca. AD 700–1100), these sherds include Cayo Unslipped, Tinaja Red, Striated, and Subin Red. Of particular note is the discovery of a censer bowl with a pedestal base at KUV-01-SF-19, on top of a potentially prehistoric mound associated with the nearby Kaxil Uinic ruins. The lack of imported ceramic bowls in the assemblage despite the expectation that bowls would be crucial to the soup-based diet of historic Maya populations (Ng 2007:235) may be explained by descriptions

Table 4.8. Ceramic Overview

Subop	% Site Total (n=321)	% Locally Produced (n=251)	% Imported (n=70)
KUV-01-A	3.1	4.0	0.0
KUV-01-B	2.2	2.4	1.4
KUV-01-C	5.6	6.0	4.3
KUV-01-D	6.8	7.9	2.9
KUV-01-E	0.6	.4	1.4
KUV-01-F	10.6	5.6	28.6
KUV-01-G	9.3	5.6	22.9
KUV-01-H	0.0	0.0	0.0
KUV-01-I	1.9	0.4	7.1
KUV-01-J	4.4	4.0	5.7
KUV-01-K	53.0	60.5	25.7
KUV-01-L	2.2	2.8	0.0
KUV-01-SF	0.3	0.4	0.0
Total	100.0	100.0	100.0

Table 4.9. Ceramic Vessel or Item Type

Object	Sherds
Clay tobacco pipes	3
Plates	3
Saucers	2
Cups and mugs	3
Jars	2
Locally produced jars, bowls, or basins	233
Locally produced censer bowl	1

of Maya groups using hollowed out gourds as food containers (Rugeley 2001), or the preference of metal serving vessels by Kaxil Uinic inhabitants. The overall lack of identifiable ceramic vessel types also unfortunately leaves us with a sample size too small to make any substantial observations about San Pedro Maya consumption habits.

Three fragments of clay tobacco pipes were also recovered from the site. They were all produced from kaolin clay. One bowl fragment was identified, as well as one stem fragment and an unidentifiable fragment. No maker's marks were visible on these pieces. Bore diameters of the two identifiable fragments were 3/32 inches and 7/64 inches respectively, indicating that the pieces represent two separate pipes.

Identification of imported ceramic vessels was limited due to the lack of consistency in naming ceramic wares during the nineteenth century (Ng 2007:218). Table 4.10 summarizes the distribution of imported ceramic vessel sherds by decoration. Decoration was determined using the Jefferson Patterson Park & Museum Post-Colonial Ceramics webpage (Samford and Miller 2002). Dates for various ceramic designs were further refined using the Delaware Department of Transportation's Identification Manual (Brown and Bewick 1982). Due to the small sizes of all ceramic sherds in the assemblage, it is unknown how many of the "undecorated" sherds were actually from vessels with decorative patterns.

The most common types of decoration were dipped annular and hand painted wares. Dipped annular wares in the assemblage displayed light blue solid fields with light blue or brown stripes near the rims. Hand-painted wares commonly exhibited polychromatic floral designs. Interestingly, one sherd from a majolica ceramic vessel likely produced in Mexico was found in Subop KUV-01-K (Figure 4.22). Almost all dateable imported ceramics in the assemblage were produced from 1830 to 1900, with a peak

Table 4.10. Ceramics by Decoration

Decoration	Sherds
Whiteware—undecorated or unknown	22
Dipped annular whiteware	14
Hand painted whiteware	11
Sponged whiteware	3
Transfer whiteware	10
Coarse earthenware	1
Ironstone	1
Majolica—unknown	1
Miscellaneous	4
Total	67

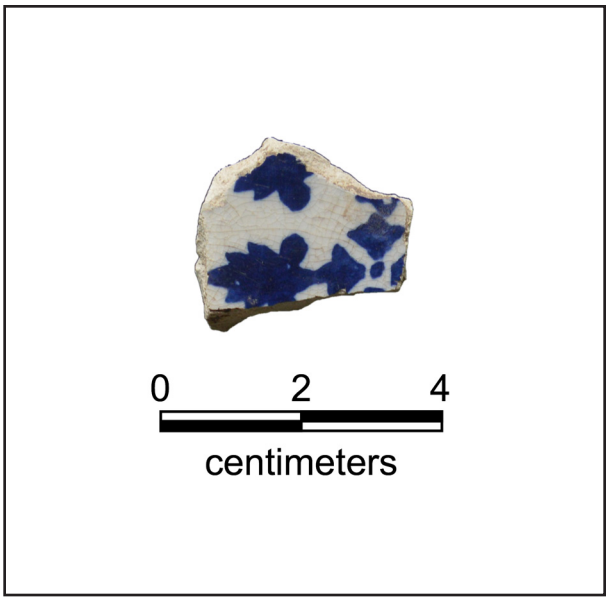

Figure 4.22. Majolica ceramic sherd (Spec. # KUV1759-06).

manufacturing range of 1880 to 1900 (Figure 4.23). The sharp drop off in production date range after 1900 is likely due to how ceramics were grouped during analysis. The earlier manufacture date range for ceramics versus glass may be attributed to the fact that glass containers were discarded shortly after consumption of the contents, while ceramic vessels were intended for longer periods of use. Again, the peak production range of this material type corresponds well with the known occupation date range of the site.

Metal

Although 504 metal artifacts were recovered from Kaxil Uinic, most were in the form of unidentifiable metal flakes. As described in Table 4.11, only 56 objects were identifiable in

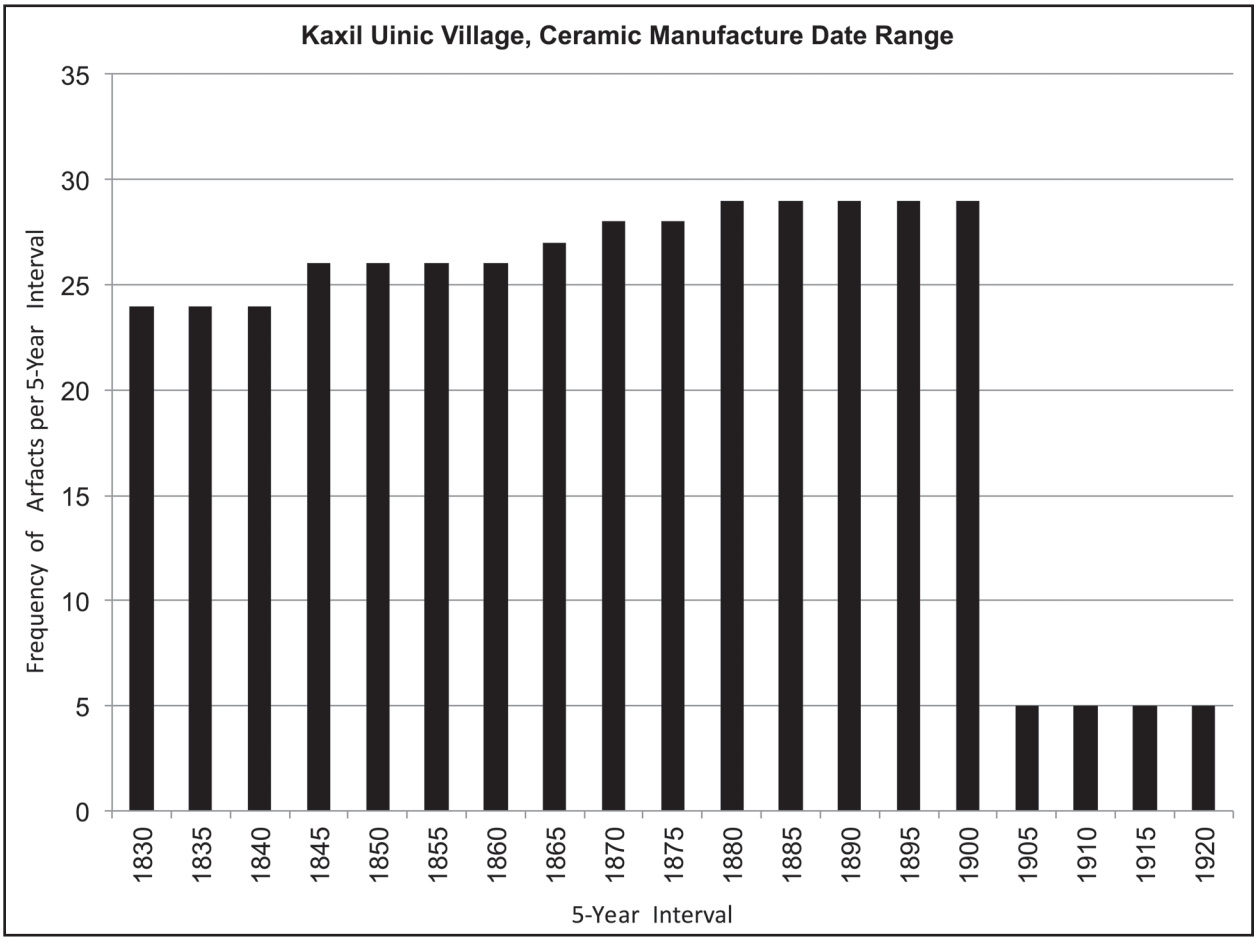

Figure 4.23. Manufacture date range of imported ceramic artifacts.

Table 4.11. Metal Overview

Subop	% Site Total (n=504)	Mean Artifact Weight (g)	MNV/ MNO
KUV-01-A	3.6	8.8	1
KUV-01-B	1.4	65.4	3
KUV-01-C	29.9	8.4	8
KUV-01-D	17.6	41.8	13
KUV-01-E	10.1	4.8	4
KUV-01-F	5.1	1.5	0
KUV-01-G	14.7	3.1	5
KUV-01-H	1.6	10.9	1
KUV-01-I	5.0	1.7	1
KUV-01-J	1.2	40.8	3
KUV-01-K	1.6	27.6	3
KUV-01-L	5.0	1.4	0
KUV-01-SF	3.2	643.1	14
Total	100.0	33.8 (Overall Mean Weight)	56

the assemblage. This is a conservative estimate, as many rim fragments were excluded from the calculations based on their fragmentary state.

The largest and most complete metal objects were generally found in surface collections. As illustrated in Table 4.12, food service items (utensils, bowls, cups, etc.) were the most abundant metal forms, followed by cans for food storage. Metal cups make up the majority of food service items collected from the site, and most display blue and white marbled designs. Metal food service items appear to have been present at Kaxil Uinic in larger quantities than ceramic ones, possibly due to the fact that metal items were relatively inexpensive in terms of price and time, as opposed to locally-produced vessels (Ng 2007:86, 278).

Nails were either wire drawn or cut. The scarcity of this object form in the metal assemblage may be attributed to their lack of necessity in traditional construction methods for houses (Rugeley 2001).

Table 4.12. Metal Vessel or Item Type

Object	Count
Transportation	1
Personal hygiene	1
Bucket	1
Cans (food storage)	7
Food preparation	4
Food service	10
Chamber pot	1
Gun parts and ammunition	6
Hardware parts	4
Cutting (machetes, scissors)	4
Lantern/lamp part	1
Nails	6
Currency	1
Chain links	2
Chiclero	4

Machete blades (Figure 4.24) and handles found at the site could have been used for *chicle* harvesting activities, but Yaeger et al. (2004:11) also note that machetes were symbolic of agricultural independence among the San Pedro Maya. Machetes are also generally used to clear thick jungle vegetation and Miller (1887) reported they were common at late-nineteenth century villages near the border, so their inclusion in the metal assemblage is not unexpected.

Several shotgun shells were recovered from Kaxil Uinic, but most were too corroded to decipher the headstamps. Based on a partially visible headstamp, at least one shotgun shell appears to have been produced by Winchester. Whether these shotgun shells are related to conflict between the San Pedro Maya and British loggers or the colonial administration—or were utilized for general purposes such as hunting game—is unknown.

Though two cart wheel hubs (Figure 4.25) were observed during survey, only one was collected due to their weights (and the nearly 2 mile hike back to camp). These wheel hubs had long

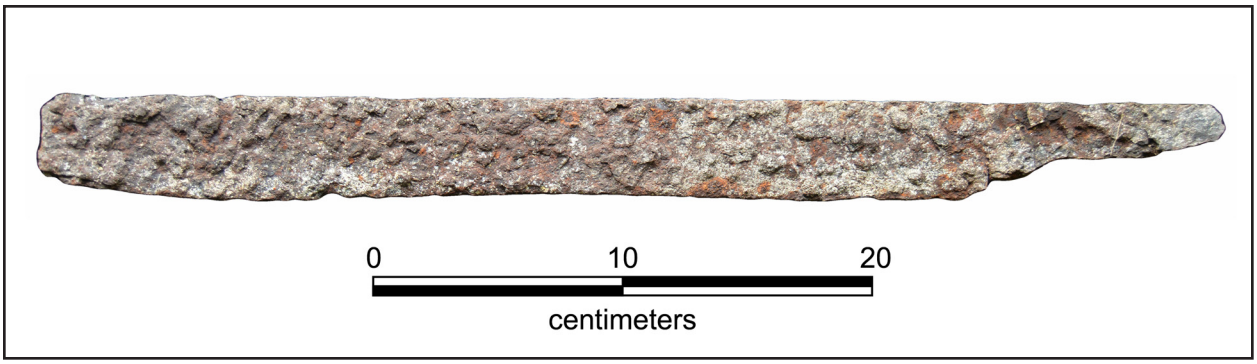

Figure 4.24. Machete blade (Spec. # KUV1509-01) recovered from Kaxil Uinic.

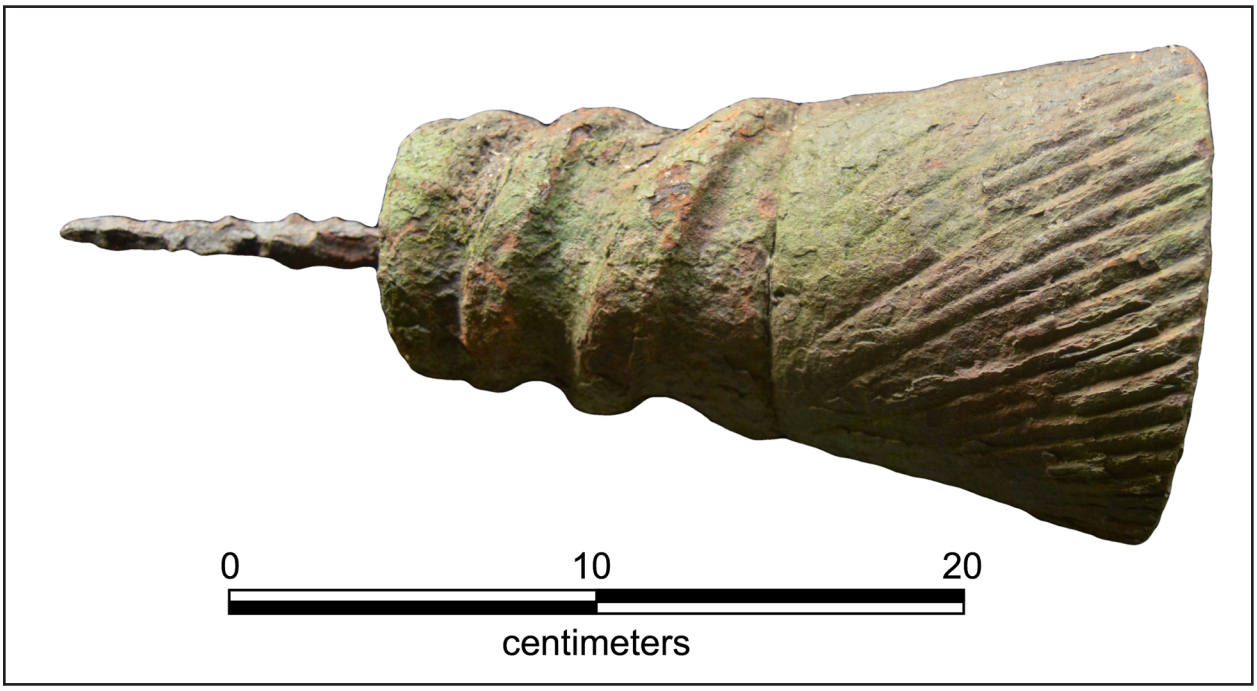

Figure 4.25. Cart wheel hub (Spec. # KUV1496-01).

metal spikes that would have been inserted into the wooden body of the cart. Logging was not uncommon in this area, and these wheel hubs may have been part of an apparatus used to transport lumber in the area after the San Pedro Maya were forcibly moved from the village.

Food preparation items included pots and grinders. Pots were generally described as cast iron tripod pots with rounded lids and small, triangular handles. Jason Yaeger (personal communication, 2015) interprets similar pots at San Pedro Sirís as being used for *pibil* cooking. One grinder recovered from the site included the brand name "The Gray Iron C'G Co. Springfield, Ohio, U.S.A." (Figure 4.26). Efforts to identify this company and its years of operation have met little success. Grinders were possibly adopted in place of, or in conjunction with, metates to produce traditional Maya foods.

One metal Vacher Balm lid is characterized in Table 4.12 as a personal hygiene item. Other metal items of note include several pots identified as *chicle* pots by Chan Chich Lodge staff (Don Pedro Barahona, personal communication, 2015). Pots would have been used to boil

Figure 4.26. Metal grinder (Spec. # 1516-01).

the *chicle* to its desired thickness. These large tripod pots exhibit external horizontal ribbing and flared rims (Figure 4.27). One pot fragment was labeled "Cannon," possibly produced by the Cannon Iron Foundry, which was known for manufacturing three legged pots used to boil palm oil in west Africa (Sedgley Manor 1999). Additionally the *chiclero* spur previously mentioned in the "Survey Summary" section of this chapter was also found (Figure 4.28). Unable to determine the manufacture date range for these items, we cannot irrefutably attribute them to the San Pedro Maya occupation of the site. They likely predate 1950, though, because the introduction of synthetic substitutes for *sapodilla* gum decreased the market demand for this export after World War II (Waddell 1981:22).

Perhaps the villagers at Kaxil Uinic engaged with the colonial economy as producers, harvesting and processing *chicle*. If true, this observation may indicate that San Pedro Maya participation in the colonial economy of Belize did increase, perhaps at the expense of some traditional lifeways as *milperos* became *chicleros* (Houk and Bonorden 2015).

One 1/2 Real coin from Guatemala was recovered from Subop KUV-01-B (Figure 4.29). The coin dates to 1900. Though the discovery of one coin could be the result of sheer chance, it is worth noting that historical observations of the Maya indicate that they often buried their money in secret caches (Rugeley 2001:108). Coins were also worn by small children as charms to protect against diseases and evil spirits, and to bring luck (Rugeley 2001:173). Furthermore, the Santa Cruz and Icaiche Maya used Guatemalan currency (Rugeley 2001:166), and Kaxil Uinic is close to the Guatemalan border.

Shell

Only eight shell fragments were recovered from the site, and the identifiable types included freshwater bivalves. Considering the proximity of the site to the *aguada*, this is not surprising. It is worth noting that shell fragments were generally concentrated in Subop KUV-01-H, which was the cross-trench of a three-stone hearth. These bivalves were likely procured for consumption by the San Pedro Maya in the case of Subop KUV-01-H.

Bone

Faunal remains found at Kaxil Uinic are summarized in Table 4.13. Some specimens remain unanalyzed, and mean artifact weights and

Figure 4.27. *Chicle* pot fragment (Spec. # KUV1497-01).

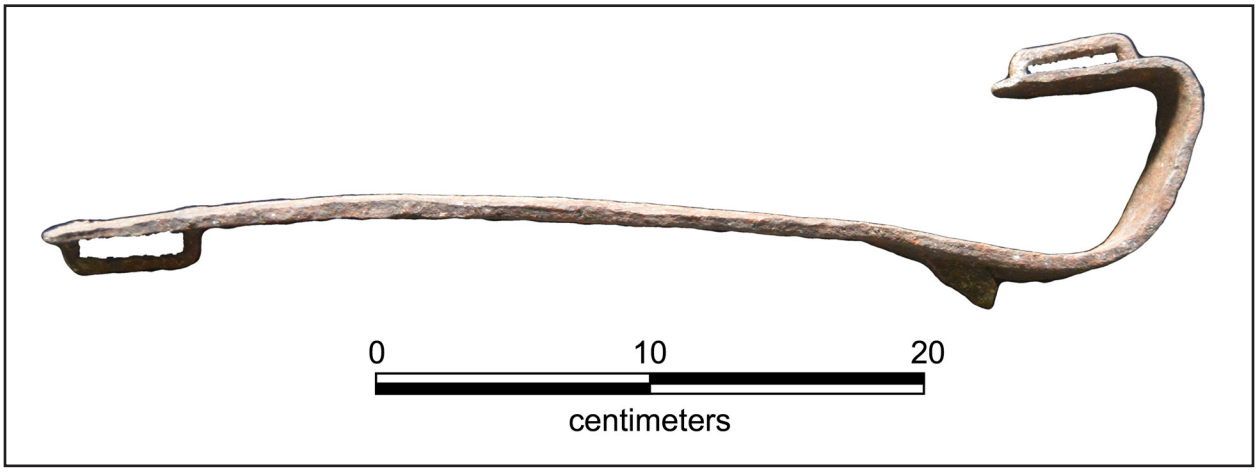

Figure 4.28. *Chiclero* spur (Spec. # KUV1634-01).

Figure 4.29. 1900 Guatemalan 1/2 Real coin (Spec. # KUV1508-01).

Table 4.13. Bone Overview

Subop	% Site Total (n=122)
KUV-01-A	4.1
KUV-01-B	16.4
KUV-01-C	0.8
KUV-01-D	0.8
KUV-01-E	27.0
KUV-01-F	5.7
KUV-01-G	4.9
KUV-01-H	2.5
KUV-01-I	2.5
KUV-01-J	7.4
KUV-01-K	18.9
KUV-01-L	9.0
KUV-01-SF	0.0
Total	100.0

Minimum Number of Individuals (MNI) calculations are therefore excluded from this table. During a one-day visit to the project, Lori Phillips analyzed the portion of the assemblage that had been processed by the lab prior to July 1, 2015.

The majority of faunal remains recovered from the site was found in Subops KUV-01-B, -E, and -K. Curiously, none of these subops contained a three-stone hearth, which may indicate some sort of behavioral/spatial patterning at Kaxil Uinic. Historical descriptions (Rugeley 2001:107) of Maya domestic spaces state that "the floor ground [was] seldom swept, and pigs, dogs, and fowls [were] allowed to go out at pleasure. Firewood, old bottles, stones, gourds, corn bags, corn sticks, [were] all in confusion." Though these animals were free to roam in domestic areas, perhaps butchering occurred elsewhere. Table 4.14 provides a more in-depth description of the faunal remains collected from the site.

The presence of pig and bird bone in the faunal assemblage is reminiscent of Miller's (1887:422) observation that the inhabitants of Kaxil Uinic raised pigs and fowls, but the peccary, deer, and turtle indicate a continued reliance on hunting traditional animals. Perhaps the pig and peccary were prepared in *pibil* pots. Freshwater turtles could be cooked into a soup (Ng 2007:290), but the concentration of turtle shell in Subop KUV-01-K could indicate prehistoric consumption.

Lithics

The distribution of lithic artifacts from Kaxil Uinic is illustrated in Table 4.15. Due to time constraints, not all lithic artifacts were analyzed, and mean artifact weights are therefore excluded from this table.

Lithic artifacts were concentrated most densely in Subops KUV-01-C, -G, and -K. Again, the high percentages of artifacts in Subop KUV-01-K may be attributed to either its size (2 x 6 m) or inadvertent mixing of artifacts within the lot with an underlying prehistoric component. Lithic artifacts found at Kaxil Uinic included debitage, metates, manos, cores, bifaces, obsidian blades, an obsidian chunk, and other chert tools. Lithic artifacts were primarily produced from chert, limestone, and granite. The lithic assemblage is illustrated in greater detail in Table 4.16.

Table 4.14. Observed Faunal Types

Lot	Description	Element	Comments	Count
KUV-01-A-02	Peccary	Mandible	Fragments.	5
KUV-01-B-02	Mammal	Cranial Elements	10 pieces, with some refits, of a cranial bone. Likely a medium to large mammal. Meningial grooves internally.	10
KUV-01-B-02	Large Mammal	Mandible	2 pieces refit for 1. Portion of the ascending ramus of a large mammal.	2
KUV-01-B-02	Medium Mammal	Long Bone	1 piece of shaft fragment of a long bone. No ID marks.	1
KUV-01-B-02	UID Mammal	UID	3 fragments of mammal bone. Small and no ID marks.	3
KUV-01-B-02	Deer	Molars	2 molars from deer. Molar 1 and 2.	2
KUV-01-B-02	Pig	Canine	1 lower canine. Likely modern pig due to cross section and curvature.	1
KUV-01-B-02	Bird	Humerus	1 humerus shaft of a large bird, possibly turkey or crax.	1
KUV-01-C-01	UID Mammal	UID	1 piece of long bone, possibly distal radius. Photo.	1
KUV-01-D-02	Mammal	Canine	1 piece of canine, missing the root. Possibly upper canine of peccary due to anterior wear facet.	1
KUV-01-E-02	Pig (Peccary?)	Mandible	Pieces refit for one mandible. Possibly Tayassu due to generally less robust size of M3 when compared to M3 from KUV1638. Molars 1–3, Premolars 3 and 4 retained. Adult due to presence of Molar 3 but not very old because occlusal wear is minimal.	33
KUV-01-F-02	Turtle (River)	Carapace	3 Pieces refit for 1. Thick carapace. One side burned.	3
KUV-01-F-02	Pig (Modern)	3rd Molar	1 element. Wider at labial end and tapers as it moves distally. Part of cranial bone still attached to roots. Occlusal surface is worn but no dentine is visible, so adult but not very old.	1
KUV-01-F-02	Bird (Small)	Tibiotarsus	1 piece. Distal end of a tibiotarsus. Very thin and small, so a small bird possibly water fowl?	1
KUV-01-F-02	UID Mammal	UID	2 fragmented pieces of likely mammal bone. No ID features, modifications, or burning.	2
KUV-01-G-01	Large Mammal	UID	1 piece of large cortical bone with medullary cavity, so possibly a long bone. No ID features.	1
KUV-01-G-01	Medium Mammal	Femur	1 shaft fragment of a medium mammal femur, possibly dog?	1
KUV-01-G-01	UID Mammal	UID Fragments	2 fragments of cortical bone with medullary cavity so possibly long bone fragments. No ID features	2

Table 4.14. (continued)

Lot	Description	Element	Comments	Count
KUV-01-G-01	Small Mammal	Long Bone	1 piece of small mammal long bone shaft fragment, burnt. No ID features.	1
KUV-01-G-01	Micromammal	Humerus	1 piece of the distal end of a micromammal (mouse?) humerus.	1
KUV-01-H-01	Unknown	Unknown	Unanalyzed.	3
KUV-01-I-01	Unknown	Unknown	Unanalyzed.	3
KUV-01-J-02	Unknown	Unknown	Unanalyzed.	9
KUV-01-K-01	Turtle	Shell	Fragments.	23
KUV-01-L-01	Unknown	Unknown	Unanalyzed.	11

Table 4.15. Lithics Overview

Subop	% Site Total (n=849)
KUV-01-A	5.2
KUV-01-B	8.0
KUV-01-C	11.8
KUV-01-D	3.9
KUV-01-E	8.0
KUV-01-F	1.0
KUV-01-G	23.9
KUV-01-H	8.5
KUV-01-I	3.2
KUV-01-J	9.4
KUV-01-K	17.0
KUV-01-L	0.0
KUV-01-SF	0.1
Total	100.0

Table 4.16. Lithic Artifacts by Type

Description	Count
Debitage	820
Mano	1
Core	9
Biface	6
Obsidian Blade	4
Obsidian Chunk	1
Metate	4
Uniface	1
Unanalyzed Lithic Tools	3

Flakes associated with lithic tool production (i.e., debitage) were the most common form of lithic artifact recovered from the site. Cores were concentrated in Subop KUV-01-K, used as construction fill for the platform in this unit. Similarly, bifaces were also concentrated in this unit in greater numbers than any other indisputably historic component, giving further credence to the theory that the platform was constructed prehistorically and later reused by the San Pedro Maya. The medial fragment of a plano-convex mano was located in Subop KUV-01-A. Obsidian artifacts were concentrated in Subop KUV-01-C. Metates were produced from granite, limestone, and sandstone. One large metate fragment was basin shaped, while another was from a rectangular slab metate with one remaining pyramidal leg (Figure 4.30). These metates were visible with their respective subops on the ground surface. With the possible exception of Subop KUV-01-K, these lithic artifacts appear to have been utilized contemporaneously with historic artifacts for similar purposes found within each subop.

