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I SAMPLING AND TIMEFRAMES: CONTEXTUALIZING THE PROTOCLASSIC AND EARLY CLASSIC PERIODS AT CARACOL, BELIZE

Arlen F. Chase and Diane Z. Chase

The era of transition between the Late Preclassic (300 B.C. – A.D. 250) and the Early Classic (A.D. 250-550) Periods is one which saw great change within ancient Maya society. This change is reflected in the ceramics of this transitional era. Ceramicists have had difficulty isolating distinct ceramic complexes within the transitional era and have instead tended to focus on specific stylistic markers (e.g., mamiform tetrapods) that were thought to be hallmarks for this transition. These stylistic markers became known as the “Protoclassic” and, while easily identified, they were never securely anchored within broader patterns of change. To this day the Protoclassic Period remains enigmatic within Maya archaeology. There are disagreements on whether or not the term should be used in Maya archaeology and, if used, how and to what the term should refer. Much of what has been used to identify the Protoclassic falls within the realm of ceramics and, thus, that data class will be the primary one utilized here. This paper first examines the history of and use of the term Protoclassic in Maya archaeology; it then uses data from Caracol, Belize to assess the relevance of the term both to Maya Studies and to interpretations of ancient Maya society.

Introduction

A solid chronology of the ancient Maya past is key to outlining the development of the ancient Maya. This chronology is continuously undergoing review and refinement in both the highlands and the lowlands using comparative analysis of individual site chronologies based on ceramics, stratigraphy, and radiocarbon dating. Perhaps the most difficult time to assess is the transition from the Preclassic to Classic Period — a time that is also of clear import in assessing the rise and development of Maya civilization. Among the issues relating to the transition from the Preclassic to Classic Periods in the Maya area are the relative paucity of excavated Protoclassic remains and preconceptions by researchers about both ceramics and this temporal era that are not grounded in contextual information.

In the highlands there remains disagreement over exactly how the sequences of the various early sites articulate with each other (e.g. Inomata et al. 2014; Love 2017). A large part of this disagreement resides in the nature of the data being used and in how researchers constitute phases and undertake ceramic analysis. While radiocarbon dating is useful in resolving some of these issues, it still needs to be anchored in high quality archaeological data (Bayliss 2015). The same chronological issues that are found in the Maya highlands also reverberate in the Maya lowlands and are reflected in the kinds of samples that are used to build chronologies and phases and to model trade linkages.

Given the limited hieroglyphic record for the Protoclassic and Early Classic Periods in the Southern Maya lowlands, pottery has generally been used to determine temporal occupation and often these temporal interpretations are derived from a limited sample of archaeologically-recovered remains. While the total sample of primary deposits containing well-dated pottery samples has been increasing each year, Krejci and Culbert (1995: 104) correctly pointed out a quarter century ago that Preclassic and Early Classic contexts in the Southern Lowlands “provides a rather slim representation of small structure burials and caches” and are “far from a balanced sample.” They (1995: 114) further argued that “the beginning of the Early Classic does not mark a break in ritual patterns, but that the break occurs a century or so later” … “in the mid-fourth and early fifth centuries” (see also Patino-Contreras 2016). In contrast to Krejci and Culbert’s (1995) assessment, the archaeological data from Caracol, Belize instead suggest a continuous development in ritual patterns through the Early Classic Period and indicate that these patterns were not limited to elite contexts, but were present among various levels of society. Thus, the archaeological data from Caracol, Belize not only provide a solid chronological sequence for this transition, but
they also significantly add to the contextually-collected sample, enabling better interpretations.

Although the ceramic modes that constituted the Protoclassic had a broad distribution (e.g., Pring 1977), most past assessments of the Protoclassic and Early Classic eras were often largely dependent on whole vessels from burials and tombs derived from limited excavation loci, sometimes only a single structure at any one site. Because the pottery vessels within these burials contained a variety of exotic ceramic forms and decorative modes that were not well-represented in the sherd material from general excavations, they were often viewed as being elite-related (e.g., Culbert 1977; Callaghan 2013: 311; Callaghan and Nievens des Estrada 2016:209-210) or ritual-specific (Reese-Taylor and Walker 2002:102), meaning that how they articulated with the rest of society was fairly unclear (see Lincoln 1985 for initial discussion of “Preclassic” ceramics in “Early Classic” contexts).

Protoclassic ceramics first had been organized as a category by George Vaillant (1927, 1935) in relation to what he referred to as the “Q Complex,” which was viewed as having origins in Central or South America and as comprising the introduction of polychrome, mammiform tetrapod feet on vessels, ring and annular bases, pot-stands, and spouted vessels into the Maya lowlands. The first published reference that recognized the early nature of these materials in the Maya area was in 1931 and related to four burials excavated in several residential groups in the Mountain Cow region of Caracol (Thompson 1931), although Gann (1918: Plate 13b) had previously published a complete mammiform tetrapod from Santa Rita Corozal in 1918. A year later, a large sample of Protoclassic and Early Classic transitional deposits, originally recovered by Merwin in 1912 in Structure B of Group II at Holmul, were published (Merwin and Vaillant 1932); because Merwin had died and Vaillant wrote up the final published report from notes, there were unresolved issues in the interpretation of these materials in terms of their dating, seriation, and meaning (e.g., Hammond 1984; Callagan 2013). An extensive deposit of ceramic vessels relating to this temporal era was also recovered at Nohmul, Belize, unfortunately from a single building that was devoid of real context because of bulldozing (Anderson and Cook 1944) – and, again leading to questions of dating, seriation, and interpretation (Hammond 1984). An early tomb excavated at the Belizean site of Pomon a added grist to the discussion (Kidder and Eckholm 1951). Gordon Willey’s excavations at Barton Ramie in the early 1950s recovered four Protoclassic burials and led to an interpretation of these ceramics as having resulted from a migration of peoples into the Southern lowlands from the Pacific Coast of El Salvador (Willey and Gifford 1961; Sharer and Gifford 1970), something now considered unlikely (Demarest and Sharer 1986).

In 1955 Robert Smith (1955: 22-23) segmented the Early Classic into three parts at Uaxactun based on the presence of specific vessel forms: a z-angle bowl for Tzakol 1; a basal-flanged bowl for Tzakol 2; and, a tripod cylinder for Tzakol 3; he had originally defined a Protoclassic phase called Matzanel (between Chicanel and Tzakol), based on Merwin and Vaillant’s [1932] Homul data, but after analysis decided that the Uaxactun ceramics did not support its existence (believing that it had just not been well-sampled in the Carnegie Institution excavations at the site). The University of Pennsylvania excavations at Tikal also did not recover a detailed sequence of these expected deposits (e.g. Culbert 1993), but such remains were recovered in subsequent excavations undertaken by Juan Pedro Laporte (1995; Laporte and Fialko 1987, 1995) in Tikal’s Lost World Complex. Ritual ceramics associated with Naj Tunich Cave in Guatemala also proved to be largely of Protoclassic and Early Classic date (Brady et al. 1998). Finally, several more recently excavated interments from various sites in northern Belize have provided significant ceramic associations (e.g., Guderjan et al. 2014; Houk and Valdez 2011; Houk et al. 2010; Kosakowsky et al. 2016; Sullivan and Valdez 2006); other materials have come from Nakum, Guatemala (Zralka et al. 2014).

These combined data continue to show that there are major issues in archaeological sampling for this temporal era. The history of the Early Classic Period in the Maya Southern lowlands is one of relatively small population
levels (see Culbert and Rice 1990), likely the result of the collapse of early Preclassic states in the northern Peten (Hansen 2015). While populations increased over time, there are far fewer primary deposits to recover when compared to the omnipresent Late Classic Period; additionally, many of these earlier deposits have been transposed and redeposited by later activities; thus, the smaller recovered samples have led to difficulties in characterizing the transition from the Late Preclassic into the Early Classic Period. Because of the longevity of the Caracol Archaeological Project (D. Chase and A. Chase 2015, 2017), however, a substantial sample of archaeological materials from 56 primary contexts have been collected from throughout the site. Caracol primary deposits are spatially widespread and cover the entire Late Preclassic through Early Classic Periods.

**Caracol Sample**

The Caracol Archaeological Project has recovered 19 caches (non-finger bowl), 38 burials, and 2 other contexts consisting of secondary refuse that contain either Protoclassic or Early Classic ceramics. In conjunction with Thompson’s (1931) Mountain Cow materials, this sample permits a firm understanding of the site’s Early Classic Period and the ceramic forms and modes that have traditionally been used to understand these temporal eras. These deposits may be dated to between A.D. 150 and A.D. 500 and reveal a fairly continuous ceramic development and one that appears not to be restricted to a single segment of Maya society.

On the earlier end of this sequence are two burials that date to approximately A.D. 150 that may be characterized as a Late Preclassic expression of the Protoclassic, following the division suggested by Brady et al. (1998). One of these Late Preclassic transitional deposits (S.D. C117B-5) contained the skeletal remains of a female interred in an Ix Chel diety costume (Rich 2003) accompanied by a wide variety of goods, including 2 pottery figurines (human whistle and armadillo), 32 ceramic vessels, and over 7000 shell and jadeite beads sewn onto a mantle fringed with dog teeth (A. Chase and D. Chase 2006). Stylistically, the vessels included within this interment included 4 incipient polychrome bowls (2 with ring-bases), 2 tetropod jars (one with Usulutan-style decoration), 1 tetropod bowl, 6 miniature vessels (2 with tetropods), 1 large dish, 1 large jar, 15 labial-flanged bowls, and 2 resist composite-angle bowls (A. Chase and D. Chase 2006: fig. 1). The composite angle bowls are similar to others known from Nohmul, Belize (Hammond 1984, vessel 17). The second Caracol deposit (S.D. C52A-1) comes from a chultun burial located approximately 3 km distant from the site epicenter; the chultun burial was associated with 6 vessels (A. Chase 1994: fig. 13.3). Two of these vessels were decorated with Usulutan-style wavy-line decoration. One of these vessels had foreshortened mammiform tetropod supports and a grooved-hook rim; one vessel had a labial flange; three were rounded-bottom bowls; and, the last was an elaborately incised deep bowl with its 4 tetropod supports removed in antiquity. The rounded bowl form seen in this deposit continues into the Early Classic era and occurs in 3 later deposits that span the Early Classic Period (C14C/2; C14C/4; and C10A/1).

The early part of the Early Classic Period at Caracol is characterized by bowls or plates with large tetropod feet and the appearance of orange-wares and true polychromes, as well as the persistence of Sierra Red slip on these new forms. Deposits containing these materials were initially found by Thompson (1931) in a vaulted tomb and in three chultuns during his excavations in the Mountain Cow part of the site. Vessels placed within one chultun interment included a Sierra Red mammiform tetropod, a ring-base orange bowl with black pseudo-Usulutan decoration on its interior, and a small decorated jar with a circumferential incision on its interior lip. The Cahal Cunil vaulted chamber 1 excavated by Thompson (1931) similarly contained 2 Sierra Red tetropod bowls, 2 decorated jars with handles, a bowl with an annular base (similar to one from Holmul; Callaghan 2013: fig. 7a), a tetropod red-slipped bowl containing the modeled image of a frog (see analogous vessel in Bonnafoux 2008: fig. 6.3e), and a miniature buff-color jar with incisions (similar to one illustrated in refuse of a similar date to the west of Caana; A. Chase and D. Chase 2016: fig. 106a). The presence of a Sierra Red mammiform tetropod in an early
Early Classic burial also occurs in a residential group outside of the site epicenter (Figure 1), where this form is associated with an orange-slipped potstand, a shoe-pot (see Brady 1992), and a small jar with circumferential incision on its interior lip. A second chultun excavated by Thompson (1931) in the Mountain Cow region yielded an orange-ware polychrome tetrapod bowl, and orange-ware polychrome collared jar, and a potstand that was once stuccoed and painted. A third, and final, chultun in the Mountain Cow region also yielded a tetrapod orange-ware polychrome plate, a red-on-orange pot-stand, a large hemispherical orange-ware polychrome bowl, and a large decorated jar. Two other orange-ware polychrome tetrapods (both with feet removed) are known from Caracol deposits: one is from Tulaktuhebe (C14C/2), 3.5 km southeast of Caracol’s epicenter, associated with a redware deep dish, both from a looted tomb; the second is associated with a handled and decorated jar with a circumferential lip groove and was recovered in association with a tomb in a residential group just southeast of Caracol’s epicentral C Group (Figure 2).

Isolated burials that were likely associated with this earliest expression of the Early Classic have also been widely recovered at Caracol. A burial recovered in a plaza immediately west of Caana yielded a decorated handled jar with interior incised lip associated with a decorated collared bowl. A burial southwest of the Central Acropolis yielded a ring-base collared jar that is Ixcanrio Polychrome. One other form
associated with the earliest Early Classic at other sites in the Maya area includes z-angled vessels (see Smith 1955 for Uaxactun). For Caracol, this form has been recovered in a looted deposit at Tulakatuhebe as well as in a residential plaza 4 km northeast of the site epicenter (Figure 3); however, this form occurs in isolation and is not directly associated with any of the other vessel forms. A final burial from immediately west of Caana yielded an Actuncan Polychrome basal-flanged bowl in association with a polychrome pot-stand (A. Chase and D. Chase 2005a: fig.3c,d), transitional to the middle facet of the Early Classic at the site. Interestingly, while they are prevalent in deposits at Holmul (Callaghan 2013) and in northern Belize at sites like Nohmul and Santa Rita Corozal (D. Chase and A. Chase 2006), no chocolate pots have been found in any of the Protoclassic or Early Classic Caracol deposits; the only one known was recovered from a Late Preclassic chultun burial that precedes this temporal era (A. Chase and D. Chase 2011a: fig. 13a).

The appearance of polychrome basal-flanged bowls at Caracol appears to mark the next evolution of pottery sub-assemblages at the site. Basal-flanged bowls are present in a wide variety of contexts at the site, having been recovered in 19 burials. The Caracol sample also attests to the lack of overlap between polychrome basal-flanged bowls with tetrapod ceramic plates, something suspected but not demonstrated elsewhere. At both Homul (Callaghan 2013) and Nohmul (Hammond 1984), they are seriated as being later, but tetrapod hemispherical bowls can co-occur with basal-flanged bowls as documented in contexts at Uaxactun (Smith 1955: figs. 3e and 12a) and K’axob (Berry et al. 2004: 256-257). Yet, it is clear that the basal-flange bowl form dominates the middle of the Early Classic Period and is likely derived from the labial-flanged bowl form of the Late Preclassic Period. Sierra Red basal-flange bowls have been recovered in tombs at Chanchich (Sullivan and Valdez 2006) and Pomona (Kidder and Eckholm 1951) with tetrapod plates, but polychrome basal-flange bowls appear to supplant the tetrapod plate as part of the Caracol burial assemblage.

There are six burials in residential groups in which basal flange bowls constitute the only pottery vessel included. In other deposits basal-flange bowls co-occur with shoe-pots (e.g., A. Chase and D. Chase 2005a: fig. 6) and in one a basal-flange bowl co-occurred with cylinder tripods (e.g., A. Chase 1994: fig. 13.4). They are also associated with hour-glass censers in several interments. Another vessel form that appears to be introduced at the same time as the basal-flange bowl is a spouted bowl or jar; this form has been recovered from 5 Early Classic interments.

The previously reported cremation from Caracol’s Northeast Acropolis, believed to represent an individual from Teotihuacan (A. Chase and D. Chase 2011b), contained vessels that are transitional between the Late Preclassic and Early Classic Period as well as two nubbin-footed tripod vases that resemble one assigned to the earlier Protoclassic at Nohmul (Hammond 1984, vessel 14). Seven flaring rim bowls were also found in association with a basal flanged bowl and a spouted jar in a tomb in Structure D8 in the South Acropolis; three flaring rim bowls were in association with a basal-flanged bowl and two spouted bowls (one potentially lidded) from an infilled tomb west of Caana. The Northeast Acropolis cremation also contained 7 basal-flanged bowls (A. Chase and D. Chase 2011b: fig. 3), 4 of which portrayed a reclining,
possibly bound, individual on the bowl exterior. The imagery of this reclining figure is widespread, occurring on basal-flange bowls from other sites, such as Holmul (Callaghan 2013: fig. 22a), Uaxactun (Smith 1955: fig. 3e), Dos Hombres (Houk and Valdez 2011: fig. 4) and Bats’ub Cave (Prüfer and Dunham 2009: fig. 4). At Caracol a similar basal-flanged vessel with a reclining individual occurs in a tomb in Structure A33 in the Northeast Acropolis in association with a miniature vessel, a spouted bowl, and a blackware goblet with a tubular base (Figure 4); this basal-flanged vessel contains an interior hummingbird image that is almost identical to one recovered at Bats’ub Cave (Prüfer and Dunham 2009: fig. 4). The blackware goblet is similar to other ones recovered in Burial 177 at Tikal (Culbert 1993: fig. 37b1) and in Burial P2B-2 at Santa Rita Corozal (D. Chase and A. Chase 2005: fig. 5); this form may derive from the combination of an incurved bowl on a pot-stand, as can be seen at both Holmul (Callaghan 2013: Fig. 24a), and at Nohmul (Hammond 1984, vessel 3). A residential tomb fleshes out some of the other vessel possibilities for the middle part of the Early Classic at Caracol; besides a miniature cup with face and a basal-flanged bowl, the tomb (S.D. C95A-1; see A. Chase and D. Chase 2005a: fig. 4) also contained a large jar, a miniature jar with ring base, an inverted goblet with bird handle (similar to forms at Tikal [Laporte and Fialko 1995: fig. 30] and Holmul [Callaghan 2013: fig. 24b]), and a tripod bowl with modeled peccary feet and three incised deity heads.

Of the nine known burials with tripod cylinders at Caracol, only one is associated with a basal-flange bowl (this same tomb also is associated with a spouted vessel; see A. Chase 1994: 167-169). Four of the burials with cylinder tripods occur in the epicenter of the site and the other five are associated with residential groups. Three different interments with cylinder tripods were recovered from an excavation into Structure C47, approximately 600 m south of the epicenter (A. Chase and D. Chase 2014). The earliest deposit was a tomb that contained a series of smaller artifacts (including a 16.4 cm long jadeite tube) and 8 ceramic vessels (Figure 5), 2 of which were cylinder tripods. Perhaps the most spectacular vessel in this residential tomb was a brown-ware bowl with 6 incised glyphic cartouches (A. Chase and D. Chase 2014: figs. 122a and 123). The glyphs are of an early style but may refer to an early form of a
primary standard sequence, iconographically signal creation mythology; they also appear to document the unknown site of “Bital” (see also A.Chase et al. 1991:10). Other vessels in this deposit included a polychrome jar, a tripod footed hemispherical bowl with a bird in its interior (similar in form and type to vessels in a tomb and an interment at Tikal; see Culbert 1993: figs. 29c-g and 32c), and a truncated black goblet. The tomb was also directly associated with a hidden Early Classic cache that contained a small lidded urn inside two lip-to-lip vessels; inside the urn were 2 shell Charlie Chaplins, 1 drilled flamingo-tongue shell, 3 beads (one each of shell, bone, and jadeite), and 2 jadeite chips. The second crypt in Structure C47 had clearly been re-entered, as indicated by the inclusion of 14 finger bowls in the fill of the burial, but contained 5 Early Classic vessels: 2 cylinder tripods, 1 basal-flanged bowl, 1 deep bowl, and 1 shoe-pot (Figure 6). An extensive caching deposit that included part of a large ceramic figurine among the finger bowls had been placed above the third Early Classic crypt, signaling a re-entry here as well. This third Early Classic burial was associated with 1 cylinder tripod, 4 bowls, and 5 dishes; the upper portion of this infilled crypt had been used to place a Late Classic burial with two pottery vessels accompanied by 2 small cache pots. A very late polychrome lidded cylinder tripod with 3 bulbous feet was recovered in Structure B42 in a residential group in association with 5 polychrome bowls and 3 lateral flanged ring-base dishes (Figure 7; A. Chase and D. Chase 2005b: fig. 18); these materials are transitional into the Late Classic Period.

A large number of Early Classic caches have also been recovered both in the epicenter and in residential groups. This includes the one hidden in the tomb wall mentioned above; two other lidded urns of Early Classic date were recovered above this same residential tomb.
Early Classic urns associated with Charlie Chaplin figures have been recovered from 3 widely spaced residential groups (e.g., A. Chase and D. Chase 2006:44; Lomitola 2012) as well as from four different structures in the site epicenter (e.g., A. Chase and D. Chase 2005a:31). It is suspected that an urn recovered in Tulaktuhebe with a painted Principle Bird deity on its interior lid and a dead corn god on its interior base also dates to the Early Classic (A. Chase and D. Chase 1987: fig. 41a,b,c). Another Early Classic deposit from Structure D1 consisted of the burnt remains of 14 ceramic vessels (10 large Aguila Orange flaring walled bowls and 4 polychrome ring-based dishes) in association with 2 limestone bars, 1 partial jadeite bead, 1 polished piece of jadeite, 16 obsidian lancets, and 25 obsidian blade fragments (A. Chase and D. Chase 2007: figs. 81-83). An even more spectacular cache consisted of an Early Classic tripod cylinder with a polychrome scene of 3 figures (figure with feather offerings; prisoner; warrior) on the cylinder and a polychrome lid with a deity-head handle (Figure 8); this vessel, excavated during the 2017 field season in Structure I28, had been
re-purposed in the fill of a Late Classic
construction.

Conclusion

Three inter-linked issues have hampered a full understanding of the Late Preclassic to Early Classic transition: the interpretation of exotic ceramic forms and decorations; preconceived temporal barriers; and, limited sampling. The exotic forms and decorative modes led to an early ceramic definition of the Q Complex, interpreted as a set of specific ceramic forms introduced to the Maya area from elsewhere (Vaillant 1924). The limited occurrences of this complex led to its association with Maya elite and an early consideration of these materials as being class-linked (e.g., Lincoln 1985), thus providing an easy explanation for why so few primary deposits have been excavated.

The Protoclassic was a time of great experimentation in ceramic forms, decorations, and slips that crossed perceived temporal boundaries. Because of limited contextualized and stratified deposits, materials found in secondary fill contexts were often pre-assigned to temporal associations, thus aggravating any attempt to better understand ceramic traditions. Although the Late Preclassic type Sierra Red was recognized as extending into the Early Classic and orange-wares were recognized as existing in the Late Preclassic relatively early (e.g., A. Chase and D. Chase 1983; Ciudad Ruiz 1988:95; Graham 1986; Kosakowsky 1982: 34-35, 1987:82), the formal sorting of sherds from secondary fill contexts tended to reify the rigid boundary that was perceived between the Late Preclassic and the Early Classic Periods, as there was no way to be sure that the correct temporal frame was selected. Thus, specific ceramic forms were provided with inferred temporal meaning, regardless of context and associations.

The true transition from Late Preclassic to Early Classic was a palimpsest of ceramic forms and decorative modes. While there is some temporal faceting (Brady et al. 1998), it is largely a single temporal period with great fluidity in ceramic forms and decorations. New ceramic trends occur at the end of the Late Preclassic Period that become more codified in the early part of the Early Classic Period with the introduction of true polychrome and large mammiform tetrapod dishes, plates, and deep bowls. Sierra Red versions of these vessel forms also occur in the early part of the Early Classic Period. The middle part of the Early Classic Period is also characterized by a wide diversity of ceramic forms, but the prominent form is a basal-flanged bowl. What the data do suggest is
that mammiform tetrapod plates were replaced in burial contexts by basal-flanged bowls. Cylinder tripods characterize the latest part of the Early Classic Period, especially in monochrome slipped form. However, more elaborately decorated cylinder tripods appear earlier and are not restricted to the latest part of the Early Classic Period. Thus, the latter half of the Early Classic does not break with ritual traditions as was argued for by Krejci and Culbert (1995: 114).

The distribution of the Caracol Protoclassic and Early Classic ceramic forms indicates that these items were widely available to the inhabitants of the site and were not restricted in their distribution. However, there is a gradient in status and wealth that can be seen in the data. The Caracol “Late Preclassic” burial that contained 32 vessels is the richest known interment for this temporal era in the Southern Maya Lowlands (based on data in Krejci and Culbert 1995). The upper tomb in front of Structure A6 contained 26 vessels dating to the later part of the Early Classic Period, signaling the wealth of its occupant(s). Both of these interments indicate that the highest elite were likely associated with the Caracol epicenter. But, the presence of Protoclassic and Early Classic ceramics in special deposits throughout the site also suggests that these items were generally available to the rest of the population and not restricted in distribution. Significantly, residential groups that were occupied in the Early Classic Period continued to be utilized into the Late Classic Period and the mix of ceramics from interments placed during this later interface also evince a great fluidity in ceramic forms, similar to what occurred during the earlier conversion. Thus, the archaeological data from Caracol help to demystify the transition from the Late Preclassic through the Early Classic Periods.

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2 EXPANDING SUB-PLAZA EXPLORATIONS OF MIDDLE PRECLASSIC ARCHITECTURE AT THE SITE OF PACBITUN, BELIZE

George J. Micheletti, Kaitllin E. Crow, and Terry G. Powis

Since the mid-1990s, large-scale excavations have focused on documenting the Middle Preclassic period at the ancient Maya center of Pacbitun. Our investigations at Pacbitun have continued to reveal supporting evidence of earlier development of social complexity than was previously conceived. Pacbitun’s Middle Preclassic saga begins in the 9th century BC with the construction of apsidal structures in Plaza B. By the late Middle Preclassic (600-300 BC), these initial platforms were replaced by sturdier rectangular architecture. Through this transition, both forms of architecture are thought to function as workshops where an intensified and increasingly standardized production of shell beads had developed from the previous facet. Occurring simultaneous to Pacbitun’s successful economic enterprise, the construction of a large plastered platform built in the adjacent elevated plaza, Plaza A, reveals the development of public ritual at the site. The recent discovery of this late Middle Preclassic platform, El Quemado, has added the final sociopolitical element to support Pacbitun’s early advancement in the Middle Preclassic period. Our investigations during the 2017 field season aimed to gather more information on the installation and progression of the social, economic, and political institutions as we attempted to better understand the relationship between each of them.

Introduction

The Preclassic period for the Ancient Maya is thought to have brought about an era of drastic social development. During the Early Preclassic (1800-1000 BC), groups of people began to establish residences in the interior of the Southern Maya Lowlands. Sustained agricultural settlements of the Middle Preclassic (1000-400 BC) period would eventually lead to population growth and the emergence of observable societies increasing in complexity. At the ancient Maya site of Pacbitun, Belize, the mechanisms of advancing complexity in the Middle Preclassic are present in the form of utilitarian and ceremonial architecture, and the evolution of a budding economic enterprise.

Nearly three decades of investigations have worked to unearth a modest Middle Preclassic community which lay hidden beneath the central plazas of Pacbitun’s site core. The initial discovery of this early community in the 1990s found several rudimentary platforms buried beneath Plaza B. Modifications to these structures amid the Middle Preclassic suggest that Pacbitun underwent a significant architectural and orientational transformation - one which helps to divide this period into an early and late facet. Found amongst these structures, a myriad of shell fragments and lithic tools associated with shell bead production is indicative of an organized economic establishment at Pacbitun.

Although our initial perception believed this early community to be simple in terms of social complexity, it would be forever altered after the more recent discovery of El Quemado (Q), a large ceremonial platform found buried beneath the northern end of Plaza A. Excavations dating back to 2013 have systematically unearthed the massive platform in an effort to reveal the structure’s configuration and architectural design. With a better understanding of Q, we believe the structure has the potential to not only supplement what we know about the socioeconomic affairs of Pacbitun, but also introduce a previously unknown ceremonial dimension that may hint at the advent of sociopolitical organization at the site during the Middle Preclassic period. However, before we can fully comprehend these larger social concepts, there are impending enquiries concerning both plazas, and the Middle Preclassic architecture that needs to be resolved.

Regarding Plaza B, considerable evidence has been discerned about the production aspect of this early community space; yet, very little information has been found to determine the residential status of the sub-plaza structures. Were these platforms solely used for manufacturing shell beads, or did they also...
function as domestic space? In Plaza A, the inimitable nature of El Quemado is justification enough to continue our intensive explorations to enhance what we know about Pacbitun’s Middle Preclassic period. Our thorough investigation of Q has enabled us to study details such as construction methods, and materials used, providing insight into the origins of this platform. Moreover, analyzing the desecration and burial of Q, and the construction of Plaza A, has also contributed information concerning the termination and abandonment of the platform. Unfortunately, this damage has also hindered our efforts to understand the architectural dimensions and plaza configuration and may have destroyed crucial evidence concerning the structure’s purpose. With little to no evidence indicating the ceremonial function or political meaning, the structure’s plaza position and orientation may prove to be vital clues to understanding its presence at Pacbitun.

Thus, in seeking answers for the uncertainties in Plaza A and Plaza B, the excavations of the 2017 field season set out to expand our investigations from these previously explored areas associated with Pacbitun’s Middle Preclassic community. In Plaza B, excavations were expanded to the west of the late Mai phase (600-300 BC) platform, Sub-Structure B-2, to further expose its contemporaneous neighbor, Sub-Structure B-3. Our preliminary analysis of the artifacts recovered from the 2017 excavation of B-3 suggest this platform was also involved in shell bead production and did not exhibit any evidence of a residential component. Beneath Sub-Structure B-3, our investigations would also unearth more of the early Mai phase (900-600 BC) platforms, Sub-Structures B-1 and B-4, as well as a third platform (Sub-Structure B-16), belonging to the same phase. All three platforms have offered new information concerning the layout and function of these early structures. In Plaza A, explorations were directed towards the unexplored areas on the west and north sides of the building. At the culmination of our fifth and final year of excavating El Quemado, we were finally able to ascertain the platform’s dimensions and confirm the structure’s south-facing theme after locating the northwest corner and northern facade of the structure. The discovery of another feature on the northside of the structure has also added to what we know about the architectural design of Q.

The Site of Pacbitun

Pacbitun is a medium sized site located on the southern limits of the Belize River Valley. Situated between the foothills of the Maya Mountains and the lowland tropical forest, Pacbitun straddles two ecozones creating a unique contrasting environment that would have offered a multitude of diverse resources. Situated around the site’s five main plazas (Plaza A-E), 41 masonry structures are densely constructed within the 145,000 square meter limits of the site core (Healy 1990:250; Figure 1). Plaza A and Plaza B have been identified as the location of Pacbitun’s original settlement dating as far back as 900 BC. These two plazas continued to flourish as the communal hub until the site’s presumed abandonment in AD 900. Several causeways lead from Pacbitun’s site core out into a periphery that is laden with house mounds and minor centers found amongst countless agricultural terraces (Healy et al. 2007; Weber and Powis 2010). Karstic landmarks such as sinkholes, rockshelters, bedrock outcrops, and caves are found throughout the region, but are most prevalent in the southern and eastern areas of the periphery zone (Spenard 2014; Spenard et al. 2013).

The Middle Preclassic Settlement in Plaza B

Extensive investigations in and around Pacbitun’s site core have been ongoing, sporadically, since the 1980s. Early excavations, conducted by Paul Healy of Trent University, primarily studied the monumental buildings in the core that were initially constructed during Pacbitun’s Puc phase (300-100 BC) and modified up until the site’s fall in the Tzib phase (AD 800-900) (Healy 1990; Healy et al. 2004). Though Healy (1990:256) ceramicly identified a Mai phase (900-300 BC) occupation at the site, the potential scale and significance of this early inhabitation would not be recognized until the mid-1990s when multiple sub-plaza platforms were discovered beneath a thick midden deposit that forms the surface of Plaza B (Hohmann 2002).
Aside from radiocarbon dates and ceramic analysis, two distinct construction patterns, and a shift in orientation, have helped to divide Pacbitun’s Mai phase into early (900-600 BC) and late (600-300 BC) facets. Associated with the early Mai phase (600-300 BC), Sub-Structure B-1 (B-1) and Sub-Structure B-4 (B-4) were found just above bedrock and are simple constructions composed of a shallow, two-course high foundation made of roughly-shaped limestone blocks and filled with tamped marl. A meter-wide alleyway containing the same tamped marl surface also appears to separate the B-1 and B-4 platforms. Interestingly, the orientation of these two platforms, running in a northeast to southwest direction, is unlike any other found at Pacbitun. Once both early structures are abandoned however, their late Mai phase (600-300 BC) replacements, Sub-Structure B-2 (B-2) and Sub-Structure B-3 (B-3), were constructed directly overtop and oriented slightly west of north – a pattern that
Expanding Sub-Plaza Explorations of Middle Preclassic Pacbitun

would persist throughout the site’s existence (Figure 2). Aside from the contrasting orientation, the later platforms are larger and well-constructed when compared with their predecessors. B-2, initially explored in the 1990s and revisited after the inception of PRAP in 2008, measures 8.3 m (east-west) by 5.5 m (north-south).

Despite the physical discrepancies between B-2 and the two early Mai phase structures, each platform appears to share one significant commonality. Associated with each structure, dozens of chert microdrills and burin spalls were found amongst thousands of marine shell artifacts representing all stages of shell bead production (Hohmann 2002; Powis 2009:11; Powis 2010). Over 3000 shell beads and 1500 pieces of shell detritus were recovered during excavation of B-2 in the 1990s. Another 2000 shell beads and 1500 shell detritus were also recovered from the 2009 excavations (Powis 2009:11; Powis 2010:14). The majority of shell found during these previous field seasons were determined to be a non-local marine shell which would have required extensive trade connections to obtain from the coast (Hohmann 2002; Powis 2009; Powis 2010).

The 2017 Excavations in Plaza B

Excavations in Plaza B had two main objectives. Our first goal was to expand outward from the previously excavated shell bead workshop, B-2, to expose the neighboring platform, B-3. In doing so, the artifacts associated with B-3 could be analyzed and compared with those found in B-2, helping to determine if the structure’s function was associated with shell bead production or if it was used for another purpose (i.e., residential). Directly beneath B-2 and B-3, excavations would also further expose the early Middle Preclassic constructions, B-1 and B-4.

At the beginning of the season we removed a large portion of backfill from the previous excavations of B-2 in Plaza B. Once this was done, the eastern wall of B-3 (running parallel to the west wall of B-2) and its southern wall, could be uncovered in a similar manner as the previous 2008 and 2009 investigations. To reach the depth of the platforms, we would need to excavate through a Middle Preclassic midden known to extend across Plaza B into the neighboring courtyards to the south and Plaza D to the north. The midden covering B-2 measures about one meter in thickness but began to rapidly thin out towards B-3, approximately one meter to the west, measuring around 20-30 cm in thickness. This is a drastic change in a very short space suggesting that the midden may continue to taper down to the west in Plaza B.

Once the level of B-3 had been reached, excavations continued to the west along the southern wall to expose the platform’s southwestern corner thought to be located in 2008. Excavations would also move north along the eastern wall of B-3 in search of the structure’s northeastern corner. Units were placed under the impression that the northeastern corner of B-3 would align with the northwestern corner of B-2, a common pattern in Plaza B (Hohmann 2002: 186; Powis 2009: 10). This assumption would initially lead us to believe that B-3 would be much smaller in size compared to B-2. However, after excavations extended approximately 5.6 m to the north, B-3 did not turn to the west but would continue to the north for another 3 m, bringing the total length of the western wall to 8.6 m (north-south). Thus, B-2 and B-3 both measure about 5 m by 8 m. However, the length of B-3 runs north-south, set at a rotational difference of 90 degrees from B-2. B-3 measures 4.7 m east to west and 8.6 m north to south. Whereas, B-2 measures 8.25 m east to west and 5.5 m north to south (Hohmann et al. 1999:20).

Similar to B-2, the interior floor of B-3 is made of a tamped marl surface. Unlike the plaster surfaces of Plaza A, the marl floors of Plaza B were more susceptible to embedded artifacts (Powis 2010: 15). The floor of B-3 measured around 20-30 cm in thickness and contained a variety of artifacts including ceramics, shell beads, chert drills, greenstone, and obsidian. Specifically, 192 shell beads, 658 shell detritus, and 19 chert drills were recovered from B-3. The floor also contained a high density of jute.

Interestingly, the limestone walls of B-3 rests directly upon the walls of the early Middle Preclassic platforms, Sub-Structure B-1 and B-4. Unlike the late Mai (600-300 BC) platforms,
these walls run northeast to southwest beneath B-2, B-3, and their shared alleyway. This is not where the differences stop however. Excavations would reveal that B-1 and B-4 do not have corners but are actually ovoidal or apsidal in shape (Figure 3). Each platform is crudely constructed and unique when compared to other similarly shaped structures, such as those found at Cuello in northern Belize, constructed at about the same time (Hammond et al. 1991). The floors of B-1 and B-4 are also tamped marl and contain a variety of the same artifacts as B-3; however, the early floors are much thinner, measuring around 5 cm thick. Both early platforms appeared to be constructed just above a modified and leveled bedrock surface.

The rounded western ends of B-1 and B-4 begin to turn beneath the southeastern portion of B-3. As our excavations continued to expand to the west, another platform was discovered running beneath the western portion of B-3. Designated as Sub-Structure B-16, the third early Middle Preclassic platform also appears to be ovate or apsidal in shape (Figure 4). However, the length of B-16 runs north-south as opposed to the northeast to southwest orientation of the other early Middle Preclassic structures. Aside from the orientation, B-16 shares all the same characteristics as B-1 and B-4 including the floor thickness and artifact assemblage. Recovered from the early Middle Preclassic structures were 487 shell beads, 1280 pieces of shell detritus, and 16 chert drills.

Excavations into Plaza B have illustrated that, between the construction of the early and late Middle Preclassic platforms, the production of shell beads appears to be a constant theme. In the early Mai phase (900-600 BC) orientation seems to vary, while in the late Mai phase the architecture appears to be consistently oriented north-south. The later buildings were also better constructed compared to those of the previous era. Both early and late platforms in Plaza B were, however, separated by one-meter alleyways (Figure 5). Moreover, there does not seem to be any apparent change in artifacts from one period to the next, nor from one platform to another. However, the shell beads recovered from B-2 demonstrate a refinement in production, with the beads becoming smaller...
and more standardized (Hohmann 2002:201). It should be noted that while these refined beads were found in B-3, there were fewer in number compared to those recovered in B-2 (Figure 6). *Jute* was equally abundant in both the early and late Middle Preclassic structures. Over 85,000 complete or mostly complete *jute* were recovered during the 2017 field season.

**Plaza A and the Middle Preclassic Platform, El Quemado**

In 2013, the monumental platform El Quemado (otherwise known as Q), was discovered beneath Plaza A while investigating an anomaly previously detected by GPR (ground penetrating radar) (Figure 7) (Skaggs et al. 2014). Sitting meters beneath construction fill, Q’s discovery sparked several successive years of excavations to expose as much of the building as possible (Davis et al. 2015; Micheletti et al. 2016; Micheletti et al. 2017; Skaggs et al. 2014). Radiocarbon dating frames the platform’s existence within the late Mai phase (600-300 BC) with its construction commencing around 550 BC and its burial occurring around the onset of the fourth century BC. The name “El Quemado, meaning “the burned one,” was given due to the structure’s heavily burned plaster surface as a result of either long-term burning practices or one single termination event before its burial. The latter is further supported by additional destruction in the form of defaced stairs, armatures, and possibly even masks as well as the removal of plaster from the corners and sides of the building.

The first three years of excavation focused on the structure’s south face which uncovered a central staircase flanked by a pair of upper and lower armatures protruding from the sixth step and third step respectively. With the southern side of the structure fully exposed in 2015, based on the attributes of the stairs, we were able to hypothesize that Q was either a radial pyramid or a south-facing structure. If Q was radial, the north, east, and west sides would be roughly identical to the layout of the southern stairs. On the other hand, if Q was a south-facing structure, the southern stairs would be unique from all other sides. However, because the Maya predominantly constructed symmetrically, as a south-facing structure, the eastern and west ends would be similar to one another. Thus, to determine Q’s architectural configuration, the east and west ends of the platform were the most logical areas to excavate in 2016.

Excavations near the east end of Q were by far the most extensive and would almost completely expose this side of the structure by
the end of the 2016 field season (Figure 8). As
the excavation progressed, it was clear that the
east side was not constructed in the same manner
as the southern stairs, meaning that Q was not a
radial pyramid. Though much of the summit
appeared to be dismantled, the structural
integrity was still present to show that Q’s east
side is a steeply inclined wall standing
approximately 2 m tall that was mainly
composed of large cut limestone blocks. All
plaster had been removed from the upper half of
the structure in antiquity revealing what
remained of the stone-robbed wall that once
formed the eastern summit. The lower half
however, was still heavily plastered over. One
distinct rectangular feature, simply referred to as
an appendage due to its functional ambiguity,
protrudes out from the wall about 1 m to the east
and is positioned about 4.5 m from the
southeastern corner of Q. The appendage,
measuring 2 m in length (north-south) at its
base, had also been partially destroyed making it
difficult to determine the feature’s true height.
Due to time constraints, efforts to expose the
west end of Q we were only able to unearth the
upper half of the southwestern corner which had
also been stripped of its plaster facade.