Miscellaneous

Two miscellaneous artifacts were found in Subop KUV-01-F. These items included an object of unknown material type with a coarse gold metallic patina and a nickel cadmium battery (Figure 4.31). The battery generally dates from 1893 to 1909.

Figure 4.30. Rectangular slab metate fragment (Spec. # KUV1693-01) from Subop KUV-01-E.

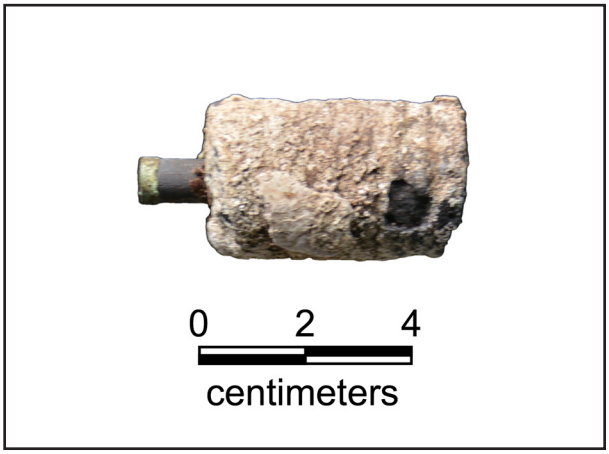

Figure 4.31. Nickel cadmium battery collected from Kaxil Uinic (Spec. # KUV1628-01).

CONCLUSIONS

Limited archival research has been done on the Caste War refugees in Belize, and traditional historical accounts of the war tend to dichotomize the Maya experience with descriptions of indigenous resistance versus acquiescence or cultural continuity versus change (Dornan 2004:12–13). As a result, archaeological investigations of Caste War Maya villages have aimed to better interpret the subaltern history of the Maya, exploring concepts of identity and intentionality (Dornan 2004) to understand how the Maya negotiated their way across the cultural landscape of nineteenth/twentieth-century British Honduras (Ng 2007). A comparison of the archaeological assemblage from Kaxil Uinic to other San Pedro Maya villages is therefore a tremendous advancement in the

small body of knowledge related to archaeological studies of the Caste War.

The 2015 investigation of Kaxil Uinic reaffirmed that the historic village was occupied from approximately 1880 to 1930 based on the manufacture date range of artifacts collected and analyzed by BEAST, yet there is evidence that the area was also visited by loggers, chicleros, and looters in later times. In comparison, Ng (2007) determined that the site of Holotunich (a small hamlet in the San José minor settlement cluster), located approximately 25.5 miles east of Kaxil Uinic, was occupied by the San Pedro Maya from about 1867 to 1893. Thus the occupation of Holotunich overlaps with Kaxil Uinic for a 13-year period (from 1880 to 1893). Similarly, material culture recovered from San Pedro Sirís, the head village of the San Pedro Maya settlement area, dates from about 1867 to 1910 (Yaeger et al. 2005a). Consequently, the occupation of San Pedro Sirís also overlaps that of Kaxil Uinic, though by approximately 30 years.

Seven three-stone hearths were identified at Kaxil Uinic with a large spatial distribution, implying that more of these features (indicative of Maya households) are potentially obscured by dense jungle vegetation. Future identification of similar rock arrangements could allow us to estimate the size of Kaxil Uinic in terms of population, as ethnographic accounts indicate the typical size of a Maya family at the time was five to six individuals, with a couple usually having three to four children (Rugeley 2001:108). One such feature was observed at San Pedro Sirís (Dornan 2004:112), though Yaeger et al. (2005a:260) additionally interpret a limestone cobble platform and associated postholes as evidence of a perishable house. Contrary to the white marl floors found in many units associated with three-stone hearths at Kaxil Uinic, no such surfaces were identified in the domestic spaces at San Pedro Sirís, though post-holes were identified at the site, and none were found at Kaxil Uinic (Yaeger et al. 2005a:261). Surprisingly, there is no mention of three-stone hearths at Holotunich. Ng (2007:118) instead describes five rock-lined features located approximately 10–15 cm below the ground surface, which she notes resemble the minimally mounded Maya structures characteristic of the Maya lowlands. Ng (2007:127) theorizes that variation in the sizes of the rock-lined structures (6 x 2 m, 3 x 2 m, 4 x 4.5 m, and 4 x 2 m) is potentially related to either wealth inequality or differing functions, but refrains from further speculation as to the precise cause or implications of the observed variation in structure sizes at the site. Conversely, no large rock alignments were observed at Kaxil Uinic, though this may be due to a sampling bias. When excavating three-stone hearths, we typically laid out 2-x-2-m excavation units centered on the hearth, yet further research indicates that the typical size of a historic Maya household was approximately 5.4 x 3.7 m (Dornan 2004:109). Ideally, if we could clear Kaxil Uinic of all ground cover and conduct a more extensive surface survey to identify additional three-stone hearth clusters, we could open larger exposures around previously unidentified hearths to better sample the interiors of these Maya domestic structures and potentially identify rock alignments similar to those observed by Ng (2007).

Other features identified at San Pedro Sirís include a cobble walkway, a yard, several rock piles, a trash toss zone, and a possible animal pen (Dornan 2004:105–106; Yaeger et al. 2005b). At least two large, distinct "midden" areas were initially identified at Kaxil Uinic, but excavations at one such area (Subops KUV-01-A, -C, and -D) revealed a three-stone hearth in association with the scatter. We surmised that our findings were therefore consistent with historical accounts of San Pedro Maya households, which state that "the floor ground is seldom swept, and pigs, dogs, and

fowls are allowed to go out at pleasure. Firewood, old bottles, stones, gourds, corn bags, corn sticks, [are] all in confusion" (Rugeley 2001:107). The presence of distinct trash zones separate from domestic structures at San Pedro Sirís is consequently a stark contrast to Kaxil Uinic. An additional feature identified at Holotunich is described as a circular pit excavated out of bedrock (Ng 2007:120). Though no similar features were identified at Kaxil Uinic, this does not necessarily mean that they are not present, as no units at Kaxil Uinic were excavated to bedrock. Neither Dornan (2004) nor Ng (2007) note the discovery of any features similar to the "mounds" located at Kaxil Uinic, further implying that these features are of prehistoric construction and likely associated with the nearby prehistoric site of the same name. Perhaps the scant amount of historic artifacts observed in a trench placed over one such mound (Subop KUV-01-K) represent offerings left at the mound by the San Pedro Maya.

It is difficult to compare the artifact assemblage collected from Holotunich with that found at Kaxil Uinic, as Ng (2007) largely attributes it to a later occupation of the site (ca. 1920–1940) by BEC loggers. However, several items Ng (2007) does attribute to the San Pedro Maya are worthy of note, including: fishing weights, wattle and daub fragments, a rosary, a crucifix, cast iron pots with tripod legs, accordion parts, snail shells, and pig bones. Many of these items (fishing weights, wattle and daub fragments, religious items, accordion parts, and snail shells) were not found at Kaxil Uinic, though that does not mean that they are not present in unexcavated areas of the site. We therefore propose that control units should be excavated in areas where cultural material is not present on the ground surface to prevent a sampling bias, which could possibly expose items similar to those listed above (see Ng 2007).

At San Pedro Sirís, where the artifact assemblage reflects a manufacture date range of 1867 to 1910, an abundance of locally produced ceramics and grinding stones were interpreted as evidence that traditional Maya food preparation and consumption practices were still utilized in the village. Several cast iron pots and metal grinders were recovered from Kaxil Uinic, however, indicating that these items were possibly adopted in place of locally produced vessels or metates to prepare traditional Maya foods. As the manufacture date range of artifacts recovered from Kaxil Uinic spans 1880 to 1930, some inferences can be drawn about changes in Maya participation in the British colonial economy after 1872. It appears that as time went on, San Pedro Maya participation in the colonial economy of Belize did increase, at least with respect to the use of imported goods such as metal grinders and service vessels, which largely replaced locally-produced items in food preparation activities at Kaxil Uinic. Descriptions (Bolland 2003:169; Jones 1977:168) of rampant epidemics at San Pedro settlements imply that the population of Kaxil Uinic was severely reduced after 1892, and by extension their labor force for maintaining their *milpas*. As colonial legislation prohibited the San Pedro Maya from owning land, the BEC acquired the title for lands around Kaxil Uinic (FM, Telegram). The residents thus probably turned to wage labor as loggers or *chicleros* to participate in the cash economy of British Honduras so that they could pay rent to the BEC (Thompson 1963:230), and probably had less time to produce locally-made ceramics or meals using traditional tools, but enough disposable income to buy cheaper metal items.

Furthermore, Dornan (2004:112) asserts that the large number of alcohol and patent medicine bottles recovered from San Pedro Sirís could be explained by ethnohistoric accounts of the importance of alcohol in Maya religious ceremonies, including funeral wakes. Grant Jones (1977:169) describes a serious smallpox epidemic spreading through the northern and

western districts of Belize from 1891 to 1892, stating that at least 30 individuals died at Kaxil Uinic. Funeral wakes associated with this epidemic alone would have likely generated numerous alcohol bottles as refuse at Kaxil Uinic, and it is important to note that a peak in the manufacture date range of glass collected from the site corresponds to this time frame.

This revelation raises further questions for Kaxil Uinic: Were these individuals buried in a mass grave? Or under the floors of houses in the traditional Maya way (Miller and Farriss 1979:232–233)? We propose that plaster surfaces like those encountered in Subops KUV-01-A and -C should be excavated to determine San Pedro Maya burial practices.

Other items of note found at San Pedro Sirís include ceramic doll parts, accordion parts, and religious pendants. Again, no such items were recovered from Kaxil Uinic, yet this does not imply they are not deposited in unexcavated areas of the site.

Additionally, further reports (Church et al. 2011) of excavations at San Pedro Sirís indicate a higher frequency of European weaponry observed at the site compared to Kaxil Uinic, including flintlock rifles predating 1850 and Enfield rifles postdating 1853. The British undoubtedly supplied the latter to the villagers prior to the Battle of San Pedro in 1867. In contrast, we only found a few shotgun shells of unknown age at Kaxil Uinic. While this disparity could be related to a sampling bias and/or the manner in which weapons did or did not enter the archaeological record at the two sites, it may also reflect the decreasing ability of the Maya to acquire firearms from the British after the Battle of San Pedro (Houk and Bonorden 2015).

Finally, to remedy the lack of archival data available on Kaxil Uinic in the Belize Archives, further archival research should be conducted elsewhere. Specifically, the Public Records Office in Kew, England, the Wesleyan Methodist Missionary Archives at the School of Oriental and African Studies in London, and the Jamaica Archives and Records Department in Kingston are likely to contain relevant records. As a crown colony of England, it is likely that most official colonial correspondence regarding British Honduras, and by extension their interactions with the inhabitants of Kaxil Uinic, are housed among the Public Records Office's archives. Methodist missionaries sent to British Honduras at the turn of the century maintained detailed records of their interactions with the "Indians" they were attempting to convert, and such accounts might provide further insight into the daily lives of the San Pedro Maya that are absent from colonial administrative records. From the late seventeenth century until 1884, British Honduras was under the jurisdiction of the Governor of Jamaica, raising the possibility that additional archival records pertinent to Kaxil Uinic might be housed there. Although other researchers (Cal 1991; Dornan 2004; Ng 2007) have documented the usefulness of archival records stored in England, the Jamaica Archives and Records Department remains an untapped resource. Research in Kingston would be consequently groundbreaking for historical archaeologists working in Belize. With additional information gleaned from the proposed investigations, a more thorough examination of the nature of cultural contact between the Maya and British during the late nineteenth century will become evident, and the subaltern colonial experience of the San Pedro Maya might be clarified.

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Bioarchaeological Analysis of Human Skeletal Remains from Chan Chich, Belize

Anna C. Novotny, Ashley Booher, and Samantha Mitchell

This chapter details the complete osteological analysis of human remains recovered from the ancient Maya site of Chan Chich in 2014 and 2015. A total of four burials containing four individuals was analyzed for this report. Each burial is listed below according to burial number and provenience (Operation, Suboperation, and Lot). Each burial is described beginning with the archaeological context from which the remains were recovered. Details of grave location, time period in which the interment occurred, position and orientation of the skeleton, and any grave goods are recounted in this section. The following section records the osteological analysis of each individual including the approximate percentage of the remains recovered, age at death, biological sex, dentition, and skeletal pathologies, if any were observed.

All skeletal data were collected in accordance with the *Standards for Collection of Data from Human Skeletal Remains* (Buikstra and Ubelaker 1994). *Standards* is a compilation of techniques used in osteological analysis that outlines methods of determining age at death, biological sex, pathological conditions, and cultural modifications to the body. As much of these data as possible were collected for each individual. Analysis of the dentition was done according to *Standards* and supplemented by Simon Hillsons' (1996) text *Dental Anthropology* and Timothy D. White's and Pieter A. Folkens' (2005) text, *The Human Bone Manual*. Pathologies were identified with reference to *Identification of Pathological Conditions in Human Skeletal Remains* (Ortner 2003). We have refrained from citing the above texts in the report except where necessary.

CHAN CHICH BIOARCHAEOLOGICAL ANALYSIS

Burial CC-B11, Lot CC-12-D-9 (One Individual)

Archaeological Context

Samantha Mitchell performed observations on the skeletal remains from Burial CC-B11, which was located in the Upper Plaza on Structure A-1 (Herndon et al. 2014). The interment was discovered on the summit of the building's central landing, after excavators penetrated a plaster cap in the penultimate phase of the landing. Excavations revealed a gap underneath a series of capstones. Inside this void, excavators could see two complete ceramic vessels, which were removed to prevent the vessels from being crushed during excavations of the feature. Cache CC-C01 was later uncovered directly above the capstones and consisted of 17 obsidian blades. The burial was enclosed by a series of five uncut capstones and crude stone walls on the west and north. Construction fill formed the eastern boundary of the burial. A single individual was interred inside of the crypt. The individual appeared to be in a flexed position, with the feet, the pelvis, and

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the legs oriented towards the north. Vessel 3 was uncovered in the southern end, and several teeth were located directly underneath the vessel (Figure 5.1). Vessel 4 was later uncovered underneath Vessel 3. The skull, vertebrae, ribs, and hand and arm bones were not in this burial, but the excavator noted patches of bone residue in the southern end of the burial; indicating that skeletal elements were once present (see Herndon et al. 2014). The ceramic vessels date to the Late Classic period, and a radiocarbon date on charcoal from within the burial corroborates this age assessment, although two dates from above the burial are a century or more older (Table 5.1). For further details reference Herndon and colleagues (2014).

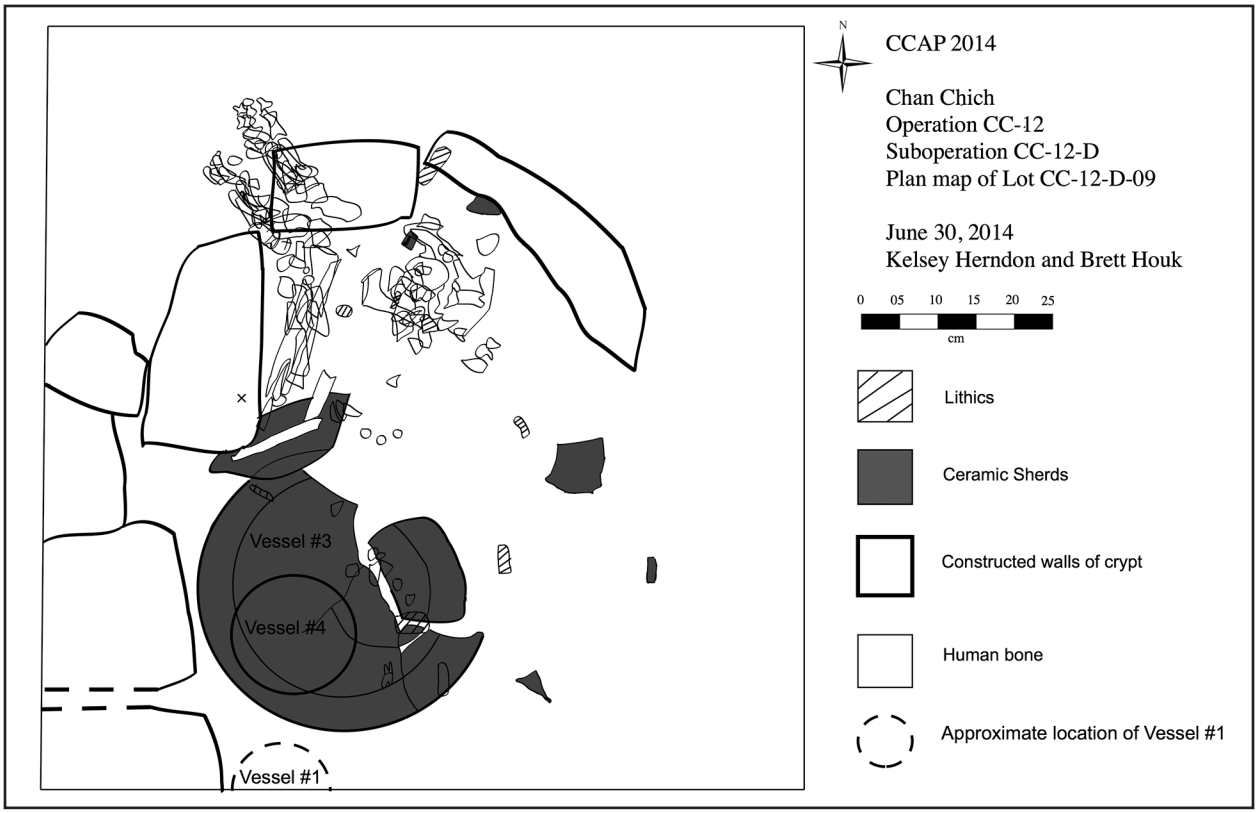

Figure 5.1. Plan Map of Burial CC-B11 (after Herndon et al. 2014:Figure 3.26).

Table 5.1. Radiocarbon Dates Associated with Burial CCB-11

Sample	UCIAMS#	Context	14C Age (BP)	±	95.4 (2σ)2	Probability
CC-12-S17	151875	Lot CC-12-D-9, charcoal from Burial CC-B11	1310	25	AD 658–722 AD 740–768	69.3% 26.1%
CC-12-S13	154688	Lot CC-12-D-7, charcoal from charcoal rich layer above Burial CC-B11	1505	15	AD 540–602	95.4%
CC-12-S08	154690	Lot CC-12-D-6, charcoal from the plaster capping Burial CC-B11	1510	20	AD 434–450 AD 470–487 AD 534–608	2.7% 3.6% 89.1%

Osteological Analysis

Burial CC-B11 contained one individual who appears to have been interred in a flexed position with the lower torso oriented to the north and the upper torso and skull in the southern end of the grave. The skeletal elements available for analysis were the feet, femur, fibula, tibia, the right os coxa, and teeth (Table 5.2). The surface of the bones was very fragile, but sufficiently intact for analysis. The remaining fragmented skeletal remains, which could not be identified, weighed 64.8 g. The average weight of an adult male skeleton is approximately 2,400 g (McKinley 1993), which indicates that the fragmented remains make up approximately 2.7 percent of Burial CC-B11. This suggests that only a small portion of the skeleton was recovered, but reaffirms only a single individual was present in the internment.

Table 5.2. Burial CC-B11 Skeletal Inventory

Element	Side	Completeness
Pelvis Fragments	Right	>25%
Pubic Symphysis	Right	>25%
Acetabulum	Right	>50%
Ilium	Right	>15%
Femur	Left	>25%
Tibia	---	>25%
Fibula	---	>15%
Talus	Left	>50%
Talus	Right	>25%
Tarsals	---	>50%
Intermediate Cuneiform	Left	>50%
Medial Cuneiform	---	>25%
Navicular	Right	>10%
Cuneiform	---	>10%
Intermediate Cuneiform	Right	>10%
Cuboid	Right	>10%
Phalanges	---	>50%
Pedal Distal Phalanges	---	>25%
Pedal Intermediate Phalanges	---	>25%
Pedal Proximal Phalanges	---	>25%
Metatarsals	Right	>5%
Metatarsals	---	>50%

Age and Sex

Age of this individual was estimated using morphological changes of the skeleton and epiphyseal fusion. Complete epiphyseal union of all skeletal elements and morphological changes to the pubic symphysis indicate the individual was between 21 and 46 years of age at death (Brooks and Suchey 1990). Sex was estimated using pelvic morphology, including width of the sciatic notch, as well as the diameter of the femoral head (Bass 1995). The measurements indicated this individual was a male (Figure 5.2; Table 5.3).

Table 5.3. Age and Sex Determinant Factors

Femoral Head Measurement	Pubic Symphysis Rank
46.97	4 (21–46 years of age)

Dentition

Eleven teeth were recovered in the southern end of the internment and were not associated with alveolar bone (Table 5.4). The teeth were poorly preserved, but a minimal amount of calculus was noted on the mandibular and maxillary teeth. A moderate amount of wear was noted on RM_1 of the mandible and RM^2 of the maxilla.

Pathology and Trauma

Evidence of osteoarthritis was noted on the distal and proximal sections of 13 pedal phalanges. Arthritic lipping was evident on 11 phalanges. An advanced case of osteoarthritis was noted on one distal and one intermediate pedal phalange, which had fused together

Table 5.4. Burial CC-B11 Dental Inventory

RM^3	RM^2	RM^1	RP^4	RP^3	RC^1	RI^2	RI^1	LI^1	LI^2	LC^1	LP^3	LP^4	LM^1	LM^2	LM^3
X	X					X						X		X	
	X		X				X	X			X		X		
RM_3	RM_2	RM_1	RP_4	RP_3	RC_1	RI_2	RI_1	LI_1	LI_2	LC_1	LP_3	LP_4	LM_1	LM_2	LM_3

Figure 5.2. Femoral head from Burial CC-B11.

and showed significant signs of osteoarthritis and lipping (Figure 5.3). The only evidence of trauma was noted on a single pedal phalange, which showed evidence of a small fracture on the distal articular surface. The fractured phalange was noted to have healed and developed osteoarthritis, which indicates the fracture was anti-mortem (Figure 5.4).

Conclusion

This burial was a primary interment and contained an adult male buried in a flexed position with the skull oriented to the south and the lower torso to the north. The skeletal elements do not appear to be disturbed after the primary interment. Many skeletal elements were not present upon excavation, but it is highly likely that varying preservation within the burial resulted in the disintegration of various skeletal elements in the southern end of the unit (Herndon et al. 2014). This is further confirmed due to the presence of the teeth in the southern end, but not the cranium. Additionally, the bones of Burial CC-B11 showed signs of cracking, which may indicate repetitive exposure to water followed by periods of drying.

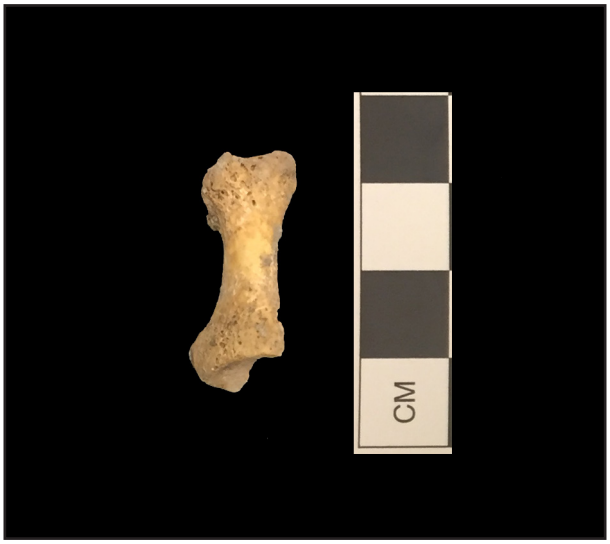

Figure 5.3. Anti-mortem fractured and healed phalange from Burial CC-B11.

Figure 5.4. Fused arthritic distal and intermediate pedal phalange from Burial CC-B11.

Burial CC-B12, Lot CC-14-F-3 (One Individual)

Archaeological Context

Samantha Mitchell performed observations on the skeletal remains from Burial CCB-12. Excavations of Lot CC-14-F-03 uncovered Burial CC-B12 directly underneath a layer of topsoil and construction fill. The individual was oriented with the feet to the east and the upper torso and skull to the west and was associated with a single three-footed vessel (see Booher et al., this volume). The bones *in situ* were highly fragmented, which is possibly due to the proximity of the burial to the surface and the poor preservative qualities of construction fill. A total of 156 fragments was recovered from the interment (Figure 5.5). The only available date for this burial is a radiocarbon date from a fragmented long bone. The bone dated to the Late Classic period with two possible date ranges of cal AD 713–744 (probability = 14.3 percent) and cal AD 765–884 (probability = 81.1 percent), as reported by Booher et al. (this volume). Reference Booher and Nettleton (2014) and Booher et al. (this volume) for more details concerning the archaeological context of this burial.

Osteological Analysis

Burial CC-B12 contained a few cranial fragments, which were extremely fragmented and could not contribute to sex estimation. There were also numerous long bone fragments. The only identifiable elements belonged to the humerus, radius, and femur, but siding was not possible (Table 5.5). The bulk of skeletal elements available for analysis included the feet, hands, and teeth. The surface of the bones is well preserved, but the remains are highly fragmented and fragile. The sex of this individual is unknown, but the average weight of the human skeleton (1,625 g) was used to estimate the percent of skeletal remains removed from the interment (Mckinley 1993). The remaining unidentifiable fragments weighed 150 g and comprised 9.2 percent of Burial CC-B12. This indicates that a large portion of the skeleton

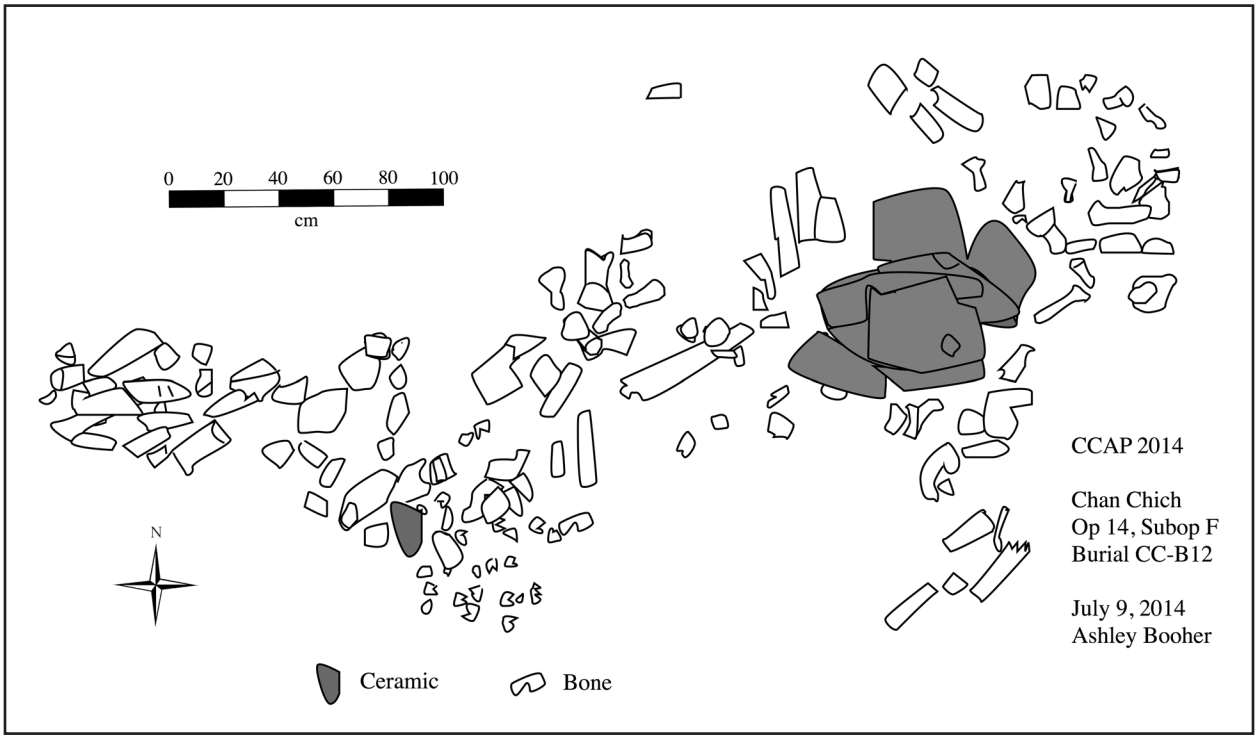

Figure 5.5. Plan Map of Burial CC-B12.

Table 5.5. Burial CC-B12 Skeletal Inventory

Element	Side	Completeness
Skull	---	>10%
Parietal	---	>10%
Occipital	---	>10%
Zygomatic	---	>25%
Scapula	---	>25%
Ribs	---	>5%
Mandible	---	>10%
Humerus	---	>10%
Radius	---	>10%
Femur	---	>10%
Tarsals	---	>50%
Cuneiform	---	>50%
Navicular	---	>10%
Metacarpal	---	>50%
Metacarpal	Right	>25%
Metacarpal	Left	>10%
Carpal	---	>25%
Capitate	---	>25%
Scaphoid	Right	>25%
Manual Phalanges	---	>10%
Manual Distal Phalanges	---	>10%
Manual Proximal Phalanges	---	>5%
Metatarsals	---	>10%
Metatarsals	Right	>10%
Pedal Distal Phalange	---	>10%
Pedal Intermediate Phalange	---	>50%
Pedal Proximal Phalange	---	>5%

was not preserved and suggests that only one individual was present in the burial.

Age and Sex

Age is estimated to be an adult, due to significant dental wear, but no other skeletal markers were present for age determination. Sex was indeterminate for this individual.

Dentition

A total of 28 teeth was recovered (Table 5.6). All of them appear to belong to the same individual and they were recovered in the same context as the rest of the skeletal elements. The teeth were well preserved and show significant signs of calculus build up. Dental modification was not noted on any of the teeth, but significant wear was noted on LM_3, LM_2, and LM_1 on the mandible and RM^3, RM^2, RM^1, LM^1, LM^3 of the maxilla. Additionally, caries were noted on LM_2 and LM_1 of the mandible.

Pathology and Trauma

There was no pathology or trauma observable on this individual.

Conclusion

Burial CC-B12 was a primary interment containing a single individual, which was associated with a single grave good. The skeletal analysis and *in situ* analysis indicate that this burial was not disturbed after the initial interment. Additionally, it appears as if this burial only contained one individual. The surface of the skeletal remains was relatively well preserved, but the highly fragmented nature of the skeleton impeded estimation of sex. The

Table 5.6. Burial CC-B12 Dental Inventory (X Indicates Presence)

RM^3	RM^2	RM^1	RP^4	RP^3	RC^1	RI^2	RI^1	LI^1	LI^2	LC^1	LP^3	LP^4	LM^1	LM^2	LM^3
	X	X	X	X	X	X	X	X		X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
RM_3	RM_2	RM_1	RP_4	RP_3	RC_1	RI_2	RI_1	LI_1	LI_2	LC_1	LP_3	LP_4	LM_1	LM_2	LM_3

numerous teeth in this burial displayed significant wear and calculus build up, which indicates that this individual was an adult. There were no observable modifications to the teeth. The poor preservation of the remains and missing skeletal elements are more than likely due to the interment's proximity to the surface.

Burial CC-B13, Lot CC-12-H-13 (One Individual)

Archaeological Context

Anna Novotny performed observations on the skeletal remains from Burial CC-B13, which was recovered during the 2014 field season from a room in Structure A-18, located in the southwestern corner of the Upper Plaza at Chan Chich (Figure 5.6). The room opens to the south on a small courtyard, and excavators discovered Burial CC-B13 while digging into the floor of the doorway of the room, looking to uncover evidence of earlier construction. The burial was beneath the penultimate floor of the room within rubble construction fill. The grave was a crypt with three limestone capstones, but no stones lining the walls, that measured approximately 70 x 50 cm. The individual within the crypt was flexed with hands beneath the cranium and with head to the south, facing down and to the west. All bones were in correct anatomical position suggesting a primary interment. A small shell fragment and crystalline substance were found when screening soil matrix from the crypt, but no other potential grave goods were found (Herndon et al. 2014:14–22).

Osteological Analysis

Preservation of the skeleton was generally poor. The bones were complete in the field and all were recovered, but only about half were observable in the lab (Table 5.7). The bones had a chalky consistency with numerous small pits and fissures. While bone shape was generally preserved, the bone surface was eroded in nearly all skeletal elements.

Age and Sex

Age was estimated using morphological changes to the auricular surface of the ilium, which was corroborated by dental occlusal wear. The auricular surface showed changes consistent with an age at death of 45–59 (Lovejoy et al. 1985).

Due to poor preservation, few morphological features indicative of biological sex were observable. Sex was estimated using morphology of the skull and pelvis. The mastoid process of the temporal was large compared to the surrounding structures. The greater sciatic notch was relatively narrow. Based on these two observations, the sex of the individual is estimated to have been male.

Dentition

The dentition was not well preserved (Table 5.8). The RM^1 was represented by the crown only, and the RP_1 and RC_1 were represented by the root tips only, which were still in occlusion in the mandible. Wear was moderate on both tooth crowns. No pathologies like caries or calculus accumulation were observed. It is likely that several of the posterior teeth of the mandible were lost premortem, however erosion of the bone surface of the mandible makes it difficult to say for certain.

Pathology and Trauma

Two cervical vertebrae, C6 and C7, show pathological bone formation and destruction on the centra of the vertebral bodies due to osteoarthritis (Figures 5.7 and 5.8). The superior articular facets of C6 are also affected, however the inferior articular facets appear normal. The superior aspect of the centrum of C6 has pinpoint porosity in the center and a small amount of lipping along the central portion of the centrum with <1/3 of the edge

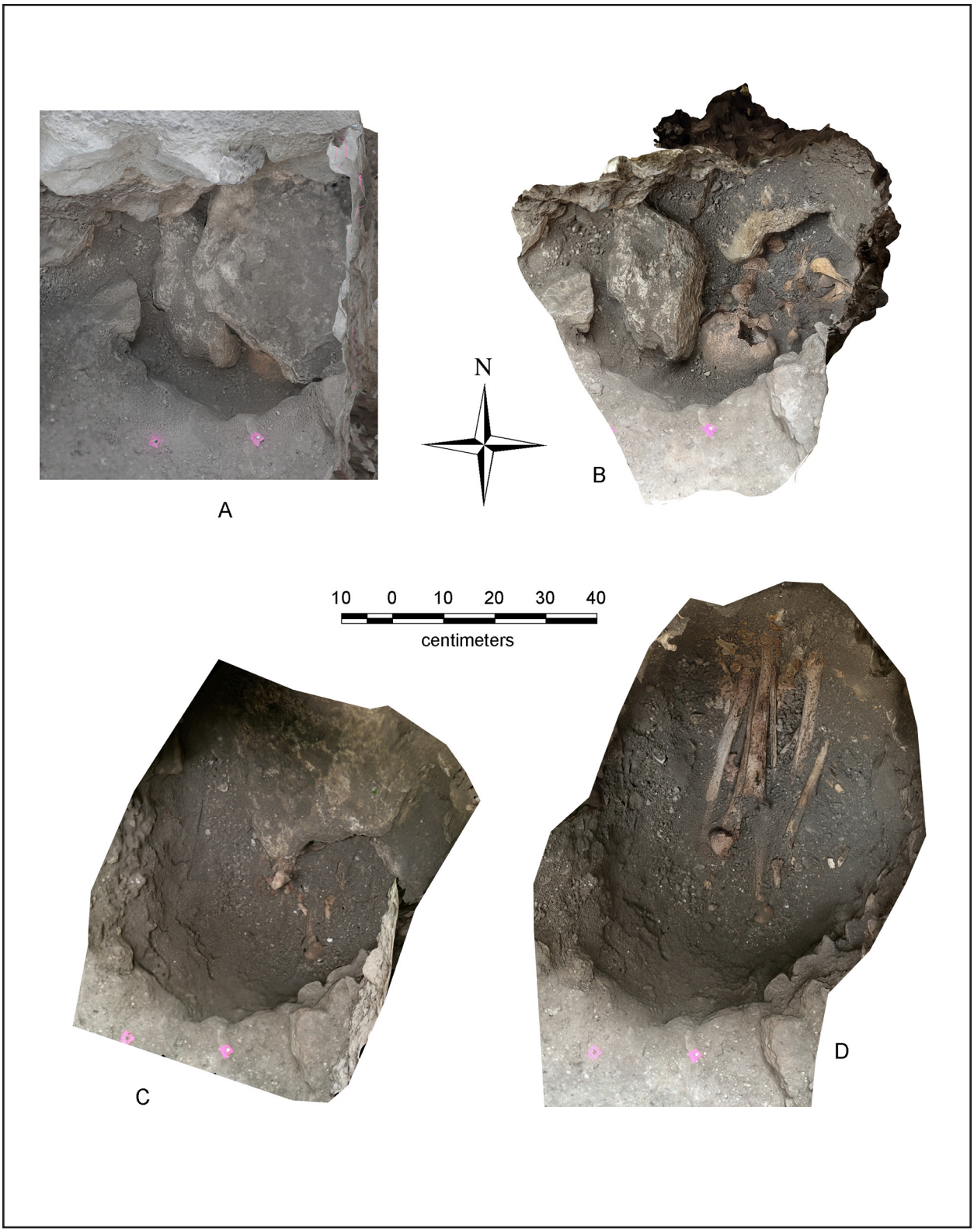

Figure 5.6. Orthophotos of Burial CC-B13 during various stages of excavation from (A) before the removal of the second capstone to (D) after the removal of the third capstone (after Herndon et al. 2014:Figure 3.13).

Table 5.7. Burial CC-B13 Skeletal Inventory

Element	Side	Completeness
Mandible	Left	>75%
	Right	50%
Frontal	Left	<25%
	Right	<25%
Parietal	Left	>75%
	Right	>75%
Temporal	Left	<25%
	Right	<25%
Sphenoid	Left	
	Right	
Occipital	Left	<25%
	Right	
Zygomatic	Left	
	Right	>75%
Maxilla	Left	
	Right	
Clavicle	Right	50%
	Left	
Scapula (body)	Left	<25%
	Right	<25%
Scapula (Glenoid fossa)	Left	100%
	Right	100%
Humerus	Left	>75%
	Right	>75%
Radius	Left	>75%
	Right	25%–75%
Ulna	Left	75%
	Right	25%–75%
Femur	Left	<25%
	Right	50%
Patella	Left	
	Right	100%
Tibia	Left	25%–75%
	Right	25%–75%
Fibula	Left	25%
	Right	<25%

Table 5.7. (continued)

Element	Side	Completeness
Pelvis		
Ilium	Left	25%–75%
	Right	<25%
Ischium	Left	25%–75%
	Right	<25%
Pubis	Left	
	Right	
Acetabulum	Left	<25%
	Right	100%
Auricular Surface	Left	100%
	Right	
Vertebrae		
C1		100%
C2		<25%
C3–C6		<25%
C7		100%
T1-9		50%
T10		
T11		50%
T12		50%
L1		100%
L2		50%
L3		<25%
L4		<25%
L5		<25%
Ribs 3–10	Left	<25%
	Right	<25%
	Indet.	Numerous
Carpals	Left	50%
	Right	<25%
	Indet.	<25%
Metacarpals 1–5	Left	<25%
	Right	<25%
Hand Phalanges	Indet.	75%
Metatarsals 1–5	Left	<25%
	Right	<25%

Table 5.7. (continued)

Element	Side	Completeness
Tarsals	Left	<25%
	Right	<25%
	Indet.	<25%
Talus	Left	
	Right	50%
Calcaneus	Left	
	Right	100%
Pedal Phalanges	Indet.	<25%

affected. The porosity seems to be coalescing along that anterior central ring, but taphonomic damage to this area makes observation difficult. The left and right superior articular facets have some porosity. The left seems like it has surface osteophytes. The inferior surface of the centrum has several large patches of coalesced porosity surrounded by pinprick porosity. The anterior margins are marked by distinct curving osteophytes. The posterior margin has smaller osteophytes forming as well. A lytic lesion is present on the left posterior corner of the inferior surface of the centrum.

The centrum of C7 has larger coalesced lesions that appear lytic. There is some taphonomic damage impeding observation. A single, large osteophyte along the anterior edge of the superior surface is curved and projecting superiorly. The inferior surface of the centrum has coalesced porosity and surface osteophytes. The edge is raised with barely observable lipping. The superior and inferior articular facets of C7 show no pathological changes. None of the other vertebrae showed any pathological changes.

Conclusion

Burial CC-B13 contained the remains of a male adult who was approximately 50 years old at death. The remains were generally poorly preserved, but osteoarthritic changes to several cervical vertebrae were observed. It is not possible to link these changes to one causal factor, however the practice of carrying heavy loads using a tumpline may have contributed to these degenerative changes in the neck. The individual was interred in a flexed position in a crypt with capstones, although no lining stones were used to maintain the grave space. The crypt was within construction fill of Structure A-18 and a plaster floor was sealed over the crypt. No grave goods were recovered that indicated the date of interment.

Burial CC-B14, Lot CC-14-J-4 (One Individual)

Archaeological Context

Ashley Booher preformed observations on the skeletal remains from Burial CC-B14, which was interred within Structure D-1 at Courtyard D-1 and located within a C-shaped bench. Structure D-1 is the largest building at Courtyard D-1 and is orientated north to south, facing the open courtyard. The grave consisted of dry fill and limestone and measured 60 cm by 50 cm. Burial CCB-14 was a single individual interment placed in a seated position with hands crossed, legs bent, and feet articulated, but not crossed (Figure 5.9). The head was positioned to the northwest with several grave goods found to the south. The ceramic vessel found associated with the burial was dated to the Late

Table 5.8. Burial CC-B13 Dental Inventory

RM^3	RM^2	RM^1	RP^4	RP^3	RC^1	RI^2	RI^1	LI^1	LI^2	LC^1	LP^3	LP^4	LM^1	LM^2	LM^3
		X													
				X	X	X									
RM_3	RM_2	RM_1	RP_4	RP_3	RC_1	RI_2	RI_1	LI_1	LI_2	LC_1	LP_3	LP_4	LM_1	LM_2	LM_3

Figure 5.7. Inferior aspect of C6 from Burial CC-B13.

Figure 5.8. Superior aspect of C7 from Burial CC-B13.

Classic period. For a complete description of the burial see Booher et al. (this volume).

Osteological Analysis

Burial CC-B14 was an extremely well preserved burial likely due to the dry fill and sealed location within a bench, which protected the burial from taphonomic processes. Approximately 75 percent of the bones were collected and observed (Table 5.9). The individual was found in correct anatomical position and maintained joint articulation of the feet indicating the burial was recovered from the primary location of interment. The pelvis was nearly complete *in situ*, but upon removal from the soil matrix the iliac blades of both the right and left pelvises disintegrated. The long bones, hands, and feet displayed the best preservation. Roughly 50 percent of the cranium was present but fragmented. Several of the vertebrae and ribs were present, with the first ribs and second, third, and seventh cervical vertebra identifiable. A total of 12 teeth was recovered. The LP_1, LP_2, and LC^1 were in alveolar bone, with two still located in the mandible and one in the maxilla.

Age and Sex

Age was estimated to be adult based on skeletal development and dental wear. The pubic symphysis and auricular surface along with the epiphyseal fusion of the femoral head were used to estimate age at death. The complete epiphyseal fusion of the femoral head and morphological changes of the pubic symphysis and auricular surface of the right os coxa indicates that the individual was between 38–48 years old at death (Brooks and Suchey 1990). Sex was estimated to be female based on the morphology of the os coxa and the diameter of the femoral head. The subpubic concavity of the right os coxa was concave, and both the right and left pubic symphyses had evidence of parturition scars (Figure 5.10). The long bones

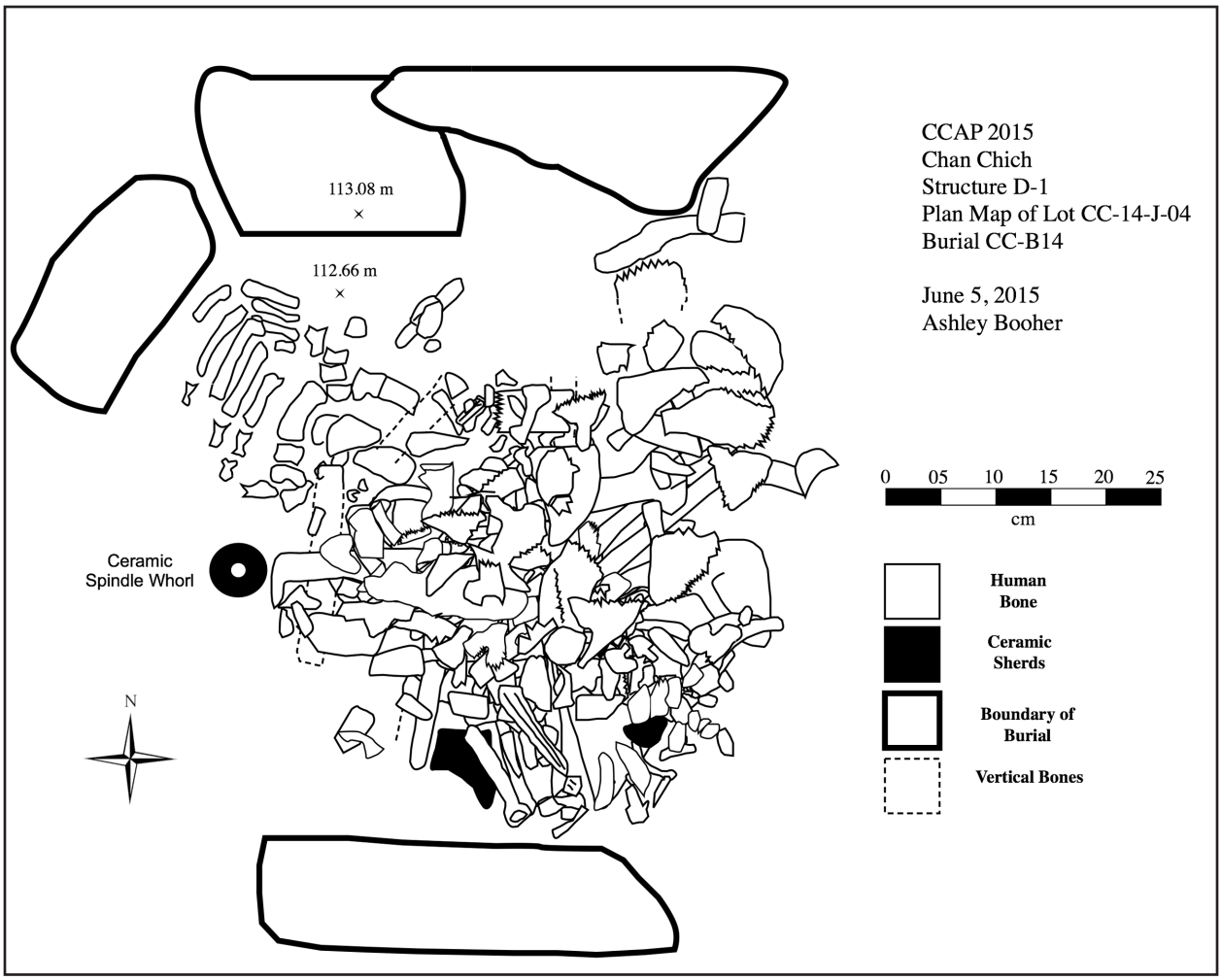

Figure 5.9. Plan Map of Burial CC-B14 (after Booher et al., this volume:Figure 2.12).

were also very gracile, and the measurement of the femoral head yielded a score of 39.2 (Bass 1995). The cranium was too fragmented to corroborate age and sex assessments.

Dentition

The dentition was reasonably well preserved with moderate occlusal wear and several dental pathologies (Table 5.10). A moderate amount of dental calculus was observed on the RM^1 on the lingual and buccal aspects, and on the lingual aspects of the left and right P_1 and LC_1. The RP_1 and both RI_1 and RI_2 exhibited extreme calculus. Interproximal carries were present on RM^1, RC^1, LC_1, LP^2, RP_1, and RP_2. The left and right M^1 and M^2 along with the LI^2 and LC^1 had fully resorbed alveolar sockets, indicating the teeth were lost antemortem. The LP_1, LC^1, and LP_2 were still in occlusion.

Several teeth showed signs of modification. The LC_1, LI_1, and RI_2 exhibit a B4 modification, a 90-degree angle modification of the edge of the tooth (Figure 5.11; Romero 1958). The LI_1 and RI_2 modification notch is lateral, while the LC_1 notch is medial, which is less common then lateral notch modifications. RI_2 shows evidence of extreme diagonal wear to the lateral edge. It is unclear whether the wear is a result of attrition, intentional modification, or a combination of the two.

Table 5.9. Burial CC-B14 Skeletal Inventory

Element	Side	Completeness
Mandible	Left	75%
Maxilla	Left	>25%
Mandible	Right	50%
Frontal	Left	>25%
Temporal	Left	>25%
Sphenoid	Left	50%
Frontal	Right	>25%
Occipital		25%
Clavicle	Right	75%
Scapula (body)	Left	>25%
Scapula (Glenoid fossa)	Left	25%
Humerus	Left	50%
Radius	Left	100%
Ulna	Left	100%
Humerus	Right	25%
Radius	Right	100%
Ulna	Right	100%
Femur	Left	50%
Tibia	Left	25%
Femur	Right	25%
Patella	Right	100%
Fibula		50%
Sternum		75%
Vertebrae		
C2		>25%
C7		100%
C3-6		50%
L1-5		25%
Rib 1	Left	100%
	Right	100%
Illium	Left	50%
Pubis	Left	25%
Acetabulum	Left	25%
Illium	Right	25%
Pubis	Right	50%
Acetabulum	Right	75%
Auricular Surface	Right	50%
Carpals	Left and Right	100%
Metacarpals	Left and Right	100%
Hand Phalanges	Left and Right	100%
Tarsals	Left and Right	75%
Metatarsals	Left and Right	75%
Pedal Phalanges	Left and Right	25%

Pathology and Trauma

The individual from Burial CC-B14 showed no evidence of trauma, although several cervical vertebrae and a lumbar vertebra displayed osteoarthritis on the centra and articular facets. One cervical vertebra (C3–6, exact number unknown), showed coalesced porosity on the surface of the left superior articular facet and the surface of the right inferior articular facet. A small spot of eburnation was visible on the left superior articular fact indicating that the joint space was nearly completely degenerated.

C7 showed osteoarthritic degeneration on the superior articular surface of the centrum and the left inferior articular facet (Figure 5.12). The surface of the centrum showed pinpoint-type porosity on approximately half of the surface. Mild lipping was observable on approximately 1/3 of the anterosuperior edge of the centrum. The left inferior articular facet showed more advanced changes to the bone surface. The porosity was coalesced with formation of a lytic lesion and a clearly observable point of eburnation.

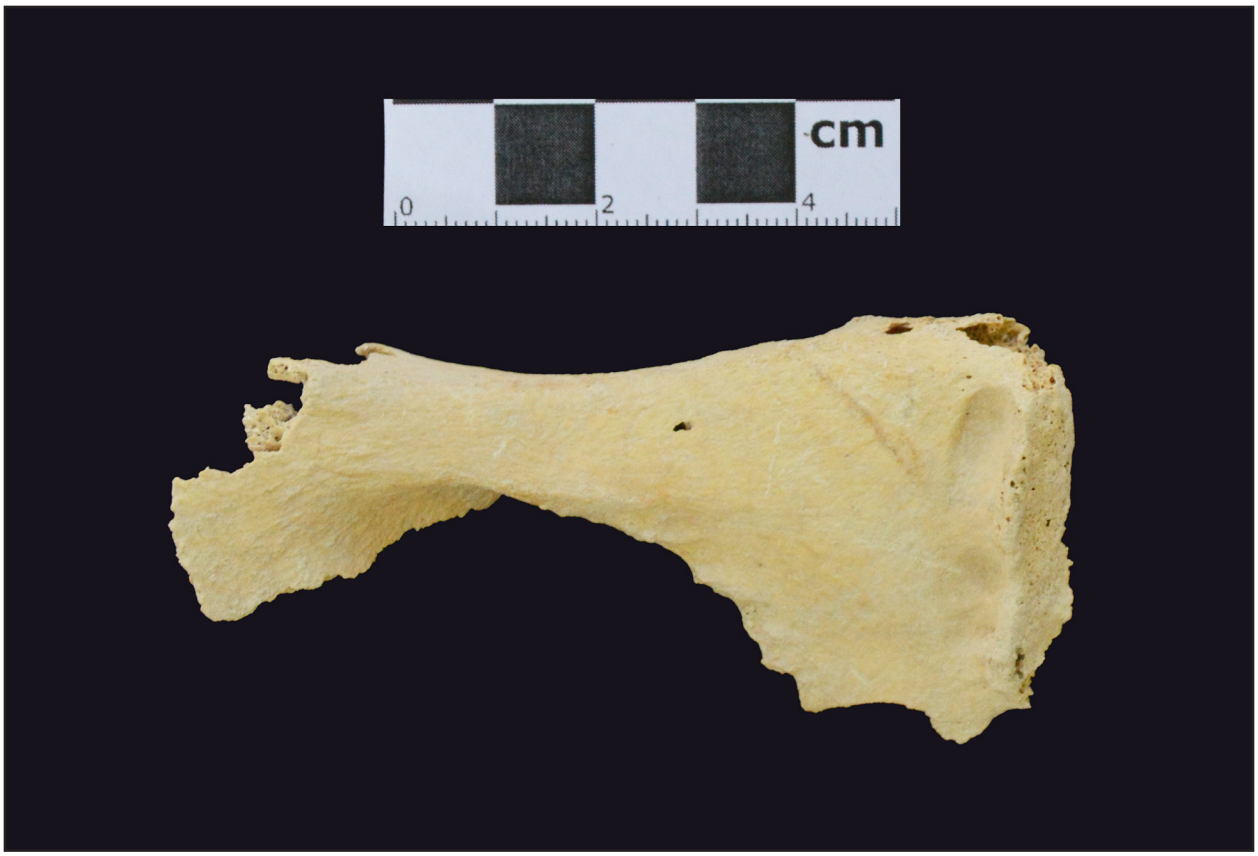

Figure 5.10. Burial CC-B14 left pubis, posterior aspect, showing pubic symphysis and parturition scars.

Table 5.10. Burial CC-B14 Dental Inventory

RM^3	RM^2	RM^1	RP^4	RP^3	RC^1	RI^2	RI^1	LI^1	LI^2	LC^1	LP^3	LP^4	LM^1	LM^2	LM^3
		X			X					X		X			
				X		X	X	X		X	X	X	X		
RM_3	RM_2	RM_1	RP_4	RP_3	RC_1	RI_2	RI_1	LI_1	LI_2	LC_1	LP_3	LP_4	LM_1	LM_2	LM_3

A fragment of cervical vertebra (C2–6, exact number unknown), displayed coalesced porosity on the superior and inferior articular surfaces of the centrum. The inferior articular facet has lipping along 1/3–2/3 of the lateral edge.

A small fragment of the centrum of a lumbar vertebra (L1–5) shows pinpoint porosity on the surface as well as lipping and curved spicules on the anterior aspect. The surface involved, superior or inferior, is unknown.

Squatting facets on the inferior aspect of the left and right talus were also observed (Figure 5.13). The facets are a continuation of the posterior continuation of the medial calcaneal articular surface. It is caused, typically, by habitual hyperdorsiflexion of the ankle joint while sitting in a squatting position with knees drawn up towards the chin. Facets are often observable on the anterior aspect of the articular surface of the distal epiphysis of the tibia, as well, but neither left nor right portions of this bone were present for observation.

Conclusion

Burial CC-B14 is an older female individual placed in a seated position with arms crossed across the chest with legs in a vertical position

Figure 5.11. LC1 with B4 type modification (see Romero 1958).