Though it would seem, through a process
of elimination, that Q could definitively be
categorized as a south-facing structure,
excavations were not able to locate the
appendage feature on the west side to confirm
this hypothesis. Furthermore, excavations had
yet to locate the north corners or north face of Q
to allow us to determine the north-south
dimensions of the structure. Thus, the 2017
excavations were set to continue to explore on
the west and north sides of Q. Our extensive
investigation of the west end would not only
search for a better-preserved wall and appendage
feature but would also attempt to finally locate a
northern corner. Although the northern
excavations on the centerline of Q appeared to
be fruitless in 2016, a cut stone alignment found
in a unit beneath Structure 3, the northern
structure in Plaza A, would justify revisiting this
location as well.

The 2017 Excavations in Plaza A

After removing backfill from the 2016
excavations of the western wall of El Quemado,
the 2017 units were set to follow the cut stones
of the wall from the summit down in search of a
preserved plaster plaza floor. Similar to the
eastern wall, the plaster had been removed from
the upper half of the western wall but remained
intact near the base. As anticipated, soon after
we had located the lower plaster facade of the
wall, a western appendage mirroring the eastside
appendage was encountered. Located
approximately 4.4 m from the southwest corner
of Q, the western appendage was much better
preserved than its eastern counterpart. Though
the top had been destroyed, much of the plaster
surface still coated the sides of the appendage.
Continuing to follow the well-preserved lower
facade down to the base of the structure, the
plaster surface would eventually lip away from
the building horizontally and continue
seamlessly as the structure’s plaza floor.
Moving north, though much of the western wall had been left intact, the upper half of the structure near the northwest corner appeared to have been stone-robbed in antiquity. As excavations continued to the north, approximately 3.6 m north of the westside appendage, the northwestern corner was finally located. Thus, from the northwest corner to the southwest corner, the main platform of Q measures roughly 10.5 m (Figure 9).

Noteworthy, excavations near the southwestern corner at the base of Q discovered an east-west alignment of nicely cut stones (Figure 10). Running beneath Q, the three-course-high cut stone alignment was clearly below the level of the platform’s plaster plaza floor suggesting that this structure predates the construction of Q. Interestingly, excavations in Plaza A in 2014 found the corner of a similar sub-plaza construction in front of Structure 5 at about the same depth (Micheletti 2016). Though the function of these structures is not yet known, their construction and elaboration greatly exceed the platforms of Plaza B.

Shifting to our explorations of Q’s north side, after removing backfill from our previous excavations beneath Structure 3 on the centerline of the platform, our investigations of an east-west cut stone alignment was determined to be one of the many task units thought to support the massive amounts of fill brought in to bury Q and build up Plaza A. However, while exploring on the south side of the task unit, a third appendage protruding from the northern facade of Q was discovered. Because excavations had initially exposed the east side of the appendage, we were able to easily locate and uncover a small section of what little remained of the plaster surface at the base of the north side of Q to the east of the appendage (Figure 11). Excavations of the northside appendage proved to be difficult as the preservation was extremely poor. Although time impeded our attempt to further explore this feature, as the season drew to a close, we were able to determine that the appendage was much longer than those on the east and west sides of Q, approximated to be nearly 3 m in length.

Finally, with all four sides of Q located, we have determined the full length and width of Pacbitun’s Middle Preclassic platform. Measuring east to west, from appendage to appendage, Q is 31.5 m long stretching across Plaza A from the northeastern corner of Structure 2 to the base of Structure 4. North to south, from the northside appendage found beneath the base of Structure 3 to the foot of the southern staircase nearly extending to the center line of Structure 2, Q measures 20.4 m wide. The western and northern excavations of Q were also able to solidify Q’s configuration as a south-facing structure.

**Conclusion**

The 2017 excavations in Plaza A and Plaza B have both confirmed and altered our interpretations of these areas, helping to unravel more of the Middle Preclassic story of the Maya at Pacbitun. Sometime after the initial settlement of the site, at least three crudely constructed early Mai phase (900-600 BC) apsidal platforms set at two different orientations were used as work space for the production of shell bead accessories. The onset of the late Mai
phase (600-300 BC) appears to issue in a new ideology expressed in the construction of several rectangular platforms oriented with the cardinal directions. Whatever the cause, it clearly had no influence over shell bead production. In fact, the industry seems to intensify and become standardized as evinced in the late Mai platforms, B-2 and B-3. Although the later constructions are slightly improved, this space continues to be a nonresidential area designated for craft production. Where then, were these specialized craftsmen living and what was their social position at Pacbitun? It is difficult to answer one of these questions without knowledge of the other. Can we even safely assume that the economic organization at Pacbitun had created social divisions? Though it is still difficult to answer this question with certainty, the argument supporting a social dynamic at the site has become more conceivable after the discovery of the monumental platform, El Quemado.

Due to the abundance of cultural materials associated with the platforms in Plaza B, our current understanding of the Middle Preclassic activities in this plaza greatly exceeds what we know about the happenings of the large ceremonial platform in Plaza A. However, we do know that Q’s construction, a project unlike any other previously undertaken at Pacbitun, coincides or closely follows the late Mai phase (600-300 BC) architectural shift in Plaza B indicating that the site was far more socially advanced than the crude production platforms had let on. The monumental platform, now known to measure 31.5 m (east-west) by 20.4 m (north-south), would have needed a large, organized labor force derived from the surrounding local community. With Q representing the first of its kind at Pacbitun, the project would have also needed skilled personnel for specialized tasks, and planners to generate and engineer an architectural design. Furthermore, something can also be said about the platform’s south-facing configuration. Q, built by and for the community, lacks any form of superstructure suggesting that the platform’s activities were meant to be visible to a public audience. Might Q have functioned as a south-facing stage for ritual/ceremonial performance? If so, with the recent architectural shift in orientation emphasizing the cardinal directions, could its northern position, as viewed by the audience, and/or the northern backdrop signify a cosmological or mythological significance? Regardless of its precise function, the ceremonial nature of Q adds to the list of attributes that have helped to categorize Q as monumental architecture. Thus, Pacbitun’s late Middle Preclassic community, equipped with an organized economy, community, and ceremonial center, appears to demonstrate the emergence of political organization as well.

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3  EXPLORING CHANGES IN ACTIVITIES IN MAYA E-GROUPS: ARCHAEOLOGICAL AND GEOCHEMICAL ANALYSIS OF E-GROUP PLASTER FLOORS AT ACTUNCAN, BELIZE

Borislava Simova, E. Christian Wells, David W. Mixter, and Lisa LeCount

E-Groups were among the first monumental spaces constructed in Preclassic Maya centers and served as important venues for negotiating social interactions and political integration among newly settled peoples. The activities and beliefs associated with these ritual complexes were integral in shaping Preclassic societies and later reorganizing them in the Classic period. Because Preclassic E-Groups persisted on the landscape over long periods of time, understanding the structure of and changes in activities occurring within them becomes critical for understanding large-scale change in not only ideology, but also social and political practice. Geochemical analysis of occupation surfaces offers a means for supplementing data from punctuated archaeological remains with microscopic residues from recurring or cyclical ritual activity occurring within such complexes. In this chapter, we present archaeological and geochemical data from five sequential occupation surfaces from an E-Group complex at the site of Actuncan, Belize, spanning the Late and Terminal Preclassic Periods (300 BC-AD 250). Results indicate persistent use of food and drink in conjunction with intermittent symbolic deposits, which, though showing gradual shifts over time, did not give way to exclusionary displays of authority.

Introduction

Ritual served a vital function in the construction of both public and private spaces across the Maya Lowlands. We come to understand the role of ritual in the past through architectural elaborations, burials, and monuments, which demonstrate substantial labor and material investment. However, constructions of ritual buildings, caches, and monuments were often large-scale and intermittent, commemorating calendrical cycles or important events. Their presence in the archaeological record not only indicates gatherings and performances occurring in conjunction with such events, but also a myriad of other ritual practices known to occur from ethnographic and ethnohistoric accounts. However, these generally involve the use of perishable structures and goods, burning, prayer and processions, all of which are difficult to examine archaeologically. As ritual complexes, such as Preclassic E-Groups, persist on the landscape over long periods of time, the shifts in activities occurring within them become critical for understanding large scale change in not only ideology, but also social and political practice. In this paper, we use geochemical analysis to supplement archaeological data on ritual activity within the E-Group complex at the site of Actuncan, Belize.

E-Groups have a long history of investigation in the Maya archaeology. Their iconic form with an eastern range structure and western radial pyramid, first systematically examined at the site of Uaxactun, is ubiquitous throughout the Lowlands. Recent research demonstrates their connections to the origins of social complexity in the Maya Lowlands, ca. 1000 B.C. to 800 B.C. (Estrada-Belli 2011; Inomata et al. 2013; Freidel et al. 2017). Many are also linked to shifts in sociopolitical organization in the Classic period, as the ritual spaces were appropriated for political display in the form of carved monuments and royal burials (Freidel and Schele 1988; Aimers and Rice 2006). Although many aspects of the architecture and deposits found within them point to the ritual functions of E-Groups (e.g., Aveni and Hartung 1989; Aveni et al. 2003; Estrada-Belli 2012; Aoyama et al. 2017), little direct evidence of activity has been recovered from these complexes. Bridging the gap between foundational caches and royal burials using more direct proxies of recurring activities will allow researchers to more explicitly link the changing uses and meanings of this pervasive and important complex to sociopolitical shifts occurring at many sites across the Lowlands.

Geochemical analysis offers a means for supplementing understanding of punctuated archaeological remains with that of repetitive, or cyclical ritual activity occurring within such complexes. Over time, occupation surfaces accumulate trace amounts of chemicals from
activities such as food processing, burning, and even storage of certain materials. With repetitive occurrence, these residues are more likely to preserve at detectable levels over long periods of time (Middleton and Price 1996). Multi-elemental characterization of floors allows us to examine the use of space even in the absence of artifacts. In this chapter, we present results from the geochemical analysis of five plaster floors from the Actuncan E-Group, in conjunction with architectural and artifact data. When taken together, these analytic techniques improve our detection and understanding of prehistoric activity, allowing us to address recurring performance within the complex and relate it to ideological and political shifts occurring in the Preclassic period.

**Actuncan’s E-Group in Context**

Actuncan is a ridgetop site, located on the bank of the Mopan River, in western Belize (Figure 1). It was originally occupied around 1000 B.C. and abandoned in the Early Postclassic period (A.D. 1000-1250) (McGovern 2004; LeCount and Blitz 2001, 2012; LeCount and Keller 2011; LeCount 2013). Many of its key ceremonial and civic structures, including the triadic group of Actuncan South and the E-Group of Actuncan North, were established in the Preclassic period (Figure 2). These architectural features, as well as large stucco masks and a carved stela, suggest the adoption of divine kingship at the site during the Terminal Preclassic Period (100 B.C. - A.D. 300). In the Terminal Postclassic period (A.D. 780-1000), following the decline of Classic kingship in the Lowlands, local power at the site was re-centered through the construction of a new civic center and resignification of long-lived buildings (Mixter et al. 2014, LeCount et al. 2011, Simova et al. 2014).

The Preclassic E-Group, located on the northwest ridge of the Actuncan site core, was among the earliest structures established at the site. Comprised of an elongated eastern platform and western radial pyramid flanking a plaza, the E-Group remained in use into the Early Classic period (A.D. 300-600) and served as the site of ritual commemoration in the Late Classic (Donohue 2014). Current understandings of its construction and occupation history closely align with interpretations of E-Groups as places of communal, integrative rituals (Chase and Chase 1995; Aimers and Rice 2006).
E-Groups have a long history of investigation in the Maya Lowlands. Early discussions of activities within E-Group largely focused on its functions as a solar observatory (Laporte and Fialko 1990, 1995; Aveni and Hartung 1989; Aveni et al. 2003). From these observations, the link was drawn to celebrations of agricultural cycles (Aimers 1993, Stanton and Fridel 2003). Recently, greater attention has been given to the early emergence of the complex, associating it with the Middle Preclassic to Late Preclassic transition (ca. 1000 – 800 B.C.) and the emergence of many markers of Maya social and political complexity. In this light, E-Groups have been discussed in relation to placemaking-activities, community-building, and new patterns in interregional interactions and sedentism (Estrada-Belli 2011, 2012; Inomata et al. 2015, 2017).

Both integrative and exclusionary practices appear central to the interpretation of these spaces. Their ability to unite dispersed populations (Estrada-Belli 2012) is often intertwined with the strategic manipulation of valuable materials and labor. Given Classic period patterns, it is not surprising that many scholars attribute activities of emerging elites to the early E-Groups (e.g., Aoyama et al. 2017; Rice 2015). Excavations within the eastern platform of Actuncan’s E-Group lend evidence to suggest a different trajectory, one where the communal liturgical functions persist throughout the history of the E-Group. In cases such as this, apparent similarities in Preclassic activities must be interrogated more closely to determine where critical differences alter the meanings and activities of the E-Group complex in the Classic period.

While there is a consensus E-Groups formed an important ritual space, critical to the creation of Preclassic communities, a clearer understanding of the specific nature of ritual activities that occurred within them is necessary. To supplement traditional archaeological evidence of ritual, and further understand the kinds of activities that occurred at Actuncan’s E-Group and how they might have changed through time, we conducted geochemical analysis of five sequential occupation surfaces on the summit of the eastern range structure. But before moving into the chemical analysis, I will provide an overview of the construction history of the E-Group complex, based on two seasons of excavations into the eastern platform (Str. 26), its central shrine (Str. 27), and the western radial structure (Str. 23).

**Construction Phases**

Excavations in the Eastern platform revealed three distinct phases of construction, beginning with a Cunil Earthen platform (Str. 26-sub-2), a Late Preclassic clay and cobble platform (Str. 26-sub-1), named Brown Jay Platform, and a Terminal Preclassic masonry platform (Str. 26), named Owl Platform (Figure 3). A Bayesian model incorporating nine
radiocarbon dates, LeCount’s ceramic seriation work, and the structure stratigraphy have provided a better understanding of the timing of these constructions (see LeCount et al. 2017). Mixter’s work with Bayesian modeling has helped narrow down the dates of construction events on the range structure and additionally provided some interesting conclusions about the timing and pace of construction.

The most unusual aspect of the complex is the Earthen Mound, (Str 26-sub-2) below the range structure. It consists of about a half meter of redeposited clay with artifacts. We located a foundational cache of Cunil ceramics with remnants of burning within the mound, dating to ca. 1000 B.C. Given the limited exposure of the construction, we cannot ascertain the form of the mound, whether it was circular, pyramidal, or elongated like later versions of Structure 26. What it does indicate is an early occupation and significance of this ridgetop location to Middle Preclassic populations at the site.

The Cunil Earthen Mound was partially buried under a large cobble fill, which appears to have extended the ridgetop to the east prior to the next construction. The subsequent Late Preclassic Brown Jay Platform (Str. 26-sub-1) has a central platform constructed out of brown clay with occasional yellow clay lenses, fronted by small cobble walls (Figure 4). The platform was raised, a series of small terraces were added to its western façade, and unusual linear cobble features were constructed on its summit in the second phase of this construction. A potential third phase was likely also present, burying this architecture, but later constructions appear to have cut into its terraces, leaving only the brown clay with yellow lenses.

The subsequent Owl Platform (Str. 26) represents a substantial shift in architectural techniques and style occurring in the Terminal Preclassic period. It features six masonry staircase constructions and nine summit plaster floors, whose constructions span from about 200 B.C. to A.D. 260 based on constrained Bayesian modelled dates (LeCount et al. 2017). However, plaza modifications at the base of the structure continued into the Early Classic. During this time frame, we see shifts in the style of architecture and substantial reworking of the platform, particularly in the staircase. Rather than burying previous steps to expand the size of the structure and build fresh, sections of the existing staircases appear to be added on to, cut into, and even reused. In the earliest staircase, the stonework is consistent, making use of small dressed limestone blocks. Over time, stone size becomes variable and more, larger blocks begin to be incorporated into the construction (Figure 5). We also have some indication of a shift in the pace of construction of the summit floors. Using the difference function on the Bayesian model constructed in OxCal 4.2 (Bronk Ramsey 2009), Mixter indicates that 5 to 110 years passed between the construction of the first six summit floors, for an average of 1 to 22 years between floor constructions. In contrast, the last three summit floors were built over a period of 215 to 441 years, for an average of one floor built every 72 to 147 years. Our chemical analysis of activity areas is currently limited to five of the first six summit floors of the
Terminal Preclassic Owl Platform, prior to the shift in pace of construction. Simova’s 2017 excavations in the E-Group plaza worked to augment this sample size and provide a basis for understanding how different parts of the complex were used. For the time being, these five floors help us target an important period during which the complex was actively used and consistently modified.

**Geochemical Analysis of Late Preclassic Floors Platform Floors**

Multi-elemental analysis of inorganic residues preserved within constructed floors have been increasingly used to study activities within prehistoric settlements (Middleton and Price 1996; Wells et al. 2000; Terry et al. 2004; Hutson and Terry 2006; LeCount et al. 2016). Lime plaster, used to construct the platform floors of Structure 26, traps and preserves a variety of chemical compounds over very long periods, and so is ideal for studying chemical residues of ancient activities. For this study, we collected point samples along the exposed plaster surfaces in 50 cm intervals using a staggered lattice design (see Wells 2010). They were processed and analyzed using Inductively-Coupled Plasma Mass Spectrometry (ICP-MS) at the University of South Florida following protocols developed by Christian Wells. The calibrated concentrations of 21 elements were determined, and the data show less than five percent variation on the U.S. National Institute of Standards and Technology Certified Reference Material (NIST CRM) standards and internal quality control blanks. While we

![Figure 6. Boxplot comparing concentrations (mg/kg) of 16 elements from the Str. 26 Floors.](image)
collected data on 21 elements, we did not consider calcium (Ca), magnesium (Mg), strontium (Sr), and aluminum (Al), as variation among these elements represent the natural limestone-derived matrix. Surprisingly, the only element among the remaining 17 elements to show any anthropogenic variation was phosphorus (P) (Figure 6).

**Geochemical and Archaeological Evidence of Prehistoric Activity**

The architectural setting of the range structure, overall, suggests a limited set of activities should be present. For instance, generalized signatures from biological debris (e.g., skin and oils) and detritus from feet and clothing (Middleton and Price 1996) should not be present to the same degree as in a domestic area, such as a house patio. Food preparation, marked by manganese (Mn), potassium (K), sodium (Na), and Mg, is also unlikely to occur on the platform centerline. Occurrence of a delimited set of activities is well supported by the lack of anthropogenically enriched element concentrations, besides P. However, this signature also limits the range of ritual practices which could have occurred within the platform. For instance, lack of K, Mg, and Na, also suggest a lack of ritual burning in this location (Heidenreich et al. 1971, Middleton and Price 1996). This is not to say that fire, known to be an important component of ritual from epigraphic and ethnographic evidence is entirely absent, but could suggest that it is occurring in smaller manifestations, perhaps within censors, which are more easily contained and removed from the floors, or alternatively burning could be occurring within other areas of the complex, like the plaza. Additionally, the lack of iron (Fe) and other transitional metals (Ti, Ni, Cu, Zn), suggest that pigments such as hematite and ochre, which were important to ritual display and craft production, were also not present in sufficient quantities, if at all, to leave a signature.

Figure 7 presents results from the spatial analysis of P signatures across the sampled floors. Concentrations of P are expressed as parts per million, or mg element/kg matrix (mg/kg). The P signatures suggest the deposition of organic materials, which contain phosphates. These findings are consistent with what we would expect to find if food and drink were present. The earliest constructed floors of the sample, Javier and Armando, had the highest concentration of P, with values as high as 32 and 65 mg/kg respectively. The last constructed floor, Lupe Fiasco, conversely, had the lowest concentration, with highest values under 3 mg/kg. The spatial distribution of P signatures...
Figure 8. Artifacts recovered from features on Javier Floor (top left: Aguacate Orange Jar, top right: Old River Unslipped Jar, left: Striated dish).

varied from floor to floor, suggesting that vertical contamination between superimposed floors was unlikely.

The earliest plaster floor we analyzed, Javier Floor, was in use between 195 and 105 BC. During excavations, we exposed a roughly constructed pavement of stones, possibly a constructed altar feature, in the southeast portion of the trench. It was associated with a pile of jute, or freshwater snails often consumed by the Maya of this region, and a cached, striated brown dish (Figure 8). Additionally, a pit feature in the western portion of the floor yielded several large, fragmented jars, partially refit in the lab. The elevated P signature complements this emphasis on food and drink in the archaeological record and shows a broader dispersion of food-related activity across this area than we see in subsequent floors. This could be an indication of longer period of use of this floor or higher intensity of activity accompanying the initial construction of the Owl Platform.

On the next constructed floor, Armando Floor, we observed few archaeological indicators activity. Features outlined in Figure 7 show one small posthole and two bases of postholes from later constructions. Artifact indicators of activity in direct association with the floor are also lacking. However, the chemical signatures reveal substantial anthropogenic enrichment of the plaster floor. Armando Floor has the highest level of phosphorus among the sampled floors, suggesting there was continued emphasis on food and/or use of other organic materials in this phase of the E-Group. It can be difficult to determine spatial patterning from the limited exposure of all the floors, but activity here does appear concentrated to the south, aligning with the earlier stone pavement or altar. This suggests a persistent organization of activity within the architectural space.

In the next two floors, Luciano and Santo Floor, we see a similar lack of archaeological features and artifacts associated with the surfaces. In these two phases, the organic signatures persist in lower concentrations (12 and 15.5 mg/kg), but appear more spatially constrained. The “hotspots” of activity revealed in Figure 7 suggest more discreet deposition areas of organic material in comparison to earlier floors.

In the last sampled plaster floor, Lupe Fiasco Floor, we again have greater archaeological evidence of ritual activities, particularly with the placement of a burial on the structure. This floor was in use between 145 to 50 BC, with three additional floors constructed above it. Unlike Javier Floor, there were no in situ artifacts indicative of food or drink, however we exposed a number of postholes of varying sizes across its surface. Due to the limited lateral exposure of the excavations, we were unable to discern a clear pattern in the placement of the postholes, but suggest that they represent ritual activity occurring on the platform. In the nearby site of Xunantunich, Brown (2017) has identified similar clusters of postholes with remnants of wooden beams, suggesting that perishable scaffolds or altars were repeatedly erected in front of structures.

Discussion

Phosphorus, derived from phosphates in organic materials, has long been recognized as an indicator of human activity, but in many studies, correlates with increased concentrations of other elements, as well. The lack of other anthropogenically enriched concentrations of elements was also unique in comparison with previous geochemical studies in other contexts within Actuncan. As a point of comparison, Fulton’s (2015) dissertation work examining Terminal Classic Period residential areas in Actuncan North, found a variety of signatures suggesting generalized use of open spaces between house groups and heightened activity.
surrounding houses. These domestic contexts demonstrated enriched levels in P, K, Mn, and Fe, among others. LeCount and colleagues (2016) work on an elite administrative structure also found a variety of signatures, but in more spatially discrete arrangements, pointing to specialized functions of the various rooms and shifts in their functions over time. Differences in the construction of floors and degree of weathering between interior and exterior spaces could partially contribute to these differences (see Middleton and Price 1996), but the pattern remains highly unusual.

Given existing perceptions of the E-Group as a special-function complex, perhaps we should be more surprised that any chemical signatures are present at all, rather than the platform presenting a clean stage for observations and periodic ritual performance or displays. However, it should be noted that while the strength of the signatures is not directly related to the duration and intensity of activity, they do tend to represent repetitive activity which is more likely to allow for the accumulation of inorganic elements in the plaster. Food and drink were and continue to be important components of many celebratory, ritual, and political gatherings.

The discrepancies in the signatures produced by food processing and consumption in domestic and public contexts observed here prompt us to more specifically examine the channels through which food was introduced into the archaeological record. In this vein, the differences in the early Javier and later Lupe Fiasco Floor are particularly interesting. Bayesian modeling suggests that the two floors were in use over similarly long spans of time, yet Javier Floor demonstrated much higher concentrations of phosphate within its matrix. Several possibilities may explain this discrepancy, among them intensity of use and changing patterns in maintenance and use of space. Javier Floor demonstrated much higher concentrations of phosphate within its matrix. Several possibilities may explain this discrepancy, among them intensity of use and changing patterns in maintenance and use of space. Javier Floor was the first floor of the Owl Platform (Str. 26), inaugurating a new, distinct construction. As such, it may have borne greater activity, allowing for more accumulation of residues. Conversely, Lupe Fiasco Floor was the last in a relatively rapid set of modifications, after which floor constructions slowed greatly. Whereas Javier Floor may have been associated with a revitalization of the complex, Lupe Fiasco may have been associated with its declining role in the community. Another intriguing possibility is suggested by the increased presence of postholes, possibly indicative of perishable altars. Perhaps the weaker chemical signature is due to a greater reliance on constructed altars for the display of food and other offerings, which could then be more fully cleared away, but not without some spills and overflows. Continued excavations within the complex are needed to provide support for these scenarios, but in either scenario, important shifts in ritual and sociopolitical practice appear to be reflected in the archaeological and geochemical markers of activity within the E-Group.

Because there are many cultural and natural factors affecting site formation processes, we cannot fully rule out the possibility that any food consumption and offerings suggested by the P signatures were accompanied by other kinds of activities which left no residues or were quickly swept or washed away by rains. However, the lack of other signatures does suggest certain trends in the use of the structure when examined in relation to other archaeological, epigraphic and ethnographic data on Maya ritual.

Conclusions

Investigation of the eastern platform of Actuncan’s E-Group demonstrate the utility of geochemical analysis in situating archaeological data from intermittent construction and special-purpose deposits within ongoing, repetitive activities. Through this approach, we are better able to identify potential shifts in practice that underlie broader ideological, social, and political change within the site.

The construction history of the platform demonstrates an early and persistent importance of this location within the site. The use of the E-Group arrangement further points to certain shared practices and ideologies among Lowland populations. However, shifts in architectural styles over time make it clear that the space was amenable to change as the needs and expectations of local populations changed. The nature of excavated features and caches within the platform further support a responsiveness to local sociopolitical dynamics. Although aspects
of the deposits, such as reference to water in jar and jute deposits are broadly shared with other E-Groups (Freidel et al. 2017), the overall nature of Late Preclassic ritual deposits breaks with patterns observed among other E-Groups whose functions become more intimately tied to the enactment of authority and divine kingship (e.g., Uaxactun and Tikal).

By examining the types and patterning of anthropogenic residues within the structure floors, we are not only learning more about the activities that took place within it, but also evaluating continuity and change at a different scale. In examining five floors from a single construction phase, we are able to detect subtle shifts in the use and meaning of one building, Structure 26, within the complex. The observed P signatures and lack of other elements suggest that food offerings, apart from consumption of food within feasts, were an important component of ritual within the E-Group complex. When we consider the setting on top of the platform, with the limited available space within a broader, open plaza, it does seem unlikely to have food consumption, or preparation, occurring within Structure 26. The lack of residues from pigments and crafting also suggest that ritual paraphernalia and elaborate costuming may not have figured in performance on the platform. However, it is possible that the nature of performance simply did not allow for these items to impact the chemistry of the plaster floors. Although these findings conform to expectations that the complex serves a limited, ritual function, they do indicate that the platforms served a broader purpose than solar and calendrical observations, prompting further awareness of the variability in activities that may have taken place within the complex.

In comparing the signatures across the five floors, we begin to see subtle changes in the way local populations engage with the platform. In the absence of in site features and artifacts, we are still able to relate earlier floors to more extensive activity, marked by higher phosphorus signatures, while later floors show a decline. Unfortunately, the soil chemistry in and of itself does not allow us to draw unequivocal conclusions about the nature of Late Preclassic ritual occurring on the eastern structure. The shifts we see could represent a declining importance of the complex, or merely a shift in the practical engagement with it, using perishable altars for instance. However, when used in conjunction with architectural and artifact data, continued analysis can elucidate the broader significance of these shifts and their relationship to developments across the site. Current research suggests that the E-Group complex was not significantly manipulated by elites or enlisted in political displays. The only burial found within Lupe Fiasco floor was modest, placed in an unlined pit without burial offerings. Cached vessels recovered so far are unassuming plainwares and although the chemical signatures indicate food and drink consumption, the only faunal remains recovered in substantial amounts were jute shells. This was not the place for conspicuous consumption, competitive displays, or exclusionary practice. Instead, we interpret it as a key location for the placement and display of communal offerings of food and drink, overlooking the banks of the Mopan, remaining visible and accessible to the broader community. The eastern platform of the E-Group represents a distinct space, which we will continue to examine in relation to the complex as a whole.

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4  FIDELITY TESTS OF LIDAR DATA FOR THE DETECTION OF ANCIENT MAYA SETTLEMENT IN THE UPPER BELIZE RIVER VALLEY, BELIZE

Bernadette Cap, Jason Yaeger, and M. Kathryn Brown

The study of ancient settlement patterns provides essential information about the relationship of sites of ancient human activity to each other and to the natural landscape. Traditional approaches of archaeological site discovery involve hours of traversing the landscape and manually recording finds. The application of airborne LiDAR has revolutionized the study of ancient settlement patterns because it captures information about large swaths of land quickly and at high resolution. The success of this technology to record mounded ancient features is variable, however, our research explores the fidelity of LiDAR data for the identification of ancient Maya settlement in the Mopan and Macal River valleys, Belize. We present here a comparison of known ancient features mapped by the Xunantunich Settlement Survey in the 1990s with features identified in airborne LiDAR data. We detected less than 40% of known features in the LiDAR data and found that factors such as modern urbanization and vegetation density had the strongest effects on the visibility of ancient features. Understanding the limitations of LiDAR is important for its application in interpretations of ancient Maya settlement patterns.

Introduction

One of the basic components of archaeological fieldwork is survey, identifying sites and other traces of human activity and locating them precisely in space. There are many ways to find sites, but in the Maya lowlands, systematic pedestrian survey has been the most common method for identifying ancient sites. Pedestrian survey is very time-intensive, particularly in the tropical forest environment that is common in the region, and it takes many years to document settlement patterns on a regional scale. As a result, there are few areas for which we have a comprehensive regional understanding of ancient Maya settlement patterns.

In the past decade, the application of airborne LiDAR (Light Detection and Ranging) to archaeological survey in the Maya lowlands, beginning with the area around Caracol (Chase et al. 2010a, 2010b), has revolutionized archaeological survey. We now possess detailed settlement pattern data for contiguous blocks as large as 1257 km² from zones across the Maya lowlands. The analysis of this data has revealed that LiDAR survey is not equivalent to the results gained through pedestrian survey, however. In this paper, we present a detailed comparison of settlement data obtained through LiDAR and through pedestrian survey in an effort to systematically identify and quantify the differences between the two approaches.

LiDAR and Archaeological Survey in the Maya Lowlands

Airborne LiDAR survey has transformed archaeological survey in the Maya lowlands because it can capture information about the modern landscape quickly and over large, contiguous expanses. LiDAR data is gathered by airborne instrumentation that emits laser pulses toward the earth’s surface and records the return of those pulses as the plane flies systematically over a study area (Fernandez-Diaz et al. 2014; White 2013). The return data for each pulse allow for the calculation of the location of the object that reflected the pulse, and collectively these comprise a point cloud of three-dimensional records that can number into the millions. Surface models can then be created from the point cloud. For identifying archaeological sites, the most useful models are those that only consider points identified via computer algorithm as returns from the ground surface, which can be isolated to essentially strip away vegetation and modern buildings to reveal a “bare earth” landscape. In this model, ancient mounds, terraces, reservoirs, and other cultural features can be identified as patterns in topographic relief. Through examination of multiple types of LiDAR-derived models of the modern surface, we gain views of ancient settlements and their relationships to the natural topography and environmental features like rivers and streams, views that are vastly superior.
Recent applications of LiDAR across the Maya lowlands have yielded many new insights into Maya society (e.g., Chase et al. 2011; Chase et al. 2014a, 2014b; Fernandez-Diaz et al. 2014; Hare et al. 2014; Hutson 2015; Hutson et al. 2016; Inomata et al. 2017; Prufer and Thompson 2016; Prufer et al. 2015 Reese-Taylor et al. 2016; Von Schwerin et al. 2016). Two concerns that archaeologists have for LiDAR data is its accuracy, that is “how close the measurements are to the true or reference values” (Fernandez-Diaz et al. 2014: 9990), and its fidelity, the “degree of exactness with which a feature is represented by the point cloud or elevation raster” (Fernandez-Diaz 2014: 9992). Scholars have primarily examined data fidelity by studying the strengths and weaknesses of LiDAR for identifying sites in diverse environmental and cultural contexts. In all of these studies, the sites and features identified most readily using LiDAR are raised features (e.g., mounds, terraces, causeways, walls), sunken features (e.g., reservoirs, aguadas), and composite features (ditch-and-rampart fortifications). Features that have little or no topographic relief are generally not detectable with LiDAR, although they might be identified in systematic pedestrian survey.

In the Maya area, scholars have employed two methods, often in tandem, to systematically evaluate the efficacy of LiDAR for detecting ancient settlement. Some have conducted digitally-based LiDAR surveys and then used pedestrian survey to ground-truth the LiDAR survey data (Hutson 2015; Inomata et al. 2017; Prufer et al. 2015; Reese-Taylor et al. 2016). When features identified in the LiDAR data are targeted for survey, ground-truthing allows scholars to quantify the impact of false positives, those features identified in the LiDAR data that are not in fact cultural features. Ground truthing ideally also should include areas for which LiDAR data did not indicate any cultural features, as this allows scholars to evaluate the impact of false negatives, those cultural features present in a survey area that are not identified in the LiDAR data (Reese-Taylor et al. 2016).

Another approach to systematically evaluating LiDAR survey data is to compare it with data from previously collected pedestrian survey data (Hutson 2015; Hutson et al. 2016; Inomata et al. 2017; Prufer et al. 2015). This is effective for identifying false negatives, but it can leave false positives unresolved, as the researcher may not be able to discount the possibility that a feature identified in the LiDAR data was not observed during pedestrian survey.

The studies referenced above demonstrate archaeological features that can be observed during pedestrian survey often are not identified in LiDAR data. The lowest identification rates are associated with areas of dense vegetation, as the vegetation impedes the ability of the laser pulses to reach the ground surface, thus reducing the number of ground returns. Furthermore, the algorithms that sort points return some of the lowest vegetation returns as ground returns, introducing significant ‘noise’ into the bare earth models for areas that have dense, low brush. These issues can create significant numbers of false negatives, as we discuss below.

Low vegetation can also create false positives, however, as low ancient features and clumps of brush can look very similar in LiDAR-derived visualizations (Hutson et al. 2016; Prufer et al. 2015). In fact, in some areas, ground truthing has revealed more false positives than false negatives (Inomata et al. 2017; Reese-Taylor et al. 2016). In these ways, vegetation density and type significantly influence the visibility of ancient features in LiDAR data. Because vegetation often varies between study areas, careful consideration of the limitations of a specific LiDAR data set is important prior to its analysis for settlement patterns (Fernandez Diaz et al. 2014), an issue that is even more important for broader comparative analyses that seek to integrate LiDAR data sets from multiple regions.

We draw particular attention to the fact that the features that are least visible in LiDAR-derived visualizations are low mounds (Hutson et al. 2016; Prufer et al. 2015). Most of these features are the remains of houses once occupied by the commoners who made up the majority of ancient Maya society. Thus, the LiDAR data systematically skew our understanding of ancient settlement patterns and, more broadly, ancient Maya society. This fact makes tests of the fidelity of LiDAR data essential, as they
allow us to make more informed interpretations about ancient Maya settlement patterns that can be observed in LiDAR data.

Here we analyze the fidelity of airborne LiDAR data collected in Belize’s Mopan and Macal River valleys, an area with a long history of ancient Maya occupation (Figure 1). Situated within our study area the major centers of Xunantunich, Buenavista del Cayo, Actuncan, Las Ruinas de Arenal, and Guacamayo. While limited research has been conducted at Las Ruinas de Arenal and Guacamayo, over a century of investigations in the Mopan River valley provides evidence of political fluctuations between the sites of Xunantunich, Buenavista del Cayo, and Actuncan from the Middle Preclassic through the Terminal Classic periods (900 BC – AD 900) (Ashmore 2010; Helmke and Awe 2013; Leventhal and Ashmore 2004). Most of what we know of this political history derives from studies of the largest sites, but the identification and characterization of the settlements located between these competing centers is important for understanding the reasons for and impacts of these shifting political fortunes.

Our study region was once covered with the broadleaf deciduous tropical forest typical of the central Maya lowlands, but slash-and-burn milpa agriculture and mahogany logging beginning in the mid-19th century have left few, if any, areas of mature forest. Instead, human activity, particularly over the last 50 years, has created a mosaic of land use and vegetative cover. There are some zones of modern urban settlement, but much more of the region consists of plowed agricultural fields, cattle pasture, and successional forest growth of various ages that have developed as milpa fields and pastures were left abandoned over the decades.

To test the effectiveness of LiDAR survey in this mosaic landscape, we compared the results of pedestrian survey conducted in the 1990s by the Xunantunich Settlement Survey (XSS) and Xunantunich Archaeological Project (XAP), directed by Wendy Ashmore and Richard Leventhal, with a survey using LiDAR data that we conducted for the same study area. We found a low rate of identification: only 37% of previously mapped sites appeared in the LiDAR data. We discuss several reasons for this low rate, some of which are unique to the study area. Our findings create an important baseline from which to build preliminary interpretations of settlement patterns in the valley and plan for further tests of the LiDAR data through ground-truthing pedestrian surveys. Our study highlights some of the limitations of LiDAR data, which are relevant for archaeologists working in areas where comparative datasets are not available and for remote sensing experts.
who can draw on this and other studies like it to make improvements in LiDAR data collection technologies and the algorithms used to analyze and process LiDAR data.

The Xunantunich Settlement Survey

From 1992 to 1996, XSS conducted intensive pedestrian survey of 11.8 km² along and between the Mopan and Macal rivers (Ashmore 1994, 1995; Ashmore et al. 1994; Connell 2000; Keller 1993; Neff et al. 1995; McGovern 1993; Robin 1999; Walkey 1994; Yaeger 1992, 2000, 2010; Yaeger and Connell 1993). For this study, we draw on a selection of areas mapped by the XSS survey (Figure 2): three 400 m wide transects (T/A1, T/A2, and T/A3), a quadrangle centered on the Xunantunich architectural center (T/A4), a zone northeast of Xunantunich (O/A2), and the area around San Lorenzo on the opposite side of the Mopan River (SL). The large areal coverage and diversity of environments and vegetation represented in these survey zones make this a good dataset for testing the fidelity of the LiDAR data in this region.

The XSS survey methods for transects T/A1-T/A3 involved establishing a central brecha along the transect’s main axis and cutting perpendicular survey lines (picados) 200 m from the brecha at 20 m intervals. The survey crew then walked systematically between the picados looking for evidence of human occupation. The methods employed in the T/A4, O/A2, and SL survey areas were similarly systematic and equally intensive. These methods provided as complete a view of the modern and ancient landscape as was possible at the time.

All the sites XSS identified were recorded with tape and compass mapping and a total station. All survey data was digitized using AutoCAD software, which we converted to ArcGIS shapefiles and geo-rectified using GPS points collected in 1995 (Neff et al. 1995) and by our project in 2009. We adjusted the projections to WGS1984 and conducted gross spatial adjustments in ArcGIS to correct the transect orientations per information derived from the LiDAR data. While there is some residual error in the conversion of the original digital files, we have confidence that the spatial data is accurate to a level that allows for faithful and direct comparison to the LiDAR data.

XSS defined a site as one or more archaeological features located within 25 m (Neff et al. 1995: Table1). It classified sites into one of seven types (Types I-VII) according to the number of mounds present, their organization, and maximum mound height.
Figure 3. Sites recorded by the (a) Xunantunich Settlement Survey pedestrian survey and (b) LiDAR survey.

Figure 4. Kernel density analysis of the (a) Xunantunich Settlement Survey pedestrian survey and (b) LiDAR survey.

Table 2. Mound densities recorded by the Xunantunich Settlement Survey.

<table>
<thead>
<tr>
<th>Survey Zone</th>
<th>Survey Area (km²)</th>
<th>Mound Count</th>
<th>Density of mounds per km²</th>
</tr>
</thead>
<tbody>
<tr>
<td>TA/1</td>
<td>3.30</td>
<td>426</td>
<td>129</td>
</tr>
<tr>
<td>TA/2</td>
<td>1.50</td>
<td>153</td>
<td>102</td>
</tr>
<tr>
<td>SL</td>
<td>0.95</td>
<td>140</td>
<td>147</td>
</tr>
<tr>
<td>O/A2</td>
<td>1.20</td>
<td>124</td>
<td>103</td>
</tr>
<tr>
<td>T/A3</td>
<td>1.30</td>
<td>35</td>
<td>27</td>
</tr>
<tr>
<td>T/A4</td>
<td>0.70</td>
<td>154</td>
<td>224</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>8.95</strong></td>
<td><strong>1032ᵃ</strong></td>
<td><strong>120</strong></td>
</tr>
</tbody>
</table>

ᵃ An additional 41 mounds located off transects T/A1 (n=37) and T/A3 (n=4) were recorded by XSS, but are not considered in the total presented here.
Fidelity Tests of LiDAR Data

(Table 1) (Ehret 1995; Neff et al. 1995). We employ the typology to maintain comparability with XSS data and because the physical attributes used to distinguish the site types can be observed in the LiDAR data.