Figure 5.12. Cervical vertebra showing osteoarthritic degeneration of the right inferior articular facet.

and feet articulated but not crossed. The individual was placed within a C-shaped bench structure with remarkable preservation, likely aided by the dry fill and sealed grave cavity. To the south of Burial CC-B14 was Burial CC-B12 located within the same bench, although a part of a later addition. The preservation between the two burials is vastly different, which could be attributed to the position of the individuals upon interment and depth below modern ground surface. The individual in CC-B12 was in an extended position and shallowly buried, while the individual in Burial CC-B14 was seated and tightly compacted and protected by a moderately well preserved bench surface (Booher and Nettleton 2014; Booher et al. this volume). The dentition exhibited moderate wear patterns that are consistent with the older age of the individual. Several teeth had evidence of modification observed both medially and laterally. The individual presented osteoarthritic degeneration of several vertebrae of the cervical and lumbar portions of the spine. The left and right tali showed evidence of squatting facets, which are a feature acquired by hyperdorsiflexion of the ankle, typically from sitting in a squatting position.

Isolated Human Remains from Lot CC-14-S-06 Artifact Deposit

Archaeological Context

Isolated human skeletal remains were encountered at the base of the west exterior wall of Structure D-3 and likely left unprotected and exposed to the elements, resulting in poor preservation (Figure 5.14). Structure D-3 is located in Courtyard D-1 and is orientated east to west and shares a common platform face with Structure D-1. The isolated human skeletal remains were part of an artifact deposit that included a West Indian chank shell and several ceramic vessels and plates. The skeletal elements consisted of two fragments of a humerus that refit and a fragment of a fibula. Neither bone was

Figure 5.13. Medial trochlear extension from Burial CC-B14.

Figure 5.14. Photo of artifact deposit (Lot CC-14-S-06) on the exterior of Structure D-3 with human bone fragments visible due east of the north arrow.

sideable. Seven other fragmented pieces of human bone were collected from the deposit that are too fragmented to identify. The bones were disarticulated and likely removed from the original place of interment and placed at Structure D-3.

Osteological Analysis

The shaft and the distal end of the humerus bone were present for observation and were re-fit in the lab. The head of the humerus was not present, likely due to poor preservation given the nature and placement of the deposit. The olecranon fossa has septal aperture. The trochlea, capitulum, and lateral epicondyle are present and well preserved, but the medial epicondyle is missing. The humerus bone was determined to be from the left side. The fibula is missing both the distal and proximal ends, only the shaft is present, preventing accurate siding of the bone. It is unclear whether the bones are from the same individual. The fragmented bones are long bone fragments, but unidentifiable in terms of specific long bones.

Age and Sex

Age and sex were indeterminate.

Taphonomy

The humerus and the fibula both exhibit root marks throughout the bone surface. The fibula has a crack down the entire length of the shaft. The fracture is postmortem and due to environmental causes, likely from expanding from exposure to moisture.

Conclusion

The isolated remains from the artifact deposit placed outside of Structure D-3 were a secondary interment given the placement and association with other artifacts. It is unclear if the bones belong to the same individual. The humerus and fibula both exhibit root marks, and the fibula has a postmortem crack likely due to water exposure. Seven other fragmented bones were found in association with the humerus and fibula, but are not identifiable.

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Digitization to Realization: The Utilization of Structure from Motion, ESRI ArcScene, and 3D Printing to Identify Taphonomic Processes and Digitally Preserve Burial CC-B14

Samantha Mitchell and Ashley Booher

Over the past several years, photogrammetric methods have significantly advanced into an effective documentation method (see Dell'Unto, 2014; De Reu et al. 2014; Wessling et al. 2014; Westoby 2012). Although there are several photogrammetric techniques capable of creating 3D models, Structure from Motion (SfM) is the sole method discussed in this chapter. The basic concept behind 3D photogrammetry involves using a single lens reflex (SLR) camera to capture a series of overlapping images and then processing those images through a software package that employs a complex algorithm to create a 3D model that can be measured, manipulated, and viewed. SfM varies from traditional photogrammetric methods in that the camera angle and position is solved automatically without the need for previously placed targets (Burns et al. 2015; Szeliski 2011).

The initial step in constructing an SfM model involves the acquisition of a series of overlapping high-quality images of an object or surface. These images are then uploaded into Agisoft PhotoScan Professional (PhotoScan), which utilizes a series of algorithms to extract specific dimensional data from the images and calculate the camera position in each of the photos. The resulting models are imported into a viewing platform, such as ESRI ArcScene (ArcScene) or Meshlab, for manipulation and display. PhotoScan is relatively inexpensive and is appropriate for individuals with limited technical experience. Open source programs are free but have been noted to be less user-friendly and more difficult to use for in-field processing (De Reu et al. 2012; Ducke et al. 2011; Green et al. 2014).

To date, the Chan Chich Archaeological Project has used 3D modeling in the field to document architecture (Houk et al. 2013; Willis et al. 2014) and the excavation of burials (Herndon et al. 2014), but has not been employed in the analysis of burials, despite the potential for detailed examination of taphonomic processes and the possibility for insights into mortuary practices. In the excavation of human burials, the documentation of minuscule details, such as perimortem or postmortem trauma, taphonomic events, positioning of skeletal remains, and the recording of associated mortuary goods, is imperative. Together, skeletal analysis, both in the field and in the lab, produces a comprehensive understanding of the mortuary practices of a burial's associated culture. The ability to not only document each of these details, but also analyze them in a 3D program is a valuable and unexploited function of using SfM and GIS in

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the excavation of a burial. The purpose of this project is to respond to the absence of documentation and analyses of burials using SfM and GIS. This is accomplished by using 3D models of Burial CC-B14 at the ancient Maya site at Chan Chich, Belize (see Booher et al., this volume). The analysis of Burial CC-B14 reported here examines the skeletal remains and evaluates the taphonomic events within the burial. This project utilizes necrodynamic analysis, which was first employed by Wilhelmson and Dell'Unto (2015) to analyze the spatial effects of body decay on the skeletal remains in an archaeological context. Necrodynamics can be defined as the movement of individual skeletal elements during the course of decomposition (Duday and Guillon 2006; Roksandic 2002:103).

The lead author produced a 3D model of the burial using photographs taken in 2015 by Ashley Booher and then mapped each skeletal element and associated mortuary object inside ArcScene. Select skeletal elements were modeled and subsequently 3D printed using a LulzBot TAZ 5 at Texas Tech University. The specific methods used to accomplish these goals and the results are discussed in the following sections.

BURIAL CC-B14

Ashley Booher excavated and performed the osteological analysis on the skeletal remains from Burial CC-B14, which was interred within a C-shaped bench in the interior of Structure D-1 (Figure 6.1; Booher et al., this volume; Novotny et al., this volume). The grave contained dry fill and limestone cobbles and measured 60 cm by 50 cm. Burial CC-B14 held a single individual placed in a seated position with hands crossed, legs bent, and feet uncrossed. The head was positioned to the northwest with several grave goods found to the south. The ceramic assemblage associated with the burial was dated to the Late Classic period. For a complete description of the burial see Booher et al. (this volume). Burial CC-B14's excellent state of preservation was likely due to the dry fill and sealed context within a bench, which protected the burial from taphonomic processes. The excavation recovered 75 percent of the bones from the burial. The individual was found in correct anatomical position and maintained joint articulation of the feet indicating the burial was recovered from the primary location of interment. The pelvis was nearly complete *in situ*, although upon removal from the soil matrix the iliac blades of the right and left pelvises disintegrated. The long bones, hands, and feet displayed the best preservation. Roughly 50 percent of the cranium was present, but fragmented. Several of the vertebrae and ribs were present, with the first ribs and second, third, and seventh cervical vertebra identifiable. A total of 12 teeth was recovered. The LP_1, LP_2, and LC^1 were in alveolar bone.

Age was estimated to be an older individual based on skeletal development and dental wear. The pubic symphysis and auricular surface along with the epiphyseal fusion of the femoral head were used to estimate age at death. The complete epiphyseal fusion of the femoral head and morphological changes of the pubic symphysis and auricular surface of the right os coxa indicate that the individual was between 38–48 years old at death (Brooks and Suchey 1990). Sex is estimated to be female based on the morphology of the os coxa and the diameter of the femoral head. The subpubic concavity of the right os coxa was concave and the right and left pubic symphyses had evidence of parturition scars. The long bones were also very gracile, and the measurement of the femoral head yielded a score of 39.2 mm (Bass 1995). Sex and age assessments could not be evaluated on the cranium due to its being highly fragmented.

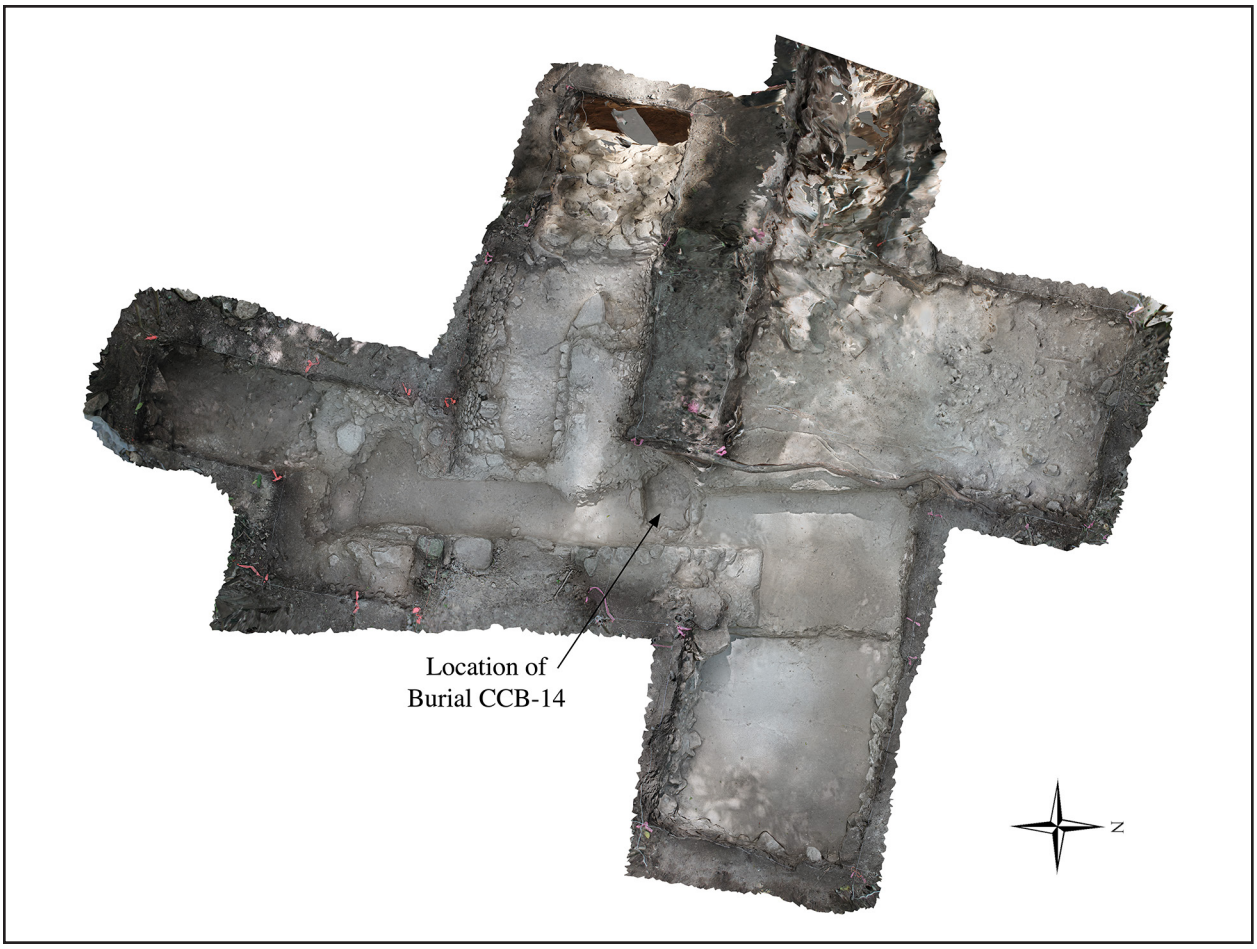

Figure 6.1. Orthophoto of Structure D-1 at the close of excavations, showing the location of Burial CCB-14. Overhead view to the west.

METHODS AND GOALS

This study utilized 3D models in conjunction with in-field and laboratory analysis to view Burial CC-B14 in a larger archaeological context. The aim of this project is to provide new information concerning Burial CC-B14 using PhotoScan (Agisoft, LLC 2013) and ArcScene (ESRI 2011). The following goals were accomplished using SfM, 3D printing, and ArcScene:

1. Establish a shareable and editable geodatabase within ArcScene.
2. In ArcScene, combine multiple stages of excavation, in-field observations, and, osteological analysis to provide a cohesive analysis.
3. Examine any taphonomic events that occurred within the interment.
4. View the model in ArcScene and examine the decomposition process within the burial.
5. Using SfM models, 3D print individual bones associated with Burial CC-B14.

To map the specific anatomical position of each skeletal element, ArcScene was used to create a series of 3D polylines and polygons to map the anatomical position of the bones recovered in the burial. Each anatomical layer was separated in a shareable layer file (.lyr) and linked to an associated attribute table.

To capture the SfM images, Booher used a Canon EOS Rebel XSi digital SLR camera in the field. Booher documented each stage of the excavation by standing over the burial and taking a series of overlapping photos from differing angles. Mitchell then imported the photos into PhotoScan and processed the 3D models. It took approximately 10 hours of processing time to build the model of Burial CC-B14, including the creation of the sparse cloud, dense cloud, mesh, and texture. In the field, two sets of SfM photos were taken by Booher during the excavation of the Burial. Afterwards, at Texas Tech University, the photos were exported into ArcScene, and then combined to represent multiple stages of excavation. The models were exported as a TIFF file, uploaded into a geodatabas, and analyzed within ArcScene.

RESULTS

ArcScene Geodatabase

The 3D files were exported from PhotoScan as a COLLADA file into a geodatabase as a multipath. First, the anatomical position of bones *in situ* was mapped using 3D polygons and polylines. Each skeletal group was placed in a distinct layer (i.e., feet in a single layer) to further understand the taphonomic processes inside the burial. Layers were also created for articulated or disarticulated skeletal elements. Additionally, a layer for fragmented remains, or skeletal elements that appeared to have been crushed or fractured due to taphonomic processes, was created. Finally, skeletal layers were associated with a shapefile (.shp) in ArcScene. Each shapefile is connected to a corresponding digital layer file (lyr.). All of the layers were saved within the geodatabase that stores all of the data in an easily accessible and shareable database (Figure 6.2).

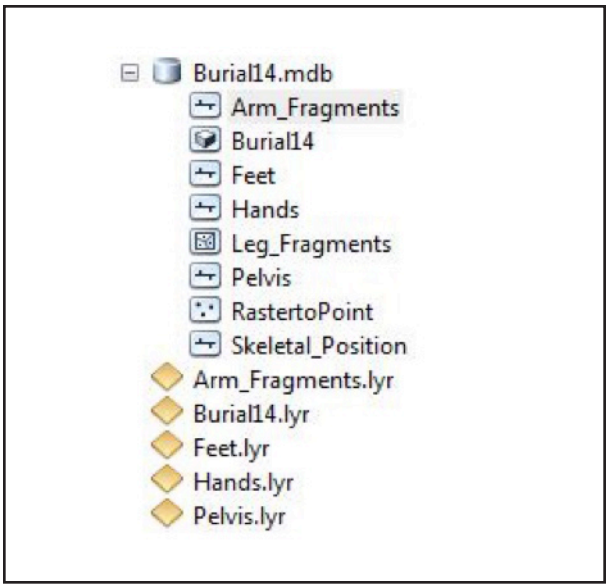

Figure 6.2. Screen shot of geodatabase of Burial CC-B14.

ArcScene Analysis

The ArcScene analysis successfully digitally enhanced the various skeletal elements in a 3D format. Viewing the 3D models in ArcScene allowed us to view and analyze skeletal elements according to their anatomical grouping and also allowed us to view cracking, crushing, articulation, and disarticulation of the remains. Booher documented two phases of excavation in two separate models (Figure 6.3). These models were exported into ArcScene and used for analysis. The resulting layers, symbology, data, and field properties are saved as a layer package that is easily accessible between users. Key skeletal elements between excavation phases are linked within the geodatabase using relationship classes. This made it easy to view and query data concerning a particular feature between one dataset and another.

The final analysis involved examining the sparse point cloud and digital elevation models (DEM). The creation of the initial sparse clouds involved using PhotoScan software to create a series of points by triangulating common markers in each of the photos. The dense cloud builds upon the sparse cloud and lays the

Figure 6.3. Phase one of Burial CC-B14 excavation viewed in ArcScene.

foundation for creating the mesh and texture of the model. After the creation of the models, the sparse point clouds are transferred as text files (.txt) into ArcScene for viewing the excavation elevations (Figure 6.4). Afterwards, a DEM was created and overlaid with contours to exemplify specific elevations of surrounding architecture and excavated and unexcavated soil. This particular method is useful for quickly referencing elevation and density data.

Taphonomy

A variety of factors affect the decomposition of an individual and may include variables such as clothing, ambient temperature, body posture, and the surrounding physical environment of the interment (Duday and Guillon 2006; Dupras et al. 2011). Many of these factors are difficult, if not impossible, to account for when analyzing the decomposition process of an ancient burial.

In regards to necrodynamics, the level of preservation, disarticulation, articulation, skeletal position, and displacement of skeletal elements were analyzed. For this study, disarticulation or articulation refers to the spatial connection or disconnection between one bone and another. Skeletal elements that are significantly displaced from their expected anatomical positions were expressly accounted for.

For the purpose of this study, only the elements visible in ArcScene are discussed. In reference to the long bones, only the ulna, radius, and tibia are included in the analysis. Reference Booher and colleagues (this volume) for more detailed description of the remains recovered during the entire excavation process. The following sections briefly breakdown the results of the necrodynamic analysis in regards to the skeletal elements present within the model. All of the details mentioned below can be referenced in the geodatabase. The final results of analysis are discussed in the concluding section of this chapter.

Hands

The hands of the individual were fairly well preserved. Over 75 percent of the hand bones were articulated, and only 25 percent of the hand bones were displaced from their expected anatomical position. The exact original anatom-

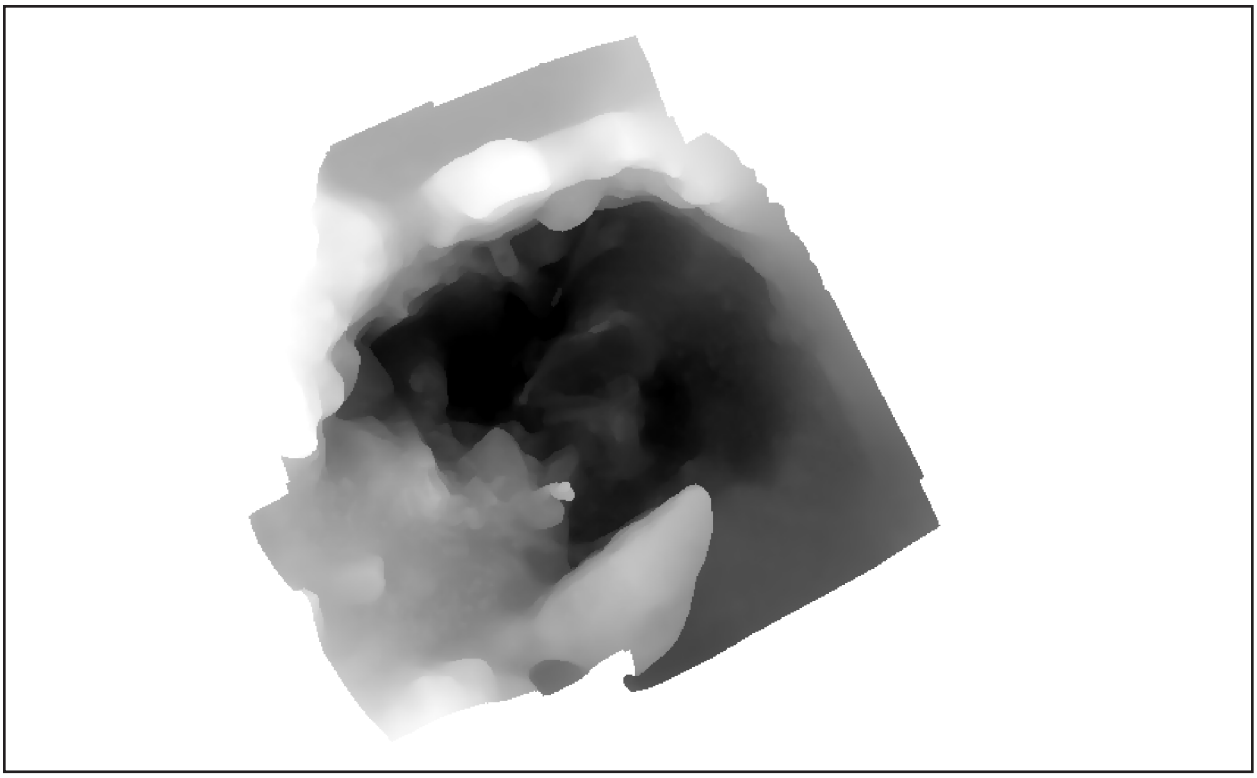

Figure 6.4. DEM of Burial CC-B14.

ical position of the hands is unknown, however the view of the 3D model in ArcScene revealed the left hand was lying in a loosely flexed position placed over the right hand (Figure 6.5). The right hand was in a relaxed position, in line with the ulna and radius, which was recovered during excavation. This indicates that that the body was positioned carefully with the left hand placed over the right.

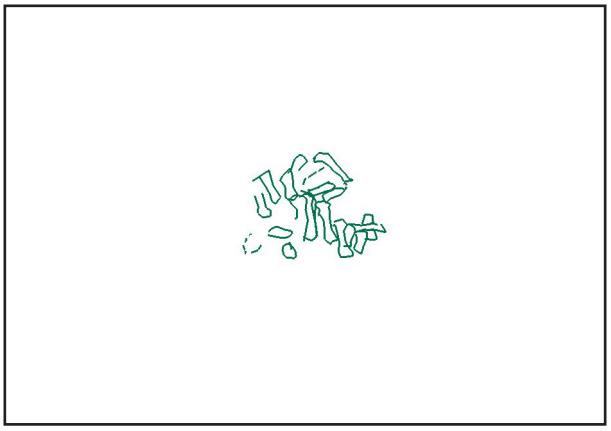

Figure 6.5. Hand viewed in ArcScene screen shot.

Feet

The feet excavated from the burial were in an excellent state of preservation, similar to the preservation of the hands of this individual. The 3D models indicated correct anatomical position and limited fragmentation or cracking. The bones of the feet were relatively articulated, with only minimal (<10 percent) disarticulation (Figure 6.6). The tarsals, metatarsals, and phalanges from both the left and right feet were recovered during excavation. The preservation of the feet combined with decreased

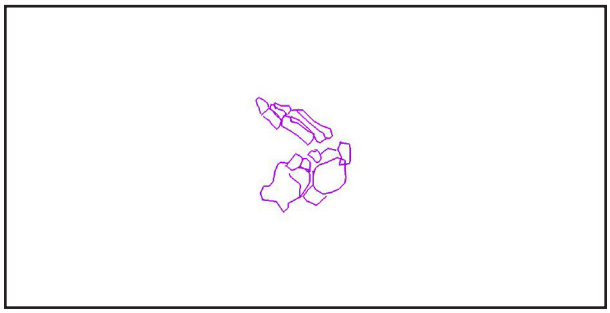

Figure 6.6. Orientation of feet viewed in ArcScene screen shot.

displacement from primary anatomical position signifies the burial was not disturbed after interment. Also, the articulations of the feet indicate minimal bioturbation within the interment after the initial deposition.

Pelvis

For this individual, the pelvic bones were uncovered in a seated position. This would indicate the individual was seated during placement, which would place the primary weight of the individual on the ischium. The pelvis was well preserved, but fragmented. This is hypothesized to be due to the weight of the decomposition and the push of gravity from the construction fill and surrounding architecture (Figure 6.7).

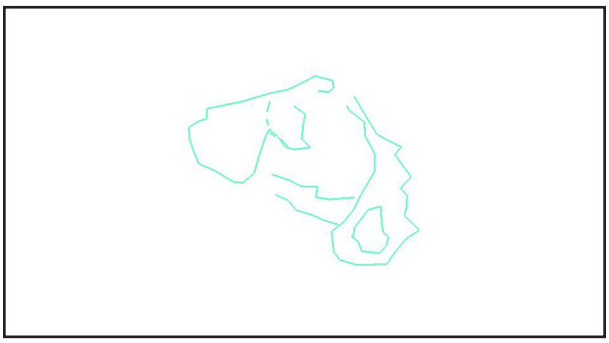

Figure 6.7. Orientation of pelvis in ArcScene screen shot.

Ulna, Radius, and Tibia

The ulna and radius were relatively well preserved and positioned with the arms horizontally crossed. Although the ulna and radius were not articulated with the humerus, the 3D model indicated the distal portions of the ulna and radius were articulated with the carpals of the right and left hands.

Decomposition Process

The result of ArcScene analysis, combined with osteological and in-field observations, suggests that the individual was not significantly disturbed after initial interment. Analyzing taphonomic processes within bioarchaeological excavations is a complicated and difficult endeavor. Recently, bioarchaeologists have turned to examining the decomposition of the human body in ancient burials (Tiesler 2010; Tiesler et al. 2007). To compensate for the challenges of analyzing necrodynamics and ostetaphonomy, a variety of data and field sources should be utilized to provide a cohesive and non-speculative analysis. The necrodynamic analysis resulted in analyzing minimum number of individuals (MNI), bone representation index (BRI) and the anatomical preservation index (API), osteological observations concerning perimortem and postmortem processing, and archaeological data from the surrounding architecture. It should be noted, the 3D models did not capture every single bone recovered from the burial. To account for this, this final analysis includes the osteological analysis and field notes recorded by Booher.

A total of 75 percent of the remains were recovered from the burial (Booher et al., this volume). The individual appears to have been surrounded by tightly compacted soil, which led to relatively good preservation. The process of decay in a filled space has been noted to contribute uniquely to the decomposition process. As the flesh decays, voids in the soil are created and skeletal elements can theoretically fill the respective voids in the interment space (Duday and Guillon 2006; Dupras et al. 2011; Mann et al. 1990). Inside of Burial CC-B14, it is highly probably that select voids in the soil were created as the body decomposed. Subsequent to the decomposition of the flesh, the skeletal elements filled the adjacent gaps. The surrounding skeletal elements were likely crushed due to the weight of the soil and construction fill. The exact spatial position of voids within the soil is not calculable; however, they may provide an explanation for significantly displaced elements or crushed and fragmented

remains. Lastly, the soil served to restrain the body and allowed for the individual to decompose in a seated position. The preservation of the individual would indicate that the soil and surrounding construction material would need to cover the individual almost directly after the initial interment to create the level of preservation observed upon excavation.

The first excavation layer and the final layer were compared, and increased cracking, fragmentation, and disarticulation of the skeletal remains was noted in the final layers. The results of this analysis indicate that the individual was likely placed within the bench with the final construction phase of the bench occurring directly after the interment period. Also, the preservative qualities of the bench seemingly prevented any animal scavenging and significant root activity within the interment. The lack of animal scavenging and limited bioturbation further indicate the individual was surrounded by the construction material of the bench directly subsequent to the interment. However, it is impossible to signify the exact construction and interment period without further radiocarbon dates. Further excavations of the surrounding architectural structures are pertinent to determining the chronological construction history. This analysis represents a preliminary attempt at understanding the taphonomic processes that affected Burial CC-B14.

SfM Modeling and 3D Printing of Skeletal Elements

This project successfully created a 3D model and 3D printed the talus from Burial CC-14. Mitchell created models of individual bones at the Texas Tech University Archaeology Lab. SfM of individual bones involved taking approximately 50 to 100 photos with scales, controlled lighting, and a Nikon D3200 camera (Figure 6.8). Approximately 50 to 100 photos, in TIFF format, are necessary for a successful model creation. The models are subsequently masked and created in roughly 2 to 3 hours. The resulting models are then uploaded into a LulzBot TAZ 5 3D printer and printed with high impact polystyrene (HIPA) grade plastic (Figure 6.9).

Additionally, a digital elevation model was created of the talus using the point cloud data from the photogrammetric models (Figure 6.10). The DEM indicated gross morphological characteristics of the talus and allows for future precise measurement of the talus. The 3D models can be measured for length and surface area inside of ArcScene or PhotoScan. Preserving the bones digitally is essential for referencing measurements for future research when the physical bone is not present.

Figure 6.9. Taking photos of talus in preparation for modeling and printing.

DISCUSSION

This project indicates 3D modeling can extend beyond the typically employed photogrammetric methods. Modeling of single bones is pertinent to the digital preservation of elements, which may quickly deteriorate after their removal. The process of creating 3D models and 3D printing allowed for digital preservation of individual bones, which would otherwise eventually decay or be unavailable for research. These data are archived and available for collaboration with other academic agencies for future analysis. The examination conducted in PhotoScan and ArcScene cannot be done using a traditional field photo or a plan map. Digital preservation is key for analyses long after the researcher has left the field.

GIS and photogrammetry are ideal for furthering the understanding of skeletal elements and taphonomic processes in a bioarchaeological context. Analyzing an ancient interment introduces difficult variables that potentially require the consultation of other academic professionals. In answer to this, ArcScene's virtual geodatabase shares skeletal and burial data between consulting parties. The geodatabase and attribute tables store XYZ data in a 3D platform that is user friendly and ideal for query and analysis. SfM allowed us to document multiple excavation phases and compare and analyze these easily. Lastly, label and annotation features in ArcScene were utilized to pinpoint specific information from osteological or in-field analysis, which is ideal for sharing data to a larger audience.

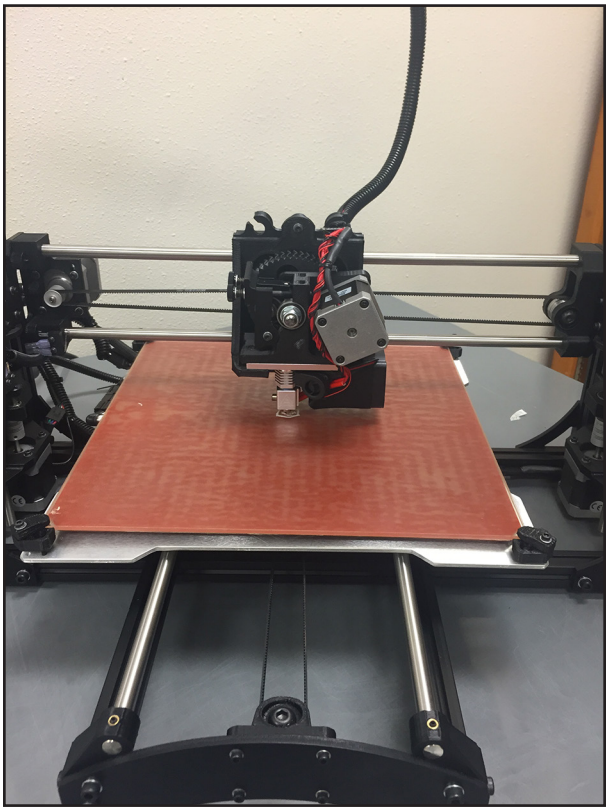

Figure 6.10. LulzBot Taz 5 printing the talus.

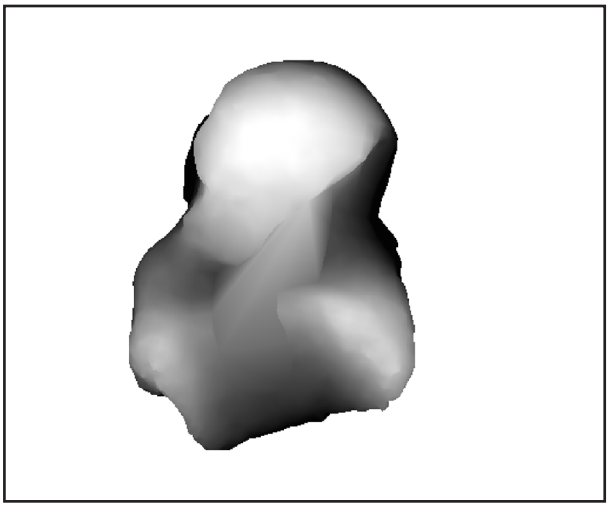

Figure 6.10. DEM of talus.

Using a variety of digital measures at Chan Chich resulted in a new method of preserving, documenting, and analyzing ancient interment patterns. To continue to understand the efficacy of analyzing necrodynamic patterns with GIS, it is essential to test this method against multiple interment patterns. For Burial CC-B14, combining GIS, field notes, and osteological analysis was an ideal method for answering questions concerning taphonomic processes that could not be easily answered with 2D plan map. This method, combined with photogrammetry and 3D printing, is a promising tool for documenting and analyzing bioarchaeological interments.

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Chan Chich Upper Plaza Preliminary Chronology and Excavation Plans for 2016–2018

Valorie V. Aquino and Brett A. Houk

The Chan Chich Archaeological Project (CCAP) conducted exploratory archaeological excavations in the Upper Plaza during the 2012 and 2013 field seasons with the goal of better defining the plaza's history of building events and architectural evolution (Houk et al. 2014; Kelley 2014). In 2014, CCAP initiated the Chan Chich Dynastic Architecture Project (CCDAP), a multi-year study aimed at tracking the evolution of kingship and dynastic architecture (Herndon et al. 2015). Developing an accurate and precise sequence of construction events for the site's architectural core is also integral to illuminating sociopolitical and economic processes, such as the evolution of Classic Maya kingship and local political signaling via construction events. Here, we present a pilot age model for the Upper Plaza utilizing accelerator mass spectrometry (AMS) radiocarbon dates obtained by CCAP in 2015.

DESCRIPTION OF UPPER PLAZA EXCAVATIONS

Hubert Robichaux (1998, 2000; Robichaux et al. 2000) and Krystle Kelley (2014; Kelley et al. 2012, 2013) explored various areas of the Upper Plaza in 1997–1999 and in 2012 and 2013, respectively. Robichaux's excavations in 1997 encountered a Middle Preclassic midden deeply buried in the northern portion of the plaza and uncovered the Terminal Preclassic Tomb 2 in the southern portion of the plaza; that discovery is the foundation of the 2014 CCDAP (Herndon et al. 2014). Krystle Kelley's thesis research in 2012 and 2013 resulted in a refined construction sequence for the plaza's deposits and identified a discrepancy in stratigraphy between the northern and southern portions of the plaza. The sequence in the northern part of the plaza is best exemplified by Suboperation (Subop) CC-10-C (see below), which encountered, in order from top to bottom, topsoil and final surface of the plaza, a thick layer of Late Preclassic fill overlying four floors, the Middle Preclassic midden first encountered by Robichaux in 1997, the oldest known plaza floor and fill, and bedrock (Kelley et al. 2012).

At the end of the 2013 season, Kelley's teams discovered a buried wall or terrace face, which separated the two conflicting stratigraphies in Subops CC-10-S and -T. Kelley (2014; Kelley et al. 2013) hypothesized that this low-lying stone feature was in fact the south face of a platform extending to the north. The 2014 season of the CCDAP set out to explore this feature, and crews opened Subops CC-12-M, -O, -Q, -S, and -T in the northern third of the plaza (Figure 7.1). All of the units except CC-12-T revealed the 1.25-m high platform face or wall (Herndon et al. 2014). The basal course of stones comprises cut limestone blocks, while the upper courses are made up of large uncut limestone boulders.

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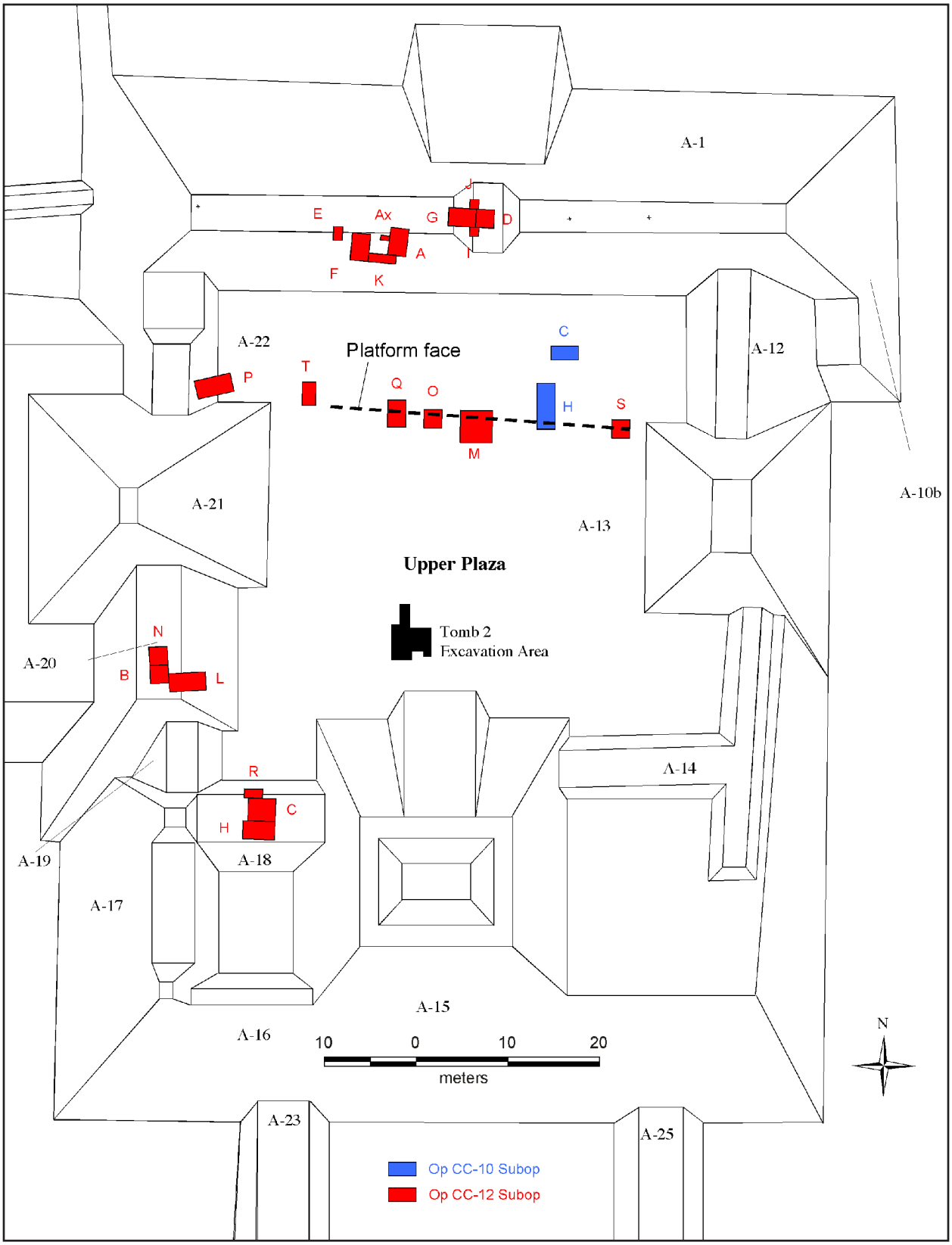

Figure 7.1. Map showing selected 2012 (C and H in the plaza) and 2014 (all other units) CCAP excavation units in the Upper Plaza and the location of the buried platform's face.

Excavations in Subop CC-12-O revealed the most detailed architectural sequence in 2014 (Herndon et al. 2014). This base of the platform or wall sits on top of a poorly preserved plaster surface (Lot CC-12-O-09), "which curves up onto the south face of the feature in a few places but also apparently continues beneath the feature in other locations" (Herndon et al. 2014:40). A 25-cm thick, compact dirt surface, first noted by Kelley et al. (2013), lies south of the feature, on top of the plaster floor that rolls up onto the plastered cut-stone portion of the feature (Herndon et al. 2014:40). Excavators uncovered up to as many as nine earlier plaster floors deeper in Subop CC-12-O, but failed to reach bedrock due to time constraints.

METHODS

Radiocarbon Measurement

CCAP obtained 11 radiocarbon dates from charcoal samples in buried Upper Plaza contexts. Samples were prepared at the Pennsylvania State University Human Paleoecology and Isotope Geochemistry Lab and the University of California Irvine Keck Carbon Cycle AMS (UCI KCCAMS) Facility following standard practices. After removing adhering sediment, samples were subject to acid/base/acid washes in 1N HCl and 1N NaOH (70°C; 30 min). The initial acid wash dissolved any carbonate contamination, and repeated base washes extracted humates accumulated from soil organic matter. A final acid wash removed secondary carbonates formed during the base treatment. Samples were then returned to neutral pH with two 15 min baths in DI water at 70°C to remove chlorides and dried. Sample CO2 was produced by combustion at 900°C for 6 hours in sealed evacuated quartz tubes using CuO powder and Ag wire. Sample CO2 was graphitized at UCI KCCAMS by reduction at 550°C using H_2 and a Fe catalyst, with reaction water drawn off with $Mg(ClO_4)_2$ (Santos et al. 2004). Solid graphite samples were pressed into targets in Al boats and loaded on the target wheel with standards and backgrounds for AMS analysis. All dates reported below (Table 7.1) are conventional radiocarbon ages corrected for mass dependent fractionation with measured $\delta^{13}C$ according to Stuiver and Polach (1977). Dates were calibrated with OxCal 4.2 (Bronk Ramsey 2009, 2013) employing the IntCal13 atmospheric curve (Reimer et al. 2013). We reported calendar years as 2-sigma calibrated ranges (95.4 percent probability) and simplified discontinuous ranges.

Bayesian Framework

Archaeologists are inherently accustomed to interpreting fragments of chronological data with relative stratigraphic relationships and contextual data gathered from expertise. Applying Bayesian methods to archaeological chronology-building simply provides a statistical framework for this informal approach, and Bayesian methods possess a number of qualities that make them suitable for interpreting and refining a suite of radiocarbon dates. The practical benefits include the ability to trim the calibrated age intervals of events; formalize whether or not phases are separated, abutting, or overlapping in time; estimate start and end boundaries of some activity; and to simulate various mathematical models with which to compare and test different interpretations of the stratigraphic sequence (Buck 2004). Chronological refinements such as these are essential when sophisticated research questions demand more accurate and precise chronologies (e.g., refining temporal markers for ceramic types and comparing cultural processes with high-resolution paleoclimate records).

Although all models represent simplified representations of reality, Bayesian age models are likely to be more realistic than radiocarbon dates in isolation (Bayliss 2009), and, through

Table 7.1. AMS 14C Dates Obtained from the Chan Chich Upper Plaza

UCIAMS #	Sample #	Lot CC-	Provenience	^{14}C age (BP)	2-σ cal range (BC/AD)
151874	CC-10-S16	10-C-8	This sample comes from subfloor fill associated with the oldest floor in the northern part of the Upper Plaza.	2560±25	805–569 BC
154684	CC-10-S12	10-C-7	This sample comes from a midden in the northern part of the Upper Plaza. This midden is above floor Lot CC-10-C-8.	2560±15	799–766 BC
151873	CC-10-S03	10-C-4	This sample is from the second plaster floor above the midden in the northern part of the Upper Plaza.	2245±25	390–208 BC
154691	CC-10-S28	10-H-4	This sample is associated with dense artifact deposit within northern platform buried in Upper Plaza.	2170±15	355–171 BC
154687	CC-12-S16	12-O-8	This sample comes from the lowest (fifth) identified layer of the 20-cm thick compact dirt surface that covers most of the southern part of the Upper Plaza.	2130±15	204–96 BC
154686	CC-12-S14	12-O-4	This sample comes from the second identified layer of the 20-cm thick compact dirt surface that covers most of the southern part of the Upper Plaza.	1850±15	AD 91–231
154690	CC-12-S08	12-D-6	This sample is from the plaster cap that patched the floor above Burial CC-B11.	1510±20	AD 435–608
154688	CC-12-S13	12-D-7	This sample comes from a charcoal rich layer of fill covering Burial CC-B11.	1505±15	AD 540–602
154685	CC-12-S03	12-C-4	This sample is from the subfloor fill of the final floor in a room on Structure A-18.	1315±15	AD 659–764
151875	CC-12-S17	12-D-9	This sample comes from Burial CC-B11 in the penultimate phase of Structure A-1.	1310±25	AD 658–768
154689	CC-12-S05	CC-12-A-4	This sample is from the final phase of construction in a room in Structure A-1 (from the floor).	1295±15	AD 667–768

the use of probability, Bayesian statistics provide a means of measuring one's strength of belief in the veracity of a particular hypothesis (e.g., testing the validity of a particular stratigraphic interpretation or comparing the strength of alternative interpretations). Importantly, a Bayesian framework emphasizes that the interpretation of data is conditional on available data at the time of analysis, thus accommodating and formalizing the often continuous, dia-

lectic interpretation of a site as investigations continue and interpretations change or become more refined.

Of the 11 AMS ^{14}C dates obtained, we identified four that we could analyze for a preliminary age model: Sample #s CC-10-S16, CC-10-S12, CC-10-S03, and CC-10-S28. While the other dates provide useful chronometric information, incorporating them into a broader age model for the entire Upper Plaza requires more work to correlate the various excavation lots and construction events from all units where dated samples were recovered. The four dates chosen for the age model, however, have been associated with specific building events into an overall sequence of archaeological stratigraphy in the northern portion of the Upper Plaza (Figure 7.2; also see Subop CC-10-C identified in Figure 7.1).

Agreement indices (A) provide a way of determining how each model fits with the available data and are generated for the posterior distributions of each radiocarbon date in a model, as well as the overall model itself (Bronk Ramsey

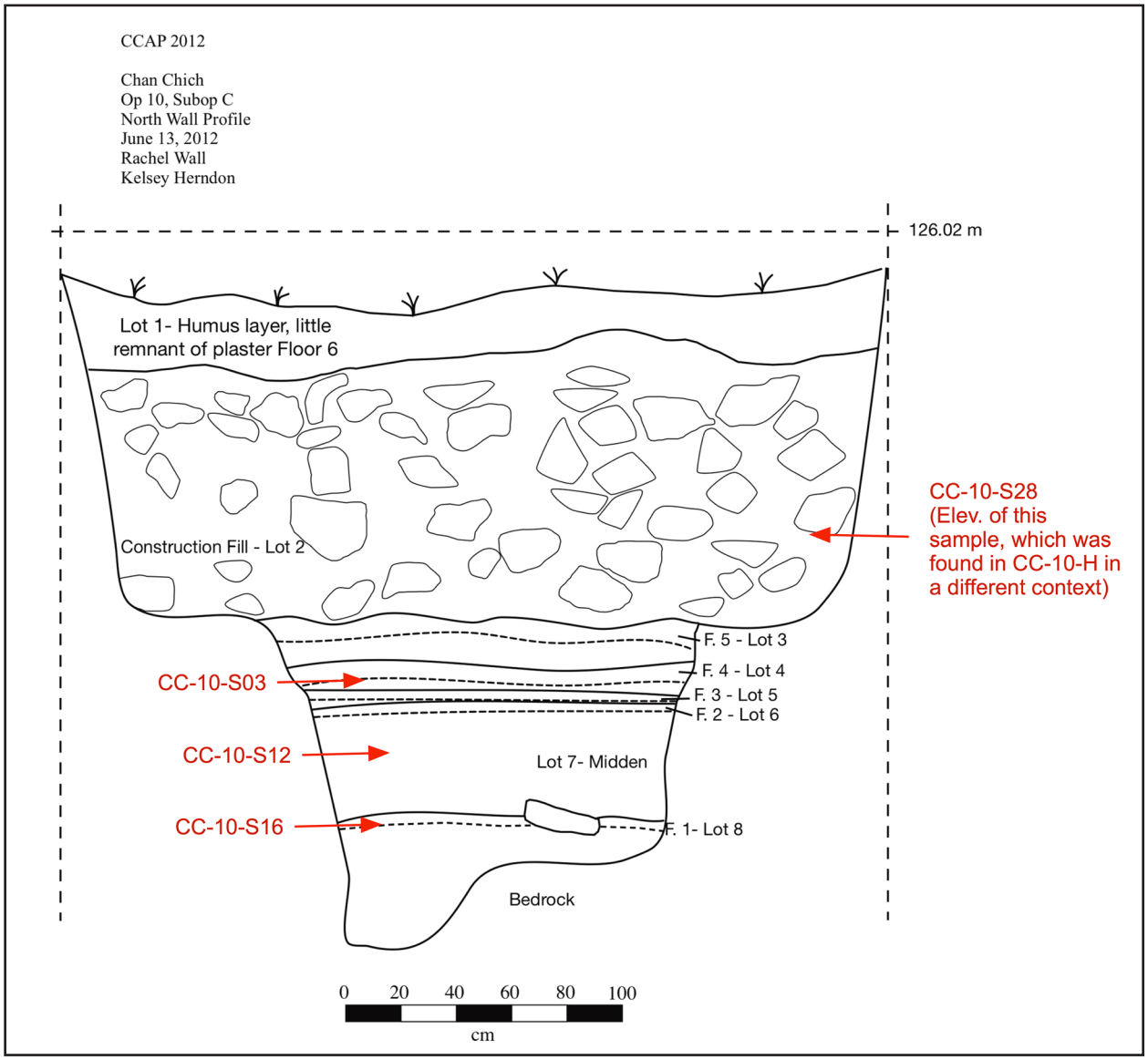

Figure 7.2. Profile of Subop CC-10-C showing locations of AMS ^{14}C samples used in Bayesian age model.

2000:201). Agreement indices falling below a critical value of 60 percent indicate a poor fit of data with the model and can be used to identify potential outlier dates or problematic stratigraphic assumptions in the model. The age model presented here has an A of 98.4 percent. It should be noted that strictly speaking, when A is greater than the critical value (A'c = 60 percent)—i.e., there is agreement between the structure of the age model and the dates—it does not mean that the model assumptions are necessarily correct. The statistic simply demonstrates that based on the utilized data there is no reason to reject the model as it stands.

RESULTS OF PRELIMINARY BAYESIAN AGE MODEL OF SUBOP CC-10-C AMS RADIOCARBON DATES

Freely available online, the program OxCal (2015) has a manual that includes detailed considerations of analysis and descriptions of commands. For our purposes here, we ordered the four radiocarbon dates and identified cultural episodes (e.g., construction of floors, midden deposit, initial clearing of bedrock) into an overall chronological *Sequence* based on stratigraphic information. The *Boundary* function enables the dating of construction events (e.g., clearing a site before construction, cessation of construction, abandonment of a living surface) that were not themselves directly dated. The sequence, boundaries, radiocarbon dates, and calibrations are presented below (Table 7.2 and Figure 7.3).

RESEARCH DESIGN FOR FUTURE WORK

Expanding the construction sequence and building upon the preliminary age model presented here is integral for gaining a more refined and textured understanding of site developmental processes and the political landscape at Chan Chich. The Upper Plaza offers an exceptional location to track the evolution of divine kingship, dynastic architecture, and political signaling due to its especially long occupational history spanning the Middle Preclassic through Late Classic periods. Notably, CCAP has documented the tomb of a Terminal Preclassic king buried in the Upper Plaza (Herndon et al. 2015:339), representing one of the earliest Maya kings in the eastern lowlands (Houk et al. 2010). The presence of this burial suggests that Chan Chich is an ideal location in which to study the emergence and development of the *k'uhul ajaw* political and religious institution

Table 7.2. Modeled Results for Subop CC-10-C Stratigraphic Sequence with Agreement (A) Index for Posterior Distributions

Archaeological Sequence for SubOp C	Unmodeled 2-σ cal range	Modeled 2-σ cal range (BC/AD)	A indices
Boundary: Abandonment of Floor 6		354 BC–AD 56	
Floor 6 subfill (CC-10-S28)	355–171 BC	354–172 BC	97.3
Boundary Floor 5		381–187 BC	
Floor 4 subfill (CC-10-S03)	390–208 BC	395–215 BC	101.1
Boundary Floor 3		692–236 BC	
Boundary: Floor 2		795–460 BC	
Midden deposit (CC-10-S12)	799–766 BC	796–594 BC	80.5
Boundary: Abandonment of Floor 1		805–596 BC	
Floor 1 subfill (CC-10-S16)	805–569 BC	806–766 BC	122.3
Boundary: Initial clearing above bedrock		1036–602 BC	

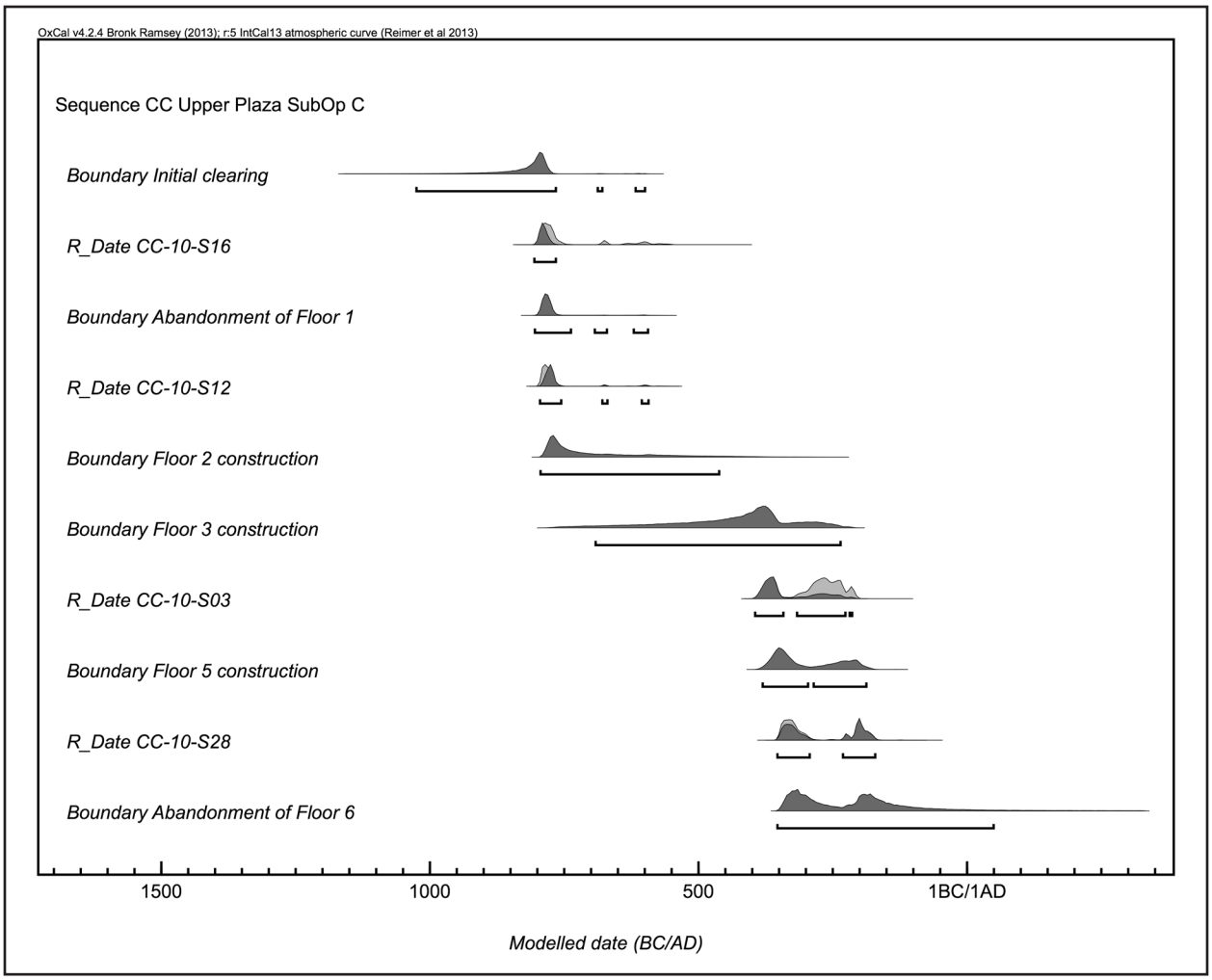

Figure 7.3. Modeled age calibrations for the preliminary sequence from Subop CC-10-C.

that was one of the most conspicuous characteristics defining the Classic period. Use of the Upper Plaza through the Late Classic period further affords a record of the evolution of political signaling via construction and the political landscape, thus deepening our understanding of the history of political power at Chan Chich. This record would ultimately then be compared against other cultural records in the region, as well as high-resolution environmental archives, to test hypotheses regarding cycles of growth, maintenance, reorganizations, and decline of the dominant and widespread Classic period *k'uhul ajaw* tradition of governance.