XSS identified 386 sites consisting of 1078 mounds (Figure 3; Table 1). Most sites had less than 5 mounds, all under 2 m in height (Types I and II). Sites were not evenly distributed across the landscape (Figure 4). A comparison of mound densities across the transects (Table 2) reveals that the highest density of mounds (224 mounds/km²) occurs within the T/A4 survey zone, while the linear transects varied from 129 mounds/km² in T/A1 to just 27 mounds/km² in TA/3. The average density recorded by XSS was 120 mounds/km². This is comparable to densities documented by Anabel Ford (1990) just north of the Mopan River, where densities varied from 105 to 129 mounds/km². To compare these densities with those documented at larger centers, we can examine Tikal, where surveys recorded densities of approximately 235 structures/km² in the 9 km² epicenter of the site and 145 structures/km² in peripheral areas (Carr and Hazard 1961; Rice and Puleston 1981:133). The latter are not much higher than the averages in the Mopan valley and adjacent areas. Comparison of settlement densities such as this demonstrates the variation of Maya polities across the lowlands and contributes to understanding the broader complexities of Maya society.

**LiDAR Survey**

Our ability to study ancient Maya settlement in western Belize on a regional scale was transformed in 2013 with the acquisition of 1057 km² of airborne LiDAR data (Chase et al. 2014b). The NSF National Center for Airborne Laser Mapping (NCALM) at the University of Houston conducted the survey in April and May of 2013 with a Cessna 337 equipped with a GEMINI system laser flying 600 m above ground. The timing at the end of the dry season was ideal, as we could expect few leaves to be present on deciduous forest vegetation and the agricultural fields to be cleared of most crops. The accuracy of the LiDAR points was approximately 20-30 cm RMS (root means square) error horizontally and 5-10 cm RMS error vertically. The result is a LiDAR dataset with remarkable resolution of 15 to 25 points per m² for the entire area.

We have focused our analyses on a study area of approximately 150 m² in the Mopan and Macal River valleys (Figure 1). Our initial examination of a bare earth model derived from the LiDAR data revealed many sites that had not been previously mapped (Yaeger et al. 2016). Here we focus on more detailed analysis, focusing on LiDAR data from the XSS survey zones shown in Figure 2.

To analyze the LiDAR data systematically and identify ancient sites, we created a suite of visualizations based on the LiDAR-derived digital elevation model (DEM) created by NCALM. These included: 1) 12 bare earth hillshades created by shifting the azimuth of the sun in 30-degree increments; 2) a multi-direction bare earth hillshade; 3) a principal components analysis of a bare earth; and 4) a local relief model (Figure 5). We chose this grouping of
Table 3. Frequency of site types in the LiDAR survey.

<table>
<thead>
<tr>
<th>Site Type</th>
<th>LiDAR Survey Count (%)</th>
<th>LiDAR Sites also Identified by XSS Count (%)</th>
<th>Count of LiDAR Sites Assigned to Same Site Type by XSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>129 (63%)</td>
<td>36 (26%)</td>
<td>29</td>
</tr>
<tr>
<td>II</td>
<td>20 (10%)</td>
<td>36 (26%)</td>
<td>9</td>
</tr>
<tr>
<td>III</td>
<td>37 (18%)</td>
<td>38 (27%)</td>
<td>21</td>
</tr>
<tr>
<td>IV</td>
<td>0 0</td>
<td>2 (1%)</td>
<td>0</td>
</tr>
<tr>
<td>V</td>
<td>0 0</td>
<td>9 (6%)</td>
<td>0</td>
</tr>
<tr>
<td>VI</td>
<td>13 (6%)</td>
<td>13 (9%)</td>
<td>9</td>
</tr>
<tr>
<td>VII</td>
<td>7 (3%)</td>
<td>7 (5%)</td>
<td>7</td>
</tr>
<tr>
<td>Totals</td>
<td>206 (100%)</td>
<td>141 (100%)</td>
<td>75</td>
</tr>
</tbody>
</table>

visualizations due to their potential to identify features hidden in shadows, and to bring out visually low, raised features on the landscape. We examined the visualizations in 500 x 500 m blocks at an initial scale of 1:3000.

When a possible feature appeared in any of the visualizations, we marked it with a point in an ArcGIS point shapefile. For each location, we then examined the original point cloud data, creating multiple profile views across the area to identify topographic profiles that showed a high potential to be an ancient feature. Through this process, we eliminated some modern constructions and trees. We also examined satellite imagery to help confirm modern features. Because ancient mounds can be very similar to undergrowth, particularly low, dense brush (Hutson et al. 2016; Prufer et al. 2015), we only identified features as ancient mounds if they had a clear, smooth, mounded shape.

Through close analysis of the LiDAR data, we identified 206 sites, totaling 466 mounds (Figure 3; Table 3). Of the 206 sites identified, only 141 were mapped by XSS, and these 141 sites account for only 37% of the sites recorded by XSS. In some cases, we were confident that a site identified in the LiDAR corresponded with a site identified by XSS, but not all of the features mapped by XSS were visible in the LiDAR data. As a result, the frequencies of site types vary between the two surveys (Tables 1 and 3). Comparison of the number of mounds mapped by XSS and mounds identified in the LiDAR survey provides a more direct, one-to-one comparison. Of the 466 mounds identified in the LiDAR survey, XSS mapped 381 of these, which represent 35% of the mounds mapped by XSS. The slightly higher identification rate of sites likely reflects the ability to identify a site regardless of whether all features (i.e., mounds) were identified. Regardless, whether using the site or the mound as a unit of comparison, the broader picture of LiDAR fidelity remains the same: nearly two-thirds of the settlement identified through pedestrian survey was not evident in the LiDAR data.

Our analysis of the LiDAR data also identified 65 sites and 85 mounds that were not mapped by XSS. While XSS methods were thorough and entailed 100% systematic coverage, it is likely that some of these new sites identified in the LiDAR represent sites that XSS missed. It is also possible that many of these mounds are false positives. Targeted ground-truthing is required to determine the degree to which the LiDAR analysis introduces false positives.

Despite these limitations, the LiDAR data do provide important settlement information. Sites with taller mounds and a larger areal footprint are highly visible in the LiDAR data and more likely to be assigned to the same site type. Because LiDAR data can be reliably used to identify most of the Type VI and VII sites in a region, the LiDAR can be used to reconstruct the top tiers of a regional settlement hierarchy. Furthermore, the overall pattern of settlement density as revealed in kernel analysis of the LiDAR data is broadly comparable to that revealed through pedestrian survey (Figure 4). Thus, the LiDAR data provides insight into regional variability of settlement density across a region. Finally, although not a focus here, the
LiDAR provides reliable, georeferenced data regarding natural topography and geomorphological features, which can then be correlated with settlement data to study questions about human-environment dynamics.

**Impediments to Visibility in the LiDAR Data**

The XSS sites with the lowest rate of identification in the LiDAR survey are those that have low mounds—less than 2 m in height—and small footprints (Tables 1 and 3). These findings mirror those of other studies (e.g., Hutson et al. 2016; Prufer et al. 2015) and represent a significant challenge for archaeologists and LiDAR experts. If we accept the consensus that the majority of these features are Maya houses, then the LiDAR data presents us with a skewed view of Maya settlement patterns, one that introduces a bias against non-elite members of Maya society, as the larger, taller constructions more likely represent elite houses and associated structures. Being attentive to this bias is critical so that we do not contribute further to the historic emphasis within Maya studies on the upper echelons of ancient Maya society.

In order to improve our ability to use LiDAR data as a tool for identifying ancient settlements, we must better understand the factors that can lead to the underrepresentation of certain types of sites. In our study area, the reasons are varied, and we would not expect the same suite of factors to be present in other study areas. Given that human population expansion and agricultural development are increasingly transforming landscapes across the Maya lowlands into mosaics of vegetation cover, however, we expect our findings to have broad applicability.

As mentioned above, the modern history of land use plays a very strong role in shaping our ability to identify ancient settlements in the LiDAR data. This is particularly clear in areas of modern urban expansion: for example, it proved very difficult to identify sites in the modern village of San José Succotz, west of Xunantunich. The density of the modern buildings masked the sites and mounds located in yards and empty lots between houses. Since the 1990’s the village has experienced significant growth, which also has caused the destruction of some sites that had been documented by XSS. Site destruction has also been driven by agriculture, as traditions of slash-and-burn hand-clearing of fields have been replaced by mechanized agricultural practices such as plowing. Plowing tends to lower the elevation of ancient mounds and reduces their relief, making them more challenging to identify in the LiDAR data. Unfortunately, the effects of urbanization and mechanized agriculture are difficult to quantify without a strong, longitudinal data set that can be used to trace the destruction of sites.

The other major factor impeding the identification of ancient settlement in the LiDAR data from our study area is modern vegetative cover. The visibility of any feature on the ground surface in LiDAR-derived visualizations is directly affected by the number of ground returns produced during the initial LiDAR data collection. The number of ground returns is impacted by the obstructions that are present above the ground surface, particularly the leaves, stems, branches, and trunks of plants. Leaves are diffuse in terms of reflectivity, which allows for some of the pulse to travel through them and reach the next target, but in areas of dense vegetation, they can still impede pulses from reaching the ground.

One way to mitigate this problem in the tropical deciduous forests of Maya lowlands is to conduct LiDAR collection flights near the end of the dry season, when many trees have dropped their leaves. Furthermore, by conducting multiple collection flights in different directions over the study area, one increases the chances of having a laser pulse travel between vegetation to the ground. Despite these efforts, there will always be uneven distribution of ground returns across a region, a factor that is strongly shaped by vegetation.

As noted above, the western Belize LiDAR data was collected to maximize ground returns, flying multiple flights in different directions during April and May, when leaf cover would be at its lowest. Because of the differences in vegetation and land use practices across our study area, we were particularly interested to assess how vegetation affected our LiDAR survey results and how they compared to other areas of the Maya lowlands. Our initial
Table 4. Effect of vegetation canopy density on identification of site types I, III, and VI in the LiDAR data.

<table>
<thead>
<tr>
<th>Canopy Density</th>
<th>Type I (n=38) % identified</th>
<th>Type III (n=32) % identified</th>
<th>Type VI (n=12) % identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to .39</td>
<td>n/a</td>
<td>n/a</td>
<td>100.0%</td>
</tr>
<tr>
<td>.4 to .49</td>
<td>57.1%</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>.5 to .59</td>
<td>23.1%</td>
<td>100.0%</td>
<td>n/a</td>
</tr>
<tr>
<td>.6 to .69</td>
<td>26.9%</td>
<td>57.1%</td>
<td>100.0%</td>
</tr>
<tr>
<td>.7 to .79</td>
<td>18.8%</td>
<td>88.9%</td>
<td>50.0%</td>
</tr>
<tr>
<td>.8 to .89</td>
<td>25.6%</td>
<td>100.0%</td>
<td>n/a</td>
</tr>
<tr>
<td>.9 to .99</td>
<td>18.0%</td>
<td>45.5%</td>
<td>70.0%</td>
</tr>
</tbody>
</table>

Analysis of this factor in the study area focuses on canopy density and ground point density, both of which relate to the ability of the laser pulses to reach the modern surface (Salleh et al. 2015). We created a vegetation density raster using the methods described by ESRI (2016) that converts the LiDAR point cloud data first into two rasters, one based on ground returns and the other based on above-ground returns. The cell size chosen in this calculation was 4 m. These two rasters were then added together to create a raster that represented the total returns per cell. The above-ground return raster as then divided by the total points raster to produce a raster that represented the density of returns above ground. In this final raster, cell values ranged from 0 to 1, where 0 represents bare earth and 1 represents the densest vegetative coverage in which no laser pulses reach the ground.

The vegetation densities in our study area break down roughly into three general categories. Densities of 0.7 to 1.0 are found most commonly in forested portions of the study area, while values between 0.2 and 0.69 tend to be urban areas, fields with crops, orchards, and less densely forested areas. Densities below 0.2 are found along the waterways, active cattle pastures, and fields devoid of crops. There are few locations within the study area that have such low values.

For our analysis we used sites, as defined by XSS, as the unit of study. Because a single site can occupy an area with different vegetation densities, we associated each site with the density that covered the greatest area of a site’s footprint. We excluded sites for which there was too much diversity in vegetative density to identify a predominant density. We also excluded sites identified in the LiDAR survey that were not also mapped by XSS.

We focus here on the effect of vegetation density on visibility of three site types that capture the spectrum of variation within the XSS site types. Sites of Type I are isolated mounds less than 2 m tall that represent the sites that we expected to be the most difficult to identify in LiDAR data. They also are the majority of sites present in the study area. Type III sites also consist of mounds less than 2 m tall, but the orthogonal arrangement of multiple mounds presents linear visual cues that are not common in nature and are generally easier to detect by eye in LiDAR data. Finally, Site Type VI sites have mounds between 2 and 5 m in height and are among the largest sites in terms of mound height and footprint. We expect that larger targets like these would be more visible on the LiDAR-derived visualizations regardless of vegetative impediments.

In our canopy density dataset, we found that no matter the density of vegetation, sites with larger mounds and more mounds have a greater chance of being identified in the LiDAR data (Table 4). Fewer of the smallest sites (Site Type I) were visible when under vegetative cover, and to a significant degree (chi square of Site Type I and III at .9-.99 canopy density – \( \chi^2 = 6.433, p=0.0112; \) chi square of Site Type I and VI at .9-.99 canopy density – \( \chi^2 = 12.260, \)
Table 5. Effect of LiDAR ground point densities on identification of site types I, III, and VI in the LiDAR data.

<table>
<thead>
<tr>
<th>Point Density (per 4m²)</th>
<th>Type I (n=38) % identified</th>
<th>Type III (n=31) % identified</th>
<th>Type VI (n=12) % identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 25</td>
<td>11.9%</td>
<td>42.9%</td>
<td>50.0%</td>
</tr>
<tr>
<td>25 to 50</td>
<td>25.7%</td>
<td>42.9%</td>
<td>75.0%</td>
</tr>
<tr>
<td>50 to 75</td>
<td>22.2%</td>
<td>81.0%</td>
<td>66.7%</td>
</tr>
<tr>
<td>75 to 100</td>
<td>21.0%</td>
<td>83.3%</td>
<td>100.0%</td>
</tr>
<tr>
<td>100 to 125</td>
<td>66.7%</td>
<td>60.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>125 to 150</td>
<td>100.0%</td>
<td>50.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

p=0.0004). There was also a significant difference in the success rate for Site Type I identifications between the highest and lowest vegetation densities ($\chi^2$=5.586, p=.0181). Under the lowest vegetative density category (.4-.49), however, we still were not able to identify all Site Type I sites. This suggests that even low-density vegetation affected site visibility.

Unexpectedly, there is not a strict linear relationship between vegetation density and identification rate for any of the three site type categories. For example, identification rates for Type I sites between vegetation densities of 0.5 to 1.0 are not significantly different. For Type I sites in particular, there appears to be a quasi-threshold at roughly at the 0.5 vegetation density level between better and worse identification rates. This finding highlights the general difficulty in locating small sites in LiDAR data. Determining the specific cause of this pattern, however, likely requires pedestrian survey. Overall, our results of the canopy density analysis demonstrate that vegetation does impede the visibility of sites within the LiDAR data, but to varying degrees.

We performed a second test of the LiDAR data to examine the effect of ground return density on site visibility. The density of points categorized as ground returns is, in part, a reflection of canopy density. Therefore, we expected to obtain similar results to those in the analysis just described. For this analysis, we used the bare earth raster created during the process of making the canopy density raster, as described above. We again examined the visibility of Site Types I, III, and VI, and of these, only those where we could determine a dominant density of ground returns.

The results of the ground point density analysis were indeed similar to the canopy density results (Table 5), but the correlation between the number of ground returns and likelihood of identifying sites was stronger than was the case for the canopy density analysis. As the number of ground returns decreased, there was a significant reduction in identification rates for smaller sites (e.g., chi square for Site Types I and III at 0-25 ground point density – $\chi^2$=6.3731, p=0.0115; chi square for Site Types I and VI at 0-25 ground point density – $\chi^2$=4.108, p=0.0426). Our results also seem to indicate that there might be point density thresholds for the identification of certain types of sites. For example, our success rate in identifying Type I sites jumped significantly once the ground point density exceeded 100 points/4 m². For Type III sites, the threshold is slightly lower at more than 50 points/4 m². These thresholds may be particular to our study area and methods we used to visualize the LiDAR data, but they suggest real limits to visibility in the LiDAR data.

Conclusions

The sites archaeologists find and the ways they find them impact our understandings of the ancient past. Our investigations into the efficacy of LiDAR data as a tool for identifying ancient settlement in the Mopan and Macal River valleys demonstrates that it is of great utility for documenting larger sites, but has limitations for smaller sites. Similar findings have been documented elsewhere in the Maya region and
other locations (e.g., Chase et al. 2011; Crow et al. 2007; Hutson et al. 2016; Prüfer et al. 2015), suggesting some broad limitations of LiDAR in archaeological applications. Collectively, these studies demonstrate that although LiDAR is truly revolutionary in its ability to provide information on large continuous expanses of land very quickly, traditional archaeological methods of pedestrian survey are still important for settlement pattern studies. In our region, pedestrian surveys will be important for checking the information obtained from LiDAR data and our interpretations of the data. We are particularly interested in understanding the relationship of false negatives and false positives in the LiDAR to determine if we can improve our abilities to identify ancient settlement in LiDAR data.

Because natural landscapes and ancient settlement traces vary, LiDAR data collection methods may differ between projects. We are also in an exciting time of methodological development and innovation, and we expect LiDAR to improve over time as the technology itself improves, and as archaeologists experiment with a wide range of methods to visualize LiDAR data. We argue that tests of LiDAR data fidelity should be an important part of this process, as they help us quantify and understand the limitations of LiDAR to specific study areas. The mosaic modern landscape of the upper Belize River valley presents a particularly challenging case in application of LiDAR products, which rely on single algorithms to characterize a diverse landscape. Our tests of the LiDAR in the valley indicate that different vegetation densities affected the ability of laser pulses to reach the actual modern ground surface. With this knowledge we can collaborate with LiDAR technology experts to create more nuanced approaches for visualizing LiDAR data for archaeological research.

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5 CLASSIC MAYA HOUSEHOLD CERAMIC BELONGINGS: AN UNTAPPED RESOURCE FOR UNDERSTANDING DAILY LIFE

Sherman Horn III and Anabel Ford

Archaeological research in the Maya area has relied on ceramics as chronological markers that are critical to the relative dating of Maya sites. A working ceramic chronology was established for the central Lowland Maya area with the Uaxactun project in the 1930s and expanded by subsequent work on collections from Barton Ramie in Belize. By the 1960s, the type-variety system was refined and elaborated by Tikal project ceramic analysts. Type-variety has proven useful for establishing the Maya ceramic timeline, but it provides few data to use for the distribution of vessel forms and shapes. Formal characteristics relate directly to vessel function, and knowing the proportions and distributions of different vessel types can reveal fundamental aspects of ancient Maya daily life.

This paper examines the distribution of Late Classic Maya vessel forms and shapes and explores vessel diversity from Maya residential units in the El Pilar area. Analysis of Late Classic vessel forms and shapes reveals common and variable forms and functions and describes the essential belongings of Maya residential units. These are the building blocks of Maya communities within the forested landscape, which we continue to map in ongoing fieldwork at El Pilar.

Introduction

Archaeologists have recognized the importance of studying ancient Maya household remains for many decades (Wauchope 1938), as they comprise the basic units of socioeconomic production and reproduction in communities (Arnold 1985; Netting et al. 1984). Artifacts from residential unit assemblages reveal only part of a household’s total possessions, but they do reflect a range of daily activities in ancient society. Descriptions and analysis of household possessions are integral to comparative studies of wealth inequality (Smith 1987), and recent studies have examined variability among Maya household assemblages to explore differences in wealth, status, or specialization (e.g., Blackmore 2012; Ford 2010; Ford and Olson 1989; Keller 2012; Lucero 2001; Robin 2013; Pagliaro 2011).

Ceramics have been curiously absent from discussions of household assemblage variability. Traditional Maya ceramic analyses have focused on constructing chronologies (e.g., Gifford 1976; Smith 1955), interpreting iconographic elements (e.g., Reents-Budet and Ball 1994), and identifying imported vessels and trade-wares, but few studies explicitly address how pottery functioned in daily life (but see Howie 2012; Lucero 1994, 2001). Maya pottery assemblages are known for their diversity and complexity, and pottery from domestic contexts present no exception to this rule; household assemblages reveal variability that has not been fully explored. We argue that ceramics possess great potential to address fundamental issues of Maya household diversity, even as pottery remains an underexploited resource because of the historical focus on chronological variability.

We have examined formal, functional, and technological aspects of ceramic inventories to characterize Late Classic (c. AD 600–900) Maya household assemblages and in this paper, initiate the exploration of household belongings. Different vessel forms correspond to different
functions: cooking, serving, storage, and transport. Analysis of functional variability can clarify important differences in domestic practice and address the quality and quantity of ceramics used by different residential units. Describing the formal aspects of each collection is the first step. With a basic formal and functional characterization of ceramic collections, we can compare consumption patterns and investigate how households used pottery. Our research assemblages derive from household middens and construction fill in the El Pilar area of the upper Belize River, and each context dates to the Late Classic (Figure 1). The household materials represent the range of environmental and social contexts of the area and provide a broad baseline for comparing the socioeconomic relationships encoded in ancient pottery.

The Potential of Ceramics for Understanding Maya Households

Research on Maya residential patterns dates the work of Ricketson and Ricketson at Uaxactun (1937), at a time when archaeologists focused on defining chronologies and excavating temples (Taylor 1967). Work by Gordon Willey and colleagues (1965) at Barton Ramie began an important shift in focus toward the examination of Maya households and established a scholarly tradition focused on defining settlement patterns and site-rank hierarchies (e.g., Ashmore 1981; Arnold and Ford 1980; Robin 2012; Puleston 1973; Rice 1976; Webster and Gonlin 1988, among others). Settlement pattern surveys have since identified numerous small structures around monumental city centers, which are interpreted as representing comparable residential units; just as we are involved with at El Pilar. Maya residences are presented as single structures or architectural groups associated with open domestic spaces, and they provide opportunities to compare household wealth, access to resources, and relative social status (see Ford 1990, 1991, 1992; Robin 2012). Data collected at the household level represent the most basic social units in ancient Maya society and have the potential to answer questions of resource acquisition and social reproduction (Wilk and Rathje 1982).

Households also represent the essential contexts of daily life for elite and general members of preindustrial communities. Late Classic Maya residences were the settings for the variety of domestic activities – the storage, preparation, and serving of food important among them – that are reflected in data gathered methodologically by archaeologists. The remnants of ancient household belongings are dominated by pottery and stone-tool fragments, materials that are ubiquitous across the settled landscape of the Maya.

Maya household studies have focused on relationships between the size and frequencies of the small structures and associated exotic artifacts with variable distributions (see Robin 2012). Studies suggest residential unit size relates to material consumption, with larger structure containing more material and exotic artifacts than smaller ones (Abrams 1994; Ford 1991, 1992; Ford and Fedick 1992; Ford and Olson 1989). Recent studies show that domestic artifacts were more diverse than had been assumed in the past, and that small households could access what archaeologists presumed were sumptuary items (Ford 2010; Ford and Olson 1989; LeCount 1996; Robin 2012, 2013; Wiewall and Howie 2010). There are tantalizing indications of great diversity among everyday Maya farmers. Examinations of non-local resources such as obsidian or green stone (e.g., Asaro et al. 1978; Ford et al. 1997; Horn 2015, among others), production of chert tools or marine shell ornaments (e.g., Hohmann 2002; Shafer and Hester 1983), and the distributions of other rare materials (e.g., granite, slate) reveal variability in household consumption. The excavations of multiple residences at Chan, in the upper reaches of the Belize River area, reveal this variability at the community scale (see chapters in Robin 2012). Detailed descriptions of ceramic household inventories, however, are notably absent from these comparisons, which leaves an important segment of the material record unexplored.

The archives of data on resource procurement, production, distribution, and consumption contained in pottery have tremendous potential to reveal different scales of socioeconomic interactions, from household
endeavors to regional interactions (Arnold 1985). Macroscopic fabric analyses document variability in materials and composition, aiding in the reconstruction of socioeconomic networks that link producers and consumers (Horn 2015). Petrographic and compositional analyses can be used to identify resources accessed for production and technological traditions of potters (e.g., Ford and Spera 2007; Howie 2012; López Varela 2005; Shepard 1955). We can employ these macro- and microscopic analyses to investigate household resource use, participation in economic systems, and knowledge of local environments for ceramic collections from El Pilar and the upper Belize River area.

Ceramics provide an untapped reservoir of comparative information on everyday household practices and common activities. Collections from excavations in the El Pilar area contain 236,388 cataloged ceramic artifacts weighing 3,418 kilograms. These collections primarily include vessel fragments (identifiable rims, bodies, bases, jar necks, handles, and pods), but they also contain ornamental and utilitarian items (figurines, spindle whorls) and amorphous baked clay objects (briquettes, daub) in smaller numbers. We have recorded 1.8 ceramic objects for every chert artifact, and the total weights of ceramics and chert objects are nearly identical. Ceramics were as important as other materials to completing household tasks, and yet the ways vessels functioned in Classic Maya households have been widely overlooked. Documentation of ceramic belongings is basic to understanding the domestic activities that structured the daily lives of farming household members in Late Classic times. Our formal-functional assemblage descriptions allow comparisons that reflect activities prevalent at individual households.

From Chronology to Possessions – A New Direction for Maya Ceramic Studies

Early Maya ceramic studies established chronological markers to facilitate dating monumental construction sequences (e.g., Thompson 1939). The Carnegie Institution of Washington’s excavations at Uaxactun, Guatemala (Smith 1955), produced a detailed sequence of stylistic horizons – Mamom, Chicanel, Tzakol, and Tepeu – that are essential to temporal comparisons across lowland Maya sites to this day. The Uaxactun analysis insightfully classified ceramics by vessel form (Figures 2-4) and recognized relationships between form and function (see Shepard 1963). Formal and functional categories provide a solid basis for comparing assemblages from different sites, but comparative studies developed to consider detailed stylistic features instead (Smith and Gifford 1966).

James Gifford (1976) advanced applications of the type-variety classification system, which continues to dominate Maya ceramic studies. Gifford’s application began with his analysis of pottery from Barton Ramie, a well-known domestic settlement along the Belize River. Type-variety was developed to analyze ceramics in the American Southwest (Colton 1953; Wheat et al. 1958), and the system was refined in the Maya area in a way that elevated stylistic attributes, such as surface treatments (e.g., slips, washes, burnishing), over characteristics more closely related to function, such as vessel form. This method privileges the most elaborately decorated vessels and largely ignores formal and functional characteristics (but see LeCount 1996; Lucero 2001). Attention to surface decoration relegates large numbers of unslipped fragments, primarily representing utilitarian ceramics that were important to everyday household activities, to simple sherd counts of varieties unspecified, if they are counted at all. Defining types by surface treatment can subsume a range of form – likely representing vessels used for distinct purposes in different social contexts – into a single type, as is the case with Late Classic Belize Red:Belize Red variety pottery, which is common in the eastern Maya lowlands (Figure 5).

Attention to surface treatment, a temporally dynamic stylistic attribute in Maya pottery, makes type-variety effective for assessing occupation sequences at sites. Type-variety assessments are designed to provide a common terminology for constructing chronologies at the regional scale and are a useful assessing shared styles (e.g., Ball 1977; Kosakowsky 2012). Tabulations of type frequencies are not helpful in assessing vessel function, however, a necessity for understanding
the daily domestic activities of household members. We need new frames of reference, contextualized within the human ecology of ceramic production and consumption that regard vessels as finished products that were circulated and used by ancient Maya households.

We can describe the formal and functional characteristics of Late Classic Maya household ceramic assemblages to begin moving beyond chronology and into an investigation of daily life. Vessel forms and shapes provide clues to everyday activities, and we can examine variability among households by comparing archaeological data from different residential contexts. We may expect similarities among cooking vessels, for example, as cooking would
be a common activity shared among households, while concurrently expecting the quality and size of serving vessels to vary with wealth and status. Comparative analyses such as these, however, and even a basic definition of what comprises a “typical” household ceramic inventory cannot be accomplished with type-variety methods. Our study takes a first step toward unlocking the great potential of Maya ceramics to explore ancient daily routines by presenting a comparative baseline, with descriptions, of household pottery assemblages from El Pilar-Upper Belize River area.

Defining pottery assemblages is the foundation for comparing household belongings. These data can reveal common and unique activities among different households and how these relate to independent wealth indicators, such as exotic artifact frequencies and house size. Were household assemblages essentially the same in kind, regardless of wealth? Were basic items, equivalent to service sets, available to all households? If we consider the frequencies and diversity of vessel forms and their associated functions, we will come closer to answering these fundamental questions.

**Household Belongings of the Late Classic Maya in the El Pilar area**

Our ceramic collections derive from survey and excavations in the El Pilar area north/northwest of the upper Belize River. The El Pilar area occupies an ecotone between western limestone ridges and eastern coastal plains, and we classify its topography into three environmental zones – the valley, foothills, and ridgelands. These distinctive landforms relate to the geology of the area, and differences in soil quality and agricultural potential characterize each zone and the available resources that would have impacted household subsistence and wealth (Fedick 1995; Ford and Fedick 1992). Based on research conducted by Ford and colleagues between 1983–1993, excavation data were based on surveys of over 600 hectares and 400 residential units conducted by Ford and colleagues between 1983–1999 (Ford 1990, 1991, 1992). One-eighth of the residential units (n = 48) were selected for testing in a stratified random sample based on distance from the river, and eleven of these households – representing a range of large, medium, and small residential units of the environmental zones along with specialized production areas – were selected for full-scale excavation from the three environmental zones (Figure 6).

We focus on assemblages recovered at residential units that are dominated by Late Classic pottery to investigate the household belongings of the Maya. Our formal study is ongoing, and the integration of detailed microscopic and technological studies are
planned for future research. We targeted basic vessel form, and variation in vessel shape and size, to achieve a functional perspective in this study. In describing the merits of functional analyses, the pioneering ceramicist Anna O. Shepard (1963:224) once said:

“The study of vessel shape can be approached from the standpoint of function, esthetics or taxonomy. Function has the appeal of human interest; the purpose of the vessel tells us something of the activities and customs of the people who used them.”

Bearing this in mind, we examine the ceramic assemblages from the El Pilar area and ask what these remains can tell us about household belongings and agency in daily life of Late Classic times.

**Vessel Forms of the Late Classic Maya Ceramic Belongings**

Our ceramic assemblage datasets include all sherds collected from residential unit excavations. We identified 9,651 diagnostic ceramic sherds\(^1\) to assess household inventories and subjected all diagnostic sherds to an attribute analysis to delineate variation among the assemblages. Distinct attributes were evaluated and measured for diagnostic sherds and were tabulated for analysis. Vessel form categories – bowls, jars, plates, and vases – were divided into common shapes by rim and profile characteristics whenever possible. Formal and analytical attributes provide basic descriptions for the El Pilar ceramic collections, and we have worked to ensure these data are comparable with

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**Table 1.** Diagnostic Late Classic Vessel Forms from the El Pilar Area. Table by Ford.

<table>
<thead>
<tr>
<th>Period Assessment (relative chronology)</th>
<th>Temper Uniformity (evenness, spatial/size distribution)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceramic Form (general vessel category)</td>
<td>Temper Percent (relative abundance)</td>
</tr>
<tr>
<td>Shape (rim profile characteristics)</td>
<td>Firing Description (color; presence/absence firing horizons)</td>
</tr>
<tr>
<td>Rim Diameter (cm)</td>
<td>Surface Description (absence/presence of slips/paints/washes)</td>
</tr>
<tr>
<td>Munsell Slip Color (value, chroma, hue)</td>
<td>Design Elements (absence/presence nature/type decorative embellishments)</td>
</tr>
<tr>
<td>Munsell Paste Color (value, chroma, hue)</td>
<td>Wall Thickness (mm)</td>
</tr>
<tr>
<td>Pocking (spalling; removal of carbonate inclusions from surface)</td>
<td>Weight (gm)</td>
</tr>
<tr>
<td>HCI Reaction (identify carbonate-bearing ceramic bodies)</td>
<td></td>
</tr>
</tbody>
</table>

---

**Figure 7.** Basic Vessel Forms in the El Pilar Area (Figure by Ford).
Vessel form categories relate to function and reflect the range of household activities in the El Pilar area. Table 1 and Figure 7 illustrate the relative frequencies of vessel forms. It is clear that these formal categories occur in differing proportions, suggesting variation in function and use. The low percentage of vases (5%), for example, suggests they served more restricted functions or saw more restricted use than bowls (40%). We can compare this composite picture to assemblages across the Maya lowlands to look for differences in activities, and it serves as a baseline for other analytical systems by using objective and standardized attribute descriptors, including Munsell colors and Udden-Wentworth grain sizes. For each catalogued sherd that was assigned a period assessment, fifteen attributes were compiled for each sherd that was assigned a temporal assessment (Table 1).

Our comparative analyses are ongoing, and we present preliminary results of common Late Classic vessel shapes. We aim to demonstrate the importance of this approach to characterizing Maya ceramics and its potential for comparative analyses at multiple scales.

Table 2. Late Classic General Form and Common Shape Diagnostics from Full-Scale Excavations (Table by Ford).

<table>
<thead>
<tr>
<th>Residential Unit</th>
<th>Geographic Zone</th>
<th>Household Size</th>
<th>Form Diagnostics</th>
<th>Shape Diagnostics</th>
</tr>
</thead>
<tbody>
<tr>
<td>281-21</td>
<td>Valley</td>
<td>Medium</td>
<td>2254</td>
<td>1288</td>
</tr>
<tr>
<td>278-26</td>
<td>Valley</td>
<td>Small</td>
<td>862</td>
<td>397</td>
</tr>
<tr>
<td>278-66</td>
<td>Foothills</td>
<td>Small</td>
<td>190</td>
<td>104</td>
</tr>
<tr>
<td>272-220</td>
<td>Foothills</td>
<td>Medium</td>
<td>553</td>
<td>344</td>
</tr>
<tr>
<td>272-182</td>
<td>Foothills</td>
<td>Medium</td>
<td>512</td>
<td>280</td>
</tr>
<tr>
<td>272-168</td>
<td>Ridgelands</td>
<td>Small</td>
<td>72</td>
<td>35</td>
</tr>
<tr>
<td>272-162</td>
<td>Ridgelands</td>
<td>Medium</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>272-145</td>
<td>Ridgelands</td>
<td>Large</td>
<td>1098</td>
<td>593</td>
</tr>
<tr>
<td>272-136</td>
<td>Ridgelands</td>
<td>Large</td>
<td>403</td>
<td>230</td>
</tr>
<tr>
<td>272-032</td>
<td>Ridgelands</td>
<td>Small</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>272-025</td>
<td>Ridgelands</td>
<td>Large</td>
<td>2864</td>
<td>1768</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>8812</td>
<td>5040</td>
</tr>
</tbody>
</table>

Figure 8. Common Shapes in Late Classic Assemblages in the El Pilar Area (Figure by Ford).
Table 3. Diagnostic Late Classic Vessel Shapes by Geographic Zones (Table by Ford).

<table>
<thead>
<tr>
<th>Residential Unit</th>
<th>Household Size</th>
<th>Bowls</th>
<th>Jars</th>
<th>Plates</th>
<th>Vases</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>281-021</td>
<td>Medium</td>
<td>433</td>
<td>34</td>
<td>429</td>
<td>33</td>
<td>297</td>
</tr>
<tr>
<td>278-026</td>
<td>Small</td>
<td>176</td>
<td>44</td>
<td>117</td>
<td>30</td>
<td>76</td>
</tr>
<tr>
<td>Valley Totals</td>
<td></td>
<td>612</td>
<td>36</td>
<td>546</td>
<td>33</td>
<td>373</td>
</tr>
<tr>
<td>278-066</td>
<td>Small</td>
<td>29</td>
<td>28</td>
<td>59</td>
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<td>6</td>
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<tr>
<td>272-220</td>
<td>Medium</td>
<td>174</td>
<td>50</td>
<td>77</td>
<td>22</td>
<td>43</td>
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<tr>
<td>272-182</td>
<td>Medium</td>
<td>78</td>
<td>28</td>
<td>67</td>
<td>24</td>
<td>106</td>
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<tr>
<td>Foothills Totals</td>
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<td>281</td>
<td>39</td>
<td>203</td>
<td>28</td>
<td>155</td>
</tr>
<tr>
<td>272-168</td>
<td>Small</td>
<td>16</td>
<td>46</td>
<td>16</td>
<td>46</td>
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</tr>
<tr>
<td>272-162</td>
<td>Medium</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>272-145</td>
<td>Large</td>
<td>142</td>
<td>24</td>
<td>303</td>
<td>51</td>
<td>78</td>
</tr>
<tr>
<td>272-136</td>
<td>Large</td>
<td>77</td>
<td>33</td>
<td>119</td>
<td>52</td>
<td>19</td>
</tr>
<tr>
<td>272-032</td>
<td>Small</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>272-025</td>
<td>Large</td>
<td>567</td>
<td>32</td>
<td>920</td>
<td>52</td>
<td>205</td>
</tr>
<tr>
<td>Ridgelands Totals</td>
<td></td>
<td>802</td>
<td>31</td>
<td>1359</td>
<td>52</td>
<td>302</td>
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<tr>
<td>Total</td>
<td></td>
<td>1692</td>
<td>34</td>
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<td>42</td>
<td>830</td>
</tr>
</tbody>
</table>

comparing individual household assemblages in the El Pilar area (Table 1, Figure 7).

Using the attributes discussed above, we identified and defined common Late Classic rim shapes within our broader form categories and assigned about 60% (n = 5040) of our diagnostic sherds to a shape class (Table 2, Figure 8).

Preliminary Household Comparisons

It is no surprise that assemblages varied in size by residential unit across the El Pilar area. Noteworthy are the residential units 272-162 and 272-032, which yielded almost no Late Classic sherds (Table 2). Residential units in the valley, for example, have larger quantities of diagnostic sherds than comparably sized households in the foothills, indicating higher levels of pottery use in the Late Classic. The larger sample of residential units from the ridgelands shows more variability in pottery use that requires additional investigation (Table 3).

Basic vessel shape distribution reveals additional patterns of pottery use and activities. At the highest level of comparison – that of the geographic zone – we see similarities in the percentages of bowls that make up household assemblages. This pattern likely reflects the multiple uses bowls can play in preparing and serving food regardless of relative household wealth or environmental zone. Jars varied more by environmental zone and made up about half of ridgeland household assemblages, which may relate to the abilities of those households to acquire and store food.

Plates accounted for a higher proportion of household from valley and foothills residences than those in the ridgelands. While these vessels are associated with food service and would be expected in higher proportions at larger households such as those in the ridgelands, their distribution may be related to production as well, but this is difficult assess (Ford and Lucero 2000). The presence of vases at households of all sizes and in every environmental zone suggests these vessels, often thought to be wealth indicators, were not restricted to specific segments of society. Finally, household assemblages in the valley and foothills more closely resemble each other than those from the ridgelands.

Residential units in the foothills showed the greatest variability in assemblage composition. The small household 278-066, for example, possessed relatively more jars and fewer plates than other households in the foothills. Household 272-182 yielded majority
plates, which may reflect greater involvement in social events involving food service or possibly production activities. Late Classic ridgeland household assemblages varied more in scale than in kind. Three of four residential inventories contained high proportions of jars compared to the total collection, but the assemblage associated with residence 272-168 was less diverse than the other ridgeland households. This assemblage contained equal, but small, numbers of jars and bowls, yet no plates, suggesting a limited range of cooking and serving activities occurred there. Despite the lack of plates, 272-168 yielded three vase fragments, which was unexpected at a small household with a limited ceramic inventory. More diverse assemblages from the larger residential units 272-136 and 272-025 contained lower percentages of vase fragments, further complicating interpretations of the role vases played in Late Classic daily life.

Conclusions and Directions for Future Research

Studies of ancient Maya pottery have focused primarily on building chronologies for much of the past century, and we are now well-positioned to move forward toward more nuanced understandings of Maya household activities (see Lucero 2001; Pagliaro 2011). Our preliminary comparisons show the benefit of functional ceramic analyses to address questions of household archaeology and ceramic ecology. We suggest that detailed attribute analyses of residential pottery assemblages are vital to understanding activities in general and domestic activities in particular of the ancient Maya. Additional research on the functional variability revealed by these analyses will produce information critical to understanding resource use, economic systems, and daily activities that characterized life in the Late Classic period.

We are working to incorporate data that reflect differences in food storage, cooking, and service practices among the different households into our continuing settlement pattern studies, which have been focused on mapping the social and environmental geography of the El Pilar area revealing household wealth differentiation and distribution. We have used a combination of LiDAR imagery and traditional field survey techniques over the past five years to map variations in settlement patterns that are the initial step toward understanding household differentiation. The next phase involves examining the make-up of household belongings and how they vary across socioeconomic and geographic contexts. How does household differentiation relate to environmental zone and participation in different social events and economic networks in different areas? Comparative study, incorporating both stylistic and technological attributes, will refine investigations of household ceramic assemblages and the activities responsible for the variability evident in our preliminary analyses. This line of inquiry holds great potential for explaining complexity in Late Classic Maya agrarian communities. Only by investigating variability of household belongings will we gain a full picture of the importance of ceramics to Late Classic daily life.

1We considered sherds diagnostic if they provided information on basic vessel form.

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Wilk, Richard R. and William L. Rathje
RECONSTRUCTING PRECLASSIC MAYA HOUSEHOLD ECONOMIES IN THE BELIZE RIVER VALLEY

Claire E. Ebert and Jaime J. Awe

Archaeologists traditionally attribute the emergence of socio-economic inequality to elite control of local craft production and regional redistribution systems. Households also employed a diverse set of economic strategies to access raw materials and finished craft items that formed the foundations of the domestic economy. This study uses geochemical sourcing of obsidian and ceramics to characterize the economic behaviors that structured the domestic economy at the ancient Maya community of Cahal Pech, located in the Belize Valley of west-central Belize, during the Preclassic Period (1200 BC–AD 300). Portable X-ray fluorescence (pXRF) geochemical analyses of obsidian from Cahal Pech document decentralized domestic obsidian exchange systems based on the differential consumption of source material, which developed during the Preclassic and persisted through the Terminal Classic Period (~1200 cal BC–cal AD 900). Instrumental neutron activation analysis (INAA) of Preclassic ceramics from Cahal Pech identified contrasting provisioning strategies based on long-distance and local ceramic exchange monopolized by some households. Understanding the irregular distribution of economically important resources between households can shed light on the social and economic contexts that led to the emergence of institutionalized hereditary inequality.

INTRODUCTION

Archaeologists have long focused on exploring the dynamics of prehistoric economies because production, distribution, and consumption of resources are embedded within larger social processes. Researchers examining the emergence of social and economic stratification in Mesoamerica during the Formative (Preclassic) Period have argued that elite status was maintained through the monopolization of regional distribution of specialized crafts (e.g., Clark 1987:280; Santley 1984). The redistribution of these goods by aggrandizing elites generated economic and social debt for subordinate members of society, resulting in transgenerational social hierarchies (Clark and Blake 1994). More recently, studies of ancient Mesoamerican economies have shifted their focus to examine the structural and functional aspects of household economic organization to examine broader socio-economic developments (e.g., Douglas and Gonlin 2012; Hirth 2009, 2016). Households were the most basic economic unit in ancient Mesoamerican societies (Ashmore and Wilk 1988; Wilk and Rathje 1982), and the domestic economy, which was structured for the acquisition of subsistence resources by all segments of society, formed the foundation upon which all other economic activities were based (Hirth 2012, 2016). Ranked social organization developed when a household, or group of households, formalized their economic well-being into social status and authority through the institutional economy, which underwrote the social, political, and religious activities for the society as a whole (Hirth 2016:21). The irregular distribution of subsistence and non-subistence resources probably encouraged economic variation and may have motivated some households towards production and distribution of specific resources intended to improve not only their household well-being, but also their status within the community.

In this study, we use geochemical compositional data of obsidian and ceramic artifacts from the lowland Maya community of Cahal Pech, located in the Belize Valley of western Belize (Figure 1), to examine the structure and function of the domestic and institutional economies during the Preclassic Period (~1200 BC-
Reconstructing Preclassic Maya Household Economies

The Preclassic represents a critical transition in Maya prehistory, when the development of settled village life, increased reliance on maize agriculture, and the adoption of ceramic technology appeared across the lowlands. By the Late Preclassic, Maya society had become complex and hierarchical, with small village settlements developing into large centralized polities serving as the focal points of economic and political activity (Chase and Chase 2012). While evidence exists for the long-distance movement of many different commodities into Belize Valley during this dynamic period (e.g., greenstone, Powis et al. 2016; granite, Tibbits 2016), our focus is on obsidian and ceramics because they are ubiquitous in all contexts and were essential for the daily subsistence of the majority of Maya households through time. Documenting distributional patterns of these key items within and between households can be used to determine how access to overlapping and contrasting economic networks may have impacted household wealth and status beginning in the Preclassic Period.

To understand differences in Preclassic economic networks associated with the development in socio-economic inequality at Cahal Pech, we performed technological and portable X-ray fluorescence (pXRF) geochemical sourcing of obsidian artifacts \( n=1189 \) from the site’s civic-ceremonial site core and peripheral household groups. The results indicate that all households relied primarily on imported obsidian blades from sources in the southern highlands of Guatemala. El Chayal obsidian dominated assemblages from Preclassic domestic contexts, a pattern that persisted until the abandonment of Cahal Pech in the Terminal Classic (~AD 850/900). Differential use of source materials between households, however, suggests that obsidian was obtained through decentralized domestic procurement systems from the Preclassic through Terminal Classic periods. Comparisons of our data from Cahal Pech to previously sourced assemblages from the sites of Blackman Eddy and Chan in the Belize Valley indicate this pattern was present across the region. Instrumental neutron activation analysis (INAA) of ceramics \( n=192 \) from radiocarbon dated Early to Late Preclassic Period deposits in the site core and two peripheral domestic groups identified contrasting long-distance and local economic networks. INAA identified seven compositional groups corresponding to changing production patterns. By the Middle and Late Preclassic, the ceramics from higher status households were compositionally distinct when compared to peripheral household settlements. Comparative analysis of ceramic assemblages from Cahal Pech and sites in the central Petén region of Guatemala suggest that Mars Orange wares were exchanged between high status groups. Ceramic exchange may have been one avenue for Maya households to underwrite economic status within a developing institutional economy.

The Preclassic Cahal Pech Economy

Cahal Pech is a medium sized center located ~2 km south of the confluence of the Macal and Mopan Rivers in the Belize Valley (Figure 3). Stratigraphic excavations and radiocarbon dating conducted by the Belize Valley Archaeological Reconnaissance (BVAR) Project in the Cahal Pech epicenter at Str. B4 and Plaza B indicate the site was first settled between ~1200-1100 cal BC as a...
Figure 3. Map of Cahal Pech showing the civic-ceremonial site core (top) and location of house groups (bottom) sampled for obsidian and ceramic compositional studies.
small agrarian village composed of economically autonomous households (Awe 1992; Ebert 2017; Ebert et al. 2017). The earliest residential occupation is associated with the appearance of Cunil complex ceramics (~1200/1100-900 BC), the majority of which are utilitarian wares including jars, bowls, and gourd-shaped *tecomates* (Sullivan and Awe 2013). The Cunil assemblage also contains decorated serving vessels including slipped bowls, plates, and censers depicting k’an cross, avian-serpent, and flamed eyebrow designs (Awe 1992; Garber and Awe 2009; Sullivan and Awe 2013). The presence of El Chayal obsidian flakes and nodules in the earliest levels at Cahal Pech indicate integration of the Belize Valley into broader regional economic networks (Awe 1992; Awe and Healy 1994; Ebert 2017; Stemp et al., this volume).

Population expansion and economic growth at Cahal Pech and other Belize Valley sites during the Middle Preclassic were accompanied by the construction of public architecture restricted to larger house groups, signaling the emergence of higher status individuals within local communities. The appearance of increasingly standardized ceramics and evidence for the expansion of long-distance exchange networks dealing in exotic items also appear at this time. Obsidian blades, decorated pottery, jade, and other valuables have been identified throughout the Belize Valley region in Middle Preclassic contexts (Awe 1992; Hohmann 2002; Kersey 2006; Powis et al. 2016). At Cahal Pech, the Middle Preclassic Kanluk ceramic complex (900-350 BC) was composed primarily of coarse paste utilitarian ceramics (Jocote Orange-brown) and fine paste Mars Orange serving wares including slipped Savana Orange and Reforma Incised types (Awe 1992; Gifford 1976; Horn 2015; Peniche May 2016). Little archaeological evidence exists for the centralized control of production or redistribution of imported items by higher-status groups at Cahal Pech. While Awe and Healy (1994) documented a transition in obsidian technology in the Middle Preclassic assemblage towards finished prismatic blades, obsidian coming from both the El Chayal and San Martin Jilotepeque (SMJ) sources were consumed differentially between households at the site (Awe and Healy 1994; Peniche May 2016). Other crafting activities, such as shell bead production (e.g., Hohmann 2002; Lee and Awe 1995; Peniche May 2016), connected some Cahal Pech households with different long-distance exchange networks. Bead production, however, is not evenly distributed across the site, likely indicating that acquisition of shell via long-distance exchange was directly regulated by individual households.

The Late Preclassic Period (350 BC-AD 300) saw the flourishing of large civic-ceremonial centers throughout the Belize Valley and evidence for the development of institutionalized elite rulership at Cahal Pech and other Belize Valley sites such as Blackman Eddy, Xunantunich, and Barton Ramie (Awe 1992; Brown et al. 2013; Garber et al. 2004; Healy et al. 2004; Willey et al. 1965). The construction of elaborate tombs and offerings within monumental temple architecture appeared at Cahal Pech during the corresponding Xakal ceramic phase, signaling the development of a royal lineage at the site (Awe 1992; Awe n.d.; Garber and Awe 2009; Healy et al. 2004). The presence of symbolically significant items such as high-quality jade crafts within burials suggest that high-status individuals were involved in exchange of exotic items that were translated into wealth and prestige. Evidence for status differentiation appears also within the settlement zone after 350 BC in the form of larger-scale domestic and non-domestic architecture. Radiocarbon dates of construction phases indicate that low masonry platforms and temple structures were built at several house groups around the Cahal Pech site core (e.g., Tzutziiy K’in, Zopilote, Zubin, and Cas Pek groups), which likely functioned as public temple buildings associated with nearby domestic structures (Ebert et al. 2016, 2017). Radiocarbon dates from burials and ceramic associations from several other large house groups suggest that this pattern of social, economic, and spatial growth occurred throughout the Cahal Pech hinterlands during the Late Preclassic (Ebert 2017; Ebert et al. 2017).

**Obsidian pXRF Analyses**

Obsidian samples analyzed in this study were derived from surface collection and stratified contexts within the Cahal Pech monumental site core, and from ten residential groups located throughout the site’s periphery. A total of 1189 artifacts were subjected to pXRF geochemical sourcing analyses. Temporal assignments are based on relative ceramic associations and radiocarbon dates where possible (see Awe 1992;
Technological analyses of the assemblage were performed by Cassana Popp and Ken Hirth in the Mesoamerican Economy and Archaeology Lab at The Pennsylvania State University. Results are reported by Ebert (2017). General patterns in obsidian technology show that the Cahal Pech assemblage was composed primarily of finished prismatic blades. Medial segments of blades are the most common artifact from Preclassic and later Classic Period contexts, with blades becoming more common beginning in the Middle Preclassic. Obsidian blade cores and manufacturing debris are not common in the Preclassic assemblage, or the assemblage for any time period, indicating that finished blades were likely imported to Cahal Pech in a pattern consistent with whole-blade or processed-blade trade (De León et al. 2009, Stemp et al., this volume).

Geochemical characterization of obsidian artifacts was conducted at The Pennsylvania State University Ceramics Laboratory according to standard procedures using a Bruker Tracer III-V+ SD handheld XRF spectrometer with X-rays emitted from a rhodium tube (see Ebert et al. 2015). Cluster analysis of pXRF data identified five obsidian source groups in the Cahal Pech assemblage (Figure 4). The majority of artifacts were imported from the El Chayal source (61.5%, n=732), with smaller amounts from the Ixtepeque (19.3%; n=230) and SMJ (18.5%, n=220) sources. Ucareo (>0.01%, n=1) and Pachuca (>0.01%, n=6) blade fragments from the central Mexican Highlands are also present.

The Early Preclassic obsidian assemblage was derived exclusively from excavated contexts at Str. B4, located in Plaza B of the site core (Table 1). Obsidian nodules and percussion flakes compose more than half of the Early Preclassic assemblage (~68%, n=15), with only one pressure blade artifact (3rd series corner blade) present in early contexts. All the Early Preclassic artifacts were assigned to the El Chayal source. Additional types of obsidian appear during the Middle Preclassic, as the percussion flake tradition was replaced by prismatic pressure blades technology at Cahal Pech (Awe and Healy 1994; Ebert 2017; Stemp et al., this volume). While the inhabitants of the site core primarily consumed blades from the SMJ source, blades from El Chayal are the dominant type found in peripheral household groups. Imported blades continued to compose the majority of the obsidian assemblage throughout the Preclassic. One obsidian blade from the Ucareo source, recovered from late Middle Preclassic levels at Str. B4, documents possible connections with the central Mexican Highlands.

El Chayal blades continued to dominate the obsidian assemblage both in the site core and settlement (63%) throughout the Classic Period, with smaller but relatively even amounts of SMJ obsidian through the Terminal Classic. Ixtepeque obsidian composes ~24% of the Late Classic assemblage, and is found in higher proportions in the settlement (n=134) compared to the site core (n=60) during this period. Blades from the Pachuca source also enter the assemblage during the Early Classic, though the total number in the Classic Period sample analyzed for this study is small (n=6). By the Terminal Classic, El Chayal blade fragments make up over 83% of the assemblage.

Ceramic INAA Analyses

Ceramic samples subjected to INAA were chosen from common types of diagnostic ceramics (total n=192) from radiocarbon dated contexts in the site’s civic-ceremonial core and from two peripheral settlement groups (Ebert 2017). All sherds were identified to type: variety-mode
Table 1. Comparison of obsidian sources for site core, settlement, and surface/unknown contexts analyzed for Cahal Pech by chronological period. The San Martin Jilotepeque source is abbreviated as SMJ. Time periods abbreviated as follows: EPC = Early Preclassic, MPC = Middle Preclassic, LPC = Late Preclassic, EC = Early Classic, LC = Late Classic, TC = Terminal Classic, UNK = Unknown Period.

<table>
<thead>
<tr>
<th>Source</th>
<th>EPC</th>
<th>MPC</th>
<th>LPC</th>
<th>EC</th>
<th>LC</th>
<th>TC</th>
<th>UNK</th>
<th>Total Source</th>
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<td>13</td>
<td>517</td>
<td>106</td>
<td>11</td>
<td>732</td>
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<tr>
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<td>18</td>
<td>7</td>
<td>210</td>
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<td>9</td>
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</tr>
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<td>43</td>
<td>29</td>
<td>816</td>
<td>127</td>
<td>15</td>
<td>1189</td>
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classification according to standard classifications for Cahal Pech and the Belize Valley (Awe 1992; Gifford 1976; Sullivan and Awe 2013). A total of 125 sherds from contexts radiocarbon dated to the Cunil and Kanluk phases (Awe 1992; Ebert et al. 2017; Peniche May 2016) were sampled from excavations in Str. B4 and Plaza B in the Cahal Pech site core. Samples were also chosen from Middle and Late Preclassic contexts at two house groups in the Cahal Pech periphery: the Tzutziiy K’in (n=40) and Zopilote (n=27) groups. Samples from the Zopilote Group come from late facet Kanluk (750-350 BC) and early/late facet Xakal phase (350 BC-AD 300) contexts at Structure 1 (Ebert and Fox 2016). Samples from Tzutziiy K’in are derived from excavations of domestic buildings at Structure 2 and 3, and date to the early/late facets of the Late Preclassic Xakal ceramic phase (Ebert et al. 2016, 2017).

All ceramic samples were prepared for INAA using standard procedures at MURR by Daniel Peirce and Michael Glascock (see Glascock 1992; Neff 2000). Initial identification of compositional groups was based on mean and standard deviations for concentration data for each element within the sample. Hierarchical cluster analysis and principal component analysis were then applied to elemental data to refine compositional group membership. INAA results for the Cahal Pech sample were also compared to the results of over 12,000 previous analyses by MURR using Euclidian Distance searches to identify similarities with other identified geochemical compositional groups in Mesoamerica. The Cahal Pech ceramics divide into seven groups that generally correspond with type:variety classifications from different time periods and contexts (Figure 5 and Table 2).
Table 2. Ceramic compositional groups at Cahal Pech identified by INAA for each chronological period and ceramic phase, listed by context. Early facet (EF) and Late Facet (LF) components of ceramic phases are listed when present. Time periods abbreviated as follows: EPC = Early Preclassic, MPC = Middle Preclassic, LPC = Late Preclassic.

<table>
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<th>MPC</th>
<th>LPC</th>
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<td>LPC</td>
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<td></td>
<td></td>
<td>Settlement</td>
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<td></td>
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</tr>
<tr>
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<td></td>
<td></td>
<td>2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n=3</td>
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<td>Site Core</td>
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<tr>
<td></td>
<td></td>
<td>Settlement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
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<tr>
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<td>Unassigned</td>
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<td>11%</td>
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<td></td>
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<tr>
<td>n=22</td>
<td></td>
<td>Site Core</td>
<td>2</td>
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<tr>
<td></td>
<td></td>
<td>Settlement</td>
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<td>2</td>
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</tr>
<tr>
<td>Total n</td>
<td></td>
<td>37</td>
<td>50</td>
<td>58</td>
<td>37</td>
</tr>
</tbody>
</table>

Group A consists of two Cunil sherds of an unspecified white-slipped type, the only two samples from excavations at Plaza B with ash temper. Group B (n=34) contains all other sherds analyzed for this study with ash temper, as well as vessels characterized by fine texture calcite/quartzite pastes. Many of these samples are decorated with dull slips and post-slip incising (e.g., Baki Red Incised, Mo Mottled, and Kitam Incised types). Euclidean Distance searches indicate that the Cahal Pech specimens are compositionally unique to previously analyzed samples in the MURR database from the Maya region.

Groups C and D contain ceramic samples attributed primarily to the late facet Kanluk ceramic phase (750-350 BC). Group C (n=13) ceramics are primarily Mars Orange wares (Savana Orange and Reforma Incised types; Gifford 1976:73-76) and were distributed between late Middle Preclassic site core (62%) and settlement contexts (38%). Group D is the largest compositional group (n=71) in the INAA sample. Most specimens come from site core contexts (87%) with Cunil and Kanluk ceramic phase temporal assignments. The group is composed primarily of unslipped utilitarian pottery (57%, e.g., Sikiya and Jocote types), but also contains high frequencies of Savana Orange wares (37%). Euclidean Distance searches indicate that many of the specimens in this group are compositionally similar to previously analyzed samples of Middle Preclassic Mars Orange ceramics from the site of Holtun, Guatemala (Callaghan et al. 2017).

Group E (n=2) and Group F (n=3) ceramics compose only 3% of the total Cahal Pech INAA sample. While both groups are compositionally distinct, they exhibit high degrees of internal compositional variability, which indicates slightly different paste recipes for each sherd. Groups E and F are found relatively evenly between site core and settlement contexts, and are composed primarily of Joventud Red sherds from the Kanluk
ceramic complex. Group G (n=45) is the second most common group in the Cahal Pech INAA sample, and is composed of sherds from the Late Preclassic Xakal ceramic complex (350 BC-AD 300), suggesting a preferences for this paste recipe within household groups during later time periods. Specimens in this group are found almost exclusively at peripheral household groups, with ~74% of sherds samples from the Tzutzii K’in Group and ~65% of the sherds samples from the Zopilote Group assigned to this group. The most common ceramic types include Sierra Red and Joventud Red, with small numbers of unslipped utilitarian wares (Jocote Orange-brown and Sayab Daub Striated types).

Discussion

We used geochemical compositional methods of obsidian and ceramics to identify the economic mechanisms associated with developing inequality among Preclassic households at the site of Cahal Pech. The results indicate that, while obsidian and ceramic economies overlapped to supply households with items needed for everyday subsistence, they were structured in different ways. The pXRF data reported in this study document a relatively decentralized network of domestic obsidian consumption at Cahal Pech throughout the Preclassic. The inhabitants of Cahal Pech were active participants in long-distance obsidian exchange systems with the southern highlands of Guatemala as early as 1200 cal BC (Awe and Healy 1994; Ebert 2017; Peniche May 2016). The results of pXRF analyses of obsidian indicate the presence of El Chayal percussion flakes and one pressure blade artifact within the earliest Cunil domestic contexts at the site core. The sample size for this period is small (n=22), however, and is derived from only one context (Str. B4) in the Cahal Pech site core, making it difficult to assess hypotheses about differential obsidian consumption between households.

The long-distance procurement networks accessed by Cahal Pech expanded during the Middle Preclassic. SMJ obsidian became the most abundant source at the site, with El Chayal and Ixtepeque artifacts found less frequently. Different types of obsidian, however, were not evenly distributed between households. While SMJ blades became prevalent in the site core (~74% of all site core artifacts for the period), El Chayal remained the primary source for blades consumed by peripheral households (~49% of all settlement artifact for the period; Figure 6). The differential procurement of obsidian types suggests a lack of centralized control over redistribution. Instead, it is more likely that obsidian moved through a network of decentralized exchange relationships operating at the household-level. By the Late Preclassic, both El Chayal and SMJ blades became more evenly distributed within the Cahal Pech site core, with Ixtepeque also composing a smaller portion of the assemblage. A small sample size for peripheral house groups (one El Chayal blade) limits our interpretation of obsidian consumption in the settlement versus the site core for this period. Based on patterns in the geochemical data for later periods, however, it appears that decentralized
Table 3. Comparison of Preclassic obsidian sources from Cahal Pech and other Belize Valley sites.

<table>
<thead>
<tr>
<th>Site</th>
<th>El Chayal</th>
<th>SMJ</th>
<th>Ixtepeque</th>
<th>Other</th>
<th>Total n</th>
<th>Citation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Blackman Eddy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Kersey 2006</td>
</tr>
<tr>
<td>Early Preclassic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>35</td>
<td>1</td>
<td></td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>Late Preclassic</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cahal Pech</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ebert 2017</td>
</tr>
<tr>
<td>Early Preclassic</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Middle Preclassic</td>
<td>44</td>
<td>82</td>
<td>10</td>
<td>1</td>
<td>137</td>
<td></td>
</tr>
<tr>
<td>Late Preclassic</td>
<td>19</td>
<td>18</td>
<td>6</td>
<td></td>
<td>43</td>
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<tr>
<td><strong>Chan</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Meierhoff et al. 2012</td>
</tr>
<tr>
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<td>6</td>
<td></td>
<td></td>
<td></td>
<td>6</td>
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<tr>
<td>Middle Preclassic</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Late Preclassic</td>
<td>8</td>
<td>22</td>
<td>11</td>
<td></td>
<td>41</td>
<td></td>
</tr>
</tbody>
</table>

Figure 7. Proportions of obsidian sources at Blackman Eddy, Cahal Pech, and Chan for Early through Late Preclassic periods.
domestic procurement of blades persisted through the end of the Terminal Classic at Cahal Pech.

Comparisons to obsidian provenance studies for other Preclassic sites in the Belize Valley document a similar pattern of local and regional decentralized procurement of obsidian (Table 3). While published data for geochemically sourced assemblages is relatively limited, we consider obsidian source data from Blackman Eddy (Kersey 2006) and Chan (Meierhoff et al. 2012) to interpret differences in obsidian consumption between these sites and Cahal Pech during the Preclassic (Figure 7). Cahal Pech possesses the only evidence for obsidian during the Early Preclassic Period (Stemp et al., this volume). Whereas Cahal Pech relied solely on El Chayal obsidian (n=22) at this early date, provenance data for Middle and Late Preclassic assemblages show the development of differential procurement networks at the site-level at other sites across the Belize Valley. Compared to the almost complete reliance on SMJ obsidian by Blackman Eddy and Chan, Cahal Pech consumption patterns indicate the use of higher proportions of El Chayal obsidian imported as blades. By the Late Preclassic, the Cahal Pech and Chan assemblages are relatively evenly spread between obsidian types, while Blackman Eddy became reliant on El Chayal obsidian. Despite small samples sizes for some periods, these comparisons indicate that Preclassic sites developed independent procurement strategies to provision themselves with non-local obsidian, and that dominant sources shifted through time.

Ceramic INAA data from Cahal Pech suggest the development of craft specialization and distribution beyond the household-level that may have contributed to status and wealth of some households. INAA identified three compositional groups (A, B, and D) that contained diagnostic Cunil ceramic types, indicating a preference for these paste recipes during the Early Preclassic. Both Groups A and B contained high proportions of fine paste slipped and grooved-incised Cunil vessels derived exclusively from the Cahal Pech site core. Specimens in these two groups were also found to be compositionally unique compared to previously analyzed ceramics in the MURR database, suggesting that Cunil ceramics were produced and distributed locally in the Belize Valley. While vessels attributed to Groups A and B were primarily decorated types, the Cunil complex sherds in Group D are utilitarian, including unslipped jars and bowls used for daily tasks including water storage and cooking (Sullivan and Awe 2013). The differential distribution of Cunil utilitarian versus decorated serving wares between compositional groups may suggest individual (household) specialized production.

The Middle Preclassic Kanluk complex ceramic assemblage from Cahal Pech was composed primarily of Jocote Orange-brown utilitarian ceramics and fine Mars Orange Paste serving wares including undecorated and decorated types (e.g., Reforma Incised; Awe 1992; Peniche May 2016). A correlation between compositional groups for Middle Preclassic Jocote vessels and earlier Cunil utilitarian wares suggests persistence in local production of these types for domestic consumption. Typological studies from sites in the Belize Valley have also documented high frequencies of Mars Orange ceramics (~60-50%) in Middle Preclassic ceramic assemblages, possibly suggesting local production within the Belize Valley region (Awe 1992; Gifford 1976; Kosakowsky 2012; Peniche May 2016). Over 77% of the Savana Orange sherds analyzed in this study were assigned to compositional Groups C (n=27) and D (n=35). These sherds were derived primarily from site core contexts associated with high-status residences and public architecture (Horn 2015; Peniche May 2016). Euclidean Distance searches for the Cahal Pech Mars Orange ceramics within the MURR database identified compositionally similar ceramics from the site of Holtun, located in the central Petén of Guatemala (Figure 8). Non-local Mars Orange sherds from Holtun, also associated with monumental architecture in that site’s civic-ceremonial epicenter, formed a distinct compositional group (Callaghan et al. 2017). Though Holtun and Cahal Pech assemblages possess similar paste recipes, higher frequencies of Mars Orange paste wares in the Cahal Pech assemblage (77%) versus Holtun region (~12%; Callaghan and Neivens de Estrada 2016), suggest the Belize Valley as the likely origin of the Holtun Mars Orange assemblage.

The Late Preclassic (early/late facet Xakal ceramic phase) at Cahal Pech and sites across the lowlands saw the introduction of distinctive Chicanel style ceramics, characterized by matte or waxy-finish red and black slips (Awe 1992; Gifford 1976). The development of this regional ceramic
Figure 8. Bivariate plot of Cahal Pech ceramic compositional groups compared to Middle Preclassic Group 1 ceramics at Hotlun, Guatemala (after Callaghan et al. 2017) based upon canonical discriminant functions #1 and #2. Ellipses represent 90% confidence of membership for identified groups in the assemblage.

style and more tightly integrated obsidian exchange networks corresponds to the rapid growth of major civic-ceremonial centers (Ebert et al. 2017). At Cahal Pech, a program of large-scale monumental construction occurred in the site epicenter (Plazas A and B; Awe 1992; Healy et al. 2004). Several peripheral settlements also witnessed the construction of larger-scale residential buildings after ~350 cal BC (see Awe 1992:207; Ebert et al. 2016, 2017). The Xakal complex ceramics sampled for INAA in this study derive from contexts at the peripheral Tzutziiy K’ín and Zopilote settlement groups (Ebert 2017). The majority (~96%) of these ceramics are restricted to compositional Group G, which includes common Xakal types (Sierra Red, Joventud Red, Sayab Daub-striated) with both utilitarian (e.g., large jars, bowls, spindle whorls) as well as more specialized forms (e.g., serving dishes, spouted vessels). While most of the later samples were derived from household contexts, the correlation between time period and context may have important implications for understanding diachronic patterns of ceramic production and consumption at Cahal Pech, and more broadly within the lowland region. Because our sample from Cahal Pech is derived primarily from peripheral households, Group G ceramics may represent differential production between the households and site core. The shift in paste recipe at Cahal Pech may also correspond to the adoption of Chicanel style ceramics as a result of the development of regional interaction networks. Additional INAA analyses of Late Preclassic ceramics from the Cahal Pech site core and from other Maya sites are necessary to characterize differential production and consumption patterns that may be associated with local tradition and status.

Conclusions

Domestic economies were essential links in local communities to larger regional socio-economic systems among early Maya societies, and household production and exchange likely shaped the function of broader institutional economies (Hirth 2012, 2016). The results of this study indicate that economic networks became increasingly complex and interconnected throughout the Preclassic, with the function of production and exchange varying by the type of goods consumed through time. Both obsidian pXRF and ceramic INAA data indicate that households were self-sufficient and procured or produced most of the items necessary for daily activities. Obsidian source data connect Preclassic households at Cahal Pech to a diversity of economic networks operating between the Belize Valley, highland Guatemala, and highland Mexico. The differential procurement of blades produced from different obsidian types suggests a lack of centralized control over redistribution (e.g., Clark 1987; Santley 1984). Our data show instead that obsidian moved through a network of decentralized exchange relationships operating at the household level. These results indicate that the exchange of finished blades likely did not contribute to unequal economic relationships between households at Cahal Pech. INAA data show that ceramics were differentially consumed through time. Local production of specialized ceramic serving vessels with ideologically significant designs first appear at Cahal Pech during the Early Preclassic Cunil phase, and were produced and consumed locally. The patterning of INAA data also provides evidence for the development of inter-regional exchange of specialized Mars Orange pottery between high-status groups at Cahal Pech and sites in the central Petén. Production and distribution of these specialized vessels may have been used as one strategy by emergent high-status households at Cahal Pech to link people in other regions of the lowlands into networks of interdependency within a
developing institutional economy organized above the level of the household. Future research focused on characterizing obsidian and ceramic assemblages from other Preclassic contexts at Cahal Pech, other Belize Valley sites, and sites across the Maya region will help us reconstruct variation in assemblages may reveal the economic strategies that shaped both local and regional economies and contributed to institutionalized social and economic differentiation.

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Tibbits, Tawny L. B.

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Willey, Gordon R., William R. Bullard, John B. Glass, and James C. Gifford
Excavations of the earliest Maya occupations at Cahal Pech and Blackman Eddy provide information to piece together the lithic technology of the first Maya in western Belize. The Cunil/Kanocha to late facet Kanluk/Jenney Creek stone tool assemblages from these two sites document different lithic raw material acquisition patterns and changes in tool production over time. In the Cunil/Kanocha phase, the Maya at both sites relied on hard-hammer and bipolar reduction to produce expedient flakes from locally available chert; similar expedient flake production of Guatemalan obsidian is documented at Cahal Pech. In the early facet Kanluk/Jenney Creek phase, expedient chert tool production continues, but obsidian prismatic blades begin to appear as trade items and evidence of chert bifaces and unifaces made from local chert is documented. In the late facet Kanluk/Jenney Creek phase, new tool types such as burin spall drills of local chert and stemmed macroblades manufactured from northern Belize chert are recovered for the first time. These general trends in stone tool technology are compared to the lithic assemblages from other contemporaneous periods at sites in Belize, Guatemala, and Honduras in an attempt to understand changes in early Maya lifestyles in the terminal Early to late Middle Preclassic.

Introduction

Recent discoveries of more preceramic (Archaic) points throughout western Belize and excavations at some of the earliest dated Maya occupations, such as those at Cahal Pech and Blackman Eddy (Figure 1), are providing necessary information to piece together early lithic production techniques and patterns of raw material use. Not surprisingly, we see that Maya sites settled in the terminal Early to early Middle Preclassic were not large-scale stone tool production centers, but seem to be associated with the lifestyle changes of relatively small communities of early Maya farmers. Reconstructions of stone tool sequences permit interpretations concerning the development of lithic technology from preceramic peoples to early Maya populations and shed some light on how this technology factors into larger behavioral adaptations associated with major cultural changes in this significant period of transition in western Belize and beyond.

The Preceramic Period in Western Belize (ca. 11,500 – 1200 B.C.)

Although no fluted Palaeoindian chipped stone bifaces have been recovered from western Belize, debitage from Actun Halal may date to the Pleistocene (Lohse and Collins 2004). Yet, many stemmed and barbed preceramic chert points have been recovered in the Cayo District, mostly as surface finds (Kelly 1993; Iceland 1997; Lohse et al. 2006; Stemp and Awe 2013). In all, 11 Lowe points and six Sawmill points provide the best evidence for hunter-gatherers in the area in what is traditionally defined as the Archaic period (Stemp and Awe 2013; Stemp et
Maya Lithic Technology at Cahal Pech and Blackman Eddy

al. 2016; Stemp et al. 2018). Some of these tools from western Belize have been identified as Northern Belize Zone (NBZ) chert, indicating contact with this region. Other chert bifaces were made from high-quality stone that, in some cases, can be locally sourced (Horowitz 2017). To date, no obsidian has been dated to the preceramic period of western Belize; however, it has been found in southern Belize (K. Prufer, pers. comm. 2016). In terms of function, current evidence suggests that Lowe points were hafted tools used as thrusting spears/harpoons and knives; whereas, Sawmill points appear to have been affixed to atlatl darts (Stemp et al. 2016; see Kelly 1993). Another diagnostic tool form identified in the Late Archaic of western Belize is the constricted adze (Stemp and Awe 2013; see Iceland 1997; Lohse et al. 2006). The constricted adzes were hafted tools used for chopping/adzing wood, most likely associated with forest clearance and horticulture (Gibson 1991).

The Terminal Early - Early Middle Preclassic Periods at Cahal Pech and Blackman Eddy – Cunil/Kanocha Phase (1200-900 B.C.)

In the periods associated with the earliest pottery in western Belize, all of the diagnostic forms and most of the production technologies of the preceding preceramic period are absent.

Cahal Pech

In the earliest levels that correspond to the Cunil phase, tool-makers relied overwhelmingly on chert from limestone deposits around the site and on chert nodules retrieved near the Macal River, as well as small amounts of locally procured quartz/quartzite (Stemp 2012; Horn 2015: 337, Table 7.9; Peniche May 2016: 266). At Structure B4, the South Trench in Group B, and in the Group B Plaza, the majority of tool types are cortical and non-cortical flakes, some with simple retouch, and flake cores and core fragments (Stemp 2012; Horn 2015; Peniche May 2016) (Figure 2, Tables 1 and 2). Hard-hammer percussion was the dominant reduction technique used to strike flakes from relatively small nodules; however, some bipolar percussion occurred as well (Stemp 2012). This was an expedient technology to produce flakes that could be minimally modified through unifacial edge retouch. In terms of other flake tools, Peniche May (2016: 271, Table 6.2) identified flake-blades or fortuitous blades in Cunil levels.

Despite the suggestion by Peniche May (2016: 277) that biface technology was present in Cunil times at Cahal Pech, the very crudely chipped “triangular, general utility biface” (SF-769) from Plaza B was recovered from a “deposit of black dirt that contained no sherds” (Horn 2015: 317), which makes a Cunil designation questionable. There is no reliable evidence for bifaces at this site (cf. Peniche May 2016: 269, Fig. 6.3) in Cunil levels.

In Group B, obsidian tool types and production methods are the same as those discussed for chert. The Maya relied on the same hard-hammer percussion technique to
### Table 1. Percentages of tool types from the Cunil to late facet Kanluk phases from Unit 7, Structure B4, Cahal Pech.

<table>
<thead>
<tr>
<th>STRUCTURE B4, UNIT 7</th>
<th>Late facet Kanluk (N = 71)</th>
<th>Early facet Kanluk (N = 29)</th>
<th>Cunil (N = 57)</th>
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<tr>
<td>oval bifaces</td>
<td>1.4%</td>
<td>0</td>
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</tr>
<tr>
<td>drills (burin spalls)</td>
<td>1.4%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>drills (on flakes)</td>
<td>11.4%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>scrapers</td>
<td>0</td>
<td>3.4%</td>
<td>0</td>
</tr>
<tr>
<td>flake cores</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>flake core frags.</td>
<td>5.6%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>tert. ret. flakes (0% cortex)</td>
<td>0</td>
<td>0</td>
<td>1.7%</td>
</tr>
<tr>
<td>pr. Flakes (100% cortex)</td>
<td>0</td>
<td>0</td>
<td>3.4%</td>
</tr>
<tr>
<td>sec. flakes (&gt;50% cortex)</td>
<td>5.6%</td>
<td>13.7%</td>
<td>12.1%</td>
</tr>
<tr>
<td>sec. flakes (&lt;50% cortex)</td>
<td>30.6%</td>
<td>31.0%</td>
<td>36.2%</td>
</tr>
<tr>
<td>tert. flakes</td>
<td>34.7%</td>
<td>44.8%</td>
<td>36.2%</td>
</tr>
<tr>
<td>sec. bif. th. flakes (&gt;50% cortex)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>sec. bif. th. flakes (&lt;50% cortex)</td>
<td>2.8%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>tert. bif. th. flakes (0% cortex)</td>
<td>5.6%</td>
<td>6.9%</td>
<td>0</td>
</tr>
<tr>
<td>sec. macroflakes (&lt;50% cortex)</td>
<td>0</td>
<td>0</td>
<td>1.7%</td>
</tr>
<tr>
<td>bl. frags.</td>
<td>11.1%</td>
<td>0</td>
<td>6.9%</td>
</tr>
<tr>
<td>burnt frags.</td>
<td>0</td>
<td>0</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

### Table 2. Percentages of tool types from the Cunil and late facet Kanluk phases from the South Trench, Group B, Cahal Pech.

<table>
<thead>
<tr>
<th>SOUTH TRENCH, GROUP B</th>
<th>Late facet Kanluk (N = 63)</th>
<th>Cunil (N = 987)</th>
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<tbody>
<tr>
<td>oval bifaces</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>drills (burin spalls)</td>
<td>90.4%</td>
<td>0</td>
</tr>
<tr>
<td>drills (on flakes)</td>
<td>1.6%</td>
<td>0</td>
</tr>
<tr>
<td>scrapers</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>stemmed macroblades</td>
<td>3.2%</td>
<td>0</td>
</tr>
<tr>
<td>flake cores</td>
<td>0</td>
<td>0.4%</td>
</tr>
<tr>
<td>flake core frags.</td>
<td>0</td>
<td>1.1%</td>
</tr>
<tr>
<td>bifacial flake cores</td>
<td>0</td>
<td>0.1%</td>
</tr>
<tr>
<td>tert. ret. flakes (0% cortex)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>pr. flakes (100% cortex)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>sec. flakes (&gt;50% cortex)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>sec. flakes (&lt;50% cortex)</td>
<td>0</td>
<td>36.0%</td>
</tr>
<tr>
<td>tert. flakes (0% cortex)</td>
<td>4.8%</td>
<td>43.4%</td>
</tr>
<tr>
<td>sec. bif. th. flakes (&gt;50% cortex)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>sec. bif. th. flakes (&lt;50% cortex)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>tert. bif. th. flakes (0% cortex)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>sec. macroflakes (&lt;50% cortex)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>sec. flakes (&lt;50% cortex) as recycl. core</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>bl. frags.</td>
<td>0</td>
<td>4.3%</td>
</tr>
<tr>
<td>burnt frags.</td>
<td>0</td>
<td>0.2%</td>
</tr>
</tbody>
</table>
Table 3. Percentages of tool types from the Kanocha to late facet Jenney Creek phases from lithic sub-assemblage from Structure B1, Blackman Eddy (from Yacubic 2006).

<table>
<thead>
<tr>
<th>STRUCTURE B1</th>
<th>Late facet Jenney Creek (N = 469)</th>
<th>Early facet Jenney Creek (N = 1869)</th>
<th>Kanocha (N = 346)</th>
</tr>
</thead>
<tbody>
<tr>
<td>bifaces</td>
<td>0</td>
<td>0.2%</td>
<td>0</td>
</tr>
<tr>
<td>blades</td>
<td>0.4%</td>
<td>0.5%</td>
<td>0</td>
</tr>
<tr>
<td>chunks</td>
<td>8.4%</td>
<td>2.5%</td>
<td>3.5%</td>
</tr>
<tr>
<td>cores</td>
<td>3.9%</td>
<td>1.6%</td>
<td>0.3%</td>
</tr>
<tr>
<td>hammerstones/ hammerstone flakes</td>
<td>0.6%</td>
<td>0.9%</td>
<td>1.4%</td>
</tr>
<tr>
<td>flake-blades (fortuitous blades)</td>
<td>1.5%</td>
<td>1.0%</td>
<td>1.2%</td>
</tr>
<tr>
<td>flakes</td>
<td>85.2%</td>
<td>93.1%</td>
<td>93.6%</td>
</tr>
<tr>
<td>bifacial thinning flakes</td>
<td>0</td>
<td>0.2%</td>
<td>0</td>
</tr>
</tbody>
</table>

produce flakes/spalls from nodules (Awe and Healy 1994: 197; Ebert 2017: 135, Table 4.2; Ebert and Awe, this volume) (Figure 3). All of the sourced obsidian dated to the Cunil phase at Cahal Pech comes from El Chayal (ECH) (Kersey 2007: 5, Table 2; Ebert 2015: 214, 2017: 136, 139, Table 4.4; Ebert and Awe, this volume). Importantly, the earliest evidence for obsidian blade technology in the Cunil phase is provided by a prismatic blade fragment recovered from Structure B4 (Ebert 2017: 135, Table 4.2; Ebert and Awe, this volume). Currently, there is no evidence for blade production itself at Cahal Pech.