Improving the Age Model

Previous work at the Upper Plaza demonstrates multiple opportunities for chronological refinement. CCAP excavations and looters' trenches have uncovered evidence of a long and complex construction history at the Upper Plaza that includes multiple buried structures lacking temporal assignations. Project investigations have yielded at least seven buried floors predating the Early Classic period (typologically dated with diagnostic ceramics), as well as an elevated Late Preclassic platform face running roughly east-west that was encountered in the northern portion of the plaza in Subops CC-10-H, -R, and -T (Houk et al. 2014) and Subops CC-12-Q, -O, and -M (see Figure 7.1).

Furthermore, the age model presented here is from the northern part of the plaza where the Late Preclassic platform is located. The ages and sequence of floors south of the platform are known to be different, although the floors and sequence have only been roughly dated using ceramic data (see below). Digital mapping and modeling utilizing Structure from Motion technology have also been undertaken to rectify the architectural sequence of Structure A-15, the tallest structure at the site indicating it to be an important focal space in the site's dynastic history; however, a full analysis remains pending (Herndon et al. 2015).

Thus far, only three of the seven Preclassic floors in the northern part of the plaza securely ordered in a coherent stratigraphic sequence have been associated with radiocarbon dates (Floors 1, 4, and 6 in Table 7.2). The preliminary age model exposes opportunities for refinement, obtaining more organic samples for more accurately constraining the posterior distributions of Floors 2, 3, 5, and 7. Furthermore, while Sample # CC-10-S28 was incorporated into the age model as being associated with the construction fill above Floor 5, the sample itself was retrieved from a different context (dense artifact deposit), albeit a neighboring one, and is only tenuously correlated based on elevation. Another sample directly associated with the construction fill would improve the accuracy of the model.

Additionally, CCAP has recognized an architectural break dividing the Upper Plaza that roughly corresponds with the buried platform face; to the north is evidence of a heavy Preclassic occupation, while to the south, a Late Classic component appears above a Terminal Preclassic dirt surface (Houk et al. 2014:331). Early Classic activities in the Upper Plaza may have been absent (indicating a construction hiatus), ephemeral (suggesting light occupation or construction investments were concentrated in other areas of the site), or simply unidentified as of yet. Conducting multiple stratigraphic trenches running north-south and east-west over multiple seasons and assessing the physical characteristics of individual strata will yield the information required to correlate construction episodes and may expose additional building phases.

In order to proceed with a targeted research agenda that employs Bayesian methods for chronology building, we need to be confident that the stratigraphic integrity, sample collection procedures, and interpretation of phases are reliable. Precise chronological models are dependent upon:

1. Careful stratigraphic excavation and documentation
2. The exact recording of ^{14}C samples within the depositional sequence
3. The selection of short-lived organisms for AMS ^{14}C dating (e.g., carbonized seeds, twigs, bones)
4. Proper chemical protocols for sample processing
5. An understanding of taphonomic processes affecting samples

Excavation Plan for 2016

Objective 1: Define the extent, form, construction sequence, and function of the buried platform in the northern part of the plaza.

- Shallow excavation units will trace the southern face of the Late Preclassic platform in an attempt to locate the southeastern and southwestern corners (Figure 7.4). These shallow trenches would only be excavated deep enough to define with confidence the upper course of the platform face. The project will accomplish this by reopening three units from 2014 (Subops CC-12-M, -Q, and -S) to expose

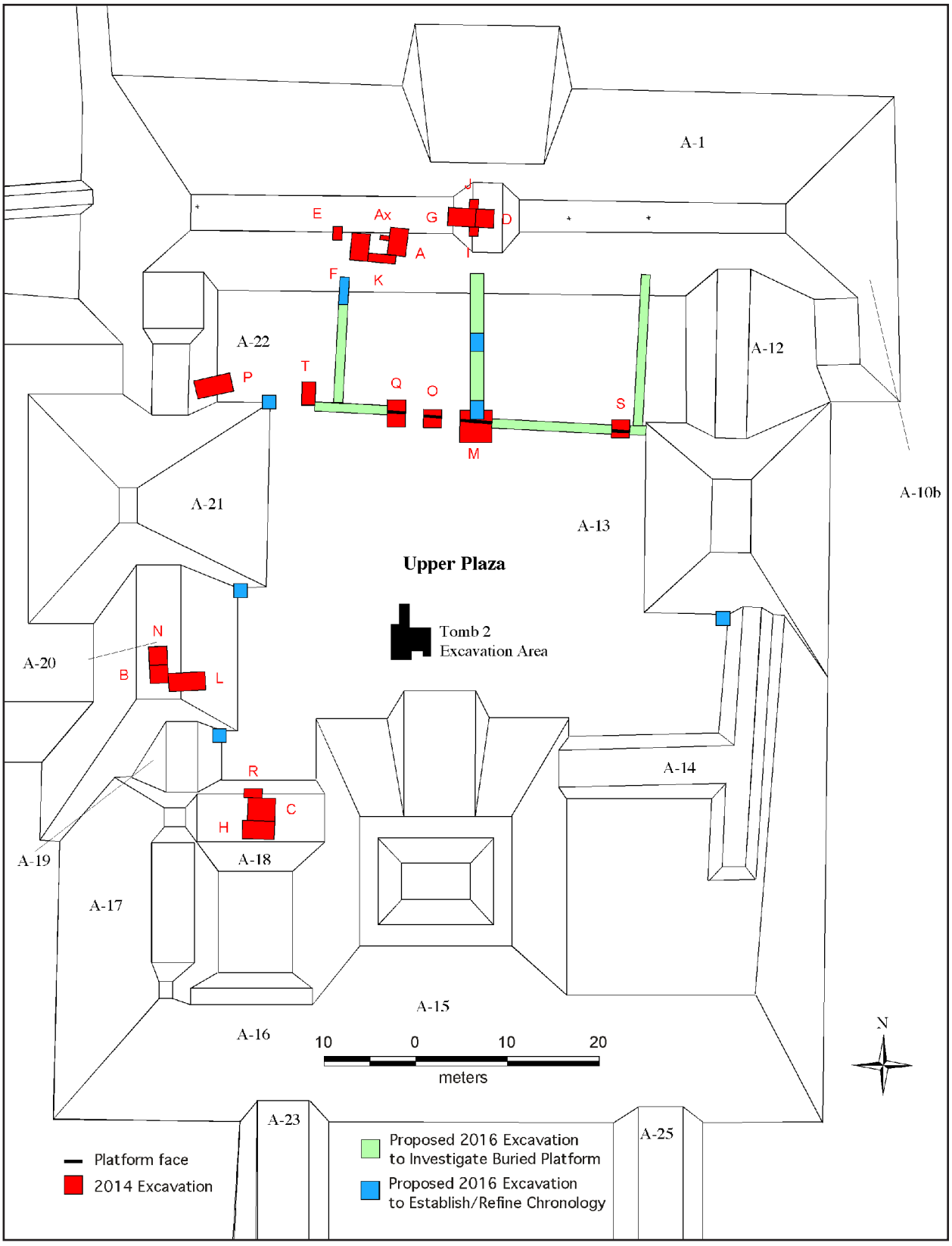

Figure 7.4. Map showing proposed excavation units in the Upper Plaza for the 2016 season.

previously documented sections of the platform. Crews will then excavate 1-m wide trenches to the east or west to follow the platform. In 2014, excavations found no evidence of the platform in Subop CC-12-T, so it is possible that the southwestern corner of the platform is located between it and Subop CC-12-Q. At most, a 1-x-8-m trench would be necessary to locate the corner in this area, if one is actually present. A probable section of the platform was partially exposed in Subop CC-12-S in the eastern edge of the plaza, but it is necessary to excavate a 1-x-13-m trench to connect that unit to Subop CC-12-M to verify whether the platform extends this entire distance. If it does, a short trench (~2–4 m) would be extended from the east edge of Subop CC-12-S to the base of Structure A-13 to attempt to locate the southeastern corner.

- If the corners are successfully located, the same method will be employed to define the eastern and western limits of the platform and to locate the northern limits of the feature, if possible. Defining the eastern and western faces of the platform may require approximately 13–16-m long, 1-m wide trenches.

- Recognizing that later construction events may have destroyed the corners of the feature, crews will simultaneously excavate a shallow unit extending from the north edge of Subop CC-12-M as far north as possible and/or necessary to attempt to locate the northern face of the platform. Although Figure 7.4 shows one large unit extending from Subop CC-12-M, it may be necessary to open multiple units to avoid trees. The unit(s) will extend from Subop CC-12-M to the base of Structure A-1, unless the northern side of the platform is encountered first. The excavated area would be approximately 1.5 x 15 m in size; initially, the unit would be excavated approximately 5 to 10 cm deep, to the top of the buried platform.

- Most difficult to determine will be the function of the platform, but the project staff will attempt to do so by considering the combined architectural and artifactual data revealed through excavations.

- Based on the findings in the initial units, additional excavations may be necessary to accomplish the objective. These additional units would be opened at the discretion of the PI and operation director.

Objective 2: Conduct additional stratigraphic excavations and radiocarbon sampling to clarify the age of the floors that pre-date the construction of the buried platform as well as the age of the platform.

- To clarify the construction sequence of the platform, one or more subunits within Subop CC-12-M will be excavated through it, following the southern face's interior side as a guide in at least one case. A primary goal of these excavations will be to look for an earlier platform summit that may be associated with the well-shaped stones at the base of the platform. A secondary goal will be to collect bone and/or charcoal to date the sequence of construction of the platform and any underlying floors. To accomplish this, one or more 1.5-x-2-m sections of the unit extending from Subop CC-12-M will be excavated to bedrock as will 1-x-3-m sections of other trenches, as determined by the PI and operation director.

- A primary goal will be to obtain additional samples for AMS radiocarbon dating from individual cultural strata, particularly to clarify the timing for Floors 2, 3, 5, and 7 identified in Subop CC-10-C and to collect samples associated with the construction of the buried platform. To determine the

age of the platform's construction(s), the project will process all suitable samples (up to 20 in total) and create a Bayesian age model based on the radiocarbon dates and construction events.

- An additional 1.5-x-1.5-m unit will be excavated at the northeastern corner of Structure A-21 to date its construction, along with other floors and buried constructions that are encountered.

Objective 3: Refine the construction chronology in the southwestern and southeastern areas of the Upper Plaza.

- To accomplish this goal, the project proposes to excavate 1.5-x-1.5-m units in the southern corners of the Upper Plaza. One unit will be placed near the junction of Structures A-20 and A-21; one will be placed at the junction of Structures A-19 and A-20; and a third will be placed at the junction of Structures A-13 and A-14.

- Units will be correlated using elevation data, strata properties (e.g., sediment matrix composition, construction material), and other contextual information (diagnostic artifacts). Units will be placed in areas exhibiting the potential for the least amount of taphonomic disturbances (e.g., at a distance from large tree roots). If needed, soils will be collected for flotation in the lab to increase the likelihood of charcoal retrieval. All dateable samples collected will have their proveniences precisely recorded (x, y, z), and when possible, short-lived organisms and/or samples taken directly from stratigraphic profiles will be selected for AMS ^{14}C dating to acquire higher chronological accuracy and precision. Multiple, independent samples for AMS ^{14}C dating will be collected and analyzed for terminal occupation contexts, which are closer to modern ground surface and more prone to bioturbation, to improve statistical estimates on the final abandonment of the Upper Plaza. Because of the deep history and the number of floors already known to exist, we expect to date a total of 20 samples. The data collected from this season will be compared against information gathered in suboperations from previous years to build a holistic sequence of events taking place along a north-south axis of the plaza.

Excavation Plan for 2017 and 2018

Conduct excavations on monumental buildings surrounding the Upper Plaza, beginning in 2017 and continuing in 2018.

- Structure A-1 (2017): Excavations will target two additional rooms on the Structure A-1 to supplement excavation data from rooms on the southwestern section of the building. Excavations will expose the interiors of two rooms to look for internal features (such as benches) and artifacts left behind to help assess the structure's function. Based on previous excavations, crews will excavate minimally two 2-x-6-m units to expose two rooms—previous work has determined that rooms are approximately 5.4 m long by 1.7 m wide (Herndon et al. 2014). Crews will conduct penetrating excavations in at least one room to expose earlier construction episodes and collect material for radiocarbon dating. The project proposes to process up to five radiocarbon samples from each construction episode revealed in the penetrating excavations.

- Structure A-1 (2018): Depending on the results of the investigations, the project may clear additional rooms or conduct more penetrating excavations in 2018.

- Structure A-15 (2017): Preliminary tunneling of Structure A-15 will take place during the 2017 season. The goal

of this preliminary work will be to assess the safety and utility of this approach of excavations. A test tunnel will be excavated off of an existing looters' trench/tunnel to target architecture identified during the 2016 processing of SfM data. Depending on the success of this first test tunnel, a second tunnel may be excavated to examine a different architectural phase or feature. During tunneling, excavators will collect material suitable for radiocarbon dating and process up to five samples per construction episode. In general, tunnels will be 1 m wide by 1.5 m high. The ceiling of the tunnel will be arched to increased stability, and shoring will be used if necessary for safety. Test trenches will extend up to 5 m.

- Structure A-15 (2018): If the test tunnels prove safe and effective, the project may conduct additional tunneling during the 2018 season.
- Structure A-21 (2017): Structure A-21 has an in-filled room with red plaster walls partially exposed in a looters' tunnel on the mounds western face. If the test tunnel at Structure A-15 is safe and effecting, the project will excavate a test tunnel at Structure A-21 to expose more of this room and look for evidence of murals or graffiti using the same methods outlined above. During tunneling, excavators will collect material suitable for radiocarbon dating and process up to five samples per construction episode.
- Structure A-21 (2018): If the test tunnels prove safe and effective, the project may conduct additional tunneling during the 2018 season.
- Structure A-22 (2017): The one unit excavated at Structure A-22 in 2014 uncovered well-preserved architecture on the eastern face of the building. This unit will be reopened in 2017 and additional excavations will be conducted to assess the form, age, and function of Structure A-22.
- Structures A-12, A-13, and A-14 (2018): Although Structure A-13 was tested by the CCAP in the 1990s (e.g., Robichaux 2000), little is known about the structures on the eastern side of the Upper Plaza. In 2018, the project will conduct excavations on all three structures to assess their forms, ages, and functions.

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The 2015 Lab Manual

Sarah Van Oss

This chapter presents updates to the policies adhered to in the Chan Chich Archaeological Project's (CCAP) field laboratory. Updates will regulate lab practices so that artifact processing remains consistent, enabling easier access to collected artifacts and their analyses and facilitating more efficiently compiled and presented data. This chapter is meant to act as a handbook for those who work in the CCAP field laboratory by providing basic information on 1) how to process artifacts, 2) how to use the project's electronic database to accomplish this, 3) how to analyze eligible artifacts, such as lithics, in the field laboratory, and 4) how students play a role in these activities. This builds on previous work by Nettleton (2013) and Phillips (2014).

THE DATABASE

The CCAP uses a FileMaker Pro relational database to record most aspects of project activities—from opening elevations to final artifact analysis (see Houk 2014). In the lab, the master database regulates artifact processing, cataloging, and analysis and records all information obtained during those activities. Combining the forms filled out by the project members in the field with those forms filled out in the lab creates this master database. Lab forms draw information directly from excavation forms so that artifacts are processed in the lab using the same database. This system enables easy tracking and cross-referencing of all data collected and observed, as well as a way to track artifacts as they move from the field and through the lab. The database, then, holds all the information needed for analysis and synthesis in the publication of the season's results in reports, articles, and theses. The following sections outline the process for combining field and lab databases and how to use the database to regulate lab activities most efficiently.

Syncing iPads and Merging Databases

The procedure used to sync the iPads utilized by the excavators in the field to the master database on the lab computer has been recently simplified from its original process (see Nettleton 2013). Starting in 2014, master databases were no longer pushed back to the iPads (Houk 2014). In our experience, it was not necessary for each investigator to have a complete database until the end of the season when data analysis began. At the beginning of the season each iPad was equipped with an empty template of the field database; the file name included the appropriate operation number, iPad number, and date. As excavators completed forms on the iPads, the project director and/or lab director imported the iPad databases onto the lab computer and then combined them with the master database on the computer, generally at the beginning or end of the workday. The original forms remained in one database on the excavator's iPad, and the lab computer then held a copy of each updated field database in addition to the updated master copy. Each field database then held only the forms necessary to that particular operation, freeing space on the iPad and saving time in the lab. We found this greatly expedited our process. Syncing occurred as

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necessary this season, but as a general rule we combined the field and lab databases every other day. Once the master database in the lab contained records of the artifacts excavated and delivered to the lab, the processing of these artifacts could begin.

To sync a field iPad with the lab computer, first plug the iPad into the computer. Under iTunes, select the iPad icon. Then, click on "Apps" under the left-hand column. Under "Apps," select the FileMaker Go application, and locate the most recent field database. Select the file you wish to save, and click "Save" at the bottom of the page. Save this file to the desktop. Once the file has been saved, you will need to change the name of the database on both the saved file and the iPad to reflect the date on which the database was saved to the computer. Additionally, the phrase "field to lab" should be added to the copy saved on the computer. Once the file has been renamed, move it to the desired folder; this season we had a folder for each operation and one to contain master databases. This allows excavators and the lab director to keep track of when information was last imported to the computer. To rename a file, in iTunes or in the computer files, simply click the name of the desired file, pause briefly, and then click again to select just the file's name. Once it is highlighted modify it as needed.

Once the field databases have been saved to the computer, combine them with the master database on the computer. To merge the two, first create a new copy of the master database with the current date by selecting File>Save a Copy as… Then rename the master database as Lab Master Database 6-18-15, or whatever date applies. Make sure to open this new database and close the old one so that new files do not get combined with the incorrect database. Once the new master database is open, open the field database to be combined with the master. When merging field and lab databases, the only forms that usually need to be imported are the Suboperation Definition forms and Lot Definition forms. Other forms, like Burial or Datum forms, should be synced using this same process as needed.

Begin with the Subop definition form. Select this form under Excavation Forms>Suboperations in both of the open databases, located in the drop-down menu on the left-hand corner of the window. Click Sort in the top right hand corner and then highlight "Full Subop" and move it to the right-hand column in the pop-up menu. Once moved, click Sort, and the program will organize the forms by Subop.

Once both open databases have had the desired forms sorted using the same system, the files can be imported from the field database to the master database. Click anywhere in the master database to make it the active file before importing the forms from the desired field database into the master. Then select File>Import>File. A pop-up menu will ask you to select the file to import; select the name of the field database file that you have just sorted, and click import. There will be another pop-up menu, which specifies the source and target layouts. Be sure both options match (i.e., the source should be Suboperations and the target should be Current Table ("Suboperations"). Ensure that "Full Subop" is selected as the matching criterion and that "Update matching records in found set" and "Add remaining data as new records" are both selected. Then click Import (Figure 8.1).

A third pop-up menu will appear when the import is complete, telling you how many modifications it has made and how many errors

Tip: When sorting any type of form in any database, be sure you are sorting all of the forms by clicking Show All on the left hand side of the FileMaker Pro window. Otherwise, you will not sort all of the forms, confusing your syncing or searching process.

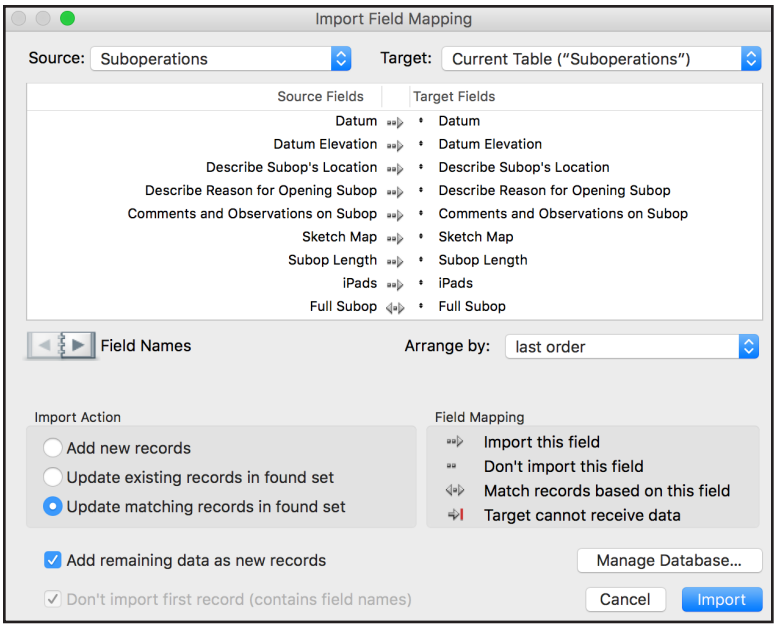


Figure 8.1. Window displaying options during syncing process between field and master databases.

(if any) have occurred. Close this menu by clicking OK. Once this is complete, the Subop Definition forms will have been successfully imported into the master database.

The above steps then must be repeated for Lot Forms and any other necessary forms, like Sample Forms, in one field database. When sorting forms in both databases, select Full Lot #, for Lot Forms, Full Burial # for Burial Forms, etc. Ensure that both databases show the same type of Excavation Form to be merged. The whole process must then be repeated for each field-to-lab database.

Summary

Though this process seems a bit cumbersome, it is useful for maintaining consistent records and ensuring that a copy of each version of the database is stored on the lab computer. In the event that a database becomes corrupted—through improper importation of files, for example—it can be reconstructed using the backup copies. The database is searchable and can produce results much faster than other collection and recording methods could. Additionally, the lab forms that keep track of the number and types of artifacts collected automatically draw information from the excavation forms so that lab operations run smoothly and efficiently. The next section explains how the Lab Master Database regulates daily activities and how the Lab Forms are used to keep track of the artifacts we process.

LAB PROCESSING

Basic Overview of Artifacts' Movement through the Lab

The 2015 season saw thousands of artifacts from three different operations through the lab. We recorded the arrival, processing, cataloging, and analysis of each set of artifacts in the Lab Master Database, and we had set physical check points for each of these stages of artifact processing (Figure 8.2). For example, each artifact collected in the field was first placed in a cloth bag labeled with the following information: provenience (site-op-subop-lot), date, excavator, artifact type, bag number out of the total number of bags, and a rough number of the artifacts inside. Additionally, cloth bags would sometimes have small paper tags with this same information. Field crews would place these bags in a trunk labeled "Field to Lab" outside the lab when they brought them in from the field. Lab personnel would then move the artifacts through the process laid out in Figure 8.2. Artifacts are first checked-into the lab, then washed, dried, packaged, cataloged, and analyzed. Each of these steps is defined in the following sections.

Check-In

In order to keep track of exactly what has been excavated, CCAP records each cloth arti-

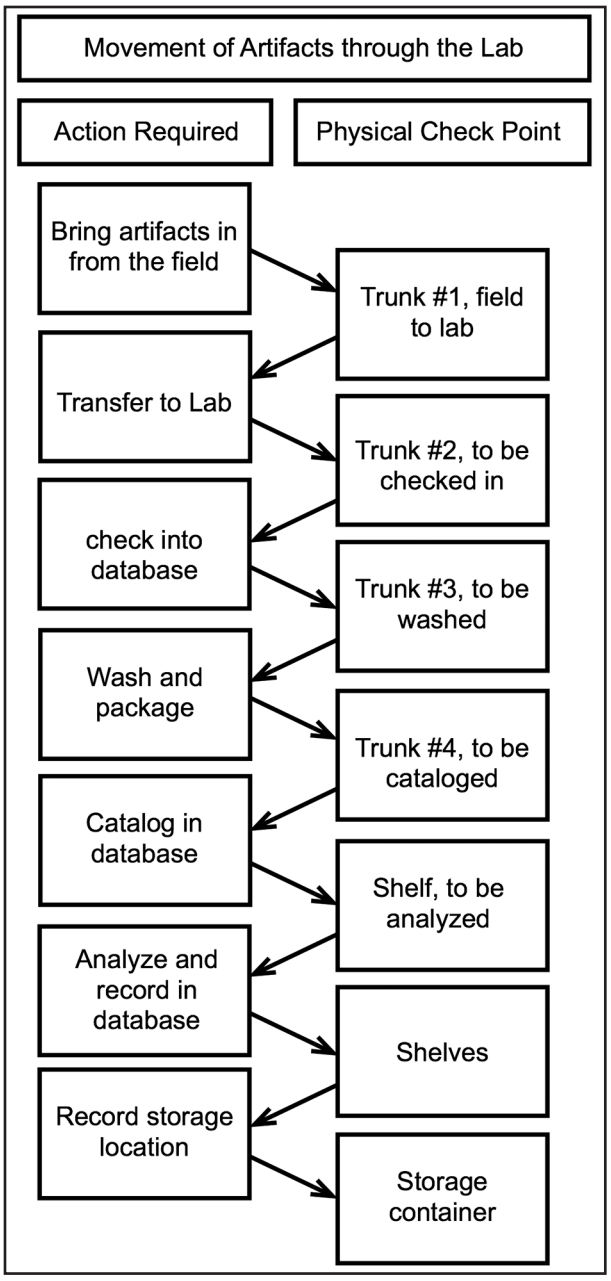
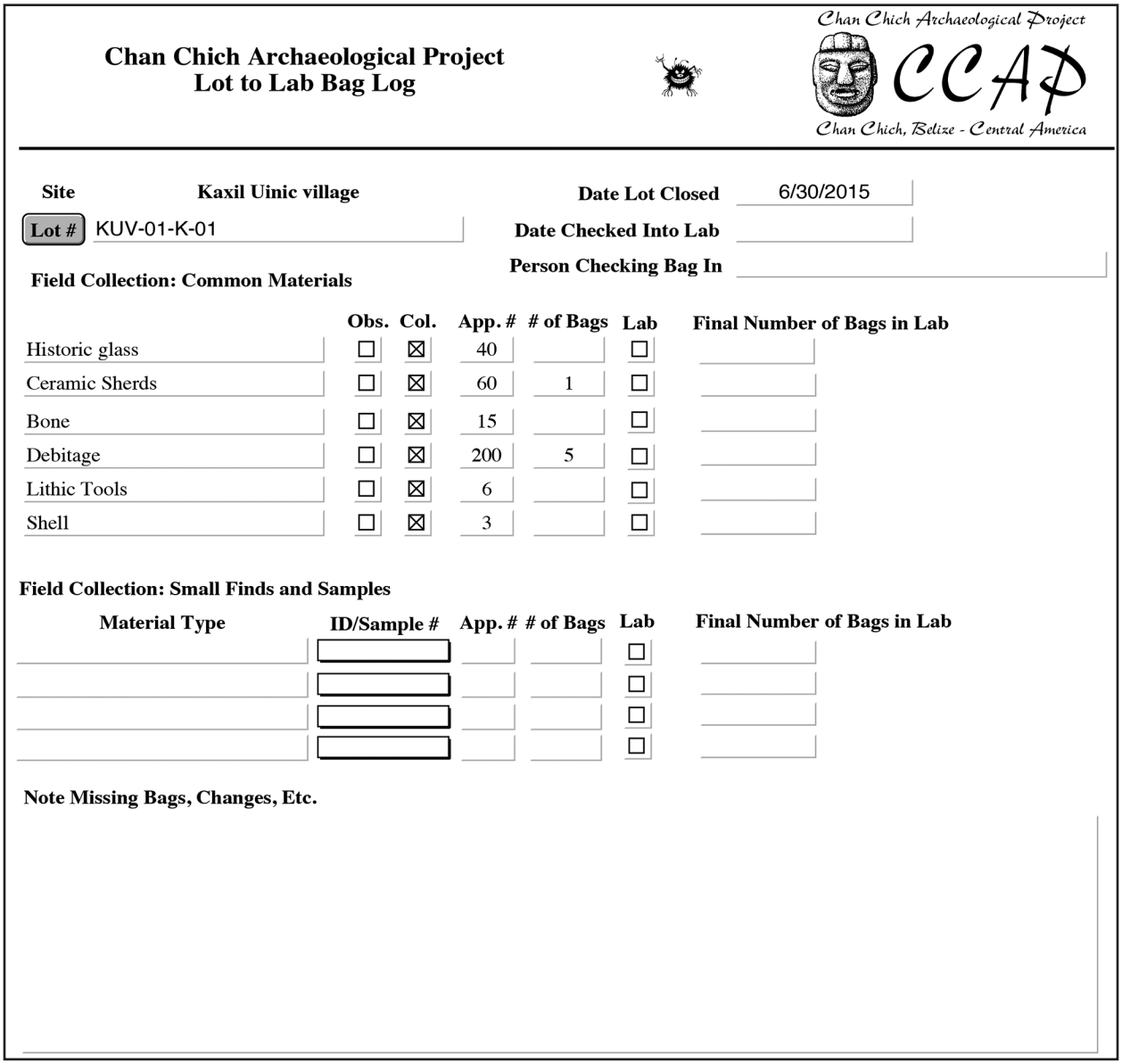


Figure 8.2 Chart demonstrating how artifacts generally move through the lab.

fact bag and its material, its provenience, and an approximate count of artifacts inside as it comes into the lab. This allows for the tracking of artifacts through the excavation and washing processes. After artifacts are brought in from the Field to Lab trunk, they can be placed in a second Check-In trunk to await their electronic registration into the Lab Master Database.