Blackman Eddy

Almost all of the tools in the sub-assemblage analyzed by Yacubic (2006: 67) from the Kanocha phase in Structure B1 at Blackman Eddy were made from locally-procured chert; however, all hammerstones or hammerstone flakes in this phase were quartzite. The cherts are consistent with those known from limestone outcrops and nodules near the site (Yacubic 2006: 66-67, 75-76). The Kanocha phase chipped chert sub-assemblage consists exclusively of debitage and some production implements (Table 3). As at Cahal Pech, hard-hammer core reduction was used to produce both cortical and non-cortical flakes, as well some flake-blades/fortuitous blades (Yacubic 2006).

At Blackman Eddy, obsidian blades and one flake were encountered in early deposits. These artifacts were found in contexts that contained both Kanocha and early facet Jenney Creek ceramics, and may date to the early Middle Preclassic period; however, a Kanocha date may also be possible (Brown 2003).

The Early Middle Preclassic Period at Cahal Pech and Blackman Eddy – Early facet Kanluk/Jenney Creek Phase (900-650 B.C.)

Cahal Pech

In the early facet Kanluk phase, the general pattern of tool production remains similar to what was observed in the Cunil phase (Stemp 2012). The majority of tools are simple flakes of local chert produced through hard-hammer percussion. Quartzite hammerstones, and at least one chert hammerstone, were recovered in some Plaza B units (Horn 2015: 337, Table 7.9). Major technological changes come in the form of more unifacially retouched flake tools (e.g., scrapers) and evidence for hard-hammer production of bifaces and bifacial thinning flakes of local chert (Tables 1 and 2). The absence of macroflakes, macroblades, or macroblade/flake cores from these levels indicates that the bifaces were made on nodules or cobbles. Peniche May (2016: 271-272, Tables 6.2-6.3) and Horn (2015: 308-309, 313, Fig. 7.1A, 317-326, Fig. 7.2) noted the presence of unifacial chert celts, chert percussion blades, and the appearance of the first chert microdrills. Although few in number, the need for bifaces and celts may suggest a growing importance on land clearance and/or digging in soil that accompanies greater agricultural development or permanent settlement (see Potter 1991: 27).

As in the Cunil phase, evidence from Group B demonstrates a continued reliance on hard-hammer percussion to produce useable
obsidian flakes (Awe and Healy 1994). However, more obsidian prismatic blades appear in early facet Kanluk times (Awe 1992; Horn 2015; Peniche May 2016; Ebert 2017; Ebert and Awe, this volume). Despite the increase in blades, there is still no evidence for blade production at Cahal Pech itself. Obsidian from San Martin Jilotepeque (SMJ) becomes the dominant source in this phase with small quantities of Ixtepeque (IXT) obsidian present as well (see Awe and Healy 1994; Kersey 2007: 5: Table 2; Ebert 2015: 214; 2017: 139, Table 4.4; Ebert and Awe, this volume).

**Blackman Eddy**

At Blackman Eddy, the overall pattern of raw material procurement in the early facet Jenney Creek phase lithic sub-assemblage remains generally consistent with the earlier Kanocha phase sub-assemblage. Most artifacts were made from locally obtained cherts with very few quartz or quartzite pieces. There is continued heavy reliance on hard-hammer chert flakes and cores; however, four chert bifaces provide evidence for this tool type at the site (Figure 4). Moreover, some of the chert flakes from this period are bifacial thinning flakes (Yacubic 2006: 77, Table 7). Chert drills on flakes from Blackman Eddy were found associated with marine shell debitage in early facet Jenney Creek deposits (Table 3) suggesting early craft production.

The first securely dated evidence of obsidian, both as blades and hard-hammer flakes, occurs in the early facet Jenney Creek
Horn (2015: 310-313, Fig. 7.1B) suggested a tranchet adze was recovered from Plaza B in this phase; however, this artifact does not resemble examples from northern Belize (Shafer and Hester 1983, Shafer 1991). Instead, the first tool types at Cahal Pech from northern Belize workshops are stemmed macroblade fragments (Shafer and Hester 1983; Shafer 1991) recovered from the South Trench and Plaza B (Stemp 2012; Peniche May 2016: 270, Fig. 6.4, 273, Table 6.4; Horn 2015: 314-315) (Figure 5). Minimally patinated macroblade fragments can be identified as NBZ chert.

Drills produced on chert flakes and small burin spall drills were recovered from late facet Kanluk phase levels in Structure B4, in the South Trench, and in Plaza B (Stemp 2012; Horn 2015; Peniche May 2016) (Figure 6). The need to perforate hard materials, like shell, may indicate an emerging craft industry focusing on bead production. Other drills on burin spalls at this time come from nearby Cas Pek (Lee and Awe 1995).

Based on the recovery of finished obsidian prismatic blades and a few examples of production waste (i.e., exhausted cores or core fragments) in this phase, most blades continued to arrive at Cahal Pech in finished form (Awe and Healy 1994; Horn 2015; pers. comm., 2017; Peniche May 2016). Most obsidian still originated from SMJ and at least one blade segment was sourced to Ucareo in Mexico (Kersey 2007: 5, Table 2; Ebert 2017: 139, Table 4.4; Ebert and Awe, this volume), suggesting an expansion of trade relations further north.

**Blackman Eddy**

At Blackman Eddy, there is continued reliance on locally available chert and quartzite (Yacubic 2006) in late facet Jenney Creek and an increase in the diversity of obsidian sources represented by prismatic blades. The chert technology primarily consisted of core reduction to produce flakes (Table 3). Although bifaces were present, no bifacial thinning flakes were recovered (Yacubic 2006) suggesting that production did not occur near Structure B1. Chert drills were also recovered, indicating the continued production of marine shell beads (Cochran 2009).

Given the absence of any obsidian debitage or polyhedral blade cores or core fragments within the sub-assemblage analyzed, obsidian prismatic blade segments from Blackman Eddy indicate acquisition of finished blades (Yacubic 2006). As in the previous phase, the dominant source at the site is still SMJ (88%) with single artifacts coming from ECH (5.5%) and IXT (5.5%), respectively (Kersey 2007: 4, Table 1).

**Comparisons to Other Sites: Western and Northern Belize in the Terminal Early Preclassic – Late Middle Preclassic**

**Pacbitun**

As at Cahal Pech, the earliest obsidian at Pacbitun occurs in the form of a hard-hammer flake recovered from the Mai complex (1020-820 B.C.) (Awe and Healy 1994: 198). Later in the Middle Preclassic, Pacbitun (Hohmann 2002; Powis et al. 2009) provides good evidence for bead manufacture using chert burin spall drills and shell beads. Obsidian blades are reported in the Middle Preclassic (Awe and Healy 1994: 198) with sourced obsidian identified as
Table 4. Trends in raw material types, tool types, and production techniques from the Preceramic to the late facet Kanluk/Jenney Creek phase in Western Belize.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Tool types</th>
<th>Raw Materials</th>
<th>Production Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preceramic (Archaic?)</td>
<td>- Stemmed bifaces</td>
<td>- Local chert</td>
<td>- Hard-hammer percussion</td>
</tr>
<tr>
<td></td>
<td>- Constricted unifaces</td>
<td>- CBZ chert</td>
<td>- Soft-hammer percussion</td>
</tr>
<tr>
<td></td>
<td>- Simples flakes</td>
<td></td>
<td>- Indirect percussion (notching)</td>
</tr>
<tr>
<td></td>
<td><em>Obsidian flakes in Southern Belize</em></td>
<td></td>
<td>- Pressure flaking (alternate beveling)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Hafting</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Projectiles</td>
</tr>
<tr>
<td>Cunil/Kanocha</td>
<td>- Simple flakes</td>
<td>- Local chert</td>
<td>- Hard-hammer percussion</td>
</tr>
<tr>
<td></td>
<td>- Retouched flake tools</td>
<td>- Obsidian</td>
<td>- Bipolar percussion</td>
</tr>
<tr>
<td></td>
<td>- Prismatic blades</td>
<td></td>
<td>- Indirect percussion/punch (known locally)?</td>
</tr>
<tr>
<td>EF Kanluk/Jenney Creek</td>
<td>- Simple flakes</td>
<td>- Local chert</td>
<td>- Bipolar percussion</td>
</tr>
<tr>
<td></td>
<td>- Retouched flake tools</td>
<td>- Obsidian</td>
<td>- Bifacial thinning</td>
</tr>
<tr>
<td></td>
<td>- Bifaces</td>
<td></td>
<td>- Indirect percussion/punch (known locally)?</td>
</tr>
<tr>
<td></td>
<td>- Prismatic blades</td>
<td></td>
<td>- Hafting?</td>
</tr>
<tr>
<td></td>
<td>- Fortuitous blades</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Crude choppers/ unifacial celts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Stemmed macroblades</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LF Kanluk/Jenney Creek</td>
<td>- Simple flakes</td>
<td>- Local chert</td>
<td>- Hard-hammer percussion</td>
</tr>
<tr>
<td></td>
<td>- Retouched flake tools</td>
<td>- NBZ chert</td>
<td>- Bipolar percussion</td>
</tr>
<tr>
<td></td>
<td>- Bifaces</td>
<td></td>
<td>- Bifacial thinning</td>
</tr>
<tr>
<td></td>
<td>- Prismatic blades</td>
<td></td>
<td>- Hafting</td>
</tr>
<tr>
<td></td>
<td>- Burin spall drills</td>
<td></td>
<td>- Burination</td>
</tr>
<tr>
<td></td>
<td>- Fortuitous blades</td>
<td></td>
<td>- Indirect percussion/punch (known locally)?</td>
</tr>
<tr>
<td></td>
<td>- Crude choppers/ unifacial celts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Stemmed macroblades</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Cuello

Analyzed together, the lithic artifacts from both the Swasey (1200-900 B.C.) and Bladen (900-650 B.C.) ceramic phases provide some comparative information for early chipped stone tool technology in northern Belize. The chipped chert assemblage consists of a variety of tools (McSwain 1991a: 168, Table 8.1; 1991b: 342, Table 4), in particular large bifaces of Colha-like and local chert, stemmed macroblades, some small bifaces, some drills, many blades, large numbers of scrapers, and pointed tools. Although most tools were made from local chert and chalcedony, the early inhabitants of Cuello also used significant numbers of tools made from NBZ chert, which they most likely produced themselves. The chipped chert technology at Cuello is essentially unchanged in the subsequent Lopez Mamom phase (McSwain 1991a: 168, Table 8.2). Chert debitage recovered at this site predominantly consisted of local chert, but NBZ chert flakes were also recovered in significant numbers, representing both flake-core technology and on-site biface production (McSwain 1991b: 341, Table 2; 344-345).

Based on clarifications by Hammond concerning a processing error (see Awe and Healy 1994), there was no obsidian associated with Swasey phase deposits. As such, the earliest obsidian artifacts consist of three prismatic blades (see Johnson 1991: 169, 171, Table 8.6) from the Bladen phase. In the later Lopez Mamom phase, three more blades are reported (Johnson 1991: 171, Table 8.6).
Hammond (1991: 197) states that three of the earliest obsidian artifacts from Cuello dated to the Bladen phase were from SMJ.

Colha

The Bolay ceramic complex at Colha is contemporaneous with Bladen at Cuello. The chipped chert artifacts from this complex were divided into two formal tool groups [a blade sub-assemblage and a biface sub-assemblage], as well as a casual/ad hoc tool group consisting of a trimmed flake/uniface sub-assemblage (Potter 1991: 21; see Shafer and Hester 1983). The blade sub-assemblage primarily consisted of hard-hammer macroblades and smaller blades, some of which were transformed into burins and burin spalls used to drill marine shell beads (Potter 1991: 21, 24; also see Hester and Shafer 1984 for Labpek). The biface sub-assemblage consists of three tool types, including a T-shaped adze, a wedge-form adze, and a Celt or biface form, all of which were likely produced using a hard-hammer technique on macroblade blanks (Potter 1991: 25-27). Given the regional distribution of formal stone tools produced on high-quality NBZ chert at other sites, the volume of manufacture, and the production of shell beads, Shafer and Hester (1991: 82, 91) argued that Colha was engaged in ‘cottage industry’ craft-specialization in the Middle Preclassic.

In terms of the obsidian from Middle Preclassic Colha, Dreiss and Brown (1989: 68, Table 2, see Dreiss 1988: 28, Table 16, 129 Appendix C) reported that all of the sourced obsidian was from SMJ. However, Brown et al.’s (2004: 231, Table 3) sourcing of a larger sample of obsidian from the Middle Preclassic indicated that a significant proportion of the obsidian (32%) originated from ECH and that a small amount also arrived from IXT (4%).

K’axob

At K’axob, McAnany and Peterson (2004: 296-299, Fig. 11.15, Tables 11.7, 11.9) noted that a substantial amount of debitage (including drill tips) and many different formal tool types, including oval bifaces, other biface forms, blades, T-shaped unifaces, and both stemmed and unstemmed macroblades, were recovered from the early facet Chaakk’ax phase (800-600 B.C.). These tools were made from local chert, local chalcedony, and NBZ chert.

Three obsidian blade segments were recovered from the early facet Chaakk’ax phase as well; however, there was no evidence for on-site production. All sourced obsidian came from SMJ (McAnany 2004: 308; Fig. 12.2, 309).

Comparisons to Other Sites: The Pasion River Region of Guatemala in the Terminal Early Preclassic – Late Middle Preclassic

Ceibal and Caobal

A similar reliance on expedient flake-core technology was noted at sites in the Real-Xe phase (1000-700 B.C.) in the Pasion River region of Guatemala. At Ceibal, the earliest stone tools were made predominantly from chert (97.6%) with far fewer produced from obsidian (Aoyama 2017a: 281, Table 2). At Caobal, chipped stone from the earliest deposits at the site also mostly consisted of chert (96.4%) with very few obsidian artifacts (Aoyama and Munson 2012: 35, Table 2). The chipped chert was overwhelmingly represented by hard-hammer percussion flakes, flake tools (e.g., denticulates and scrapers), and simple flake cores, although chert biface and blade technology was present at Ceibal in the Real-Xe phase (Aoyama 2017a: 282, Table 3; Aoyama and Munson 2012: 35, 37, Table 3).

Hard-hammer reduction of obsidian nodules or macroflakes also occurred at Ceibal and Caobal. Evidence for blade technology, in the form of prismatic blades, is present as well (Aoyama 2017a: 283, Table 4; Aoyama and Munson 2012: 35). At Caobal, obsidian only came from ECH (Aoyama and Munson 2012: 35). In addition to ECH (81.7%) obsidian, small quantities of SMJ (17%) and IXT (1.3%) material were also found at Ceibal (Aoyama 2017a: 281, Table 1; but the percentages in the early Middle Preclassic in Aoyama 2017b: 217, Table 2 are ECH – 74.1%, SMJ – 24.5%, IXT – 1.4%). No polyhedral cores, macroblades, percussion blades, or initial series blades occurred at Caobal, indicating acquisition of finished blades. However, evidence for on-site blade production is found at Ceibal. This is the earliest documented blade production for SMJ.

In the Escoba-Mamom phase (700-350 B.C.) at Ceibal and Caobal, there is heavy reliance on local informal chert tools in the form of flakes and retouched flake tools. At Ceibal, there is also evidence for continued local chert blade production, as well as biface technology based on the recovery of biface fragments and bifacial thinning flakes (Aoyama 2017a: 282, Table 3). An oval biface fragment and evidence for biface reduction in the form of two thinning flakes do not appear until the Mamom phase at Caobal (Aoyama and Munson 2012: 36-37, Table 3).

In the Escoba-Mamom phase, there is evidence for local prismatic blade production at Ceibal and the amount of obsidian reaching the site substantially increased as evidenced by the higher percentage of obsidian (29.3%) in the chipped stone assemblage (Aoyama 2017a: 281, Table 1). In this phase, most obsidian comes from SMJ (93.4%) and much smaller amounts were procured from ECH (6.4%) and IXT (0.2%) (Aoyama 2017a: 281, Table 1, 2017b: 217, Table 2). Blade production at Ceibal is demonstrated by the recovery of exhausted polyhedral cores, macroblades, percussion blades, ‘crested’ blades, flakes from polyhedral cores, and platform rejuvenation flakes. As such, obsidian, particularly SMJ, was imported as large polyhedral cores that were used to produce blades locally. The comparatively high percentage of cortex on obsidian artifacts (16.4%) and lower percentage of prismatic blades (38.6%) also indicate the continued import of large flakes and small nodules of SMJ for the production of percussion flakes as well (Aoyama 2017a: 289).

At Caobal, the amount of obsidian increased slightly from the earlier phase. Most obsidian (69.1%) originated from SMJ, while smaller amounts of ECH (29.4%) and IXT (1.5%) obsidian were recovered (Aoyama 2017a: 289). The change in the primary source of obsidian at Caobal in this phase is similar to that observed at Ceibal. Moreover, low percentages of cortex on obsidian at Caobal suggests that Ceibal was provisioning Caobal with finished blades and semi-exhausted cores (Aoyama 2017a: 289; 2017b: 225).

**Tikal**

Chert blade technology is first documented in the early Middle Preclassic Eb phase (800-600 B.C.) at Tikal (Moholy-Nagy 2003: Table 2.30). In the subsequent Tzec phase (600-350 B.C.) deposits, chert prismatic blades, exhausted polyhedral cores, oval bifaces, and stemmed bifacial points were recovered (Moholy-Nagy 2003: Table 2.30). Like chert blades, obsidian blades first appear in the Eb phase. In the Tzec phase, more obsidian blades (17) and a polyhedral core fragment were recovered from the site, suggesting the possibility of local blade production (Moholy-Nagy 2003: Tables 3.18, 3.24, 3.29; Moholy-Nagy et al. 2013: 87). The earliest Middle Preclassic obsidian blades were predominantly from SMJ, although some material sourced to ECH is reported (Moholy-Nagy et al. 2013: 89, Table 6). Evidence for local blade production, based on two exhausted SMJ blade core fragments, also occurs nearby in the Ah Pam phase of the Middle Preclassic (750-550 BC) in the central Petén Lakes region (Rice et al. 1985: 595).

**Comparisons to Other Sites: The Copan Valley and the La Entrada Region in Honduras in the Terminal Early Preclassic – Late Middle Preclassic**

**Copan and the La Entrada Region**

In Honduras, the earliest stone tools date to the Early Preclassic Rayo phase (1400-900 B.C.) at Copan and appear in the form of expedient core and flake technology (Aoyama 1999:53). Most of the material (90.5%) represents general hard-hammer debitage. Unlike the sites in Belize and Guatemala, the majority of lithic artifacts (90.5%) were made from obsidian and only eight were produced from local chert. However, this may be a product of sampling (G. Braswell, pers. comm., 2017). Despite the high proportion of obsidian, of which 97.4% was identified as originating from the IXT source, no prismatic blades or polyhedral cores were recovered. Aoyama (1999:53) notes that 27% of the obsidian artifacts possess cortex, which suggests the IXT obsidian was acquired in the form of large flake
spalls or small nodules, possibly indicating direct acquisition or down-the-line trading.

In the Middle Preclassic (900-300 B.C.), the majority of tools in the Copan Valley and the La Entrada region were made from obsidian (59.3% - Copan; 55.8% - La Entrada). The chert artifacts are mostly hard-hammer flakes (94.3%), some informal flake tools (e.g., denticulates, scrapers and a drill), and flake cores, with very few chopping tools (Aoyama 1999: 59, Table 4.1).

The obsidian artifacts from the Copan Valley overwhelmingly consist of hard-hammer flakes (93.4%), informal flake tools, and some prismatic blades (2.7%) (Aoyama 1999: 60, Table 4.2). Most (99.5%) of the obsidian tools were made from IXT obsidian. The majority of IXT obsidian continued to be acquired as large flake spalls or small nodules. The rest of the obsidian came from La Esperanza (0.3%) and ECH (0.2%). No polyhedral cores or macroblades were recovered in the Copan Valley, indicating that there was no local prismatic blade production (Aoyama 1999: 65).

At the Middle Preclassic sites in the La Entrada region, most artifacts were made from obsidian (67.6%) with fewer produced from local cherts (32.4%). As in the Copan Valley, chert tools were mostly hard-hammer debitage (86.8%). Informal flake tools, flake cores, and a few crude chopping tools were also recovered (Aoyama 1999: 62, Table 4.4).

Unique to La Entrada in the Middle Preclassic is the fact that San Luis/Source Y was the source of most (71.1%) of the obsidian artifacts. The remaining tools consisted of IXT obsidian. Most obsidian artifacts are general debitage (85.2%) or flake tools (5%) made using hard-hammer percussion. The absence of prismatic blades made from San Luis obsidian, the recovery of flake cores, and the very high percentage of artifacts with cortex (85.8%) indicates that this obsidian was acquired directly from nearby outcrops or local streams. The eight IXT obsidian blades, however, imply down-the-line exchange at the La Entrada sites in this period (Aoyama 1999: 63).

**Discussion and Conclusion**

Evidence for changes in lithic raw material use and stone tool technology can be traced from the preceramic through to the Middle Preclassic periods in western Belize (Table 4). Hafted formal tools made from fine-grained stone (e.g., NBZ chert) and the complex array of manufacturing techniques that characterize preceramic lithic technology are not found in the subsequent Cunil/Kanocha phases at Cahal Pech and Blackman Eddy (Lohse 2010; Stemp et al. 2016; cf. Clark and Cheetham 2002; Iceland 2005). In Cunil/Kanocha, stone tools were manufactured from locally obtained chert that was used to make simple flake tools using hard-hammer and bipolar percussion. At Cahal Pech, obsidian is introduced in the form of hard-hammer flakes struck from small ECH nodules with few prismatic blades. Our current analysis of Cunil and Kanocha lithic material does not suggest technological continuity between the preceramic and the earliest Maya ceramic-using populations in western Belize when compared to the scattered Archaic lithic tools recovered. We recognize that more data are necessary to further support this assertion. New evidence from Early Xunantunich, however, may shed light on this issue as preceramic deposits have been found underlying Early and early Middle Preclassic occupation (Brown et al. 2011).

In the early facet Jenney Creek/Kanluk phase at Cahal Pech and Blackman Eddy, flake-core reduction still dominates, but bifacial chert tools are present. Obsidian blade technology is more visible, but there is no evidence for local blade production. In the late facet Jenney Creek/Kanluk phase, local chert flake-core reduction continues, as does biface production. There is also the introduction of finished tools made from NBZ chert, in particular the stemmed macroblade. There are significant numbers of burin spall drills, and associated shell beads. Prismatic blades become the dominant obsidian tool type and hard-hammer reduction of obsidian nodules dwindles.

Despite general knowledge about trends in lithic technology in western Belize, more work is needed to fully flesh out lithic procurement and production in the terminal Early to late Middle Preclassic periods in this region. Lithic connections to sites further away, such as Colha, demonstrate the early integration of Maya communities into complex regional socio-economic networks and acquisition of obsidian.
demonstrates the establishment of long-distance exchange systems to provision sites with resources that were not found locally. Lithic data from Cahal Pech and Blackman Eddy provide good foundations for understanding the roles of chipped stone tool technology in the cultural development of the first lowland Maya communities and highlight the need for more effort in reconstructing the technological transition from preceramic hunter-gatherers to early settled farmers in western Belize.

Acknowledgments We would like to thank the Belize Institute of Archaeology for their continued support of our investigations in the Belize River valley, and for providing us with permission to excavate at Cahal Pech and Blackman Eddy. Funding for the Belize Valley Archaeological Reconnaissance (BVAR) Project has been generously provided by grants from the Gordon Childe Fund of University College London, the Social Sciences Research Council of Canada, the National Science Foundation, and the Tilden Family Foundation of San Francisco, California. Funding for the Belize Valley Archaeological Project’s excavations at Blackman Eddy and Cahal Pech was provided by Texas State University, Foundation for the Advancement for Mesoamerican Studies, Inc., and Southern Methodist University. Funding for lithic analysis was provided by a Faculty Development Grant from Keene State College. We are also grateful to all the staff, local archaeologists, and students who, over more than 30 years, have contributed significantly to our investigations at Cahal Pech and Blackman Eddy.

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8 PRECLASSIC ANIMAL RESOURCE USE AND THE ORIGINS OF ANCIENT MAYA LIFEWAYS AND SOCIETY: CONTRIBUTIONS FROM BELIZE ZOOARCHAEOLOGY

Norbert Stanchly and Chrissina Coleen Burke

This paper examines the important contributions made by zooarchaeological research in Belize to our understanding of Preclassic animal resource use and the origins of Maya lifeways and societies. The Preclassic Maya utilized animals for both dietary and non-dietary purposes. Although animals played an important role as basic nutritional supplements and as raw materials for artifact production, zooarchaeologists also recognize the importance of fauna in the development of social relations. Animals figured prominently in Maya creation mythology and served to create, maintain, and solidify Preclassic political and social relationships via both public and private performance and mechanisms such as feasting.

Introduction

This paper summarizes contributions from zooarchaeological research in Belize to our current understanding of the use of faunal resources by the Preclassic Lowland Maya. The Classic Maya exploited a broad and diverse array of fauna for basic nutritional requirements and as raw material for artifact production (Powis et al. 1999; Emery 2008). Animals also played an important social role in the dynamics of socio-political relationships (Pohl 1985). Differential access to fauna was based on status or authority (Emery 2002). The recovery of faunal remains from burial and cache contexts attests to their importance in Classic Maya ideology (Pohl 1983).

Recent archaeological research at several ancient Maya centres (Figure 1) indicates many of the hallmarks of Classic Maya civilization had their genesis during the earlier Preclassic, or Formative period (Adams 1977; Garber 2004; Hammond 1991; Hanson 1989, 1990; Healy and Awe 1995; McAnany 2004; Pendergast 1981). These include, for example, the emergence of ranked and other forms of complex hierarchical society, public art and architecture, craft specialization, long-distance interregional trade networks, increasingly sophisticated subsistence economies, the development of writing, and the introduction of kingship (Hammond 1986; McAnany 2004).

In assessing the Preclassic use of faunal resources by the ancient Lowland Maya we contextualize faunal exploitation with respect to Classic period patterns of animal resource use. To what extent, if any, do Classic period patterns of faunal use find their origins during the Preclassic?

Zooarchaeological research in Belize has a history that can be traced back over five decades. Prior to the beginnings of excavations at Altun Ha, David Pendergast understood the value of faunal analysis to understanding Maya subsistence patterns. He assembled a multidisciplinary team from the Royal Ontario Museum to collect as many modern mammal and bird species as possible for building a skeletal reference collection to aid in the analysis of any faunal remains expected to be collected during the following six years of excavation at the site (Pendergast 1979).

This collaborative approach to understanding ancient Maya animal use continued in the 1970s with the ROM’s excavations at two cave sites in Belize: Actun Polbiche and Eduardo Quiroz Cave, both excavated by Pendergast with the analysis of the animal remains undertaken by Dr. Howard Savage and Elizabeth Luther, at the University of Toronto (Pendergast 1971, 1974). These represent some of the earliest faunal research of cave sites in the Maya Lowlands.

Throughout the 1970s and 1980s, faunal research became an important component of analysis at several sites in the Maya Lowlands, including here in Belize. One of the most influential studies on the Preclassic Maya was by Norman Hammond at the site of Cuello in the Orange Walk District (Hammond 1991). The analyses of the large faunal assemblage from Cuello has provided important insights on Preclassic Maya animal resource use (Carr and
Preclassic Animal Resource Use

In the succeeding decades, zooarchaeological analysis has become a standard facet of archaeological research. Our understanding of the relationship between the ancient Maya and their animal resources has shed important light on patterns of dietary use, bone and shell artifact production, craft specialization, trade and exchange, differential access to faunal resources, the importance of animals in the establishment and maintenance of socio-political organization, and the importance of fauna in Maya ritual and ideology.

Through a comparison of these assemblages we contextualize Preclassic Maya faunal utilization within the temporal framework of the later Classic period. To what extent, if any, do Classic period patterns of faunal use find their origins during the Preclassic? What patterns can be discerned in the use of animals as subsistence items during the Preclassic? Were there regional differences in the procurement of fauna for food? Was there differential access to food sources based on rank or status? If so, when did this emerge? What do faunal assemblages tell us about Preclassic trade and exchange of animal resources? Was there craft specialization in the manufacture of bone and shell artifacts? What do faunal remains tell us of Preclassic Maya ideology?

The Maya Preclassic

Many of the hallmarks of Classic Maya civilization had their genesis during the earlier Preclassic, or Formative period. These include, for example, the emergence of ranked and other forms of complex hierarchical society, public art and architecture, craft specialization, long-distance interregional trade networks, increasingly sophisticated subsistence economies, the development of writing, and the introduction of kingship.

The Preclassic, or Formative period, spans approximately 2,250 years with a traditional, but inferred, start date of 2,000 BC and ending ca. AD 250. The Preclassic is divided into three main divisions, Early Preclassic, Middle Preclassic, and Late Preclassic. The Middle and Late Preclassic periods have been further subdivided. The Middle Preclassic has an early and late facet, while the latter three hundred years of the Late Preclassic are sometimes referred to as the Terminal Late Preclassic or Proto-classic period.

The Early Preclassic period has, to date, proven to be largely invisible archaeologically, although recent investigations at Cuello in northern Belize, and the sites of Cahal Pech (Awe 1992; Healy et al. 2004) and Blackman Eddy (Garber et al. 2004) in western Belize, have radiocarbon dates suggesting initial occupation of these sites during the Terminal Early Preclassic, ca. 1,200-9000 BC. This period witnessed the beginnings of settled village life, the adoption of maize agriculture, and the introduction of ceramic technology. These early communities were likely small with egalitarian social and political organization, while ideology and religion were probably shamanic in nature.

The Middle Preclassic period saw the expansion of village settlements along rivers throughout the Lowlands. During the Early Middle Preclassic, there is first evidence of public architecture (Micheletti and Powis 2015; Garber et al. 2004), and the first indications of
social and political complexity. By the Late Middle Formative we have ranked societies in the form of chiefdoms and the introduction of monumental architecture (Hansen 1989, 1990). Ideology and religious practice continues to be shamanic in origin, and early chiefs were probably village shamans (Freidel 1992).

By the Late Preclassic, Maya society underwent profound changes, many of which reached their florescence during the Classic period. Formalized monumental architecture, including vaulted tombs and stucco-decorated facades, is seen at several centres throughout the lowlands and definitive architectural styles are apparent including the tripartite arrangement of buildings atop the summit of structures as seen at sites such as El Mirador in Guatemala (Hansen 1990), and Lamanai in northern Belize (Pendergast 1981). The Late Preclassic also saw the emergence of the archaic state (Marcus 1993) and the adoption of divine kingship (Freidel and Schele 1988).

In summary, the Preclassic period saw the beginnings of settled village life, the adoption of ceramic technology, increasing social and political complexity, an ideology grounded initially in kin-based shamanism, and culminating in the appearance of large urban centres with monumental architecture, writing systems, strict status divisions, and the appearance of divine kings or lords.

Preclassic Faunal Utilization

Archaeological research on the Preclassic has a long history in Maya archaeology dating back to the Carnegie Institution of Washington’s Uaxactun Project of the 1930’s (Hammond 1982:355; McAnany 2004:3). Despite this, it has been argued that our knowledge of the Preclassic Maya is a poor reflection of the wealth of knowledge obtained from research into the Classic Maya (Healy and Awe 1995:2).

Although we agree this is certainly true with respect to the study of elements of ancient Maya society; however we argue this does not appear to apply to our understanding of faunal utilization. Despite the exponentially greater amounts of archaeology conducted on Classic period centres, the amount of zooarchaeological data recovered from Preclassic contexts is at least comparable if not more substantial than that recovered from later Classic contexts. Belize contribution to our understanding of Preclassic animal utilization is significant, and largely reflects the concerted efforts of many researchers whose primary interest has been to document and investigate the beginnings of Maya civilization (Table 1). The sites we discuss here include both inland and coastal Maya centres and include: Cerros, Cuello, Cahal Pech, Pacbitun, Colha, K’axob, Blue Creek, Colha, Caracol, Ka’kabish and Blackman Eddy (Table 2).

The Early Preclassic

Zooarchaeological data for this period come mainly from the margins of the Maya lowlands, for example, the Soconusco region of the Mexican and Guatemalan Pacific coastal plain. Even here the evidence is scant with most vertebrate faunal materials recovered from Terminal Early Preclassic contexts.

At the site of Paso de la Amada, Chiapas, faunal material recovered from redeposited midden indicates a focus on estuarine resources with the vertebrate assemblage dominated by a diverse array of marine and brackish water fishes (Wake 2004). Fish species include gar, sea catfish, jacks, snapper, mojarra, shark or ray, and cichlids (Wake 2004:215, Table 1). The diversity represented among the fish taxa is also reflected in the amphibian, reptilian, and mammalian species identified. This diversity attests to the knowledge and familiarity that the inhabitants of the site had of the microhabitats within their local environments, a trend that first appears with the introduction of semi-permanent and/or permanent village settlement in the Archaic period of Mesoamerica and continuing throughout the Preclassic period.

Although some larger game such as deer and peccary are present, the vertebrate assemblage indicates a reliance on smaller species such rabbit, turtle, lizard, gopher, and fish (Wake 2004:219). This reflects an established Archaic pattern of faunal utilization in other parts of Mesoamerica such as the Tehuacan Valley (Flannery 1967). Wake (2004:211) makes additional reference to increased amounts of invertebrate remains recovered from Archaic and Early Formative period shell mounds at the site.
Evidence for animal utilization in the Early Preclassic in Belize is scant and at this point, appears restricted to materials recovered from terminal Early Preclassic levels. At Cahal Pech and Cuello, the earliest ceramic phases yielded relatively small numbers of vertebrate remains (Awe 1992; Stanchly 1994; Wing and Scudder 1991). These included mostly mammal bone at both sites and at Cuello, there is greater diversity with reptiles (i.e. freshwater turtles), amphibian and fish also represented (Wing and Scudder 1991). At Cahal Pech, Cunil phase levels have produced mainly mammal remains and freshwater shells (Stanchly 1995). Recent analysis of faunal materials from Maya Hak Cab Pek Rockshelter (Orsini 2016) in southern Belize suggest less diversity in animal taxa utilization during the Preceramic period (ca. 9,120-3,348 B.C [after Orsini 2016:31]) with an emphasis on larger mammals.

The Middle Preclassic

Faunal assemblages from Middle Preclassic contexts at the sites of Blackman Eddy (Garber et al. 2004), Cahal Pech (Powis et al. 1999; Stanchly 1995), Cuello (Wing and Scudder 1991), Colha (Shaw 1999), Pacbitun (Healy et al. 2004; Stanchly 1999a), and K’axob (Masson 2004a, 2004b), indicate a continued focus on the hunting and procurement of small terrestrial and riverine vertebrate and invertebrate species, although larger game such as deer, peccary, begin to increase in relative numbers. These larger animals would have provided significant amounts of protein, thereby supplementing a diet increasingly reliant on maize agriculture.

In addition to the continued exploitation of local microhabitats and environs, the faunal assemblages indicate increasing knowledge of more distant sources of both vertebrate and invertebrate resources. The presence of marine fish and shellfish species at distant inland sites such as Cahal Pech (Powis et al. 1999:368-369) and Pacbitun (Healy et al. 2004:224) indicates the establishment of long-distance trade and exchange networks by the Middle Preclassic.

The faunal samples recovered from these sites indicate similarities in the types of animals procured for food. Although diversity in exploited taxa is still evident, there is a common reliance on small, medium, and large game species such as armadillo, river turtles, agouti and paca, peccary, deer, and, with the exception of the Belize Valley sites (Stanchly and Awe 2015) and Pacbitun (Boileau 2013), domestic dog. In fact, dog becomes a dominant species at all northern Belize sites (e.g. Cuello, Colha, K’axob) by the end of the Middle Preclassic, not only as a food source, but possibly also as an important food in ritual feasting (Clutton-Brock and Hammond 1994; Shaw 1999).

Mollusc utilization during the Middle Preclassic focused primarily upon the exploitation of freshwater snails and bivalves. Beginning in the Middle Preclassic, we see a rapid increase in the use of the freshwater mollusc triad of jute (Pachyhilus spp.), apple snail (Pomacea flagellata), and pearly mussel (Nephronaias sp.). The presence of these three shellfish, often in numbers exceeding the hundreds of thousands (Healy et al. 2004:224-225), in midden and construction core contexts, is almost a ubiquitous feature of Middle and Late Preclassic Maya sites. These include Cahal Pech (Stanchly 1995), Blackman Eddy (Garber et al. 2004), Pacbitun (Healy et al. 1990, 2004; Stanchly 1999a), Caracol (Cobos 1994), Minanha (Stanchly et al. 2008; Solis 2010), K’axob (Harrigan 2004), Blue Creek (Stanchly 1999b), Ka’kabish (Stanchly 2013) and Lamanai (Stanchly, personal observation).

The presence of large amounts of jute in these contexts is commonly interpreted as food refuse, especially where the specimens exhibit either broken or punctured spires which sever the muscle attachment of the snail from its shell (Healy et al. 1990).

At some sites, the exceedingly large amounts of jute found in platform and plaza core contexts indicates their use as construction material and not necessarily solely as items of food refuse (Solis 2010; Walden and Biggie 2017). Finally, the possibility exists that the deposition of freshwater shells in such large numbers may also be ideologically based, perhaps related to some sort of water or sea-related ritual (Halperin et al. 2003; Wagner et al. 2013; Walden and Biggie 2017). The near universal occurrence of large quantities of freshwater molluscs in Middle Preclassic...
deposits in Maya sites requires further explanation.

The presence of finished marine shell beads and debitage in Middle Preclassic contexts at Blackman Eddy, Cahal Pech, Kakabish, Blue Creek, and Pacbitun, indicates the beginnings of craft specialization in shell bead production. Healy (1998) believes these were likely part-time craft specialists engaged in “cottage industry” production. The presence of marine shell at distant inland sites indicates knowledge of and access to coastal resources by the end of the Early Middle Formative.

The types of marine shell species used in the production of beads are informative. During the Middle Preclassic the dominant species favoured as raw material were the conchs (Family Strombidae). Moreover, to our knowledge, there is no evidence for the use of Spondylus until the Late Preclassic. This suggests either the Maya did not possess the knowledge or skill to access the deep-water habitat of the thorny oyster, or the shell held no value as a prestige item during the Middle Preclassic. The appearance of Spondylus in Late Preclassic cache and burial contexts (see McSwain et al. 1991), may be a reflection of the presence of increasingly formalized status differences and the beginnings of the institution of kingship.

Our understanding of the ritual use of fauna during the Middle Preclassic is vague. Some remains have been recovered from burial or cache contexts. At Pacbitun, an Early Middle Preclassic cache contained marine shell beads (Healy et al. 2004:216). A large midden deposit associated with building construction at Blackman Eddy during the Early Middle Preclassic has been interpreted as evidence of ritual feasting (Garber et al. 2004:37). The midden contained large quantities of freshwater and marine shells, and “faunal remains were dispersed throughout” (Garber et al. 2004:37).

In summary, data from several Middle Preclassic contexts indicate a continuation of the exploitation of locally available species. There is an increase in the relative abundance of medium to large size game. Domestic dog is important at several sites in northern Belize, but its appearance on the menu at sites within the Belize River Valley region is rare in comparison.

Invertebrate remains become more common and we see the almost ubiquitous deposits of huge amounts of freshwater shells in midden and core contexts. Marine shell bead production appears, further suggesting the beginnings of craft specialization, with conch shell the preferred raw material. The use of Spondylus as a raw material is, to our knowledge, not known in the Maya Lowlands until the Late Preclassic. The presence of marine shell and marine fish at inland sites indicates access to coastal resources. The exact nature of this access is not known; however, we can infer the beginnings of elaborate long-distance trade and exchange networks. The presence of fauna in caches and burials indicates their importance in Maya ideology.

The Late Preclassic

The faunal assemblages from the sites of Colha and Cerros have been the subject of detailed zooarchaeological analyses (Carr 1985; Shaw 1991, 1999) and provide us with a good framework from which to examine Late Preclassic patterns of animal resource use.

The Colha and Cerros faunal assemblages reflect marked differences in access to faunal resources, in both quality and quantity, the increasing importance of fauna as elite prestige items, and the further elaboration of long distance trade networks. The Colha data (Shaw 1999) point to the importance of fauna in ritual and competitive feasting as a mechanism for creating socio-economic and socio-political relationships (see Clark and Blake 1994).

Subsistence patterns at both sites indicate the increasing importance of large mammals to the diet. Marine and freshwater fish occur in the Colha assemblage and marine fish dominate the Cerros assemblage. This reflects Cerros’ coastal location within Chetumal Bay. Dog continues to be an important dietary contributor at Colha and also at Cerros. Their presence at Cerros is interpreted by Carr (1985:126) as raising of dog as a supplemental food source for times when fish could not be procured to provide the sites meat supply.

Leslie Shaw (1999:94-95) provided a convincing argument that the frequency of dog remains in Preclassic deposits is related to their use in ritual feasting. She stated that if they
Table 1. Subsistence and Dietary Trends during the Maya Preclassic.

<table>
<thead>
<tr>
<th>Early Preclassic 2000-1000 BC</th>
<th>Middle Preclassic 1000-400 BC</th>
<th>Late Preclassic 400 BC-AD 250</th>
</tr>
</thead>
<tbody>
<tr>
<td>• maize agriculture</td>
<td>• intensified maize agriculture</td>
<td>• intensive agriculture systems</td>
</tr>
<tr>
<td>• hunting-foraging</td>
<td>• focus on riparian fauna but increase in fauna associated with secondary growth and maize fields; dogs important in some regions</td>
<td>• maize is staple crop</td>
</tr>
<tr>
<td>• focus on riparian resources?</td>
<td>• long distance trade &amp; procurement of marine fauna</td>
<td>• differential access to faunal resources appears</td>
</tr>
<tr>
<td>• faunal resources mirror Archaic patterns of exploitation?</td>
<td>• freshwater shellfish important resource</td>
<td>• increased focus on large game species</td>
</tr>
<tr>
<td>• most of the above inferred</td>
<td>• feasting important in establishing socio-political alliances</td>
<td>• feasting important in establishing socio-political alliances</td>
</tr>
<tr>
<td>• more data needed</td>
<td></td>
<td>• less focus on freshwater shell</td>
</tr>
</tbody>
</table>

were solely a food source then they would have provided a reliable source of meat throughout Maya prehistory as the only domesticated mammal. The general lack of dog found in Classic deposits indicates they were not a preferred meat source. The high frequency of dog, especially during the terminal Late Preclassic, may be indicative of their use in ritual feasting “as a social mechanism to legitimate and solidify power” (Shaw 1999:95). The latter part of the Late Preclassic would have represented a time of changing political fortunes for many with the transition from a kin-based ideological system to one of kingship. Interestingly, dog remains are not a common find in sites (e.g. Cahal Pech and Pacbitun) within the greater Belize River Valley area (Boileau 2013; Stanchly and Awe 2015). At Caracol, the majority of dog remains are worked teeth found within Late Preclassic burials (Giddens Teeter 2001).

High frequencies of freshwater shell continue to be documented in Late Preclassic midden contexts. Marine shell is found in Late Preclassic contexts such as burials and caches at numerous inland sites, including Tikal (Moholy-Nagy 1989) and Spondylus makes its debut as a prestige item as burial and cache inclusions, with the notable appearance of Spondylus as a prestige item.

Discussion

The preceding review of Belize’ contribution to our understanding of Preclassic Lowland Maya animal use indicates the importance of animal resources of food sources, as raw material for artifact production, as agents in the negotiation of emergent political hierarchies, and as important objects of ritual. Several patterns are apparent, some are continuations of previous patterns of Archaic period exploitation of resources, many are precursors of emergent Classic period patterns, and finally, others appear to be distinctly “Preclassic” in nature.

The Preclassic Maya exploited a broad and diverse array of local and distant fauna for basic nutritional requirements and as raw material for artifact production. This diversity, a pattern that persists throughout the Classic and Postclassic periods, is testament to the intimate familiarity the Maya had with local environments. Throughout much of the Preclassic the majority of site specific faunal assemblages reflect a reliance on hunting of an important dietary role although they are less common than in the preceding Middle Preclassic. We begin to see some of the faunal patterns most commonly attributed to the Classic period. These include the presence of shell and bone artifacts as burial and cache inclusions, with the notable appearance of Spondylus as a prestige item as burial and cache inclusions, with the notable appearance of Spondylus as a prestige item.
Table 2. Summary of Preclassic Faunal Use of Select Belize Sites.

<table>
<thead>
<tr>
<th>Site</th>
<th>Comments</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackman Eddy</td>
<td>Middle Preclassic focus on procurement of small terrestrial and riverine taxa with relative increase in abundance of larger game; large amounts of freshwater shell in Middle and Late Preclassic contexts; presence of marine shell beads during Middle Preclassic; possible evidence of feasting during Middle Preclassic</td>
<td>Garber et al. 2004</td>
</tr>
<tr>
<td>Blue Creek</td>
<td>large amounts of freshwater shell in Late Preclassic contexts; Middle and Late Preclassic marine shell beads</td>
<td>Stanchly 1999b</td>
</tr>
<tr>
<td>Cahal Pech</td>
<td>Presence of freshwater shells, dog, peccary and deer in Early Preclassic Cunil phase; Middle Preclassic focus on procurement of small terrestrial and riverine taxa with relative increase in abundance of larger game; presence of marine fish and marine shell by Middle Preclassic; large amounts of freshwater shell in Middle and Late Preclassic contexts; presence of marine shell bead manufacturing during Middle Preclassic; dog not common</td>
<td>Awe 1992; Powis et al. 1999; Stanchly 1995; Stanchly and Awe 2015</td>
</tr>
<tr>
<td>Caracol</td>
<td>large amounts of freshwater shell in Middle and Late Preclassic contexts; appearance of marine shell and fish by Late Preclassic; modified dog remains in Late Preclassic burials</td>
<td>Cobos 1994; Giddens Teeter 2001</td>
</tr>
<tr>
<td>Cerros</td>
<td>increasing importance of large mammals to diet by Late Preclassic; high relative abundance of fish reflects coastal location; Late Preclassic dog remains interpreted as supplemental food source</td>
<td>Carr 1985</td>
</tr>
<tr>
<td>Colha</td>
<td>Middle Preclassic focus on procurement of small terrestrial and riverine taxa with relative increase in abundance of larger game; dog common in Middle Preclassic; use of dogs in feasting during Late Preclassic; differential access to faunal resources by Late Preclassic</td>
<td>Shaw 1991, 1999</td>
</tr>
<tr>
<td>Cuello</td>
<td>dog common in Middle Preclassic; use of dogs in feasting during Late Preclassic; increase in relative abundance of large mammals by Late Preclassic</td>
<td>Carr and Fradkin 2008; Clutton-Brock and Hammond 1994; Wing and Scudder 1991</td>
</tr>
<tr>
<td>Ka’kabish</td>
<td>large amounts of freshwater shell in Middle and Late Preclassic contexts; presence of marine shell beads during Middle Preclassic; appearance of worked <em>Spondylus</em> by Late Preclassic</td>
<td>Stanchly 2013</td>
</tr>
<tr>
<td>K’axob</td>
<td>Middle Preclassic focus on procurement of small terrestrial and riverine taxa with relative increase in abundance of larger game; dog remains common by end of Middle Preclassic; large amounts of apple snails in Middle and Late Preclassic</td>
<td>Harrington 2004; Masson 2004a, 2004b</td>
</tr>
<tr>
<td>Pacbitun</td>
<td>Middle Preclassic focus on procurement of small terrestrial and riverine taxa with relative increase in abundance of larger game; extremely large amounts of freshwater shell (<em>i.e. jute</em>) in Middle and Late Preclassic contexts; presence of marine shell bead manufacturing during Middle Preclassic; appearance of worked <em>Spondylus</em> by Late Preclassic</td>
<td>Boileau 2013; Healy et al. 2004; Stanchly 1999a</td>
</tr>
</tbody>
</table>
what we assume to be locally available terrestrial and riverine food sources. The procurement of local species was supplemental to an increasing reliance on maize agriculture. The Preclassic Maya made use of freshwater fish, turtles, and molluscs, as well as small to large size mammals, such as armadillo, paca and agouti, peccary and deer.

There is a trend toward the greater importance of larger sized mammals, such as deer and peccary, by the Late Preclassic. This increase in mammal appears to be at the expense of some of the turtle species. Freshwater fish appear to be a relatively consistent occurrence throughout the period. The use of domestic dog increases throughout the Middle and Late Preclassic periods but becomes relatively rare in later Classic period assemblages, suggesting to some researchers (e.g. Shaw 1999), that their use as a food source reflects their importance in ritual feasting rather than a dietary staple.

Beginning in the Middle Preclassic, marine resources appear in both midden and ritual contexts. Marine shell bead production is evident at a number of coastal and inland sites, indicating the possible beginnings of craft specialization in the production of shell artifacts. Marine fish are also found at distant inland sites as food refuse. These may have been specialty food items (Wing and Scudder 1991). The presence of both cranial and post-cranial elements at Cahal Pech indicates that the fish were transported whole some 110 kilometres from the Caribbean, suggesting that they were preserved in some manner, perhaps by salting or smoking the fish (Powis et al. 1999). The presence of marine fish and shellfish indicates that the Middle Preclassic Maya had developed extensive trade and exchange networks at an early date.

During the Middle Preclassic we also see the appearance of vast quantities of freshwater snails and bivalves in construction core and within midden contexts. This appears to have been a ubiquitous feature of Lowland Maya sites lasting until the Late Preclassic. As with domestic dog, the use of freshwater shellfish and invertebrates diminishes greatly during the Classic only to make a resurgence in the Postclassic. The presence of large quantities of freshwater shellfish, especially jute, often numbering in the hundreds of thousands, implies their use as a food source although non-dietary explanations are worthy of future study.

With the onset of the Late Preclassic we see an increasing focus on larger game, such as deer. This appears to be especially true in deposits interpreted as representing elite contexts (e.g. at Cuello). Both quantity and quality increase. This is likely the beginning of a pattern noted in the Classic period marking the differential access to large game by the elite (Pohl 1976). There is also a concomitant increase in the amount of ritually deposited fauna in burial and cache contexts, and, in particular, the presence of greater amounts of marine shell, both worked and unworked. It is not until the Late Preclassic that we see the first evidence of the use of Spondylus in such deposits. During the Classic period, the thorny oyster became a common occurrence in the burial and tombs of Maya kings and their noble ranks (Moholy-Nagy 1984). The Late Preclassic likely represents the adoption of Spondylus as a prestige item. The use of dogs in feasting events in conjunction with the appearance of differential access to faunal resources as food and prestige items reflects the emergence of increasingly stratified society and kingship.

Excavations at the sites discussed, highlight the significant contributions made by research in Belize to our understanding of Maya Preclassic faunal utilization.

Concluding Remarks
This paper has addressed key questions pertaining to the use of faunal resources by the Preclassic Lowland Maya and the contributions made to such discussions by zooarchaeological research in Belize. A number of patterns have been discerned in the use of fauna as subsistence items during the Preclassic. Although there are some basic regional differences in the procurement of fauna for food, such as the greater frequency of marine resources at coastal sites such as Cerros, there is a great deal of uniformity in terms of the diversity of resources noted.

The limited data we have on hand does appear to indicate that at least by the Late Preclassic and probably as early as the Late Middle Preclassic there was differential access
to animal resources based on rank or status; however, more data are needed. In particular, we need to excavate representative samples of elite and non-elite deposits. In a similar vein to Classic Maya archaeology, much of our knowledge of Late Preclassic centres has focused on the excavation of elite contexts to study the emergence of institutionalized kingship.

Zooarchaeological data make it clear that by the Middle Preclassic the Lowland Maya were engaged in interregional long-distance trade and exchange. The exact nature of this remains unclear and additional investigation is required. The presence of marine fish at sites such as Cahal Pech, Caracol and Pacbitun may indicate that there were coastal sites focused on the procurement and redistribution of marine resources.

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9 RITUAL USE OF ANIMALS IN ANCIENT MAYA MORTUARY CONTEXTS: RESULTS OF FAUNAL ANALYSIS FROM THE STRUCTURE A9 TOMB AT XUNANTUNICH

Chrissina C. Burke, Katie K. Tappan, Gavin B. Wisner, and Jaime J. Awe

During the 2016 field season excavations at Xunantunich, Belize Valley Archaeological Reconnaissance (BVAR) Project archaeologists discovered the tomb of an elite male individual within Structure A9. Besides ceramic vessels, jade beads, and obsidian blades, we recovered an abundance of faunal remains in the burial chamber. The faunal materials associated with the burial include large cat claw bones, a locus of animal limb bones, and worked shell pieces. This paper presents a detailed discussion of the zooarchaeological assemblage from the tomb, as well as the methods used, and results identified from the faunal analysis. Additionally, the importance of animals to ancient Maya ritual mortuary practices is addressed, with specific focus on large cats. This research discusses the interplay between deer and large cats to ancient Maya elite and commoners and reveals a possible interpretation for the identity of this individual based on the faunal remains present. Finally, we demonstrate how faunal analysis can provide context for understanding elite burials in the past.

Introduction

Zooarchaeological data analysis contextualizes many aspects of archaeological research. From contributing an understanding of diet, and bone tool or personal adornment manufacture, to the identification of species employed in ritual contexts - these analyses provide a holistic understanding of human and animal connections in the past. In the summer of 2016, the Belize Valley Archaeological Reconnaissance (BVAR) Project excavated structure A9 on the west side of Plaza A at the site of Xunantunich. Excavations at the base of A9 revealed a set of hieroglyphic panels and two eccentric caches. Excavations in the structure itself uncovered a large vaulted tomb. With a maximum length of 444 cm, an average floor length of 353 cm and width of 214 cm this is one of the largest burial chambers excavated in the region to date (Tilden et al. 2016).

Within the tomb, we recovered an anatomically athletic, adult male individual along with 36 ceramic vessels, six jade beads, 13 obsidian blades, two bone hairpins, one shell ring, and an abundance of vertebrate faunal remains (Tilden et al. 2016). The faunal materials were concentrated in two locales, those directly associated with the burial and a locus, or pile, of long-bone faunal elements near the feet of the individual. The locus of animal long-bones was approximately 30 cm to the northwest of the feet of the individual and contained four chert cores generally placed in the four cardinal directions (Figure 1).

Faunal materials recovered from the tomb include multiple taxa, elements, and individuals. This faunal research highlights the importance of including animals in mortuary analysis, and more specifically, the incorporation of an understanding of taphonomic processes that influence the preservation and, therefore, the researcher’s ability to interpret human behaviors. Below, questions asked, methods employed, results identified, and discussion of the importance of species, bone elements, and bone sides present within the tomb, to ancient Maya ideology, are undertaken. Finally, we emphasize how zooarchaeological analysis contributes to understanding elite individuals’ significance within burial and ritual contexts.

The individual interred within the A9 tomb is of great importance to our understanding of the ancient polity of Xunantunich. Given the limited number of burials recovered in the site core to date, and this being only the second elite burial recovered in the site core, any information contextualizing the importance of this discovery, including the fauna associated with the individual, is essential.

Zooarchaeology Research and Questions

Zooarchaeologists focus on human-animal interactions in the past via multiple lines of inquiry. First, as expected, animals are studied as a part of human diets – such as questions concerning what animals people were eating; second, skeletal and shell remains can be used to assist with the reconstruction of ancient
environments, specific animals may be found in certain seasons or different years and climates; third, evaluating the modification of animal and shell materials into personal adornments and tools; finally, and more importantly to this research, human cultures, such as the ancient Maya, often employed fauna for ritual purposes. Therefore, these materials can represent significant symbols in everyday life or leadership, as demonstrated through ethnography and iconography.

To understand the significance of the individual buried within the tomb, several questions were identified to guide research. First, as with all faunal analyses, understanding the basic demographics of the faunal material recovered is a necessary step in the process. What skeletal elements (bones), sides, portions, and taxa are present within the tomb? After identifying what is present in the faunal assemblage, determining preservation biases is next. What is known taphonomically about the fauna associated directly with the burial and those cached near the feet? Are there differences in preservation and did diagenesis conceal any cultural modifications? Third, given the ritualistic nature of faunal materials associated with human burials, do the associated taxa reflect the status of the individual buried within the tomb? Finally, as many zooarchaeologists around the world have noted, right or left sides may be important culturally to the selection of animal remains as mortuary goods, therefore, what do the elements, sides, and taxa present suggest about this individual within the context of Maya ideology at the site?

**Materials and Methods**

The burial and associated artifacts, including the faunal remains, were excavated,
mapped and removed by BVAR personnel in 2016. Most of the faunal remains were subsequently dry-brushed in Belize and then exported to the Northern Arizona University, Department of Anthropology, Faunal Analysis Laboratory (NAUDAL) for further cleaning and analysis by Burke, Tappan, and Wisner.

The materials used for the analysis include comparative faunal collections from the Stanley J. Olsen Laboratory of Zooarchaeology at the Arizona State Museum, the Charles L. Douglas Vertebrate Zoology Collection at the Museum of Northern Arizona, and the Northern Arizona University, Department of Anthropology, Faunal Analysis Laboratory. Identifications were also accomplished using osteological guides, although our taxonomic classifications remained conservative, as not to inflate results (Andrews 1969; Gilbert 1985 and 1990; Mcusick 2001; Olsen 1964, 1968, 1979, and 1982). Data collected include in-field contextual information, Phylum, Class, Order, more specific taxonomic category (if possible), body portion (such as exoskeleton, cranial, appendicular, axial), element, portion of said element, side, age (generally, subadult or adult), sex, size class (small, medium, or large), and modifications either cultural or taphonomic in nature.

All faunal material was quantified to NISP, number of identified specimens, where identified as to skeletal element or taxon/size-class (size class identified following Pendergast 1971:78). Also recorded was the minimum number of elements (MNE), to specific element and side to assist with identifying our MNI values or minimum number of individuals and to determine if right or left elements were more prevalent (Lyman 1994).

Finally, any bone and shell artifacts were analyzed for modifications into tools or other personal adornments. Analysis of these materials allowed for a more specific identification and presentation of details tied to the individual interred in the tomb to further contextualize the importance of the individual.

**Results**

As we address the results of this analysis, attention should first be called to the taphonomic context within which the analysis was made. Taphonomy refers to natural or cultural processes, like animals chewing on bones or an earthquake fracturing architecture that lead to an incomplete and biased archaeological record (Efremov 1940). Taphonomic agents are the immediate physical cause of modifications to animal bones or artifacts – and taphonomic effects are the results or traces of these agents. By studying these processes, we can remove the taphonomic “overprint,” and truly observe the patterns resulting from natural and cultural effects.

The faunal remains recovered in the tomb were eroded, exfoliated, and generally poorly preserved. This was likely caused by the collapse of the tomb’s vaulted roof, and due to the destructive nature of the limestone deposits within the chamber. Additionally, much of the wall plaster had fallen from the walls over time and as it got wet and spread out on the floor, it aggregated in clumps and coated all the cultural remains on the tomb floor (Tilden et al. 2016). This hardened plaster made removal of the materials difficult, leading to fragmentation, which further obscured natural and cultural modifications, such as cut marks. In spite of their condition, we were able to spatially separate the faunal remains into two locales within the tomb, those associated directly with the human skeletal remains, and a cache of long-bones near the feet of the individual in the northeast corner of the tomb. We were also able to identify carnivore gnawing marks on several of the deer long-bone elements, suggesting the animal remains were available to scavenging carnivores prior to caching. Within the marrow cavity of the long-bone locus elements, a very dark, organic matrix, consisting of plant roots was noted – this further led to the increased fragmentation during removal. Given the extreme humidity within the tomb as well, skeletal elements often crumbled under the pressure of excavation tools.

Besides the three elements displaying carnivore modification, one long-bone fragment exhibited cut marks. These marks appear more like hacking or chopping marks, which are produced by striking the bone with a stone implement at a perpendicular angle, leaving a v-shaped cross section, with small fragments of bone crushed inwards (Potts and Shipman
Table 1. Faunal Remains Recovered from A9 Tomb.

<table>
<thead>
<tr>
<th>Taxonomic Category</th>
<th>Location within Tomb</th>
<th>NISP</th>
<th>% NISP for Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class: Mammalia</td>
<td>Cache</td>
<td>1,853</td>
<td>82%</td>
</tr>
<tr>
<td>Order: Artiodactyla</td>
<td>Cache</td>
<td>46</td>
<td>2.03%</td>
</tr>
<tr>
<td>Order: CF Artiodactyla</td>
<td>Cache</td>
<td>99</td>
<td>4.37%</td>
</tr>
<tr>
<td>Panthera onca</td>
<td>Cache</td>
<td>47</td>
<td>2.08%</td>
</tr>
<tr>
<td>Puma concolor</td>
<td>Cache</td>
<td>13</td>
<td>0.57%</td>
</tr>
<tr>
<td>Odocoileus virginianus</td>
<td>Cache</td>
<td>191</td>
<td>8.44%</td>
</tr>
<tr>
<td>Class: Mammalia</td>
<td>Human Associated</td>
<td>6</td>
<td>0.27%</td>
</tr>
<tr>
<td>Class: Gastropoda</td>
<td>Human Associated</td>
<td>3</td>
<td>0.13%</td>
</tr>
<tr>
<td>Order: Felidae</td>
<td>Human Associated</td>
<td>5</td>
<td>0.22%</td>
</tr>
<tr>
<td>Order: Rodentia</td>
<td>Human Associated</td>
<td>1</td>
<td>0.04%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>-</td>
<td>2,264</td>
<td>100%</td>
</tr>
</tbody>
</table>

*Location within Tomb = directly associated with the human skeletal remains (human associated) or recovered from the cache of long bones in the northeast corner of the tomb (cache).

**NISP = Number of Identified Specimens, where specimens are identified to skeletal element and taxon.

Note - Panthera onca and Puma concolor elements were severely fragmented.

Chopping marks are common in disarticulation of body portions, suggesting these marks could be the results of acquiring the limbs for this locus.

The long-bones located near the feet of the individual are generally all oriented southeast to northwest (Figure 1). A few of the elements appeared to have been moved, likely because of taphonomic factors – resulting with some having an east to west orientation. The skeletal elements in this locus are also stacked upon one another – given the taphonomic issues, the best estimate is that there was approximately 3 to 4 layers of these elements. Also, surrounding the long bones were four chert cores, positioned approximately in the four cardinal directions.

Our analyses identified 2,264 specimens to either a specific taxon and/or skeletal element – even if element was just general long-bone. Taphonomic issues in the tomb led to this higher than expected NISP value and does not represent cultural processing of the faunal remains. During excavations, while elements were becoming more and more fragmentary, an attempt was made to record the number of long-bones present. The number of identified specimens (NISP), where identified reflects skeletal element or body portion (appendicular, axial, cranial) and taxon, associated directly with the human skeletal remains is 15 (Table 1). Of these, 12 of the elements are mammal and three are mollusk. Five of the elements are the third phalanx, or the claw bone, of a feldid. The size of the third phalanx suggests either jaguar (Panthera onca) or cougar (Puma concolor), but identification, even with comparative materials from the Museum of Northern Arizona (MNA) in Flagstaff and Arizona State Museum (ASM) in Tucson, was not possible. The claw bones were found near the hands of the human burial. One of the elements associated directly with the burial is a rodent right dentary from the family Muridae (mice and rats), although unidentifiable to species. This rodent is likely intrusive and taphonomic, not cultural. The remaining six mammalian skeletal elements are unidentifiable to skeletal element or taxon.

Besides the mammal remains, three shell pieces were recovered. One of these pieces is a worked shell adornment that possibly功能ed as a ring (Figure 2). This ring was found below the left hand of the individual. Only half of the ring remains, but it resembles a “bow-tie ring” recorded at Dzibilchaltun (Taschek 1994). The remaining two shell pieces appear to be shell inlays or potentially bead spacers, although the perforations are not complete and appear more like depressions. One piece was found west of the cervical vertebrae, and the second was recovered east of the mandible. These pieces (Figure 3) are nearly identical in size, the first one has a length of 28.5 mm, a width of 7.25 mm, and breadth of 2.00 mm. The second one,
which is missing a very small piece, is 28.1 mm in length, 7.00 mm in width, and has a breadth of 2.00 mm. Both were modified in a similar pattern and they appear to be shell pendants with inlays. Shell artifacts with inlays are fairly common in caches and elite burials in the Belize Valley (Thompson 1931: Plate XLVII; Willey et al. 1965: Fig. 310). At Baking Pot, for example, Audet (2006:199, fig. 5.18) recovered a similar inlaid shell pendant, except that the latter was carved. More elaborately carved and inlaid shell discs are also reported at several cave sites, such as Actun Neko (Morton et al. 2012).

Finally, two bone hairpins were recovered from under the east side of the human remains. Again, due to the poor preservation, these materials were very fragmentary and recovered in 17 pieces. Two, pointed tip fragments were recovered with two blunt ends, suggesting at least two separate hairpins.

The NISP of skeletal elements cached near the feet of the burial is 2,249. Given their poor preservation; many elements did not retain anatomical features useful for taxon identification, although a few more specific identifications were possible with the comparative collections at the MNA and the ASM. Elements splintered and fractured during removal, therefore, NISP counts indicate the high degree of fragmentation. Individual complete element counts are not possible given this extreme fragmentation. Of these skeletal elements, 251 have been identified to genus and species (Table 1).

Radii, femora, tibiae, metatarsals, one patella and one calcaneus were recovered from the long-bone locus, although significantly more tibiae were observed. The few femora recorded were easily identified to species given the diagnostic nature of the proximal and distal ends. The two right femora represent one puma and one white-tailed deer, while one of the two left femora was successfully identified as jaguar. We think it is reasonable to assume that the remainder of the long-bones in the locus are jaguar, puma, and white-tailed deer given the lengths and diameters of the elements. Because of the poor preservation of species-specific diagnostic features, however, our identifications remain conservative.

The minimum number of individual (MNI) for the long-bone locus is four individuals based on the number of remaining left tibiae. There is a possibility, however, that at least 10 individuals might be represented, but here again, their poor preservation precludes us from making an accurate count. The MNI for third phalanges or claws bones is more problematic, given the difficulty of siding those elements to right or left paw and specific phalanx within said paw.

Finally, mammalian faunal remains associated directly with the hands of the burial include five un-sided third phalanx or claw bones, representative of a jaguar or puma pelt, robe, or more likely mittens (Ballinger and Stomper 2000; Willey 1972). Minimum number of individuals for the third phalanges was not possible due to the fragmentary nature of the
remains and the difficulties in identifying side, forelimb, and hind limb in these elements.

**Discussion**

Fauna within the Maya region are frequently associated with ritual activities and the supernatural. Often fauna in ritual contexts are non-dietary in nature. For the tomb long-bone locus, we discovered a higher number of tibiae, which, given the lack of significant meat utility, supports a ritual context for the locus itself. The femora associated with the large cats and deer is interesting because they are the only femora identified within the bone pile, and generally, these elements would be tied to subsistence given the large muscle masses associated with the femur, but a lack of cut marks suggests these elements were included for the locus. The patella and calcaneus recovered could indicate the long-bones were fleshy when placed within the tomb, meaning the patella was a “rider” instead of intentionally included (Binford 1981:234). The third phalanges associated directly with the burial are common across the Maya region. Sites such as Altar de Sacrificios, Altun Ha, Calakmul, El Perú-Waka’, El Zotz, Holmul, Tikal, Piedras Negras, Uaxactun, and Yaxchilan all have claw bones associated with burials (Edmonson 1971; Pendergast 1982; Pohl 1983; Scherer 2015). The interpretation, when such elements are found, has commonly been that the interred individual was covered with a large cat pelt (Smith 1950). Another possibility is that the individual was interred wearing jaguar mitts or gloves akin to the image of the dancing figure on the Altar de Sacrificios vase (Montgomery 2000).

Symbolically, left-sided ideology is tied to the heart and life-giving powers and the underworld – hind-limb elements are offered to the gods and used to make tools (Schlesinger 2001:178-183). Left tends to indicate ritual activities in elite ceremonial contexts according to Pohl (1976; 1983), while right can be correlated to male and power ideologies according to Brown (2004). It has also been suggested that male activities are often found on the right side of buildings, lending more credence to the argument that with better preservation we would have observed more right-sided elements in the tomb (Inomata 2001).

Several of the elements were confidently identified to jaguar, puma, and white-tailed deer. From an ethnozoological perspective these species are related and represent specific ideological concepts for the Maya. First, jaguars were associated with the night, caves, underworld, hunting, and stealth activities, which could be one reason for them showing up in the bone pile locus – since similar artifact loci from tombs are often very similar to those found in caves and cenotes (Miller and Taube 1993:103-104; Pohl 1983:56). Second, the large cats are associated with validating an elite individual’s status as a ruler (Teeter 2004:188). Since jaguars and other large cats symbolize masculinity, courage, strength, power, and destructiveness – the animal itself is thought to protect Maya rulers – the wayob or animal-spirit protectors are often represented in tombs through jaguar claws, bones, and teeth to benefit and demonstrate the ruler’s rank in society (Anderson and Medina Tzuc 2005:129; Pohl 1983:73; Schlesinger 2001:163-166).

Given the jaguar occupies the top of the food chain the Maya connected the animal to humans – also considered the top of the food chain – therefore, identifying themselves as the big cat (Miller and Taube 1993:102). Since jaguars and humans occupied the same power realm, the two also shared control over the rainforest (Miller and Taube 1993:103-104). So, the ancient Maya believed their dominance in the world was reflected in the predator and prey relationship between the jaguar and deer – suggesting the elite were the jaguars and the commoners or rivals were the deer (Pohl 1994:132). After major victories, the Maya elite would feast by consuming deer, metaphorically demonstrating their power to eat their defeated rivals, victims, or subordinates (Pohl 1994:132). Since the rulers were of the highest importance they would wear jaguar pelts at these feasts to symbolize their connection to the jaguar (Miller and Taube 1993:102). At Copán for example, 16 jaguars were sacrificed to celebrate the installation of the 16th ruler, with one whole jaguar being buried beneath a mound in the Great Plaza (Miller and Taube 1993; Pohl 1983). At Altun Ha, at least three pelts were present in
the Sun God’s tomb based on the number of third phalanges recovered (Miller and Taube 1993).

Jaguars depicted with deer were frequently tied to ruling or power and control; the jaguar-deer dance demonstrates this constant struggle for power between the elite and the commoners (Pohl 1983:71). In fact, the mere presence of a jaguar in any context may validate the power and rights of an individual to rule (Pohl 1983:73). Coincidentally, the word for jaguar, balam, was often tied to government officials and native priests in 16th century Yucatán, and has often meant sorcerer in Central Mexico (Benson 1998:69; Pohl 1983:73; Saunders 1994:109-110). Larger cats can also be tied to religious significance, specifically with medicinal and supernatural properties in their meat, blood, teeth, and claws (Emery and Healy 2014).

Finally, deer were considered supernatural as well and often associated with the sun (Pohl 1983:62). Deer are also commonly found in elite burials, as they were the food of the rulers and not the food of the commoners.

Conclusion

Based on the faunal remains recovered from the tomb, specifically the locus of jaguar, puma, and deer long-bones as well as large cat third phalanges, we suggest the fauna represent the jaguar-deer dichotomy in Maya ideology. With the elite represented by the large cats and the rivals or commoners represented by the deer – we propose the individual buried in this tomb is that of a significant leader. More specifically, the osteological evidence for the individual interred suggests a middle-aged male, with an “athletic” build – indicating he may have played a physically active role. Additionally, the faunal remains have been AMS radiocarbon dated, producing a date range of AD 685 to 890, placing him within the context of the Naranjo and Caracol conflict (Awe et al. this volume). Given the lack of other animal taxa as mortuary goods – this individual’s fauna suggests that in war, he was likely a skilled leader, potentially even an elite warrior – he was not buried with any other faunal remains besides the adornments he was wearing. Instead, all the large cat and deer elements argue elite leadership-status, especially when coupled with the discovery of the hieroglyphic panels flanking the staircase of the structure within which the tomb was found. The discovery of this tomb and the analysis of the fauna within, provide context for the role of Xunantunich in the regional political landscape in western Belize during the Late Classic. Continued analysis and research of faunal materials associated with elite burials can provide a more holistic understanding of individual identity and tie this identity back to regional politics.

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"FOOLS MAKE FEASTS, AND WISE MEN EAT THEM": INTERPRETING PROBLEMATIC “SMASH-AND-TRASH” DEPOSITS AT KA’KABISH, BELIZE

Kerry L. Sagebiel and Helen R. Haines

Maya archaeologists commonly discover “smash-and-trash” deposits—consisting of large quantities of broken sherds, lithics, faunal materials, and other remains—in varying contexts on Maya sites. Interpretations of these deposits commonly fall into four groups: simple trash or midden deposits, remains of feasts, termination rituals, or rituals of commemoration and veneration. At Ka’kabish, Belize, a series of smash-and-trash deposits, dating to the Formative period and consisting primarily of sherds and reconstructible vessels, were encountered in the Group D South Plaza. This paper will systematically present the expectations for these four different explanations, focusing on ceramic remains, and attempt to interpret the Group D South Plaza deposits by comparing them to the set of expectations for each.

Introduction

Ka’kabish is located in north-central Belize about 10 km northwest of Lamanai. The site was first occupied during the Middle Formative period ca. 800–600 BC. The earliest evidence of this occupation is in the center of the Group D South Plaza in Operation 8. In this location a series of smash-and-trash deposits were encountered spatially associated with Formative platforms and a secondary burial placed in a hollow carved into bedrock. This burial was associated with many jade and other objects indicating the significance of the person to the early community. This burial and its contents have been discussed in detail elsewhere (Lockett-Harris 2016). The focus of this paper is the smash-and-trash or problematical deposits located above the burial and exploring possible interpretations of them based primarily on the ceramics.

Smash-and-trash deposits in the Maya area typically consist of large quantities of artifacts, mostly ceramic sherds, and are often associated with structures or monuments. The common interpretations of these deposits are as termination rituals, the remains of feasts, commemoration rituals, or simple accumulations of trash. This paper will explore some of the expectations for the ceramics from these types of deposits and will then compare those expectations to the deposits found in Operation 8.

Middens

Middens are trash deposits and the expectations for such are that they will consist mostly of utilitarian objects that have reached the end of their use life (Schiffer 1972, 1987). Ceramics found in middens will consist of: a variety of domestic types (mostly monochrome slipped, unslipped, and striated) and domestic forms (cooking, food preparation, storage, and serving), few ritual types or forms, relatively small sherds that have little to no use-life left, few reconstructible vessels, and no whole vessels. Depending on how long the midden is in use, it may contain sherds from a range of time periods.

Feasting

“Feasting may be defined as a form of ritual activity centered on the communal consumption of food and drink. Rituals of this kind have played many important social, economic, and political roles in the lives of peoples around the world” (Dietler 2011:179). Feasts are, therefore, occasional events of a special nature participated in by numerous people at discrete periods of time.

Ceramics disposed of after a feast will likely have the following characteristics: a variety of large-capacity utilitarian types and forms for food cooking and preparation, a high proportion of decorated serving vessels for social display, a large quantity of small serving vessels (possibly of redundant type and size), vessels for special “festival” foods and beverages, a lack of high-capacity storage vessels, and the presence of ritual types and forms (e.g., censers, musical instruments, figurines, etc.). Assuming any intentionally or unintentionally broken ceramics will be disposed...
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of immediately as part of the feasting ceremony as ritual trash (Walker 1995), sherds will likely be large, show little use wear or reuse, and many vessels will be reconstructible. The sherds should also date to a relatively short, discrete period of time.

Termination

Termination rituals are events that end the use life of a structure or monument. They sometimes occur with the complete abandonment of a site. The expectations for the ceramic remains from these events are more difficult to delineate as we have less ethnographic and historical knowledge of these kinds of events than we do for middens, feasting, or commemoration. In addition, termination rituals may involve feasts, or middens might be used as fill if the event includes burying a structure or monument, so there is likely to be overlap with these other practices. If we assume that these events are mostly ritual in nature, then they should be rather discrete events, meaning the ceramics in them should date to a short period of time. Also, the ritual nature of termination will mean overlap with ceramics used in feasting, particularly, the remains of a large proportion of ritual vessel types and forms and many large sherds and reconstructible vessels. However, it is possible that during abandonment events, utilitarian ceramics will also be disposed of or abandoned rather than moved to new locations given their weight, bulk, and fragility (Schiffer 1987). There are also historical accounts of the destruction of all domestic pottery in every household during calendrical ceremonies in Mesoamerica and these often coincide with termination of buildings (Chase and Chase 1998; Tozzer 1941). In general, termination events likely will consist of a wider variety of pottery than for feasting events, but will mirror feasts in terms of the deposits consisting of large sherds, reconstructible vessels, and ceramics dating to a defined period of time.

Veneration

Veneration is a recurring set of ritual behaviors tied to the veneration of a deity, person, place, and/or thing. Therefore, evidence of veneration will be located near burials and tombs, ritual structures, pilgrimage areas, natural features, shrines, or monuments. Veneration events tend to be recurring and often consist of the deposition of heirlooms, ritual objects, and unique objects as well as the removal of objects and parts of objects as mementos (Palka 2014). In some ways, veneration deposits may resemble midden deposits in that they will likely be used periodically over time, therefore, the ceramics in them will come from a range of time periods. The inclusion of heirloom ceramics and partial ceramic objects and the removal of pieces of ceramic objects as mementos will mean that many small sherds and non-reconstructible vessels will be included as in middens. Veneration deposits may resemble feasting and termination deposits in that they may include more ritual objects. It is also possible that types and forms will skew towards special types that are decorated. However, forms may be somewhat limited to vessels that can hold offerings such as serving vessels and small storage vessels. Cooking, food preparation vessels, and large storage vessels are likely to be less common. The two aspects of veneration that may distinguish the deposit type from feasting and termination is the inclusion of non-local ceramic types, as people often travel some distance to pay respects and make offerings, as well as the inclusion of heirlooms.

The above expectations for the types of ceramic remains found in these four kinds of deposits is quite generalized and specific quantities of each ceramic variable are not given (Table 1). But they serve as a model or heuristic device against which to test particular deposits, as will be attempted for the Operation 8 smash-and-trash deposits below.

Deposits in Operation 8 in the Group D South Plaza

Perhaps the most significant aspect of the Operation 8 smash-and-trash deposits is their location directly above an individual buried in a shallow hollow carved into bedrock. This secondary burial is surrounded by 23 small pits also carved into bedrock that contained a variety of artifacts: 47 jade objects (including an “Olmec” spoon pendant shaped like a bird), 2500+ shell beads, a deer antler, speleothems and a stalagmite, ochre and chalk balls, quartz
Table 1. General expectations for four different kinds smash-and-trash of deposits.

<table>
<thead>
<tr>
<th>Utilitarian types and forms dominant</th>
<th>Midden</th>
<th>Feasting</th>
<th>Termination</th>
<th>Veneration</th>
</tr>
</thead>
<tbody>
<tr>
<td>A large proportion of ritual types and forms</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>A large proportion of decorated types</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Small sherds with no use-life left predominant</td>
<td></td>
<td>X</td>
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<td></td>
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<tr>
<td>Large sherds and reconstructible vessels</td>
<td></td>
<td>X</td>
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<tr>
<td>Sherds from many time periods</td>
<td></td>
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<tr>
<td>Sherds from discrete time periods</td>
<td></td>
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<tr>
<td>A large proportion of non-local types</td>
<td></td>
<td>X</td>
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<tr>
<td>A large proportion of heirlooms</td>
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<td>X</td>
</tr>
<tr>
<td>Location near specialized structures or monuments</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

crystals, chunks of ochre, faunal remains, obsidian, carbon, and 1,502 sherds. One pit was capped with an inverted Consejo Group modeled bowl and a Consejo Group incised bowl was inverted over the burial. The radiocarbon date from charcoal within the Consejo Red incised vessel is 799–511 BC (median 655 BC). The Consejo vessels are part of the Mormoops Complex (Swasey Sphere) and date to 800–600 BC.

Directly above the burial and pits is the first smash-and-trash consisting of 4,409 sherds, 26 partially reconstructible vessels, faunal remains, obsidian, and carbon. If the bedrock deposits and smash-and-trash deposits are considered together as a single deposit they contain: 5,911 sherds, 2 whole vessels, 26 partially reconstructible vessels, 5 spouted vessels, 4 worked sherds, 2 buckets, 2 cups, 2 lids, 1 censer, 1 bottle, and 1 possible figurine fragment. The preservation of the sherds in the smash-and-trash is good with 57% retaining their surface, 21% are rim sherds, and 75% of rims are identifiable to form. The forms are quite significant with 89% identified as bowls and dishes and 9% as slipped jars (serving vessels). Only 1% of the identifiable forms are unslipped jars (cooking or storage).

Half of the vessels in the smash-and-trash are types falling within the Noctilio Complex (Mamom Sphere) and dating to 600–400 BC the other half may be curated or heirloom vessels from the earlier Mormoops Complex. Other important aspects of the deposit are the inclusion of many likely imported vessels with volcanic ash paste (Gomer 2013) and vessels with resist designs along with a large quantity of local decorated (incised and modeled) vessels.