Artifacts cannot be checked into the lab until their associated closed Lot form has been imported into the Lab Master Database. To check-in an artifact or a set of artifacts, open the most recent Lab Master Database and select the Lot-to-Lab Bag Check In Form under the Lab Forms dropdown menu on the left side of the FileMaker Pro window (Figure 8.3). Then, click in the blank field next to "Lot #" and scroll down to select the Lot number that corresponds to the information on the cloth artifact bags you wish to check-in. Once selected, if the database is current, lots closed in the Excavation forms already synced with the master database will auto-populate the information in the Lot-to-Lab Bag Check In Form to display what the excavators have recorded for this lot. This means that if the excavator has logged five bags of ceramics and three bags of lithics from Lot CC-14-S-7, then those numbers will automatically appear in the fields indicated in the Lot-to-Lab Bag Check In Form. Once these appear, ensure that all bags are present and check the box next to the material indicating it has been received in the lab. Additionally, enter the number of bags received in the lab next to this box (see Figure 8.3). Once all materials from this lot have been recorded, you can move on to the next set of artifacts from a different lot. If any discrepancies appear during this process—you may have one fewer bags than expected, for example—they should be cross-checked with the excavator at the end of the day so that any mistakes can be rectified. With this and all other forms in the FileMaker Pro system, files are saved automatically, so once one task is complete, simply move on to the next.

Tip: When checking artifacts into the lab, the form in the FileMaker Pro system will present all artifacts from one lot. So that no artifact bags are counted twice or missed, all artifacts from one lot should be checked in at one time. This allows any discrepancies to be easily visible and mended.



Chan Chich Archaeological Project
Lot to Lab Bag Log

Chan Chich Archaeological Project
CCAP
Chan Chich, Belize - Central America

Site Kaxil Uinic village

Date Lot Closed 6/30/2015

Lot # KUV-01-K-01

Date Checked Into Lab

Person Checking Bag In

Field Collection: Common Materials

	Obs.	Col.	App. #	# of Bags	Lab	Final Number of Bags in Lab
Historic glass	☐	☒	40		☐	
Ceramic Sherds	☐	☒	60	1	☐	
Bone	☐	☒	15		☐	
Debitage	☐	☒	200	5	☐	
Lithic Tools	☐	☒	6		☐	
Shell	☐	☒	3		☐	

Field Collection: Small Finds and Samples

Material Type	ID/Sample #	App. #	# of Bags	Lab	Final Number of Bags in Lab
				☐	
				☐	
				☐	
				☐	

Note Missing Bags, Changes, Etc.

Figure 8.3. Check In Form as it appears in FileMaker Pro.

WASHING

Once artifacts have been checked-in, move them to the washing trunk, which this year sat on the veranda of the lab. All artifacts that enter the lab must be cleaned so that analysts can better assess each artifact. By far the most time consuming process in the lab, each material or type of artifact must be washed so that it remains intact while removing as much of the soil as possible. I elaborate on these processes in the following sections, first presenting a general washing process, then explaining how each type of artifact should be cleaned. A general reference chart that includes how each material ought to be packaged also appears after these explanations for clarity's sake.

Remove artifacts awaiting washing from the trunk one bag at a time and clean each according to the appropriate methods for that material. For this, use the water from the garden hose or sink in the lab. Once an artifact has been cleaned, place it on a metal screen to dry

along with all other artifacts from that bag. It is essential that you place the cloth artifact bag and the field tag, if present, under the screen containing its artifacts. This enables the lab director and students to maintain provenience, which is the most important thing we do in the field lab. To reiterate, DO NOT misplace the provenience of any artifact. Ensure that each bag correlates to exactly what came out of it, particularly if space is limited and screens contain more than one set of artifacts (Figure 8.4).

Once cleaned artifacts are completely dry, write catalog tags with the provenience information—the exact count of artifacts, the current day's date, the material and the lot number—and place them in small, plastic tag-bags. Leave the "Catalog #" section blank for the moment; this will be filled out later. Then place each artifact or set of artifacts in a clear, plastic bag along with the catalog tag in its smaller bag. If multiple bags are needed for the same material type from a given lot, write Bag 1 of 3, Bag 2 of 3, and so forth on each artifact tag and list the number of artifacts in each bag and the total artifacts as 200 of 300, for example. Doing this will ensure that anyone analyzing the artifacts will know there are multiple bags. After the dry artifacts have been placed in plastic bags, take them inside and place them in the cataloging trunk to await cataloging in the master database.

Figure 8.4. Artifacts drying on screen with cloth artifact bags indicating the exact provenience of each material. Photo by author.

For the past two field seasons, CCAP has conducted excavations in both ancient and historic contexts, resulting in a variety of artifacts. Each artifact type requires a different washing process, so here I explain each for the materials CCAP has encountered in its excavations and which cleaning technique to use.

Prehistoric Ceramics

Ceramic sherds represent a large percentage of excavated materials at Chan Chich. Usually made from local materials, the quality of these artifacts varies from terrible to remarkable. When washing prehistoric ceramics, submerge handfuls of sherds in a bowl of clean water and scrub each one with the toothbrush to clean most of the dirt from the sherds. Be careful that the sherds are not under the water for more than 15 minutes because they have a tendency to disintegrate in the water. Additionally, use caution with those sherds that have incised or painted designs because too rigorous scrubbing will remove the designs from the ceramic.

Tip: When cleaning multiple bags of one type of artifact from one lot or context, try to keep them together throughout the washing and packaging process so that, when cataloging, all of these artifacts can be kept together under one catalog number. Otherwise, cataloging, and more importantly, analysis will be completed incorrectly.

Tip: Refresh your water often when washing any kind of artifact. Smaller artifacts can be lost in the dirt at the bottom of a washing bowl, and filthy water can replace dirt already removed from an artifact. As a general rule, once you can feel silt on the bottom of your bowl, replace the water.

When these appear it is best to keep more dirt on the sherd rather than lose the designs that can be used to determine the time period to which a particular context dates. When packaging, make sure that the ceramics are completely dry. Though this may take a day or two during the rainy season, water in the plastic bags can damage the artifacts by causing mold or disintegration.

Lithic Debitage and Tools

Debitage, or those lithics that result from the production of stone tools, represents the second most common artifact type to come through the lab. Like ceramics, wash lithics with clean water and a toothbrush. Lithics are more durable than ceramics, so do not worry as much about damaging them. However, be aware that some stone tools have other materials still adhering to the tool, like the one in Figure 8.5 that displays the remains of hafting material, in this case asphultum, on its proximal end. When these are observed, take caution when washing so that this evidence is not erased.

Figure 8.5. This spear point still has hafting material on its proximal end. Therefore, exert caution when washing this artifact so as not to remove this material. Photo by author.

Ground Stone

Like lithics, ground stone artifacts (manos and metates) should be washed with a toothbrush and water to remove the soil. So far, CCAP has not had the resources to chemically test ground stone or lithic tools to determine for what the Maya could have used them. If this becomes a possibility, these tools should be cleaned off carefully with a dry brush to preserve any biological data present on the artifacts.

Historic Glass Bottles

Over the past two seasons, BEAST has conducted investigations at historic sites near Chan Chich. Glass bottles present a prevalent type of artifact brought in from these investigations. To clean the bottles, use dish soap and water with a toothbrush to clean both inside and out. Often, the bottles come into the lab with soil caked inside. To loosen the dirt, we utilized chaining pins, rolled strips of aluminum foil, and toothpicks so that we could gently remove the dirt from the interior of the bottles without breaking the glass. If these methods are insufficient, bottles should be soaked overnight in clean water with a small amount of soap. The next day, empty the bottle of the water and silt. If necessary, soak overnight a second or third night as needed. Slowly, the dirt will loosen and pour out of the bottle (Phillips 2014). This process may require several days depending on the amount of dirt inside the bottle. Remove as much dirt and algae as possible with a small tooth or bottlebrush. Dry completely so no mold grows in the bag, and package in large plastic bags.

Historic Glass

Like the historic glass bottles, glass shards should be cleaned with soap and water. This should be executed with extreme caution to avoid accidental cuts.

Historic Metal

Clean metal with only a dry toothbrush, as water will worsen any rust on the artifacts, in order to remove as much of the soil and roots as possible (Phillips 2014). As with historic glass, use caution to avoid cuts to the skin on metal artifacts, as this can result in infection.

Historic Ceramics

Historic ceramics, unlike prehistoric ceramics, are more durable as they are fired at higher temperatures and glazed. Therefore, clean historic ceramics with a toothbrush and water, with a small amount of soap if necessary.

Human and Faunal Bone

Needless to say, the upmost care should be used when handling human bone. Remove soil gently with a dry toothbrush, using bamboo tools when needed to clean caked on soil. Wooden tools should only be used with caution with an orientation horizontal to the bone so that they do not scratch the exterior. Water may be used sparingly, but bone should never be submerged in water, as this will cause damage (Novotony, personal communication to Houk, 2015). Remove as much soil as possible from bone, including the interior, particularly when exporting these biological remains to the United States. When the removal of soil presents too much risk to the integrity of the bone, leave it intact and allow analysts to clean it further when the bone can be examined in a controlled environment.

Jute Shell

Clean *jute* shells by soaking them for a short time in clean water, then gently tapping the outside with a finger or rubber toothbrush end to clean out any soil on the interior of the shell. A toothpick may also be used to loosen the dirt inside the shells. Scrub the outside with a

toothbrush to clean extra soil from the exterior. If all soil cannot be extracted from all of the shells, this should be noted in analysis (Phillips 2014).

Other Shell

Other shell brought into the lab can be river shell, marine shell, or unidentifiable shell. Some river shell has a very delicate, white composition and we found that water only disintegrated the shell. For this reason, clean river shell gently with a damp toothbrush, with hardly any water present. Shell artifacts that are of unknown types of shell should be cleaned in this manner as well to preserve the integrity of the artifacts. Most marine shell can be cleaned with water and a toothbrush.

Charcoal and Soil Samples

Samples should not be washed; rather, re-package charcoal into plastic bags with a catalog tag for export and analysis. Soil samples should be kept in cloth bags until they are analyzed.

PACKAGING

After drying completely, artifacts should be packed with their catalog tags in clear, plastic bags (Table 8.1). The exception to this rule is human bone. Each bone or set of related bone should be stored and shipped in small, aluminum foil packets with provenience information written on each packet (Novotony, personal communication to Houk, 2015).

Table 8.1. Washing and Packaging Quick Guidelines

Material	Washing Method	Packaging
Ceramics	Water and toothbrush; be careful of damaging the slip and any designs	Plastic bags
Charcoal samples	DO NOT WASH. Carefully remove soil or sediment with sterile metal tools before weighing and repackaging.	Plastic bags
Faunal bone	Clean gently with tootbrush and wooden art tools or a toothpick and very little water	Plastic bags
Historic ceramics	Soap can be used on historic ceramics if necessary, but generally water and a toothbrush will do.	Plastic bags
Historic glass	Soap and water with a toothbrush.	Plastic bags
Historic glass bottles	Soak with dish soap in clean water and then clean with toothbrush.	Plastic bags
Human bone	Very gently clean with a dry brush; use water only when absolutely necessary.	Aluminum foil packets
Jute shell	Soak for a short time in water, tap gently to remove dirt from inside the shell, and scrub outside with a toothbrush.	Plastic bags
Lithics	Scrub with water and toothbrush.	Plastic bags
Metal	Brush with dry toothbrush; do not use water.	Plastic bags
Other shell	Clean with a damp toothbrush.	Plastic bags
Soil samples	DO NOT WASH.	Plastic bags or cloth bags
Special finds	Check with the operation director or project director before washing special finds.	Plastic bags or special packaging for specific artifact

CATALOGING

After washing excavated artifacts, catalog them in the Lab Master Database so that we have an exact record of everything brought into the lab. Cataloging assigns a unique number to each artifact class from each lot and represents a preliminary type of analysis. Lab staff create an Artifact Catalog form for each class of artifacts (ceramic sherds, debitage, stone tools, etc.) that contains the exact artifact count in addition to its provenience information (Figure 8.6). In this form, each type of material from each context receives a unique catalog number that includes the lab code for each operation. For example, a bag of historic glass bottles from Lot QHC-

Chan Chich Archaeological Project
Artifact Catalog Form

Chan Chich Archaeological Project
CCAP
Chan Chich, Belize - Central America

Lot: QHC-02-SF-46 | Catalog #: 1025 | Category: Historic bottle glass | Count: 2

Lab Code: QHC | Generate Full Catalog #: QHC1025

Comments: whole bottle neck of frosted glass, base with legible words "skin, hair and York"

Date Cataloged: 5/27/2015

Cataloged By: S. Van Oss

Go	Spec #	Industry	Form	Subform	#	Type:Variety
	QHC1025-01	Bottle	Medicinal	Patent	1	
	QHC1025-01	Bottle	Medicinal	Patent	1	
	QHC1025-02	Bottle	Beverage	Other or	1	
	QHC1025-02	Bottle	Beverage	Other or	1	

Figure 8.6. Artifact Catalog Form as it appears in FileMaker Pro.

Note: Field bags often come in with labels saying "Bag 1 of 3," etc. This should be taken into account when checking artifacts in, washing, and packaging. But, often field bags hold more artifacts than plastic storage bags, so catalog tags should be labeled with new "Bag # of total #" when all of one type of artifact from one context has been washed and is being repackaged or cataloged. If washed all together, this can be done before cataloging, but it can also be done during the cataloging process.

02-T-01 receives a different catalog number than historic glass shards from the same lot.

When cataloging these artifacts, use only one catalog number for all of one type of artifact from a specific lot. If after washing, the lab has three bags of historic bottles from Lot QHC-02-T-01, they should all receive the same catalog number on their catalog tags. This will allow for an easier analysis process because all of the artifacts are accounted for in one form, rather than many—an error that results in confusion for analysts and lab workers alike.

Select Artifact Catalog Form in the Lab Master Database under the Lab Forms section in the drop-down menu on the left of the FileMaker Pro window. Then create a new form by clicking New Record in the upper right hand corner of the window. Select the appropriate lot number from the drop-down menu next to Lot # (Figure 8.6). Then enter the exact, total count of the artifacts (even if in multiple bags), the date, the first initial and last name of the person cataloging the artifacts, and any necessary comments (if there are multiple bags, that should be mentioned in the comments). Click "Generate Full Catalog #," and enter this number and the letters that precede it onto the paper catalog tag accompanying the artifacts. If there is more than one bag of one type of artifact, be sure that each tag has the same catalog number and a label that says "Bag x of y" (where the second number is the total number of bags), and replace each tag in its small plastic bag and then place this inside the bag with its artifacts so that the label is visible. Once each tag has been completed, move cataloged artifacts to the "To Be Analyzed" shelves, which are organized by site, operation, and material type.

ANALYSIS

This season, CCAP members divided analysis in the field between the operation and laboratory directors and other analysts. In the lab, we analyzed lithic tools (including obsidian), ground stone artifacts, and *jute* shells, and conducted some preliminary analyses of special finds. Professors Fred Valdez and Lauren Sullivan evaluated excavated ceramics, Lori Phillips analyzed faunal bone, Brooke Bonorden, Briana Smith, and Gertrude Kilgore examined historic artifacts, and human bone and charcoal samples were exported to Texas for assessment at Texas Tech University's Archaeology Lab. Here I outline the basic analytical processes that occur in the field laboratory.

Each artifact undergoing analysis receives another form in the FileMaker Pro database that assigns the artifact a Spec. #, an extension of its catalog number that allows investigators to examine and record data from each specimen. To assign a Spec. #, select Artifact Analysis Form from the same dropdown menu where the other Lab Forms are located. Select New Record in the right hand corner, and select the appropriate Full Catalog Number from the dropdown list. The form will auto-populate the correct provenience information. These forms make it possible to collect and store data in one, searchable database allowing investigators to easily access this information for synthesis in publications and reports.

Spec. #s are created by assigning each artifact a unique two-digit identification after its catalog number. For example, if one context pro-

duced three lithic tools with the catalog number CC0555, the first will receive a Spec. # of 01, the second 02, and so on. The form will generate a Full Spec. # by appending the Catalog # in front of the Spec. # assigned by the analyst. This differentiates the tools, while maintaining their relationship to one another via the initial catalog number. Each tool is then evaluated. Enter the date analyzed and the name of the analyst (new for 2016).

To do this, proceed down the form to fill out each section as it applies to a particular artifact. Sub-fields will auto-fill as more general information is selected. For example, if "Stone" is selected as the Category, options including "Battered Stone," "Chipped Stone," "Ground Stone," and so on will become available as the Industry. Selecting "Ground Stone" will restrict the choices for artifact Form to common ground stone artifact types. Some artifact forms are further classified by subforms. Follow these and the other prompted fields—including measurements, weight, burning, battering or use wear present, material and its quality, and any other notable features—to properly file the data collected from each artifact (Figure 8.7).

Additionally, each artifact should also receive its own plastic bag and tag after analysis. Make a new analysis tag with the Spec. #, provenience information, the current date, the form, and the weight of the object. Place this tag in a plastic tag bag, which you then place inside the plastic artifact bag. This tag replaces the catalog tag, and each analyzed artifact will receive one with its unique Spec. # number. After these steps, artifacts can be moved onto "Analyzed" shelves to await inventory and storage.

The following sections outline what analysts take into account when evaluating the different types of artifacts examined in the field lab. These guidelines ought to change with new information and research goals. The process for lithic, jute shell, and ground stone analysis follow here: these basic practices remain consistent year to year.

Chipped Stone Analysis

This season, most of the analysis of stone artifacts consisted of lithic tools and ground stone due to their ubiquity and time constraints that limited our ability to look at the more general debitage. As a general rule debitage comprises those artifacts formed during the production of tools, while tools often display a definite and intentional form. Though the Maya did make tools of convenience from debitage, this soft rule applies broadly and is useful in teaching students about lithics.

After an artifact is designated a flake or lithic tool, determine its proper orientation to take measurements. In lithic analysis, the proximal end represents the unutilized or hafted end on tools or the end containing the percussion platform on a flake. The distal end is opposite the proximal end and is often the utilized end on tools. Take the length of tools and flakes by measuring the distance from the proximal end to the distal end. Width represents the greatest distance perpendicular to the length. Measure thickness by taking the thickest distance between both faces at angles as close to ninety degrees as possible to the other two measurements (Phillips 2014). Record all of these to the nearest tenth of a millimeter when possible, one-millimeter precision will suffice when more precise measuring devices are not available. Take weights to the nearest tenth of a gram. Calculate measurements on tools that do not possess these features, like cores or ground stone artifacts, in three dimensions, taking care to measure as perpendicularly as possible.

Debitage

For flakes, the ventral side represents that face that would have been snug against the original core, only revealing itself after the flake's

Chan Chich Archaeological Project
Artifact Analysis Form

Spec QHC0594-02

Chan Chich Archaeological Project
CCAP
Chan Chich, Belize - Central America

Site	Qualm Hill Camp	Lot	QHC-01-SF-04	Full Catalog #	QHC0594
Op	QHC-01	Burial		Spec #	02
Subop	QHC-01-SF	Cache		Historic bottle (whole)	

Enter for All Artifacts

Category	Glass
Industry	Bottle
Form	Medicinal
Subform	Patent Medicine

Enter for All Artifacts Except Bulk Sherds and Debitage

Completeness	Complete
L (cm)	12.84
W (cm)	4
Th (cm)	.53
W (g)	86

Enter for Stone and Glass Artifacts

Raw Material	Clear Glass
Raw Material Quality	
Battering	

Enter for All Artifacts

Number	Burning
1	No

Enter Comments Here for All Artifacts Except Ceramic Vessels and Sherds

Vert small bottle with "guaranteed entirely vegetable" embossed on one side and "Barry's pain relief" embossed on the other. Bottle has oil finish that was applied. Sides of rectangular bottle are beveled with "Read directions" and "New York" embossed on the two narrower sides. Body of bottle has straw marks. Bubbles are also visible in body of bottle. Mouth blown? Seam running around base only indicating cup mold. Seam along base also has excess glass imperfection. Bottom of bottle has small outward dimple, possibly glass tipped Pontil scar? Same medicine advertised in 1883 newspaper.

Enter for Ceramic Vessels and Sherds

Type:Variety	
Chan Chich Complex	
Time Period	

Counts

# Rim		# Plate	
# Body		# Bowl	
# Base		# Jar	
# Shotgun		# Cylinder	
Total Sherds		# Other	

Ceramic Comments

Figure 8.7. Artifact Analysis Form as it appears in FileMaker Pro.

removal. That is referred to as the interior surface in Figure 8.8. The dorsal side would have represented the exterior surface of the flake that faced away from the center of the core. On primary and secondary flakes, the dorsal side will display cortex (the rough exterior of

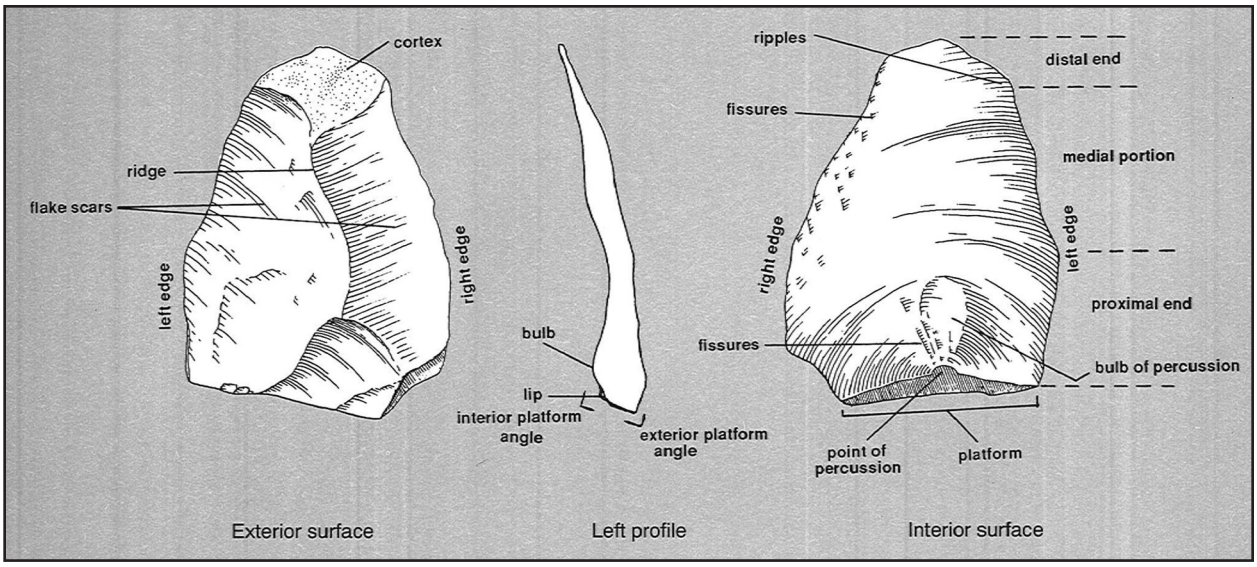


Figure 8.8. Terminology for the analysis of flakes (after Debenath and Dibble 1994:Figure 2.3).

unworked stone that, when removed, reveals a finer grained, workable material) or ridges where other flakes have been taken off.

Debitage is analyzed in bulk, grouped by material type and flake type. Thus, when analyzing flakes, divide them first by material (chert or chalcedony, etc.) and then by the type of flake: primary, secondary, tertiary, or shatter. Primary flakes are the first to come off during the knapping process and have 100 percent cortex on the dorsal face. Secondary flakes have some cortex remaining, and tertiary flakes have none at all. Shatter is not a flake in that it does not have a percussion platform, but these fragments result from the tool making process. After classifying these, enter the count but do not enter measurements for length, width, or thickness, unless there is only one flake in the category. All flakes of one type, e.g. all of the primary chert flakes, receive the same Spec. #. Weigh all of the flakes together and enter the total weight. Take note of any burning present on these flakes.

Tools

To analyze tools, examine all aspects of the artifact. Classification and type identification is particularly important in this process. To do this, we use David Hyde's (2003) master's thesis as a basis for evaluation. Like other lithic artifacts, we take the measurements and weight of each artifact. We then determine the artifact's form and sub-form(s) based on Hyde's specifications and enter this information into the artifact analysis form. For example, under the chipped stone artifact category, bifaces, by definition, show shaping and work on both faces of a tool, whereas unifaces are worked on only one side. Cores are those artifacts that result when flakes are taken off of an initial stone or cobble, leaving scars and removing cortex. Following Hyde's (2003) specifications fill out the artifact analysis form according to the correct specification of each tool.

On each lithic tool, also search for battering or use wear along its margins. Battering often looks like fingernail impressions in foam, crescent-shaped and fairly shallow. However battering can also result in the removal of entire flakes or breakage of the tool. Note where this battering appears and how severely it manifests in the appropriate selection menus and comment section of the analysis form. Also note any burning—often indicated by red or dark discoloration of the raw material, crazing, cracking,

and heat spalling—present on the artifact, the raw material type, and raw material quality.

Ground Stone Analysis

Ground stone is also a lithic artifact industry, however the specifications of these artifacts require a different type of analysis than other lithic tools. Ground stone artifacts most commonly consist of manos and metates, used by ancient and modern people for the grinding of grains and other substances. For the distinction of these, use as a basis the *Cerros Report Volume II: The Artifacts* (Garber 1993). Outlined there are the different distinctions of the types of manos—distinguished by their cross-sections and their plan shape—and metates—differentiated by their overall shape.

Like other lithic tools, take length, width, and thickness measurements on each ground stone artifact. Generally length indicates the longest linear distance between two points on an artifact. Width represents the largest linear measurement perpendicular to the length, and thickness represents the third dimension that measures the largest distance between two faces of an artifact. Weight is taken in grams. Also evaluate ground stone artifacts for evidence of use wear—what usually feels like very smooth surfaces—present on the grinding faces of an artifact and note these in the comment section of the analysis form. Additionally, ground stone often consists of a different kind of raw material than chipped stone lithic tools. For example, granite is a prevalent ground stone material type found at Chan Chich.

This season, the lab examined numerous of manos that did not fit into any of the categories presented by the Cerros report (Garber 1993). These artifacts regularly displayed plans with rectangular centers and ends that tapered to a rounded point. These consistently appeared with a virtually square cross-section, having measurements in width and thickness that were less than 1 mm different from one another (Figure 8.9). Therefore, we created a "Square" subform option in our FileMaker Pro software to accommodate these specific artifacts.

Jute Analysis

When analyzing *jute* shell, divide each catalog number into separate species groups. Though there are many species of jute, the two that appear most often at Chan Chich are *Pachychilus indiourm* and *Pachychilus glaphyrus* (Phillips 2014). The first of these appears smaller and has a smooth exterior, where the latter is larger in general and has more defined ridges on its outer shell (Figure 8.10). According to Phillips (2014:141), "If identification to species is not possible, *Pachychilus* sp. should be the label used." Having determined the species of the shells, weigh those of the same type as a group and record them in one collective analysis form. Enter the count and total weight. Note whether any soil remains inside of the shells in the comment section.