Comparing the deposit to the above expectations, the evidence is strongest that the earliest smash-and-trash contains the remains of a feast or other food-related ritual include: the large number of reconstructible vessels, the good overall preservation of the vessels, the very high proportion of serving vessels, the very low proportion of cooking and storage vessels, the high proportion of decorated ceramics, the inclusion of forms likely used for “festival” foods and beverages—including spouted vessels for chocolate, buckets, cups, and a bottle—and the inclusion of a possible figurine fragment and a censer. Evidence that this ritual or feast was related to the veneration of the person buried in bedrock includes the location directly above the burial and the inclusion of what are likely heirloom vessels and imported ceramics.
The burial and first smash-and-trash were covered by a floor and an uncarved limestone marker was erected that remained visible for some time as it protruded through the floor. Later, a second floor was laid down and a second smash-and-trash was deposited on top of it. The second smash-and-trash consisted of 1,276 sherds, 9 whole vessels, 71 reconstructible partial vessels, a lip-to-lip cache, 2 bottles, 1 spouted vessel, 1 worked sherd, and 1 censer. The deposit also contained faunal remains, charcoal and ash, and obsidian. The preservation of the sherds is excellent with 87% retaining their surface, 18% are rim sherds, and 78% of rims are identifiable to form. The forms are 85% bowls and dishes and 10% slipped jars (serving vessels). Again, only 1% of the identifiable forms are unslipped jars (cooking or storage).

Four radiocarbon dates from the deposit range from 762–388 BC (median of 575 BC), which accords with the dates of the Mamom pottery in the deposit. Twenty-three percent of the pottery is earlier Mormoops pottery and could be the remains of curated or heirloom vessels. Many of the vessels are decorated, such as Muxunal Red-on-cream vessels that appear to be resist technique and Guitara Incised sherds with the “double-line break” motif.

Evidence that this is likely the remains of a feast or other food-related ritual include: the large number of whole and reconstructible vessels, the inclusion of a cache, the excellent preservation of the vessels, the very high proportion of serving vessels, the very low proportion of cooking and storage vessels, the high proportion of decorated ceramics, the inclusion of forms likely used for “festival” foods and beverages—including a spouted vessel for chocolate and a bottle—and the inclusion of a censer. The large amount of charcoal, ash, and faunal remains in the deposit also provides evidence of food preparation and consumption. Evidence that this ritual or feast was related to the veneration of the person buried in bedrock includes the location directly above the burial and the inclusion of what are likely heirloom vessels as well as the possible removal of portions of many vessels as mementos.

At some unknown point later in the Formative, Structure (Str.) D-1 (not fully excavated) was constructed less than 2 m south of the bedrock burial and smash-and-trash deposits. It was then enlarged or re-faced (Str. D-2) and a Chicago Orange (Formative) jar was cached in it. Later, an apron was added to the front (Str. D-3) with fill containing transitional “Mamo-Chic” pottery (ca. 400–200 B.C.). Normally, building fill is thought to be recycled trash, although it is assumed that this kind of fill is unlikely to be brought from very far away. The fill of Str. D-3, however, is remarkably similar to that of the two earlier smash-and-trash deposits and may also represent the remains of some kind of feast or ritual.

The fill of Str. D-3 contains 818 sherds, 1 whole vessel, 5 buckets, 2 basins, 2 lids, 2 possible figurine fragments, 1 spouted vessel, 1 bottle, 1 censer, and 1 drum along with faunal remains, ash, and obsidian. The preservation is good with 71% of the sherds retaining their surface, 13% are rim sherds, and 57% of rims are identifiable to form. The forms are 76% bowls and dishes and 12% slipped jars, and only 3% unslipped cooking and storage jars. Interestingly, the deposit contains many small serving bowls and one vessel of unidentifiable form with a modeled face.

This fill deposit is comparable in preservation and content to the two smash-and-trash deposits with the major difference being that fewer rims are identifiable to form, there is a lack of whole and reconstructible vessels, and there are fewer decorated vessels. However, there is still evidence that this is the remains of a feast or other food-related ritual including: the good preservation of the vessels, the high proportion of serving vessels, the low proportion of cooking and storage vessels, the inclusion of forms likely used for festival foods and beverages—including a spouted vessel for chocolate and a bottle—and the inclusion of a censer, a drum, two possible figurine fragments, and the vessel with the modeled face. The large amount of ash and faunal remains in the deposit also provide evidence of food preparation and consumption. Given that this fill is less well preserved and lacks the large number of whole and reconstructible vessels found in the earlier smash-and-trash deposits, it is likely that it was
exposed as midden for some time before being incorporated into Str. D-3. Whether it is all from a single event or whether it simply represents the remains of several special events located somewhere in the Group D South Plaza is unclear at this time. However, its location near the antecedent burial and smash-and-trash deposits is intriguing suggesting that ritual and, possibly, commemorative events continued to be held in that location for hundreds of years.

Conclusions

For many years Mayanists have interpreted smash-and-trash deposits as middens, termination events, the remains of feasts, and as evidence of commemorative or veneration activities. By further exploring what these events entailed in terms of behaviors and material remains and by measuring archaeological deposits against these expectations, we can begin to tease out different events, that will allow us a firm basis from which to explore and theorize about issues such as placemaking, ancestor veneration, and political theater.

References


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11 THE EARLY-LATE CLASSIC TRANSITION AT CUELLO: RESULTS FROM THE 2017 SEASON OF THE CLASSIC CUELLO ARCHAEOLOGICAL PROJECT

James L. Fitzsimmons, Natalie Figueroa, and Prasanna Vankina

The archaeological site of Cuello is one of the most recognizable Preclassic sites in the Maya area. Research began there in the mid-1970s under Norman Hammond and his team, and in the decades that followed Cuello—and other early Maya sites like Nakbe, El Mirador, and San Bartolo—was fundamental in changing our image of the Maya Preclassic. The majority of the work at Cuello focused on a very small, early portion of the city center, in and around an area known as Platform 34. However, much of the visible stone architecture at the site dates from the Classic Period, when the site transformed from being a dispersed rural community to a rather centralized, large town. Modest in size but clearly following the trend towards political complexity common in the Maya lowlands at that time, Cuello became part of a larger community of Classic polities in northwestern Belize. The Classic Cuello Archaeological Project (CCAP) is exploring these later eras at Cuello and undertook its first excavations in January 2017. This paper presents the results of that first season.

Introduction

The archaeological site of Cuello is one of the most recognizable Preclassic sites in the Maya area (Figure 1). Research began there in the mid-1970s under Norman Hammond and his team, and in the decades that followed Cuello—and other early Maya sites like Nakbe, El Mirador, and San Bartolo—was fundamental in changing our image of the Maya Preclassic. The early research at Cuello demonstrated that the origins of settled village life in the Peten and Yucatan began as early as 1200 BC, if not before, and shed light on the history of the earliest, identifiably Maya inhabitants of northwestern Belize.

Most of the early work at Cuello focused on a very small, Preclassic portion of the city center, in and around an area known as Platform 34, although mapping revealed a settlement that was much larger. One can find, for example, standing architecture approximately 1200 meters southwest, 750 meters south, 600 meters west, and 500 meters north of the heart of the ceremonial precinct, otherwise known as Platform 1 or the ‘Acropolis’ (Hammond 1991: 9; see Figure 2). This stone architecture dates from the Classic Period, when the site transformed from being a dispersed rural community to a rather centralized, large town. Modest in size but clearly following the trend towards political complexity common in the Maya lowlands at that time, Cuello became part of a larger community of Classic polities in northwestern Belize. The Classic Cuello Archaeological Project (CCAP), under the direction of James Fitzsimmons (Middlebury College), is exploring these later eras at Cuello and undertook its first excavations in January 2017. This paper presents the results of that first season.

Cuello

The Cuello site is located at a mid-point between two larger ceremonial centers, Nohmul and El Pozito, east of the River Hondo and very close to the modern town of Orange Walk,
The Early-Late Classic Transition at Cuello

Belize (Figure 1). From the work done by Hammond, Kosakowsky, and others on the original Cuello project, there are indications that the general population at Cuello may have reached its peak during the Early Classic. Indeed, the Early Classic appears to have been a time of great change at the site. For example, the 60 test pits their team sunk throughout the site suggest that the stone architecture created during the Preclassic was actually not reused or remodeled by the Early Classic occupants, who seemed to prefer to build in new areas or atop perishable Preclassic buildings. The excavations of the 1970s and 1980s suggested, moreover, that the Maya built the northeast group in the Early Classic and that there was a local switch from kin-based to community-level ceremonial as well as political activity (Wilk and Wilhite, Jr. 1991: 125-133). Cuello then falls under the control of one family or group of related families.
Based in the new, ceremonial precinct (Norman Hammond, personal communication 2016).

According to Wilk and Wilhite, Jr. (ibid 127), the Early Classic was also a time when wealth disparities were on the rise. What Early Classic residential information we have suggests that basic, perishable houses coexisted with well-plastered platforms faced with cut stone. Like other sites in the Maya lowlands, this was accompanied by a switch from building such houses on a single raised substructure, as was common in the Late Preclassic, to houses framing the familiar patios we know all too well for the Classic Period (Kurjack 1974; Ringle and Andrews 1988). Moreover, the number of lone platforms increased during the Early Classic: Wilk and Wilhite, Jr. (1991: 127-128) have suggested that this heterogeneity stems from differential access to resources and is further evidence for the widening gap between the haves and the have nots at the dawn of the Classic Period.
The Early-Late Classic Transition at Cuello

The Late Classic does not, on the basis of those same test pits, appear to have been a good time for Cuello. The results from those pits suggested that the population declined markedly during the Late Classic. Scholars have suggested that because Cuello is not in as advantageous a location for intensive farming/transportation as places like Nohmul, El Pozito, and Lamanai, at least some of the population here may have emigrated to these increasingly prosperous centers during the Late Classic (e.g., see Hammond 1974: 181; Wilk and Wilhite, Jr. 1991: 133). This is not to say that the earlier project at Cuello found no evidence of Late Classic construction at the site, but that it looked as if construction slowed down: the population became less visible archaeologically. According to Wilk and Wilhite, Jr., Cuello does not appear to have ever recovered from this decline, with little-to-no clear evidence of occupation during the Postclassic.

2017 Season at Cuello

How does the above picture of Cuello accord with the results of the 2017 season in the northeast group (Figure 3)? The short answer is that it does not. Perhaps a longer, better answer would be ‘it’s complicated.’ The vast majority of the test pits dug outside of the Preclassic epicenter in the 1970s and 1980s were nowhere near the northeast group. As a result, although we probably have a good sense of what the general population was doing during the Early Classic, without major work in the northeast group we cannot hope to understand the political transformations happening at the site during the Classic Period. Over the course of the 2017 season, we excavated several test pits in the easternmost plaza fronting Structure 19, the largest temple-pyramid at the site. We eventually combined three of the test pits to form a trench designed to find the front face of Structure 19. We also cleared out and cleaned two looter’s tunnels/trenches in that structure. The results were rather surprising, especially in light of the enormous sequence represented by the earlier excavations in and around Platform 34.

First, we were able to recover Fine Grey sherds on the surface in a few areas of the plaza. They were found in three different test pits, each 20-25 meters apart from one another. We know that fine paste wares span the full Late Classic and Terminal Classic phases through Protohistoric eras in the Maya area, but that the peak of their popularity and distribution occur in the later Late Classic and Terminal Classic. As Joe Ball (2014) and others have noted, their distribution is pan-lowland, varying somewhat regionally by period (Bishop 2003; Forsyth 2005). As Laura Kosakowsky has observed, there is a trace occurrence of Late Classic Fine Gray in northwestern Belize as well (Kosakowsky et al. 2013).

We also know that Fine Gray can be separated into two macrogroups, Chablekal and Tres Naciones, associated respectively with Late into Terminal Classic timespan and with a fully Terminal Classic dating (e.g., see Foias and Bishop 2013; Bishop and Rands 1982). Those two groups of Fine Grey pottery, divided chemically and stylistically, have been used to effectively document and map a number of patterns in the Maya area (e.g, see Ball 2014; Bishop and Foias 2013; Demarest 2013; Foias and Bishop 1997; Forne et al 2010; Forsyth 2005; Bishop et al. 1982).

We do not know yet whether we are looking at Chablekal or Tres Naciones at Cuello, although given the pattern for northwestern Belize it is probably Chablekal, which was a product of the greater Palenque region, the surrounding coastal plain of Tabasco and western Campeche, and the lower and middle Usumacinta drainage. If it is Chablekal, then it dates to no earlier than 750 or 760—this is when Chablekal first emerges in its home region. Given that Fine Grey is scattered on the surface, the northwest group may have collapsed on the same schedule that many other Classic centers did, particularly those who fell in the late 8th or early 9th centuries. That being said, there is a Postclassic facet for Cuello: Hammond and his team found Postclassic refuse deposits around Structure 35, some dating as late as the 12th century. They even found a Late Postclassic effigy incensario in the vicinity of Str. 35 (Hammond 1991). But as of yet there is no evidence of actual Postclassic settlement here. As a result, refining the ceramic sequence for these end times—including, but not limited to, knowing whether we are dealing with Chablekal
or Tres Naciones—is critical for understanding how and when the site was abandoned. The Fine Grey we have is not refuse per se. It is surface scatter. Hopefully we will be able to get a larger sample of Fine Grey in future seasons, but for the moment it looks as if the final phase in the northeast group dates to the late eighth century.

The second surprise is that the Classic epicenter appears to have been built atop a small, natural hill (Figures 4 and 5). To the north, the hill slopes down into a rock quarry, and then back up to a flat region dotted with mounds and chultuns. Given the long occupation history for Cuello, the hill came as a bit of a shock: bedrock in this back area is perhaps one meter below the surface. By comparison, the test pits from the 1970s around Structure 35 were approximately 5-6 meters deep before they finished. There were a few fake-out moments with the bedrock in these pits: one of the layers just 40 cm below the surface looks like bedrock, with a whitish paste, but does not have that familiar feel—or the sterile soil—one would generally associate with bedrock. We finally hit that sterile soil after about a meter, continuing downwards for a while just to make sure. This would be the third surprise.

The humus layer in these pits is not quite like solid rock to excavate, but years—if not decades—of being pounded down daily by cattle from the local Cuello distillery and ranch makes it a very different experience from digging normal humus. The floor below it as well as the ballast is actually a relief (Figure 5): it is much easier to excavate than the top level, which presumably would be much wider if not for the cattle. The overall sequence is not only shallow but brief: there is only one floor in front of Structure 19. Owing to its position just below the surface, it is in very bad shape. Presumably the floor was resurfaced many times over its history, but there is no evidence of any serious modifications and no second floor to be found, at least nowhere near Str. 19 or any of the nearby buildings. Below the floor are successive layers of light-colored, loose soil that get progressively darker until one hits the white of bedrock. It was the same in every pit we dug, although admittedly because we did not excavate in or around Platform 1 this season, we may have hit upon a particularly late—or hastily built—portion of the ceremonial precinct.

The final surprise would be the dates. Thus far we do not have radiocarbon for the plaza, but the ceramics seem to place the floor in the Late Classic (Kosakowsky and Robinson, personal communication 2017). The best samples we have are from floor and from the whitish layer immediately below the ballast for that floor. Much of the information we have on the ceramics from the 2017 season is preliminary; a more detailed analysis has yet to take place and will surely refine the information presented here.

The floor of the plaza has a mixture of Early Classic and Late Classic ceramic types, although it is so torn up by roots, rockfall, and other intrusive features that it is difficult to date with any precision. The layer below, however, is in terrific shape. Here the ceramics are a mixture of Preclassic and Terminal Preclassic types, so common Aguila Oranges and Sierra Reds as well as less common Zapote Striated and Yaxnik Through-the-Slip Incised. The layer

Figure 4. CC100-1-4. The hill slopes downward, south to north, into a low plain dotted by mounds and chultuns.

Figure 5. CC100-6. East wall profile.
below the floor fill of the plaza, in each of the test pits we excavated, contain Tzakol 3/Tepeu 1 types and forms as well (Kosakowsky and Robinson, personal communication 2017). What this means is that level below the plaza floor corresponds to sometime between 550 and 700 AD. Although the ceramic sample in the deepest, final layers is very small, the general sequence seems to be a mixed Early Classic-Preclassic layer, followed by what might be Late Preclassic.

There is a somewhat similar picture with regard to Structure 19 itself (Figure 6). Over the course of the season we cleaned out two looter’s pits. The first is directly on top of the building on the east side; the looters’ followed the contours of the entrance to collapsed room on the top and started throwing rocks and debris down the back of the pyramid. The building appears to have had a vault on the top, despite its small size: Structure 19 is approximately 10.5 meters tall. The looters did not go below the level of the platform floor here, which extends across the entire top of the structure. In the second looter’s pit, they punched through the south side of the building. As can be seen in the drawing, Structure 19 was refurbished at least once, with a floor running through the looter’s pit. The looters disturbed and destroyed a feature of some sort: in the west wall of the pit there is a section of stone—out past the retaining wall—that looks to have been disturbed in antiquity. Large boulders, either from a collapsed vault or disturbed rubble fill, proceed downwards along wall of the looter’s pit until one gets to a section of smaller stones. There aren’t many, and one can peel them off of the wall and find large stones behind them, but they are certainly odd. Our best guess is that a feature—perhaps a cache—was put below the floor in antiquity and then carved out by the looters, who left only bits of rubble clinging to the wall to hint at what it would have been. It does not look like the looters disturbed a burial: there is no bone in the pit, no evidence of a vault, and no burial floor in the pit. If it were a chamber, the looters would have had to destroy the ceiling, the floor, and most of the walls to create what appears in the drawing. The feature looks more like a cache that was set into the floor of the original building; the hypothetical cache and original floor were then covered in the next construction phase. Whatever the looters did find, they decided to keep going another meter into the building before giving up. The sherds in both looter’s pits were almost exclusively Late Preclassic types, including Margay Black-on-Red, although there are both Terminal Preclassic and Middle Preclassic sherds as well (a Tower Hill Red-on-Cream) in the fill (Kosakowsky and Robinson, personal communication 2017).

From our own excavations on the outside of the building, it looks as if the builders laid a
foundation in Tzakol 3/Tepeu 1 times, so as to not have the building sink in the loose, sandy soil it sat upon, and then built the first phase of the structure. The plaza floor extends to the building, and as with the test pits we found no purely Early Classic material. Overall the building, like the plaza, gives the impression of a rather shallow time depth.

Discussion

We might sum up the 2017 season as follows:

1) There is an emerging Late-Terminal Classic phase for Cuello, as represented by the appearance of Fine Grey (Chablekal?) in surface scatter;

2) No dedicated Early Classic layers have yet been found, although the structures surrounding Platform 1 may reveal a completely different sequence;

3) The plaza in front of Structure 19 was built—at earliest—at the beginning of the Late Classic, possibly as late as 700 AD;

4) The layers below the plaza floor are shallow and utterly unlike those found around Platform 34, which goes back to the Middle Preclassic; and

5) Structure 19 would appear to have a relatively shallow time depth, perhaps built in Tzakol 3/Tepeu 1 times.

The earliest phase we have atop the natural hill of the northeast group is Late Preclassic at best. We may even be looking at an Early Classic date here: many of the identifiable types we have, even for the lowest level atop the hill are transitional Late Preclassic-Early Classic ceramics. There are no floors, postholes, or any real signs of activity in the ceremonial precinct before the Late Preclassic-Early Classic transition. In other words, the Cuello we excavated in the 2017 season is thoroughly unlike the one from the 1970s and 1980s. Taken by itself, the data from portion of the precinct we excavated does not fit with the idea of a boom in population during the Early Classic or a steep decline in the Late Classic. If one were excavating Cuello without the prior history of research here, one would probably conclude that there was a boom in construction in the Late Classic, with a minor Late Preclassic-Early Classic facet.

How are we supposed to reconcile these two very different results? Again, we have to remember that the original project at Cuello excavated 60 test pits. Those pits were determined at random, with almost none of them falling anywhere near the northeast ceremonial precinct. They provide an image of a Preclassic Cuello that changes suddenly in the Early Classic, with a shift to a new ceremonial center in the northeast, a population boom during the Early Classic, a decline in the Late Classic, and a sparse Postclassic component. The 2017 excavations were from 6 test pits, were not random, and were only in the east part of the ceremonial precinct. They suggest a Late Classic transition, with nothing that is purely Early Classic. Most of the material is not even Preclassic. So again, what do we do with these two results?

Perhaps the two results are not mutually exclusive. We have terms like Late Preclassic, Early Classic, Late Classic, and Terminal Classic for a reason. They help us to discuss broad moments in prehistory. But it is possible for us to fall victim to our own categories. If we look at what has happened to the Preclassic over the last twenty years or so, what we see is a Preclassic whose outer boundaries are eroding. To be sure, there is a boundary between the Preclassic and Classic. But it is not a hard and fast line for many places. We would do well to remember that for terms like Early and Late Classic too. What we may be seeing at Cuello, with these two seemingly different results, is evidence of change happening during a transitional phase, namely the Early-Late Classic transition. Tzakol 3/Tepeu 1 spans a rather large time span, ranging from about 550 to 700 AD. We found these ceramics in a band across the plaza, stretching to the base of Structure 19. There are no purely Early Classic layers in the northeast ceremonial precinct; Early and Late Classic ceramics blend together in each of the test pits we excavated. So what if the transition to Classic-style ceremonial and political behavior at Cuello actually happens sometime between 550 and 650? One would still see expansion and development, in terms of settlement, for the Early Classic, as well as a gradual decline in the Late Classic, which is
what the older (and much more complete) settlement data suggests.

What if Cuello becomes more complex first and then one family or group of families decides to build the ceremonial precinct? In this scheme, there are several emerging religious, political, and economic hierarchies in the town (heterarchy). One family builds upon preexisting ideas and inequalities, creating a kind of ‘bottom up’ (as opposed to top down) social enchantment after local conditions become suitable for it (e.g., see Geertz 1980; Demarest 1992; Houston 1998; Canuto and Fash 2004). They do not create an ideology to suddenly ‘sell’ to the populace, convincing them to become more like their larger neighbors, but rather exploit an ideology already present in the town as a result of the social, political, and religious climate of the Maya lowlands in the mid-500s and 600s. Architecturally, the ceremonial precinct appears like a sudden change, but given the settlement data it may actually represent the outgrowth of a slow process begun in the Early Classic.

What if the family (or group of families) build the ceremonial precinct and ‘seize’ power during the Early-Late Classic transition, a time of increasing complexity but fail in the long-term because places like Nohmul or El Posito outpace Cuello? Perhaps once the locals make the shift to a “Classic-style” polity they realize that other places do it better and begin to leave. Obviously, more research is necessary to flesh out the timing and the reasons for these transitions.

Conclusion

In order to confirm the Early-Late Classic transition hypothesis presented here, we will have to return to Structure 19 as well as sink further pits in Platform 1 (where there is a pre-existing test pit from the 1980s). The shallow time depth, the lack of multiple floors in our excavations, and the missing, unequivocally Early Classic layers in the northeast group all suggest a very short period of glory for the area. The Fine Grey here, as well as sporadic encounters with Postclassic material around the site, suggests a long but meager presence too. The family or group of families responsible for the ceremonial precinct fell out of favor in the 8th century but the settlement itself, having a much longer history, managed to survive long-term.

Why would Cuello have suddenly reinvented itself, only to fall apart? The answer to this question, unfortunately, rests upon two other long-term questions for the project. The first, simply put, is ‘Why Cuello?’ So why would anybody choose to live here during the Classic Period, as opposed to anywhere else within 5-10 kilometers or so? Undoubtedly the farming was good, as it certainly was during the Preclassic, but there does not appear to be a clear reason for why people would live here, as opposed to the town that is now Orange Walk. Cuello is not on the river—that would be Orange Walk—and although it has chert in abundance, the same could be said of many places in the general vicinity. Perhaps the people at Cuello were avoiding floods, but there is probably more to this question than the river.

The second, and rather interrelated question, is ‘What was Cuello’s relationship to the surrounding population centers?’ Nohmul and El Posito are the largest centers in the area and presumably drew people in from the countryside. As Hammond has suggested, Nohmul, El Posito, and distant Lamanai may indeed have been better farmland. Cuello is flanked on either side by the sites of Nohmul and El Posito. San Estevan is a little over 10 km away across the river. Is Cuello working with them? Competing with them? Subordinate to one of them? Perhaps Cuello becomes a good place to live, if for a brief moment, because it is responding to larger geopolitical or economic events. More research needs to be done at Cuello to answer both of these questions. The key is creating more of a regional framework for the Classic Period in northwestern Belize, perhaps focusing locally on the transition between the Early and the Late Classic.

Acknowledgements The Classic Cuello Archaeological Project would like to thank the Belize Institute of Archaeology, particularly the current and former Directors, Drs. John Morris and Jaime Awe, respectively. Likewise, thanks are long overdue for the efforts of IA staff members, including Melissa Badillo, Sylvia Batty, Jorge Can, and Josue Ramos, for helping
to get the 2017 season going. The project would also like to thank Srs. Waldir Cuello, Francisco Cuello, and the entire Cuello family for their help with the 2017 season, as well as Orlando and Cindy De la Fuente for their hospitality. The CCAP would like to thank Middlebury College, Christopher D. Gladstone, and Elise J. Rabekoff for their generosity and support of the 2017 season. Likewise, we would like to thank Laura Kosakowsky and Robin Robinson, who generously agreed to look at waves upon waves of jpegs of ceramics at the Vancouver meetings. Finally, the project would like to thank Norman Hammond, whose support, insight and guidance over the years has been invaluable.

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When Early Preclassic ceramics were encountered in the 1970’s at the site of Cuello in Northern Belize there were few other sites or regions with comparable pottery. Since the original discovery of Swasey ceramics at Cuello, many sites in northern Belize and adjacent areas have been identified that share this pre-Mamom tradition. In this paper we propose the identification of and describe the principal attributes of the ceramics of the Swasey Sphere including the Swasey and Bladen Ceramic Complexes at Cuello, and the Mormoops Ceramic Complex at Ka’kabish. We will highlight the geographic extent of Swasey Sphere ceramics and compare them to other contemporary Early Preclassic pottery such as Cunil in the Belize Valley, Eb in the Petén, and Xe in the Pasion River area. The Early Preclassic is a period of increased sedentism, population growth, and emerging Maya cities, however, pre-Mamom ceramics across the southern Maya Lowlands exhibit only minor shared attributes and they appear to be more regionalized than subsequent time periods.

Introduction

In the 1970’s when pre-Mamom ceramics were uncovered at the site of Cuello (Hammond 1975, 1976, 1978, 1991; Hammond et al. 1979; Pring 1977), near the modern town of Orange Walk in northern Belize (Figure 1), there were few other known sites with early pottery. Middle Preclassic Mamom pottery (Smith 1955; Smith and Gifford 1966) was well documented at other Maya lowland sites, but pre-Mamom ceramics were found only at Tikal (Culbert 1993), Yaxha/ Sacnab (Rice 1979), Altar de Sacrificios (Adams 1971), and Seibal/[Ceibal] (Sabloff 1975). Some types of the earliest ceramic complex, Jenney Creek, at Barton Ramie (Gifford 1976) included possible pre-Mamom attributes. Since that time, pre-Mamom ceramics have been found at numerous other sites in northern Belize and throughout the southern Maya Lowlands.

The Swasey Ceramic Complex at Cuello

The earliest pre-Mamom ceramics at Cuello, called Swasey (Pring 1977), are simple in design, execution, and form, although technologically sophisticated (Kosakowsky and Pring 1998). The complete sample of Swasey ceramics from Cuello numbered in the tens of thousands, however, a sub-sample of representative Swasey pottery was selected from chronologically unmixed deposits for the type descriptions, totaling 4,794 diagnostic rim sherds, and three whole vessels. The Swasey Ceramic Complex is defined by five ceramic groups (Table 1), and is confined to the lowest levels of excavation of Platform 34 at Cuello, identified on stratigraphic sections and Harris matrices for the site as Phases 0 (old land surface) and I (Hammond 1991). The Swasey Complex dates to between 1,000-800 BCE.

Only 10% of the assemblage is unslipped (Copetilla Group), while the remaining 90% is monochrome slipped, most commonly red of the Consejo Group with a generally glossy, non-waxy surface finish, a white underslip, and surfaces that exhibit characteristic rootlet

Figure 1. Map of northern Belize, showing location of Cuello and Ka’kabish and other archaeological sites in the region.
Table 1. Ceramic Types of the Swasey Complex at Cuello.

<table>
<thead>
<tr>
<th>Ware</th>
<th>Group</th>
<th>Type</th>
<th>Variety</th>
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<tbody>
<tr>
<td>Unspecified</td>
<td>Copetilla</td>
<td>Copetilla Unslipped</td>
<td>Copetilla Variety</td>
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<td></td>
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<td>Patchchacan</td>
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<td></td>
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<td>Pattern Burnished</td>
<td>Patchchacan Variety</td>
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<tr>
<td>Rio Nuevo Glossy</td>
<td>Consejo</td>
<td>Consejo Red</td>
<td>Consejo Variety</td>
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<td></td>
<td></td>
<td>Backlanding Incised</td>
<td>Backlanding Variety</td>
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<td>Backlanding Incised</td>
<td>Grooved-incised Variety</td>
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<td>Pettville Red-and-cream</td>
<td>Pettville Variety</td>
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<td>Pettville Red-and-cream</td>
<td>Variety Unspecified</td>
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<td>Tiger</td>
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<td>Tiger Buff</td>
<td>Tiger Variety</td>
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<td>Cowpen Incised</td>
<td>Cowpen Variety</td>
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<td>Cowpen Incised</td>
<td>Grooved-incised Variety</td>
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<td>Machaca</td>
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<td>Machaca Black</td>
<td>Machaca Variety</td>
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<td></td>
<td></td>
<td>Chacalte Incised</td>
<td>Chacalte Variety</td>
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<tr>
<td>Fort George Orange</td>
<td>Chicago</td>
<td>Chicago Orange</td>
<td>Chicago Variety</td>
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erosion marks. Less common monochrome ceramics include the Tiger (Buff) Group, the Machaca (Black) Group, and the self-slipped or washed pottery of the Chicago (Orange) Group. Decoration consists of groove incising (Backlanding Incised: Grooved-incised Variety and Cowpen Incised: Grooved-incised Variety) and dichrome slips that are created by leaving the white underslip uncovered and slipping only one side of the vessel red (Pettville Red-and-cream). Examples of fine-line incising occur in the monochrome red, buff, and black groups, and fewer examples of modeling and punctuation on monochrome reds, and pattern burnishing on unslipped jars (Patchchacan Pattern Burnished) also occur (see Pring [1977] and Kosakowsky [1983, 1987] for greater details). Common vessel forms are bowls and jars with thickened rims and squared lips. Strap handles fashioned of double and triple cylinders of clay are characteristic, attached loosely to jars of the Tiger and Chicago ceramic groups, from the rim to the neck/body juncture. There does not appear to be a specialized set of ceramics (Kosakowsky and Pring 1998; Robin 1989), unlike early ceramic assemblages elsewhere in Mesoamerica (Clark and Blake 1994; Clark and Gosser 1995), and the repertoire of Swasey pottery includes a complete range of forms for both utilitarian and non-utilitarian functions (Figure 2).

In order to test the validity of the ceramic sequence, the analysis of the ceramics from the later 1992 and 1993 excavations at Cuello was
Table 2. Ceramic Types of the Bladen Complex at Cuello.

<table>
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<th>Ware</th>
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<th>Type</th>
<th>Variety</th>
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<td>Consejo Red</td>
<td>Estrella Variety</td>
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<td></td>
<td>Barquedier Incised</td>
<td>Barquedier Variety</td>
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<td>Barquedier Incised</td>
<td>Grooved-incised Variety</td>
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<td></td>
<td>Fireburn Red-and-cream</td>
<td>Fireburn Variety</td>
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<td></td>
<td>Fireburn Red-and-cream</td>
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<td></td>
<td>Cudjoe Composite</td>
<td>Cudjoe Variety</td>
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<td>Cudjoe Composite</td>
<td>Variety Unspecified</td>
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<td></td>
<td>Sand Hill Gouged-incised</td>
<td>Sand Hill Variety</td>
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<td></td>
<td>Canquin Black-on-red</td>
<td>Canquin Variety</td>
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<tr>
<td></td>
<td>Other Consejo Group</td>
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<td></td>
<td>Ramgoat Red</td>
<td>Ramgoat Variety</td>
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<td></td>
<td>Calcutta Incised</td>
<td>Grooved-incised Variety</td>
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<td>London Red-and-unslipped</td>
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<td>Tiger</td>
<td>Tiger Buff</td>
<td>Cut and Throw Away Variety</td>
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<td></td>
<td>Cowpen Incised</td>
<td>New Home Variety</td>
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<td></td>
<td>Last Chance Grooved-incised</td>
<td>Last Chance Variety</td>
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<td></td>
<td>Peppercamp Pattern-burnished</td>
<td>Peppercamp Variety</td>
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<td>Machaca</td>
<td>Machaca Black</td>
<td>Wamil Variety</td>
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<td>Chacalte Incised</td>
<td>Yo Creek Variety</td>
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<td>Quamina</td>
<td>Quamina Cream</td>
<td>Quamina Variety</td>
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<td></td>
<td>Tower Hill Red-on-cream</td>
<td>Tower Hill Variety</td>
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<td></td>
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<td>Variety Unspecified (Resist)</td>
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<td></td>
<td>Isabella Bank Incised</td>
<td>Isabella Bank Variety</td>
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<td>Doubloon Bank Grooved-incised</td>
<td>Doubloon Bank Variety</td>
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<td></td>
<td>Saltillo Orange-on-cream</td>
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<tr>
<td>Crabcatcher</td>
<td>Crabcatcher Red</td>
<td>Crabcatcher Variety</td>
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<tr>
<td>Gold Button</td>
<td>Gold Button Brown</td>
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<tr>
<td>Fort George Orange</td>
<td>Chicago</td>
<td>Chicago Orange</td>
<td>Nago Bank Variety</td>
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<td>Cotton Tree Incised</td>
<td>Cotton Tree Variety</td>
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<td>Willows Bank Pattern-burnished</td>
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<td>Honey Camp Orange-brown</td>
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<tr>
<td></td>
<td>Copper Bank Incised</td>
<td>Copper Bank Variety</td>
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done by Kosakowsky and Pring (1998) without prior knowledge of the stratigraphic context numbers or Harris matrix information from the site. When chronological assessments were plotted on the Harris matrix, they produced a clear distinction between unmixed contexts with Swasey pottery, identified by vessel forms and types present only in that complex, and those mixed with the later Bladen types.

The Bladen Ceramic Complex at Cuello

The original definition of the Swasey Complex (Pring 1977) included Bladen pottery. The larger sample size from later seasons allowed the subsequent refinement of the sequence and separation of Bladen pottery from earlier Swasey pottery (Kosakowsky 1987). The Bladen Complex lies stratigraphically above Swasey and, although clearly derivative from Swasey, represents a period of elaboration in
ceramic technology and design. The complete sample size of Bladen ceramics numbered in the tens of thousands, however a sub-sample of approximately 13,000+ diagnostic rim sherds and 13 whole vessels was selected for intensive analysis and type descriptions. While some researchers have suggested that the modal differences between Swasey and Bladen argue for the faceting of a single complex (Andrews in Andrews and Hammond 1990:579; Valdez 1987), Kosakowsky and Pring (1998) feel that the introduction of new ceramic types and vessel form changes are significant enough to warrant the identification of separate complexes using Gifford's (1976) definition of a ceramic complex. The Bladen Complex dates to between 800–600 BCE.

The Bladen Complex is composed of nine ceramic groups (Table 2) of which eight are slipped, again predominantly monochrome red of the Consejo Group, and is marked by the first appearance of cream (Quamina) and red-on-cream-slipped pottery (Tower Hill red-on-cream) that is antecedent to the red-on-creams in the later Middle Preclassic. The Copetilla (Unslipped), Consejo (Red), Tiger (Buff), Machaca (Black), and Chicago (Orange) Groups continue from the Swasey Complex with new types and varieties, and vessel forms. New ceramic groups include the previously mentioned Quamina (Cream), Ramgoat (Red), which lacks the cream underslip of the Consejo Group, and Honey Camp (Orange-brown) (Figure 3). Two new ceramic groups, Crabcatcher (Red) and Gold Button (Brown) were found only in a *chultun*, Feature 361, and consist mostly of small thin-walled bowls (Figure 4) that may represent the debris from the ceremonial drinking of *chicha* during a feasting event (Hammond et al. 1995). While the rest of the Bladen ceramic assemblage, like the preceding Swasey pottery, represents a full range of utilitarian and non-utilitarian types and forms, the chultun sample appears specialized, although there does not seem to be a specialized set of Bladen mortuary vessels (Robin 1989).

Monochrome slips of the Bladen complex are similar in texture (glossy and non-waxy) to the preceding Swasey slips, but are more consistent in color. Bowl and jar forms continue to predominate, with the addition of flaring-sided dishes. Thickened rims and squared lips
Table 3. Ceramic Types of the Mormoops Complex at Ka’kabish.

<table>
<thead>
<tr>
<th>Ware</th>
<th>Group</th>
<th>Type</th>
<th>Variety</th>
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<tbody>
<tr>
<td>Unspecified</td>
<td>Copetilla</td>
<td>Copetilla Unslipped</td>
<td>Unspecified</td>
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<td>Rio Nuevo Glossy</td>
<td>Consejo</td>
<td>Consejo Red</td>
<td>Unspecified</td>
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<td></td>
<td></td>
<td>Barquedier Incised</td>
<td>Unspecified</td>
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<td></td>
<td></td>
<td>Barquedier Incised</td>
<td>Grooved-incised</td>
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<td></td>
<td></td>
<td>Fireburn Red-and-cream</td>
<td>Unspecified</td>
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<td></td>
<td></td>
<td>Cudjoe Composite</td>
<td>Unspecified</td>
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<tr>
<td>Ramgoat</td>
<td></td>
<td>Ramgoat Red</td>
<td>Unspecified</td>
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<tr>
<td>Machaca</td>
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<td>Machaca Black</td>
<td>Unspecified</td>
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<tr>
<td>Quamina</td>
<td></td>
<td>Quamina Cream</td>
<td>Unspecified</td>
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<tr>
<td>Fort George Orange</td>
<td>Chicago</td>
<td>Chicago Orange</td>
<td>Unspecified</td>
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</table>

The Mormoops Complex at Ka’kabish

The site of Ka’kabish is located in north central Belize, approximately 10 km northeast of the site of Lamanai between the New River Lagoon and the Rio Bravo Escarpment (see Figure 1). Recent excavations at the site began in 2005, with the bulk of the research occurring since 2010 defining a long occupation sequence (Sagebiel and Haines 2015).

The Mormoops Complex is the earliest complex at Ka’kabish, dating to the Early Preclassic 800–600 BCE and overlaps in time and principle identifying attributes with the Bladen Complex at Cuello (Kosakowsky 1983, 1987). The following description of Mormoops ceramics is based on 2,017 sherds, including 673 rims, and 37 reconstructible vessels (Table 3). Mormoops ceramics have almost exclusively been excavated from the site center, primarily out of the basal deposits of the Group D Plaza (particularly Operations 3, 8, and 15) (Aimers 2012; Haines 2012; Haines et al. 2014; Lockett-Harris 2013, 2014; Sagebiel and Haines 2015).

As stated previously, the Swasey Ceramic Complex at Cuello is confined to only the lowest levels of excavation (Hammond 1991). The succeeding Bladen Ceramic Complex corresponds to Phases II–IIIA on stratigraphic sections for Cuello (Hammond 1991; Kosakowsky and Pring 1998), and thus the rationale for splitting the two complexes is based not only on the introduction of new types and forms, thus conforming to type: variety rules (Gifford 1976; Willey et al. 1967), but on clear stratigraphic differences. Furthermore, the decision to split the ceramics into separate complexes was intended to help highlight, rather than obscure the differences.

The predominant Consejo Group at Ka’kabish has a bright, glossy, non-waxy, red slip on a white underslip. The red slip has typical white rootlet erosion and fully eroded surfaces often have a white, chalky appearance, apparently, the remnants of the underslip. There are instances where the underslip was not applied and the slip was applied directly to the paste body. The slip in these cases tends to have a reddish-orange rather than bright red color and lacks the white rootlet and chalky erosion. This type is known as Ramgoat Red and is part of the Ramgoat Group (Pring 1977; Valdez 1987).
Paste colors are light pastels of white to yellow (buff), brown (tan), pink to orange, or gray with thick gray cores. Large angular calcite inclusions predominate, but sherd inclusions occasionally occur. Several Consejo vessels were sampled for petrographic analysis and were found to have volcanic ash inclusions (Gomer 2013).

Bowls are the most prevalent form; most have flared to slightly outcurved walls and flat bases. Rims are direct or slightly everted with round or, occasionally, square lips. Jars with short necks and tecomates are also fairly common and there are several bottles as well (Figure 5). The Consejo Group also includes Barquedier Incised: Unspecified, Barquedier Incised: Grooved-incised, Fireburn Red-and-cream, and Cudjoe Composite. Other Mormoops Groups include Copetilla, Ramgoat, Machaca (including Chalcate Incised), Quamina (including Tower Hill Red-on-cream), and Chicago (Haines et al. 2014; Sagebiel and Haines 2015).