Also take note of any perforation or spire lopping in these shells in the comment section. The first three shells in Figure 8.10 have been spire-lopped; that is, the tip of the shell has been removed to access the animal inside. Perforation also appears very often and looks as if a needle has poked a hole in the shell, likewise to access to the animal inside for consumption. These features present evidence of processing of the *jutes* as foodstuffs for historic and prehistoric populations and should be recorded in the comments section of the analysis form.

LABELING AND PHOTOGRAPHY

All artifacts that receive a Spec. # should be labeled with that number directly on the artifact. This prevents artifacts from losing their provenience if their identification tags are lost or damaged. To label most artifacts, use a pH neutral pen to write an artifact's Spec. # in

Figure 8.9. Mano displaying a nearly square cross section with a rectangular plan and tapering ends. Photo by the author.

Figure 8.10. *Jute* shells. *Pachychilus glaphyrus* (left); *Pachychilus indiourm* (three shells to the right). Photograph courtesy of Terry Powis.

small but legible print away from the edges of the artifact and in an unobtrusive space (Nettleton 2013). Once dry, this then should be covered in a layer of clear nail polish so that the ink stays put. If clear nail polish is not available, Acryloid B-72 may be used in its place (see next section for how to make Acryloid B-72). On some artifacts that are dark in color, place a layer of white-out on the artifact and let it dry. Then write the Spec. # on the white-out and seal with clear nail polish or Acryloid B-72.

These artifacts should also be photographed, and those photos uploaded into their corresponding artifact analysis forms. Take most photos on a black felt background in a natural light. Also be sure that each photo either contains the Spec. # tag for the artifact or that

each frame number and associated artifact are recorded on a photolog. Photos should also include a scale. For darker artifacts, a white background may be used. Photograph obsidian according to the methods presented by Phillips (2014). Lay out two pieces of PVC pipe with a piece of clear plastic stretched between them and a white background underneath. Place the obsidian on the plastic and photograph. This allows for light to pass through the obsidian revealing its transparency and finer details (Phillips 2014).

Tip: When using Acryloid B-72 to cover Spec. #s on artifacts, the solution can become opaque when drying, obscuring the number. If this occurs, dilute the solution with a bit of acetone so that the adhesive substance dries clearer.

ACRYLOID B-72 AND CERAMIC RECONSTRUCTION

This season, the lab director reconstructed several ceramic vessels excavated in 2014 (Booher and Nettleton 2014; Herndon et. al. 2014). To do this, Acryloid B-72 was utilized to adhere the broken pieces of ceramic together. To make this solution, combine Acryloid B-72 pellets with acetone. This season, an old pill bottle served as an Acryloid solution container. First mark on the container the desired amount of liquid solution with a permanent marker by filling it first with the same amount of water. Pour out the water and fill the container with the desired amount of Acryloid B-72 pellets. Multiply the desired final amount of solution by 0.2 to achieve the amount of grams of Acryloid B-72 necessary for a 20 percent solution, which is the most useful for our purposes (Nettleton 2013). For example, if we were to make a 20-percent solution and the desired amount was 100 mL, the number of grams of Acryloid B-72 pellets would be 20 grams. Fill the container with this correct measurement of pellets, then cover these with acetone up to the line previously marked on the container. Let the mixture sit and the acetone will dissolve the Acryloid B-72 pellets to make the adhesive solution. After the pellets have completely dissolved, the glue is ready (Nettleton 2013). If the glue starts to thicken too much, small amounts of acetone may be used to thin the solution back to the desired consistency.

Note: The Acryloid solution allows for a reversible reconstruction. If necessary, undo the adhesive with acetone added gradually to the location until the glue breaks down.

Note: Though this translation of milliliters to grams is not exact, it is accurate enough for work in the lab.

To reconstruct ceramic vessels, we used this solution to bind broken pieces back together. To support those sherds during this process, we employed sand and cloth field bags. Fill a bucket or plastic container with enough sand to support the entire vessel. Place cloth artifact bags cut along the seam on the sand to act as a barrier between the artifact and the sand so that grains do not get trapped in the Acryloid B-72. Reconstruct the vessel first without any glue on top of these bags, using sand to support all of the pieces so that each joint is as tight as possible (Figure 8.11). Once the entire vessel is laid out in this way, begin adding glue with a paintbrush to those seams that connect the largest, weight-bearing pieces. This allows those smaller pieces to rest more easily in the reconstruction and prevents over-stressing these smaller fragments. Glue small sections together first, proceeding then to glue already reconstructed sections to each other, until the vessel takes form. Occasionally, individual sections also need support while drying, so smaller sand and cloth supports can be made in other containers or to one side of the original.

Figure 8.11. Vessel during reconstruction using sand to support drying pieces.

This facilitates the reconstruction of the entire vessel because all of the pieces will have been glued properly. Let this pieces dry completely, which may take a while in the humidity, but will occur. Once all of the pieces are secured, pack and store the vessel safely in a container with padding to protect the vessel from breakage during transportation or storage.

STORAGE, INVENTORY AND ORGANIZATION

Artifact storage at CCAP is located on site. As artifacts move through the lab, they are stored on shelves to await analysis and then are moved to "Analyzed" shelves so that they are easily accessible throughout the season. However, with the plethora of artifacts excavated this season, the lab became more and more crowded, so we moved some of the artifacts to five-gallon plastic buckets outside of the lab. We later employed this system to store the artifacts at the end of the field season. Once analyzed artifacts required relocation, each was moved to a "Lab Bucket," each of these labeled with a number. We also used large trunks and smaller plastic tubs to store some artifacts, labeled Trunk 1, Trunk 2, and so forth, independent of the Lab Bucket numbers. Students and lab assistants made hand-written list of each bucket that the lab director later converted to Excel spreadsheets. Each list contained the Spec. # or Catalog # of each artifact, the number of bags present, and the lot from which it came. This enables an easy, searchable database that details each artifact's or set of artifacts' location, facilitating retrieval. These buckets and

trunks were then closed tightly and stored in a secured storage facility at the lodge for the coming season.

Inventory was also taken of the field and lab equipment. Like the artifacts, lists detailed in which container (i.e., trunk, lab bucket, etc.) each item was stored. These too are now Excel spreadsheets. The easiest way to take this type of inventory is to conduct it simultaneously with packing at the end of the season. Likewise, this recording enables project members to see what has been broken or used up during the season and what needs to be purchased for the succeeding one. The list of things to buy for the project should be given to the project director. Field and lab equipment then are stored in a safe, dry place to await the following season.

STUDENTS IN THE LAB

Students play an important role in the daily functioning of the field lab. This season, we conducted two sessions with about 10 students each. Every workday, one student would be rotated into the lab instead of going into the field for the day. We generally followed the process outline by Nettleton (2013): we would begin with artifact check in and record all of the artifacts that came into the lab the day before. Then we would move outside and spend the morning washing artifacts on the veranda. These would then dry during the afternoon and could be bagged and tagged at the end of the day, or the next morning. During the mid-afternoon, we would catalog artifacts and label those that had been assigned Spec. #s. In general, students did not help with analysis, but occasionally the lab director would conduct lithic analysis lessons that outlined the basics of the methodology. Students also took inventories and made storage lists at the end of the season. The experience in the lab contributes greatly to the work the students do in the field by communicating how excavation and lab data collection relate and inform one another and how the combination of the two sets of practices comes to result in a conclusion about the past.

> **Tip**: Because there is a different student in the lab each day, the lab director must teach each person how the lab works. To facilitate this, and sanity in general, I suggest that signs be posted at each physical checkpoint and the computer detailing each process for that stage. This will make everyone's lives a bit clearer and simpler.

CONCLUSION

This chapter outlined the processes used in the CCAP field lab so that future students and project members have a set of practices that remain consistent from season to season. The past few years have seen a great amount of growth in the project, and, as this continues, the lab practices must also improve. However, this chapter will hopefully provide those who work in the lab in the future with a starting place, making investigations over several seasons more consistent. This consistency will allow for many people to benefit from the project's data and conclusions by providing clear access to not only the data, but the processes as well.

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The Chan Chich Archaeological Project: 1996 to 2015 Project Lists

Compiled by Brett A. Houk

This chapter includes lists of sites, operations, tombs, burials, caches, stone monuments, and radiocarbon dates most recorded by the Chan Chich Archaeological Project (CCAP) since its inception in 1996 and the Belize Estates Archaeological Survey Team (BEAST) since 2013. It is meant to serve as a reference document for future seasons and is updated each year.

SITES

Table 9.1 lists Maya sites on and near the Gallon Jug (GJ), Laguna Seca (LS), and the adjacent Yalbac (Y) properties with Belize Estate (BE) designations. As noted by Sandrock (2013) and Sandrock and Willis (2004), BEAST assigned BE numbers to previously named sites and to newly discovered sites with four or more structures, the tallest of which must be at least 4 m high including structure and substructure or basal platform, that are not within 1 km of another recorded site BE site.

Table 11.1. Recorded BE Sites (UTM Zone 16N)

BE #	Site Name	Property	Original Source	UTM N	UTM E
1	Chan Chich	GJ	Guderjan (1991)	19 40 412	2 75 875
2	Kaxil Uinic (E'kenha)	LS	Guderjan et al. (1991)	19 40 538	2 73 381
3	Punta de Cacao	LS	Guderjan et al. (1991)	19 46 100	2 86 728
4	Gallon Jug	GJ	Guderjan et al. (1991)	~19 43 900	~2 83 450
5	Laguna Verde	GJ	Guderjan et al. (1991)	~19 47 250	~2 80 500
6	Laguna Seca	GJ/LS	Guderjan et al. (1991)	~19 50 850	~2 84 000
7	Qualm Hill (ruin)	LS	Guderjan et al. (1991)	~19 57 300	~2 87 500
8	Wamil	Y?	Guderjan et al. (1991)	~19 39 900	~2 94 900
9	Sierra de Agua	Y/LS?	Guderjan et al. (1991)	~19 40 600	~2 99 500
10	Gongora Ruin	LS	Guderjan et al. (1991)	19 54 400	2 93 459
11	Ix Naab Witz	LS	Sandrock (2013)	19 55 187	2 85 854
12	La Luchita	LS	Sandrock (2013)	19 50 011	2 77 178
13	Montaña Chamaco	LS	Sandrock (2013)	19 51 187	2 75 043
14	Sylvester Camp	GJ	Sandrock (2013)	19 45 510	2 78 128
15	Qualm Hill camp	LS	Sandrock and Willis (2014)	19 57 213	2 85 282
16	Kaxil Uinic village	Y/LS	Thompson (1963)	19 40 073	2 73 487

Houk, Brett (compiler)
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In addition to prehistoric sites, a number of historic sites are present in and near the BEAST survey area. Table 9.2 includes a list of those visited by the CCAP or BEAST or reported by other researchers. Significant historic sites are also assigned BE numbers.

Table 9.2. Known and Reported Historic Sites

Name	Location	Description	Source(s)
Kaxil Uinic village BE-16	Approximately 500 m south of BE-2 primarily on Yalbac Ranch, although the northern limits of the village are on Laguna Seca Ranch.	In 2012, the CCAP re-located the remains of the historic Maya village and *chicle* camp known as Kaxil Uinic and its associated *aguada*. The village was probably settled in the 1880s, and was closed in 1931 by the Belize Estate Co. BEAST mapped and excavated the site in 2015, recording seven three-stone hearths and multiple artifact scatters, which included turn of the century glass bottles and cast iron pots.	Bonorden and Kilgore (this volume); Houk (2012); Thompson (1963)
Qualm Hill camp BE-15	Immediately west of Cedar Crossing on the west bank of the Río Bravo.	A 215-x-90-m scatter of historic artifacts that likely represents the location of Qualm Hill (also known as Quam or Quam Hill), which was "the seasonal headquarters of the British Honduras Company during the mid 1800s" (Cackler et al. 2007:124). Qualm Hill is historically important as the site of a "Chichina" Maya raid led by Marcus Canul in 1865 (Bristowe and Wright 1888:27–28), yet artifacts recovered from the 2015 survey and excavation generally post-date the raid. The site, which primarily consists of surface artifact deposits, has been disturbed in recent years by individuals scavenging the historic logging equipment and modern loggers camping in the middle of the historic camp.	Bonorden and Smith (this volume); Bristowe and Wright (1888:27–28); Cackler et al. (2007:124)
El Infierno logging camp	Reportedly 1 km east of Guatemala border, northwest of Gallon Jug	This site is mentioned in reference to the location of the Maya site of El Infierno, which is described as "behind" the logging camp; no other details provided.	Guderjan et al. (1991:61)
Unnamed	Approximately 75 m southwest of BE-13, 50 m west of a swamp	BEAST located a possible abandoned *chiclero* camp, as evidenced by a small collection of bottles, in 2013.	Sandrock (2013)

CHAN CHICH CONTROL POINTS

Table 9.3 lists the UTM coordinates for important mapping control points at Chan Chich. Most of the points described are marked with metal surveyor spikes or large nails. Elevations are given for the top of the spike or nail. All points are OPUS corrected. Although the project shot several new control points in 2014, they are not included in this list because the total data station apparently was not properly calibrated.

Table 9.3. Chan Chich Control Point UTM Coordinates

Point	Description	Northing	Easting	Elev (m)
Main Site Datum (2012)	Spike in asphalt near pavement's edge between bar and Structure A-1	1940412.85	275875.56	118.72
Structure A-1 Central Datum	Spike in central landing, summit of Structure A-1	1940390.29	275877.30	129.49
Structure A-1 East Datum	Eastern summit of mound	1940385.65	275895.98	131.76
Structure A-1 West Datum	Western summit of mound	1940395.39	275847.77	131.27
Structurea A-4 Datum	Western summit of mound	1940535.23	275863.09	126.02
Structure A-5 Central Datum	N1010 E1030 in local A-5 grid	1940519.90	275904.50	123.01
Structure A-5 West Datum	Western summit of mound	1940523.61	275891.81	122.95
Structure A-8 Datum	Summit of mound	1940494.17	275964.4	126.30
Structure A-9 Datum	Summit of mound	1940434.43	275958.13	126.41
Upper Plaza West Datum	East of Structure A-21	1940358.03	275857.15	125.99
Upper Plaza Southeast Datum	In southeast corner of plaza	1940337.89	275891.17	126.11

OPERATIONS

To date, the CCAP has conducted excavations at Chan Chich and Kaxil Uinic ruins, and BEAST has made surface collections of isolated finds and at Qualm Hill camp and conducted excavations there and at Kaxil Uinic village. Operations numbers are assigned sequentially by site, preceded by a site abbreviation. Thus, the first operation at Chan Chich is designated Op CC-01. Table 9.4 lists the operations that have been assigned through the 2015 season.

Table 9.4. List of Operations at Opened by CCAP and BEAST

Op	Season	Definitions	Subops	Source(s)
CC-01	1997	Excavations on the northern stairs of Structure A-1	A–C	Houk (1998)
CC-02	1997	Excavations at the Upper Plaza	A–J	Robichaux (1998)
CC-02	1998	Excavations at the Upper Plaza, including landing of Structure A-1	K–W	Robichaux et al. (2000)
CC-02	1999	Excavations at the Upper Plaza including summits of Structures A-1 and A-13	X–AK	Robichaux (2000)

Table 9.4. List of Operations at Opened by CCAP and BEAST (continued)

Op	Season	Definitions	Subops	Source(s)
CC-03	1997	Excavations at the ball court	A–E	Ford (1998)
CC-04	1997	Test pits in Group C	A–C	Meadows (1988)
CC-04	1998	Test pit in Plaza C-2	D	Ford and Rush (2000)
CC-05	1998	Excavations at Courtyard C-1	A–L	Ford and Rush (2000)
CC-06	1998	Excavations at Group H	A–F	Meadows and Hartnett (2000)
CC-07	1999	Excavations at Structure C-6	A–E	Harrison (2000)
CC-08	1999	Excavations at Structure A-11	A–B	Houk (2000)
CC-09	2001	Excavations at Plaza C-2	A–M	Unpublished field notes
CC-10	2012	Excavations at the Upper Plaza	A–F	Kelley et al. (2012)
CC-10	2013	Excavations at the Upper Plaza	G–T (plus Ix)	Kelley et al. (2013)
CC-11	2013	Excavations at Structure A-5	A–O, N–R (plus Fx)	Herndon et al. (2013)
CC-12	2014	Excavations at the Upper Plaza, Chan Chich Dynastic Architecture Project	A–T (plus Ax)	Herndon et al. (2014)
CC-13	2014	Excavations at the Back Plaza	A–N (plus ST, seven shovel tests)	Vazquez and Booher (2014)
CC-14	2014, 2015	Excavations associated with processional architecture including the Eastern and Western Causeways, Courtyard D-1, Structure D-48, Structure C-17, and Structure C-18A, and Structure D-36	A–AW (plus Ex, ARx, AMx, and SF)	Booher et al. (this volume); Booher and Nettleton (2014)
KU-01	2012	All excavations at Kaxil Uinic in 2012	A–H	Harris and Sisneros (2012)
KUV-01	2015	All excavations at Kaxil Uinic village in 2015	A–L (plus SF)	Bonorden and Kilgore (this volume)
QHC-01	2014	Surface collections made by BEAST at Qualm Hill Camp	SF	Phillips and Sandrock (2014; Sandrock and Willis (2014)
QHC-02	2015	All excavations at Qualm Hill camp made by BEAST in 2015	A–S and SF	Bonorden and Kilgore (this volume)
SF-01	2014	Surface collections made by BEAST that were not associated with a site	SF1–SF3	FileMaker Pro database

SPECIAL DEPOSITS

Over the course of eight seasons of research, the CCAP has excavated one cache, one tomb, and 14 burials. Table 9.5 lists the burials thus far recorded, and Table 9.6 lists the tombs documented at the site, including a looted tomb first recorded by Guderjan (1991). Table 9.7 includes the single cache entry in the list of special deposits.

Table 9.5. List of Burials

Burial #	Season	Provenience	Context	Source(s)
CC-B1	1997	CC-4-A-3	Primary burial in Late Preclassic fill, Courtyard C-1	Meadows (1998)
CC-B2	1997	CC-2-J-6	Tomb 2, Terminal Preclassic burial in Upper Plaza	Houk et al. (2010)
CC-B3 (4, 6)	1998	CC-5-C-3 and -H-2	Secondary scatter of human bone associated with surface deposit of artifacts on steps of Structure C-2; Terminal Classic (?). Burials CC-B3, -B4, and -B6 combined by Frank and Julie Saul into Burial CC-B3.	Ford and Rush (2000)
CC-B5	1998	CC-6-C-9	Late Classic (?) primary burial beneath Courtyard H-3	Meadows and Hartnett (2000)
CC-B7	1998	CC-4-D	Secondary scatter of human bone associated with surface deposit of artifacts on steps to Structure C-6; Terminal Classic (?)	Ford and Rush (2000)
CC-B8	1999	CC-7-B	Primary Terminal Classic burial beneath bench in Structure C-6	Harrison (2000)
CC-B9	2001	CC-9-G-7	Primary burial of a child in Structure C-12 patio; Late Classic (?)	Unpublished field notes
CC-B10	2012–2013	CC-10-A-8 (extends into CC-10-G)	Primary (?) subfloor burial, poorly preserved; early Late Preclassic	Kelley et al. (2013)
CC-B11	2014	CC-12-D-9	Primary burial of an adult in a small crypt in Structure A-1. The burial is associated with the penultimate construction phase and was encountered beneath the central landing on the structure. The small crypt contained four complete vessels. Likely associated with Cache CC-C1.	Herndon et al. (2014); Novotny et al. (this volume)
CC-B12	2014	CC-14-F-3	Primary, simple found in dry-laid fill within a bench, very close to the surface. Burial contained a single shallow Achote Black bowl with nubin feet and post-firing graffiti—incised quadripartite designs—on two exterior sides and in the middle of the vessel's interior.	Booher et al. (this volume); Booher and Nettleton (2014); Novotny et al. (this volume)
CC-B13	2014	CC-12-H-13	Primary burial of robust adult in a small crypt associated with the penultimate phase of Structure A-18 in the Upper Plaza. No grave goods.	Herndon et al. (2014); Novotny et al. (this volume)
CC-B-14	2015	CC-14-J-04	Primary burial of adult female buried in a seated position within a bench in Structure D-1. She was interred with a piece of anlter, a small shell bead, a *jute* shell, and a mold-made ceramic spindle whorl.	Booher et al. (this volume); Mitchell and Booher (this volume); Novotny et al. (this volume)

Table 9.6. List of Tombs

Tomb #	Season	Provenience	Location	Source(s)
1	--	Structure C-31	Looted tomb referred to as the King's Tomb; Late Classic (?)	Guderjan (1991)
2	1997–1999	Upper Plaza, CC-2-J-6	Tomb 2, Terminal Preclassic tomb in Upper Plaza	Houk et al. (2010); Robichaux (1998, 2000); Robichaux et al. (2000)

Table 9.7. List of Caches

Cache #	Season	Provenience	Context	Source(s)
CC-C1	2014	CC-12-D-8	Structure A-1, penultimate phase. This cache contained 17 obsidian blades, found loose but grouped together in fill, resting on one of the capstones of Burial CC-B11.	Herndon et al. (2014)

STONE MONUMENTS

Table 9.8 lists the stone monuments recorded within the CCAP and BEAST permit area. To date, no monuments with legible texts or dates have been found in the area. The only monument with evidence of carving is Stela 1 at Kaxil Uinic (see Harris and Sisneros 2012; Thompson 1939).

Table 9.8. Recorded Stone Monuments in CCAP/BEAST Permit Area

BE #	Site	Monument	Location	Description	Source(s)
1	Chan Chich	Stela 1	Main Plaza, base of Structure A-2	Uncarved and burned stela	Guderjan (1991:43)
2	Kaxil Uinic	Stela 1	Main plaza, base of Structure 3	Broken in two pieces, heavily eroded stela with evidence of carving, illegible; 1.95 m tall, 80 cm wide, 55 cm thick	Guderjan et al. (1991); Harris and Sisneros (2012:52); Thompson (1939)
		Altar 1	Main plaza, base of Structure 3	Round, limestone altar (ca. 130 cm diameter; 30 cm thick), uncarved	Guderjan et al. (1991); Harris and Sisneros (2012:56–56); Thompson (1939)
3	Punta de Cacao	Stela 1	Plaza A, near base of Structure A-5	Uncarved stela	Robichaux (2004:200)
		Possible stela or altar	Plaza A, in front of Structure A-5	Large, uncarved block of stone, 82 x 82 x 40 cm, broken into two parts.	Hartnett (2005)
4	Gallon Jug	Stela 1	Main plaza	Very small stela that may not actually be a monument, only 45 cm high	Sandrock (2013)

Table 9.8. Recorded Stone Monuments in CCAP/BEAST Permit Area (continued)

BE #	Site	Monument	Location	Description	Source(s)
7	Qualm Hill	Stela 1	Northeastern corner of Plaza A	Uncarved stela, laying flat; 1.8 m long, 0.6 m wide, and 0.4 m thick	Cackler et al. (2007:121)
		Altar 1	Plaza B	Broken in half, plain altar measuring 1.5 m in diameter and 1 m thick	Cackler et al. (2007:123)
10	Gongora Ruin	Stela 1	In plaza in front of Structure 1	Small, uncarved stela. Note that BEAST was unable to re-locate this monument in 2014.	Guderjan et al. (1991:81); Sandrock and Willis (2014)
11	Ix Naab Witz	Stela 1	Upper plaza near southwestern corner of Structure 6	Small, uncarved stela, 1.05 m tall, 40–60 cm wide, 35 cm thick	Sandrock (2013)

RADIOCARBON DATES

Table 9.9 presents the results of radiocarbon samples run by the project since 2012. Table 9.10 presents the calibrated age ranges and isotope data for those same samples.

Table 9.9. Radiocarbon Samples

Area	Context	Sample #s	Comments	PSU #	UCIAMS #	Modern Fraction	±	$D^{14}C$ (‰)	±	^{14}C age (BP)	±
Upper Plaza	Lot CC-10-C-7	CC-10-S12	Charred material. This sample came from a midden in the northern part of the Upper Plaza. This midden is above floor Lot CC-10-C-8.	6390	154684	0.7273	0.0013	-272.7167	1.3023	2560	15
Upper Plaza	Lot CC-10-C-8	CC-10-S16	Charred material. This sample comes from subfloor fill associated with the oldest floor in the northern part of the Upper Plaza.	6386	151874	0.7271	0.0019	-272.9396	1.9490	2560	25
Upper Plaza	Lot CC-10-C-4	CC-10-S03	Charred material. This sample is from the second plaster floor above the midden in the northern part of the Upper Plaza.	6385	151873	0.7561	0.0020	-243.8584	2.0222	2245	25
Upper Plaza	Lot CC-10-H-4	CC-10-S28	Charred material.This sample is associated with dense artifact deposit within northern platform buried in Upper Plaza.	6397	154691	0.7631	0.0013	-236.8672	1.3000	2170	15
Upper Plaza	Lot CC-12-O-8	CC-12-S16	Charred material.This sample comes from the lowest (fifth) identified layer of the 20-cm thick compact dirt surface that covers most of the southern part of the Upper Plaza.	6393	154687	0.7669	0.0013	-233.0904	1.2797	2130	15
Upper Plaza	Lot CC-12-O-4	CC-12-S14	Charred material. This sample comes from the second identified layer of the 20-cm thick compact dirt surface that covers most of the southern part of the Upper Plaza.	6392	154686	0.7941	0.0015	-205.9289	1.4563	1850	15
Upper Plaza	Lot CC-12-D-6	CC-12-S08	Charred material. This sample is from the plaster cap that patched the floor above Burial CC-B11.	6396	154690	0.8289	0.0016	-171.1195	1.5594	1510	20

Table 9.9. Radiocarbon Samples (continued)

Area	Context	Sample #s	Comments	PSU #	UCIAMS #	Modern Fraction	±	$D^{14}C$ (‰)	±	^{14}C age (BP)	±
Upper Plaza	Lot CC-12-D-7	CC-12-S13	Charred material. This sample comes from a charcoal rich layer of fill covering Burial CC-B11.	6394	154688	0.8292	0.0014	-170.7725	1.4281	1505	15
Upper Plaza	Lot CC-12-C-4	CC-12-S03	Charred material. This sample is from the subfloor fill of the final floor in a room on Structure A-18.	6391	154685	0.8489	0.0013	-151.0105	1.3403	1315	15
Upper Plaza	Lot CC-12-D-9	CC-12-S17	Charred material. This sample comes from Burial CC-B11 in the penultimate phase of Structure A-1.	6387	151875	0.8494	0.0023	-150.5843	2.2638	1310	25
Upper Plaza	Lot CC-12-A-4	CC-12-S05	Charred material. This sample is from the final phase of construction in a room in Structure A-1 (from the floor).	6395	154689	0.8512	0.0014	-148.8458	1.4124	1295	15
Back Plaza	Lot CC-13-M-3	CC-13-S14	Charred material. This sample comes from a probable cooking feature in Structure A-23. Will help date terminal occupation.	6388	151876	0.8554	0.0023	-144.6185	2.2870	1255	25
Str. D-1	Lot CC-14-F-3	CC-14-S04	Bone. This sample is human bone from Burial CC-B12 in Structure D-1.	6418	154712	0.8589	0.0017	-141.0115	1.6736	1220	20

Sample #	$\delta^{13}C$ (‰ VPDB)	$\delta^{15}N$ (‰ Atm N2)	%C	%N	C:N	From	To	%
CC-10-S12						799 BC	766 BC	95.4
CC-10-S16						805 BC	569 BC	95.4
CC-10-S03						390 BC	280 BC	95.4
CC-10-S28						355 BC	171 BC	95.4
CC-12-S16						204 BC	96 BC	95.4
CC-12-S14						AD 91	AD 231	95.4
CC-12-S08						AD 435	AD 608	95.4
CC-12-S13						AD 540	AD 602	95.4
CC-12-S03						AD 659	AD 764	95.4
CC-12-S17						AD 658	AD 768	95.4
CC-12-S05						AD 667	AD 768	95.4
CC-13-S14						AD 673	AD 863	95.4
CC-14-S04	-10.49	8.83	52.73	18.60	3.31	AD 713	AD 885	95.4

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