**Early Preclassic Ceramics in Northern Belize and the Southern Maya Lowlands**

Swasey Sphere ceramics, similar to those at Cuello and Ka’kabish, also have been identified in northern Belize (see Figure 1) at the following sites with full ceramic sphere membership (Ball 1976): Colha (Valdez 1987), Nohmul (Hammond et al. 1987, 1988; Pring 1977), El Pozito (Pring 1977), San Estevan (Rosenswig 2008), Santa Rita Corozal (Chase and Chase 1987; Pring 1977), Pulltrouser Swamp and K’axob (Fry 1989), Blue Creek (Kosakowsky and Lohse 2003), and Kichpanha (McDow 1997). Sites in northern Belize with peripheral sphere membership include: Chan Chich (Valdez and Houk 2000), Gran Cacao (Sagebiel 2005), and Dos Hombres (Sullivan and Sagebiel 2003). Additionally, Swasey Sphere ceramics have been identified at the site of Rio Azul in the northeastern Petén of Guatemala (Adams 1999) and in southeastern Campeche (Walker 2014).

While several Bladen decorative modes, such as fine-line incising, exist in common with the Xe ceramics of Altar de Sacrificios (Adams 1971), and the Real Xe complex at Ceibal (Seibal) (Inomata et al. 2013; Sabloff 1975) in Guatemala, they are typologically distinct; surface colors and textures as well as pastes are very different. The paucity of white-slipped sherds in the Cuello and Ka’kabish collections, a ceramic marker for Xe, supports this differentiation. Early Eb pottery from the earliest contexts at Tikal also exhibits modal decorative similarities to the Bladen Complex (Culbert 1993), as does the early Ah Pam pottery of the Lake Yaxha/Sacnab region (Rice 1979), but these are also typologically distinct from the pre-Mamom in northern Belize. Modal similarities, such as red-on-cream decoration also exist with coeval ceramics from the Belize Valley including the late Cunil at Cahal Pech (Sullivan and Awe 2013), Kanocha at Blackman Eddy (Garber et al. 2004), and early Jenney Creek at Barton Ramie (Gifford 1976). However, all these pre-Mamom complexes throughout the southern Maya Lowlands are marked by regional heterogeneity rather than the increasing homogeneity that begins in the Middle Preclassic.

**Conclusions**

The original dating of the Swasey Complex at Cuello was controversial due to
problems with radiocarbon samples that resulted from the recycling of old wood in later contexts (see Hammond 1984; Marcus 1983, 1984; Potter et al. 1984). The re-evaluation of the radiocarbon dates from the site (Andrews and Hammond 1990; Housley et al. 1991; Law et al. 1991) produced a shortened chronology, and the extensive excavations demonstrated, without a doubt, the stratigraphic position of the Swasey ceramics beneath Bladen (Pring and Hammond 1982).

The shortened chronology placed the lowest levels at Cuello between 1,200–1,000 BCE though there is still some disagreement about the assignment of 1,200 BCE for the earliest Swasey dates and whether or not the earliest Cunil dates in the Belize Valley predate those in northern Belize (Lohse 2010). The recent work by Lohse (2010) on the Preceramic in Belize, summarizes these early radiocarbon dates, and suggests that at least by 1,000 BCE there were sedentary, pottery producing villages throughout the southern Maya lowlands. Unfortunately, the dating controversy about Swasey ceramics resulted in some questioning the regional differences in the pre-Mamom (Lopez-Varela 1996). Another consequence of the shortened chronology was the renaming of the time period in the archaeological literature as “Early Middle Preclassic” rather than “Early Preclassic” to reflect these later dates and to differentiate the ceramics from some of the earlier pottery in the Maya highlands, Pacific coastal region, and the Gulf Coast of Mexico (Coe and Diehl 1980; Lowe 1975, 1978; Sharer 1978). While there is currently a gap in occupation between the Archaic and the earliest ceramics in northern Belize (Lohse 2010), we have decided to return to the original designation of Swasey Sphere ceramics as “Early Preclassic” to highlight the important differences between this pre-Mamom pottery and the subsequent Middle Preclassic Mamom, rather than linking it to the increasing ceramic homogeneity of the Middle Preclassic and very different ceramic attributes. By 1,000 BCE there were sedentary, pottery producing communities throughout northern Belize and the rest of the southern Maya Lowlands, and the ceramics produced in these emerging Maya cities exhibit only minor shared attributes. They certainly appear to be more regionalized than subsequent time periods in the Middle and Late Preclassic. Swasey may be one of four coeval Early Preclassic southern Maya Lowland ceramic spheres: Swasey in Northern Belize, Xe in the Pasion River area, Eb in the Petén, and Cunil in the Belize Valley and the southeastern Petén. The identification of these four, separate yet coeval, ceramic spheres in the Early Preclassic supports the ceramic evidence of regionalization and perhaps only loosely connected, although growing, Maya villages and cities.

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13 THE DEVELOPMENT OF TERMINAL PRECLASSIC AND EARLY CLASSIC ROYAL ARCHITECTURE AT CHAN CHICH, BELIZE

Tomás Gallareta Cervera, Brett A. Houk, and Claire Novotny

The archaeological site of Chan Chich is the southernmost and the second largest Maya city in the Belizian portion of the Three Rivers adaptive region. Excavations at the Upper Plaza, located in the site’s center, have yielded evidence of a continuous occupation that dates from the Middle Preclassic to the Late Classic period and includes a Terminal Preclassic royal Maya tomb. Excavations in this area during the 2017 season yielded evidence of different types of elite architecture, such as a long platform, dated to 400 BC, and a funerary crypt containing a probable royal burial dated to the Early Classic period. The results of our excavations give us rich information about Chan Chich’s transition from a small village to an early Maya kingdom.

Introduction

Chan Chich is the southernmost Maya city in the Belizian portion of the Three Rivers adaptive region, which spans portions of Belize, México, and Guatemala (Dunning et al. 1998; Garrison and Dunning 2009). The Río Bravo, Booth’s River, and Río Azul/Río Hondo and their watersheds define the region and encompass over a dozen large sites including Chan Chich, Dos Hombres, and La Milpa in Belize, and San Bartolo, Xultun, La Honradez, and Rio Azul in Guatemala (Figure 1). The Guatemalan half of the region was home to some spectacular Preclassic developments including a royal tomb, dating to 150 BC, and elaborate polychrome murals, perhaps 50 years younger, at San Bartolo (Saturno 2006:73).

Although smaller than the largest centers in the western portion of the region, by the Late Classic period Chan Chich was the second largest site in the eastern half of the Three Rivers adaptive region, trailing only La Milpa in monumental area (Houk 2015:Table 10.1). The monumental core of the site is centered on a 350-m long, north-south line of contiguous plazas on a broad hill overlooking Chan Chich Creek (Figure 2). The architectural center of the site is arguably Structure A-1, a large tandem range building that divides the Main Plaza from the Upper Plaza, separating public space from private space. Elevated approximately 7 m above the Main Plaza, the Upper Plaza constitutes an elevated acropolis or palace group with two large temple-pyramids, attached lateral courtyards, and a commanding view of the Main Plaza from the central landing and eight once-vaulted rooms that face north from Structure A-1. Accessed by stairways on either side, the

Figure 1. Map of northwestern Belize and Three Rivers adaptive region showing the locations of major Maya sites.

central landing on Structure A-1 is the only formal entryway into the Upper Plaza.

During the first season of excavations at Chan Chich in 1997, the Chan Chich Archaeological Project encountered a Terminal Preclassic royal Maya tomb in the Upper Plaza at the site (Houk et al. 2010). That discovery, coupled with subsequent excavations of early Middle Preclassic floors and features, promoted additional excavations in the Upper Plaza to investigate the earliest settlement of the site and the subsequent transformation of a small village into the seat of power for an early Maya king. In this paper, we summarize our evolving understanding of the Preclassic foundations of Chan Chich and present our newest data on the
Terminal Preclassic and Early Classic royal architecture at the site.

**History of Excavations**

During the first three seasons of CCAP excavations (1997–1999), Hubert Robichaux (2000) directed investigations in the Upper Plaza, documenting looters’ trenches, excavating chronological test pits, exposing collapsed rooms on Structure A-1, and studying the final architectural phases of Structure A-13. A major focus of Robichaux’s work, however, particularly during the 1997 seasons, involved documenting a collapsed royal tomb, which Robichaux discovered during the course of test pit excavations in front of Structure A-15, the large temple-pyramid on the southern side of the Upper Plaza (Houk et al. 2010).

The Upper Plaza has been a primary area of interest over the past six seasons, and the 2016 and 2017 seasons in the Upper Plaza, part of a three-year Alphawood Foundation grant, specifically set out to study “the development of the royal acropolis and its dynastic architecture subsequent to the establishment of a royal dynasty at the site ca. AD 200–250 and to examine how architecture reflects the evolving relationship between political organization (i.e., divine kingship) and monumental construction” (Houk 2016a:6). The investigations included additional stratigraphic excavations, broad horizontal exposures of buried architectural features, and a robust program of radiocarbon dating. While the 2016 and 2017 investigations focused on deposits in the plaza, the planned 2018 season include new excavations on the buildings bordering the plaza.

In 2016 and 2017, the CCAP excavated chronological test pits in the center of the plaza, in the southeast corner of the plaza, in front of Structure A-13, at the base of Structure A-1, and in the southwestern courtyard at the base of Structure A-15 (Figure 3). Combined with results from previous seasons, the data from
Figure 3. Contour map of the Upper Plaza showing the 2017 excavations, Subop CC-15-B from 2016, and the location of Tomb 2.

these units provide a much more detailed chronology for the plaza’s development. The most complicated and informative excavations, however, constitute a block of units in the northern part of the plaza, which exposed the truncated platform of a buried temple and a later intrusive crypt, which contained the remains of potentially another royal individual. These discoveries are described below.

The Middle Preclassic Community: Evidence from the North and East Upper Plaza

It appears, although our excavation sample is limited in many areas of the site, that the first occupants of Chan Chich settled on the hilltop that is now buried by the Upper Plaza during the Middle Preclassic period, around 900 BC or slightly earlier. Occupation remained focused on this area for several centuries until the beginning of the Late Preclassic period when the small village expanded into areas now covered by the Main Plaza, Back Plaza, Western Plaza, and Norman’s Temple. Even with this expansion, however, the Upper Plaza remained the center of the village.

The oldest radiocarbon dates come from the deepest floors in the north-central part of the Upper Plaza and suggest the first occupants of the site settled there in the early Middle Preclassic period. The two samples, which came from floor fill above bedrock and were collected over the course of two seasons from the same excavation unit, returned 2-sigma date ranges of cal 911–804 BC and cal 931–833 BC (Gallareta et al. 2017:Tables 2.2 and 2.3). The residents of the site gradually expanded their settlement on the hilltop throughout the Middle Preclassic period, and samples from the north-central, northeast, and east parts of the plaza, as well as from below Structure A-1, yielded radiocarbon dates spanning cal 800–400 BC (Gallareta et al. 2017:Tables 2.2 and 2.3).

Thus far, our excavations have only documented plaster surfaces—some of which are presumably plaza floors, while others may be platform surfaces—that date to the Middle
Preclassic period, with one notable exception. Excavations in 2016 at the base of Structure A-1 documented an apparent buried structure (Lot CC-15-B-4), which two radiocarbon samples date to cal 766–540 BC and 749–407 BC as described by Houk (2016a:11). This may be the earliest version of Structure A-1, which forms the northern edge of the Upper Plaza (Figure 4). Hubert Robichaux (1998) encountered the same structure approximately 10 m to east and documented a thick plaster surface, which rolled down as a step or terrace. The 2016 and 2017 excavations similarly documented a 35–40 cm step or terrace, indicating the presence of a long structure that oversaw Chan Chich’s Upper and Main Plaza areas from the Middle Preclassic.

The lower surface exposed on this structure during the 2016 excavations is at the approximate elevation of the modern plaza floor—and was originally mistaken for the plaza floor. Below the surface, the 2016 excavations encountered 1.1 m of cobble/small boulder fill, which buried a well-preserved plaster floor (Lot CC-15-B-9). Below this surface, excavations documented an additional five floors above bedrock, which lay approximately 2.5 m below the modern plaza surface in this area. An additional four radiocarbon dates, spanning the Middle Preclassic period, date this sequence, with the deepest sample from above the oldest floor, returning the oldest age range of cal 826–782 BC (Houk 2016a:Table 1.4).

Excavations in 2012 in the northeast area of the Upper Plaza encountered a sequence of six floors above bedrock, which was 2.25 m below the modern plaza surface. The deepest deposits included an eroded plaster floor, which was possibly constructed to create a level surface over uneven bedrock. A single radiocarbon sample from the 15–50-cm thick fill layer returned a range of cal 805–569 BC (Houk 2016b:Table 7.10). Above this floor, the excavations revealed a 40-cm thick midden, which contained Swasey ceramics (Kelley 2014:56) and produced a single cal 799 to 766 BC date from charcoal (Houk 2106b:Table 7.10). Robichaux (1998) encountered this same midden near the base of Structure A-1 in 1997.

Structure A-13 consists of a large mound located at the eastern section of the Upper Plaza. A chronology-building test pit at the base of the structure documented additional Middle Preclassic floors overlying bedrock (Figure 5). The 2-x-3-m unit yielded evidence of six plaster floors and ceramic materials that range from the Middle Preclassic period on the lower floors to the Late Classic period. At its lowest level, we observed evidence of a posthole (Figure 6) with Mamom ceramics and two AMS dates (cal 554–411 BC and cal 644–552 BC) that bracket this ancient feature to the Middle Preclassic period. The area was later covered by a plaster floor and a platform foundation made of carved stones, oriented east to west and dated to cal 762–482 BC (Gallareta et al. 2017:Tables 2.2 and 2.3).

The Late Preclassic City: Evidence of Royal Architecture in the Upper Plaza

During the Late Preclassic period, the Upper Plaza expanded to south—as documented in Subop CC-15-Q in the southeast corner of the plaza and Subop CC-15-L at the western base of Structure A-15—and vertically with new floors and new structures. Subops CC-15-Q and CC-15-L yielded evidence of two architectural features, possibly platforms: the oldest, in Subop CC-15-Q, dated to cal 358–278 BC and the latter to cal 236–185 BC (Gallareta et al. 2017:Tables 2.2 and 2.3). In the central part of the plaza, the
Late Preclassic sequence began with a series of floors with thin layers of construction fill, which buried the Middle Preclassic floors. In the southern end of Subop CC-15-A, an 11 m long trench, excavations documented six floors spanning the early Middle Preclassic into the Late Preclassic that predate the first documented structural feature in this part of the plaza—an alignment of cut stone blocks constructed on an eroded plaster floor (Lot CC-15-A-7). This alignment of finely shaped and regular limestone blocks extends at least 22.5 m east-west (Herndon et al. 2014:38) and has been exposed in multiple excavation units between 2012 and 2017. While we have been unable to date Lot CC-15-A-7, the floor upon which the feature rests, the next oldest floor (Lot CC-15-A-8) returned a cal 767–434 BC date (Gallareta et al. 2017:Tables 2.2 and 2.3). Subsequent to the construction of the alignment, the Maya raised the plaza floor to the south—comparable floors are not found on the north side of the alignment. The first floor was plaster, like those that preceded it, but the second floor was a compact dirt surface that apparently extended over much of the plaza area south of the alignment and elevated the plaza floor to the same elevation as the top of the alignment (Kelley 2014). This floor measured 20-cm thick and was constructed during the Late Preclassic or Terminal Preclassic period based on a date of cal 204–96 BC from a sample obtained in 2014 (Houk 2016b:Table 7.10) and a date of cal AD 128–236 from a sample collected in 2016 (Houk 2016:Table 1.5). Combined, these dates bracket the construction of the alignment, suggesting it was built near the end of the Late Preclassic period. Our current interpretation of this alignment is that it was a step or platform associated with a buried substructural platform nicknamed Blanca and described below.

Blanca’s Construction Sequence and its Relation to the Upper Plaza

Excavations of the 2017 season revealed the presence of a buried, truncated platform in the northern section of the Upper Plaza, south of Structure A-1 (Figure 7). The structure base was made with large rectangular, white blocks of cut limestone, which were slightly inclined inwards—excavators nicknamed the structure

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**Figure 6.** Photograph of the Middle Preclassic posthole in bedrock at the bottom of Subop CC-15-M.

**Figure 7.** Orthomosaic of the 2017 northern block excavations showing the plan of Blanca and Crypt 1 (top) and plan drawing of Blanca (bottom).
Blanca because of the white stones. The uncovered section of the structure measured 8.75 m east-west by 4.20 m north-south and we know the structure continues to the east and north, beyond our excavation block. Blanca’s form is complex and its partial dismantling obscures its final Late Preclassic configuration. The portion we exposed consists of two, possibly three, tiers with a projecting front axial outset, which would have measured 4.5 m wide but was partially destroyed by subsequent construction (discussed below). The overall shape is rectangular with rounded corners. The axial outset is battered, while the other faces are not. The two tiers are low enough to possibly function as steps. Additionally, a stone alignment located to the north of the basal body is interpreted as a possible third tier of the platform.

The plaster floor in front of Blanca suggests that the northern plaza was repaved at least three times while the structure was in use. The three plaster floors were very close together, only separated by thin layers of fill. Ceramics recovered above the last floor associated to Blanca are from the Mamom (600–400 BC) and Chicanel (400 BC–AD 150) spheres. Ceramics from the inside of Blanca were mostly Chicanel (400 BC–AD 150) types. Based on architectonic style and associated ceramic materials we suggest that Blanca was constructed around 400 BC.

Before the Early Classic, and probably around the Terminal Preclassic period, Blanca was dismantled or “chopped” and buried under a massive renovation, which apparently elevated the Upper Plaza’s floor to its modern level in the northern part of the plaza. An intrusive primary burial was placed on top of Blanca after the structure was already in-filled and covered by the main Upper Plaza floor, providing a terminus ante quem for Blanca’s destruction. Burial CC-B17 consisted of a prone and extended individual oriented north-south with his hands on top of his pelvis. The cranium was covered with an inverted large Society Hall Impressed bowl dated to the Late Preclassic period (Gallareta Cervera et al. 2017). It is unclear if the individual was buried in a prepared cist or deposited as a simple burial; although we noticed three rough stones to the west of the burial, we cannot say conclusively that any funerary architecture or prepared surfaces were present. It is also unclear if the Late Classic plaza floor was broken in order to inter this burial or if the floor was constructed above this individual. However, a single radiocarbon date obtained from a piece of bone from the burial returned a 2-sigma age range of cal 154 BC–AD 47 (Gallareta Cervera et al., 2017, Tables 2.2 and 2.3).

**Terminal Preclassic, Tomb 2**

The construction of Tomb 2 and its capping shrine is the next documented significant construction event in the Upper Plaza. Located in the southern part of the plaza, north of Structure A-15, Tomb 2 occupied a portion of the plaza south of the major construction that buried Blanca. The elliptical tomb chamber spanned 3.25 m by 0.8 m and cut 1.15 m into bedrock. Placing the tomb in bedrock required cutting through a series of four older floors. Kelley (2014), based on subsequent excavations east and north of the tomb, suggested the youngest floor cut by the tomb’s construction was the compact dirt surface described above and documented in multiple locations in the southern and central areas of the plaza, meaning the tomb was constructed after cal AD 128–236. This assessment aligns with the ceramic data, which suggest an approximate date of AD 200–350 for the vessels in the tomb (Houk et al. 2010). Twelve large limestone capstones sealed the chamber; these, in turn, were buried beneath rubble fill and an apparent low shrine platform (Houk et al. 2010:232–233). In addition to the 11 ceramic vessels, the tomb contained the deteriorated remains of an adult male, several poorly preserved organic artifacts, and four jade jewels—two ear spools, a tubular bead, and a helmet-bib head pendant (Houk et al. 2010). The latter diadem—particularly when combined with the elaborateness of the tomb’s construction, the tomb’s location, and the diversity of grave goods—indicates the individual buried in Tomb 2 was an early king of Chan Chich (Houk et al. 2010).

**The Early Classic Acropolis: Excavations of the Upper Plaza Chamber**

Excavations at the north of the Upper Plaza between Structure A-1 and Tomb 2
discovered an intrusive, rectangular chamber, oriented north-south that sliced through Blanca’s platform face and several underlying floors (Figure 8). The chamber’s builders re-used a Middle Preclassic floor as the chamber’s floor. The chamber’s four walls were heterogeneous in style and construction techniques. The chamber measured 1.60 m east-west by 2.3 m north-south, and the walls were preserved to a height of 1.25 m. The northern wall was made of large and nicely carved rocks covered with stucco and faint traces of red paint remaining. Additionally, the north wall had a possible step composed of two large, semi-carved stones of the same size and shape. A small, carved stone directly to the south of this wall might have been used as a step into the chamber. The east and west walls were different; both were made of small, uncut, and roughly faced rocks. The southern wall is the most unusual and consists of two parts. The lower part is a layer of compact soil between the chamber surface and a plaster floor, not a formally constructed wall. The upper part of the wall consisted of roughly shaped stones placed on top of this stucco floor. The chamber floor rolled up onto the dirt fill at the south of the chamber, suggesting that this was the original construction technique used to build the chamber.

The upper preserved courses on the western and southern walls were apparent vault stones—many of the stones on the western wall’s upper course were inadvertently removed during excavations, before the field crew recognized the chamber as a constructed feature—but the preserved examples jut into the chamber. This suggests that the chamber was originally a sunken, vaulted room, accessed via stairs on the north. If so, the vault would have risen above the level of the Plaza Floor. However, after a period of use, the vault was destroyed and the chamber filled to the level of the plaza as discussed below. All four walls had evidence of deteriorated stucco plastering. Samples recovered from under the chamber’s re-used floor suggest it was constructed and between cal 796 to 748 BC, and a charcoal sample from the floor surface yielded a date of cal AD 237–333 (Gallareta Cervera et al. 2017: Tables 2.2 and 2.3).

Although we are unsure of the original function of the chamber, the Maya used it as a crypt prior to filling it, and we have designated the feature Crypt 1. Excavations in the chamber yielded the remains of at least two individuals located in the southern half of the chamber, on the surface floor. The center and northern portions of the crypt did not yield any cultural remains. One of these individuals (Burial CC-B16B) was articulated, primary, and extended, with its head to the east and its feet, crossed at the ankle, to the west (Figure 9; Novotny et al. 2017). A bone sample dates Burial CC-B16B to cal AD 247–353 (Gallareta Cervera et al. 2017: Tables 2.2 and 2.3). A funerary offering of an Ixcanrio Orange Polychrome pedestal bowl dated to the Terminal Preclassic or Early Classic period was associated with Burial CC-16B. When buried, the individual was wearing two Spondylus shell ear flares and a serpentine helmet-bib head pendant—associated with rulership and a possible heirloom from the Late Preclassic period (see Houk et al. 2010)—as funerary regalia. Although similar in style to the diadem from Tomb 2, the helmet-bib head pendant from Crypt 1 is thinner, less well crafted, and of less exotic raw material. Ceramics in the chamber fill and surrounding the burial consisted mostly of Tzakol sherds with some Chicanel sherds, suggesting that this context dates to the Early Classic period.

Burials CC-B16A, -B16C and -B16D consisted of clusters of disarticulated bone fragments belonging to adults located at the south end of the crypt. Burial CC-B16A consisted of bones of the left foot, an articulated...
Figure 9. Photograph of Burial CC-B16B during the 2017 season, view to the south. The remains recorded as Burial CC-B16C are visible at the right edge of the photograph, north of Burial CC-B16B’s feet, and the remains recorded as Burial CC-B16D include the cranium and long bones visible south of Burial CC-B16B’s lower legs. Burial CCB-16A is not in this photograph as it was excavated in 2016.

right leg, and an articulated right wrist and hand (Novotny et al. 2016). Burial CC-B16C was a cluster of bones located adjacent to the feet of Burial CC-B16B, approximately 10 cm to the south of Burial CC-B16A. Burial CC-B16D was immediately south of the lower legs of Burial CC-B16B and comprised a cranium stacked on top of a pile of long bones in the southwestern corner of the crypt. Novotny and colleagues (2017) suggest that the best explanation for the burial location within the chamber is that Burial CC-B16A was interred first, perhaps in a flexed position given the position of the right leg, and subsequently disturbed by the interment of Burial CC-B16B before decomposition was complete. Burials CC-B16A, -B16C and -B16D may be the displaced remains of the same person (Novotny et al. 2017).

At some point after Burial CC-B16B was interred, the Maya destroyed the crypt’s vault and filled the chamber with large, medium, and small boulders and sediment, before covering it with the final floor of the Upper Plaza. The fill in the northern part of the chamber yielded higher artifact densities as well as evidence of burning, approximately 65 cm above the floor in the room. The nature of this event is unclear, but charcoal from the deposit yielded a date of cal 55 BC–AD 211 (Gallareta Cervera et al. 2017: Tables 2.2 and 2.3). Charcoal recovered from beneath possible capstones in the fill returned a date range of cal AD 87–227. Ceramics from the chamber’s context are mixed, yielding a mix of Early Classic and Late Preclassic types. Despite these two Terminal Preclassic dates, six other samples from the crypt largely date to the Early Classic period.
Discussion

Middle Formative Community

Our excavations indicate that around 900 BC, during the Middle Preclassic period, the community of Chan Chich occupied and gave meaning to the landscape through the construction of formal architecture in the Upper Plaza. Stratigraphic evidence suggests the construction of multiple plaza floors in the north, middle, and east portions of the Upper Plaza, as well as possible public buildings made of vernacular architecture at the plaza’s north and east edges. Unfortunately, most evidence of Middle Preclassic architecture comes from plaster floors and platform surfaces. However, evidence in the north of the plaza reveals evidence of a substructure that predates Structure A-1 and dates to cal 766–540 BC and 749–407 BC (Houk 2016a:11). Based on previous and current excavations we estimate that this Middle Preclassic version of the structure extended at least 15 m east-west along the north edge the plaza. This long structure oversaw the Middle Preclassic landscape from a perch at the edge of the Upper Plaza's hilltop.

An early version of Structure A-13 suggests the use of platforms made of large rectangular carved stones and postholes likely used to sustain a wood and thatch superstructure. Robichaux (1999:34) also documented a Middle Preclassic posthole south of Structure A-1, further suggesting the use of this vernacular architectural style at the Upper Plaza. Moreover, Robichaux (1999:37) also suggests that the size and location of the feature might indicate that the structure was quite large and public in function. The five to six floor renovations and the raising of the plaza surface 2.25 m above its natural level during the Middle Preclassic period suggests a high degree of community cooperation and organization.

Late and Terminal Preclassic Village Turned Kingdom

The Late Preclassic period at Chan Chich’s Upper Plaza was a time of political growth and architectural expansion. The plaza expanded to the south with the construction of platforms and stone buildings, suggesting a growth of political relevance and consolidation of power by elite members. The floor sequence in the northern Upper Plaza is complex. Excavations have yielded a sequence of eight Preclassic plaster floors associated with Structure A-1 in Subop CC-15-B. On the western corner of Blanca, we uncovered three plaster floor levels, but we did not reach bedrock, which suggests that there might be more floors underneath this area.

The excavation of Blanca, an 8.75-m long platform made with large rectangular, cut blocks of white limestone and with round corners constructed around 400 BC, gives us a small window to explore the stratigraphic complexity of the Late Preclassic and Terminal Preclassic periods at Chan Chich. We know that the southern face of Blanca’s axial outset was slightly battered, sloping inward, and consisted of cut and regular limestone blocks. At its eastern and western edges there might have been two steps or terraces in addition to the outset’s platform face. We also know that this substructure continues to the north and to the east, but its final form is unclear.

The floor at Blanca’s base was renovated at least three times during the Late Preclassic period and it is likely contemporaneous with the Late Preclassic platform buried beneath Structure A-1 (see Houk 2016). At this time, this early version of Structure A-1 had been actively used as the northern edge of the Upper Plaza for around 500 years. Excavations also suggest that Blanca was “chopped” and buried under the plaza floor in the Late Preclassic and further dismantled to accommodate a crypt during the Early Classic.

By the end of the Terminal Preclassic period, the Upper Plaza apparently housed an early divine king. This individual’s tomb was placed in the southern part of the plaza sometime around AD 250, based on ceramic and stratigraphic data. This early king indicates the elite had further consolidated their power and ruled a small kingdom from the royal architecture of the Upper Plaza.

Early Classic Funerary Crypt

Excavations of the intrusive chamber, which cut through part of Blanca, suggest that
the chamber: a) is in fact an improvised crypt, b) dates to the Early Classic period, c) housed multiple elite burials, and d) was probably re-entered during its use. Architecturally, the unit consisted of four walls that formed a rectangular chamber with its longest side oriented north-south. We also identified large cut stones—which we interpret as vault stones—in the south, east and center portions of the chamber, although these were floating in fill within the chamber. The four masonry walls from this chamber were not homogeneous, and their construction cut through Blanca, the Late Preclassic period platform. This can be observed on the east and west walls and particularly on the southern wall, which was built on top of a floor level before reaching the crypt floor. The northern wall was made of carved stones and originally was covered with a layer of stucco. On top of this wall, we found at least two steps, which suggest an entrance to the chamber.

Crypt 1 had two burials: one primary and one secondary. The primary individual (Burial CC-16B) had associated funerary items and elite markers that identify it as a high elite, or perhaps royal, individual. Burial CC-B-16A was interred in the middle of the chamber, and then disturbed sometime later when Burial CC-B-16B was interred. During the Early Classic period, the chamber vault was removed and the crypt was filled with a silty matrix and medium-to-large, uncut stones.

There are some interesting parallels between Tomb 2 and Crypt 1. Both consisted of elaborate funerary architecture protecting the remains of individuals with objects associating them to the high elite. The crypt, however, consisted of a reused funerary space and was hence less exclusive than Tomb 2. Funerary paraphernalia and grave goods were also less prominent in the crypt—Burial CC-B16B only had one vessel, a serpentine jade object, and Spondylus ear flares as grave goods. However, the inclusion of a helmet-bib head pendant, a possible heirloom from the Late Preclassic period, indicates that the burials belonged to a set of powerful individuals, perhaps even a divine king from the Early Classic period. Analysis by Novotny et al. (2017) reveals that there were a minimum of two individuals, all adults and possibly males, present at the crypt. The location of the crypt, an almost mirror of Tomb 2 but at the northern portion of the Upper Plaza, and its proximity to Structure A-1, a monumental structure used since the Middle Preclassic period, associates this burial with regal activities. We suggest that Burial CC-B16 consists of members of the Chan Chich royal court who were in office at the beginning of the Early Classic period and that the chamber, an elite crypt, function as an exclusive burial space for important members of the royal court.

Conclusions

Although our excavations have not yet targeted the structures surrounding the Upper Plaza to any great degree yet, the picture emerging from the excavations within the plaza itself shows the transformation of a small Middle Preclassic village into a small kingdom by the Terminal Preclassic period. The rulers used the plaza as a royal necropolis for an early king and a likely successor in the Terminal Preclassic and Early Classic periods, respectively. Through time, the ruling family radically modified the Upper Plaza, truncating and burying an early temple and creating, and then filling, a royal crypt, as they enhanced the monumentality of their small kingdom. Future excavations in the Late Classic structures surrounding the plaza should add clarity to this picture.

Acknowledgments

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14 EARLY MAYA CIVILIZATION IN THE THREE RIVERS REGION

Fred Valdez, Jr.

Several prehistoric Maya sites in the Three Rivers Region of NW Belize and NE Peten, Guatemala are considered for their developments from the Preclassic to the Early Classic. Architecture, ceramics, and burials are among the data for interpretations of changes in Maya Civilization for these early periods. In NE Peten, Rio Azul excavations revealed a rich trajectory of developments from the Preclassic (ca. 400 BC) into the Early Classic including the practice of painted tombs. La Milpa, Chan Chich, and Dos Hombres, in NW Belize, provide significant data for early tombs in the general region. Broader connections and comparisons to neighboring areas as well as more distant contacts or influences are presented and relayed to social, political, and economic interaction(s).

Introduction

The transition from the Maya Late Preclassic (400 BC-AD 250) to the Early Classic (AD 250-600) saw a dramatic change in population settlement, material culture, and political organization. As is always the case, change for any society is a turbulent and difficult process. Several prehistoric Maya sites in the Three Rivers Region (TRR) of NW Belize and NE Peten, Guatemala are considered for their developments/changes from the Late Preclassic to the Early Classic (Valdez and Scarborough 2013; Figures 1 and 2). A few comments on the Three Rivers Middle Preclassic serve as a means of giving context to the Late Preclassic of the region. While there are indications of Middle Preclassic occupants in the TRR, it is most significantly represented on the Guatemala side of the border with a decorated structure, G-103-sub 2, at the Maya site of Rio Azul (Figure 3). The decoration of the structure consists of a central panel with a “U” element at center and two dots/circles, one above and one below the “U”. This central panel is flanked by large “J”-scrolls that may represent a skyband (Figure 4). The entire panel is incised onto a matte-finished thick plaster. The region generally, however, lacks a significant Middle Preclassic settlement yet discovered. The Late Preclassic, therefore, demonstrates a broad and significant occupation across the entire region.

On the western portions of the property, Rio Azul and El Pedernal serve as models of major Late Preclassic activity while Dos Hombres, La Milpa, Medicinal Trail, and Chan Chich provide equally important data along the eastern and southern areas. I will use settlement data, architecture, ceramics, and burials as descriptive markers for Maya occupation and activity. These material culture aspects also help elucidate the similarities and especially the differences from the Late Preclassic into the Early Classic.

The Early Classic traditions in the TRR are represented by developments at Rio Azul, Dos Hombres, La Milpa, and the Barba Group. Interestingly, there are two significant phases in the region, 1) an early Early Classic seemingly represented by “Maya” material culture and 2) a late Early Classic demonstrating stylistic
Early Maya Civilization in the Three Rivers Region

Late Preclassic

Certain features and attributes of the Late Preclassic in the Three Rivers Region are quite representative of most of the Maya. The discussion here will focus on a few ceramics (types and forms), architecture (both domestic and ritual), and burials.

Similar ceramics across the Maya region include Sierra Red and Society Hall types (among many others), while spouted jars (or chocolate pots) and basins are among familiar Late Preclassic forms. It is rather fascinating just how similar several types seem to be across broad Maya regions. The ceramic similarities are so close in many cases that pottery from one site could be easily lost within a collection from another site. An additional intriguing development is the technological changes in Maya pottery from the early part of the Late Preclassic to material of the very Late or Terminal Preclassic. By the Terminal Preclassic forms become more complex, slips are harder and leaning towards a glossy finish, and polychrome is formally introduced before the Preclassic is complete. Maya architecture of the Late Preclassic has several representative forms and diagnostic features. Architecturally, a common structure shape/form includes round (and/or keyhole shaped) platforms. This architectural platform type has been excavated in the Belize side of the TRR at Medicinal Trail (Hyde 2015; Figure 5), at Dos Hombres (Houk 1996), and at El Pedernal (Hendon 1989) in Guatemala. It remains uncertain, however, if these platforms supported domestic structures or building of more ritualistic interests.

Of significant ritual and/or community interests were monumental constructions as discovered with G-103 at Rio Azul (Valdez...
Late Preclassic Round Platform at Medicinal Trail.

Late Preclassic Monumental Architecture at Rio Azul’s G-103.

These buildings provide some of the best evidence for coordinated labor and the use of thick plaster painted red. The constructions also provide insights into Late Preclassic Maya architectural technology. Originally, these large Preclassic temples were likely platforms for timber temples. Eventually, timber temples were replaced with temples of thin-walled masonry structures with perishable roofs. This latter form was in place by the Protoclassic/very Late Preclassic as evidenced at Rio Azul’s G-103.

Late Preclassic burials are known from several sites in the Three Rivers Region including Dos Hombres (Trachman and Valdez 2001) and Chan Chich (Houk and Robichaux 2003). These two sites serve as proxies for regional expressions of interment activities. Several burials dating to the Late Preclassic were excavated in the Dos Hombres area. The burials, which included adults and subadults, were placed with similar grave offerings including greenstone, shell, and ceramic vessels. An interesting observation by Trachman (Trachman and Valdez 2001), involved a burial from the Dancer Group near Dos Hombres that had a female buried with a shell bivalve found over the pelvic region. The practice of wearing a bivalve in such a position was reported as an activity from the ethnohistoric record that may represent a practice for socializing the gender of the individual. Although it cannot be stated as an identical or similar concern extending back to the Late Preclassic, the action is nonetheless intriguing as a possibly long-lived tradition.

One of the best examples of a Terminal Preclassic (or Protoclassic) tomb comes from the site of Chan Chich (Houk 1998a, 1998b) at the southern part of the TRR. Chan Chich Tomb 2 was excavated in the Upper Plaza of the site by Houk and Robichaux (2003). The tomb chamber was elliptical in shape and had been covered by a dozen capstones. Among the burial furniture were greenstone artifacts, possible cotton paper, fragments of painted stucco, fragmentary wood, and 11 ceramic vessels. Among the pottery vessels were five mammiform tetrapod support bowls, two spout-and-bridge jars (often called chocolate pots), two basal flange bowls, a ring base jar, and a basal angle bowl. The vessels are all chronologically assigned to the end of the Preclassic, though several forms continue into the Early Classic. One slip type in particular, found in the Chan Chich tomb, is Rio Bravo Red which is known to bridge the Preclassic and Early Classic (Sagebiel 2005:247–253; Sullivan and Valdez 2006:79).

Early Classic

The TRR Early Classic seems to be stylistically and in content similar to many sites across the entire Maya area (Buttles, Sullivan, and Valdez 2005; Sullivan and Valdez 2006). Data for the Early Classic is limited to ceramics, settlement impressions, and several tombs and burials. Architecture for Early Classic structures is rather limited. One interesting adjustment of the Early Classic city is the move to monumental construction almost entirely of masonry. Stone are better cut and shaped to reduce the amount of plaster required, especially as compared to the
thick rolling plaster of the Late Preclassic. It may be the lack of significant timbers that led to the development of the corbel vault and more extensive masonry construction. Given the limited knowledge of Early Classic architecture in the TRR, the focus here will be settlement comments, pottery descriptions for two phases, and burials that also reflect two phases.

Population estimates and settlement have often been limited to data concerning major Maya centers. Mayanists had been left with the impression that there was a decline during the Early Classic that accounted for an underrepresented occupation. In the Three Rivers Region, the site of Rio Azul had a significant Early Classic presence while the Belize side of the TRR seemed to promote the population decline theory. Fortunately, much survey and excavation at small sites and rural localities has demonstrated that a significant part of Early Classic populations may have moved from site centers to hinterland settlements. The reason(s) for population re-settlement is uncertain, but I suspect the Maya may have fouled their cities as one possible scenario. The cities remained important and sacred, but much of the population had moved out, utilizing the centers primarily for ritual(s).

Early Classic Maya pottery can be quite distinctive with a particular shade of orange rather than the red of the Late/Terminal Preclassic. Vessel forms combined with the “glossy” orange slip are the strong indicators of Early Classic pottery. The basal flange bowl form (Figure 7) is another good indicator of Early Classic Maya. It seems that two significant temporal phases can be seen in Maya pottery. The early phase of the Early Classic follows a particular transition out of the Terminal Preclassic. This early phase is what may be called an Early Classic “Maya” phase that includes the basal flange bowl. A later phase may be termed the Early Classic “Maya-Teotihuacan” phase that continues with many of the same forms, but add a slab-footed tripod cylinder, often with a cover or lid. These basic distinctions serve to validate the two-phase division posited here, but there is a far more extensive array of pottery to each phase.

Burials and tombs for the Early Classic are known across the TRR. Rio Azul is known for its phenomenal painted tombs (Figure 8). Most of the excavated and documented (looted) tombs of Rio Azul’s Early Classic date to the proposed second/late phase, “Maya-Teotihuacan”. An early phase Early Classic tomb is represented in the TRR by Dos Hombres Structure B-16 (Durst
The Early Classic tomb found and excavated at this locale was found beneath a cut in the floor of an elite residential structure near the main plaza (Durst 1998; Robichaux and Durst 1999; Sullivan and Sagebiel 2003. See Figure 9). The tomb was capped by more than 20,000 fragments of obsidian blades, flakes, and cores. The ceramics chronologically place the tomb in the early phase of the Early Classic with a particularly diagnostic. Dos Arroyos Orange Polychrome basal flange bowl (Figure 7) and a Yaloche Cream Polychrome scutate lid.

A late phase Early Classic tomb (or cist) was excavated at the Barba Group, a residential group about 2.5 km northwest of Dos Hombres (Hageman 2004). This group is located in the Dos Hombres periphery, on a survey transect between Dos Hombres and La Milpa. The Barba Group tomb was located below a small shrine on the east side of the plazuela. Among the burial furniture was a series of ceramic vessels including an effigy turkey pot, a jaguar effigy bowl, and a Teotihuacan-style tripod cylinder with a lid (Figure 10). The tripod cylinder has a finely executed Maya head as the lid handle.

Another late phase Early Classic tomb, Burial B11.67, was uncovered at La Milpa in the Great Plaza near Structure 1 (Hammond et al. 1996). A former chultun had been utilized to construct the tomb. Among the various associated artifacts was a Paradero Fluted Teotihuacan-style tripod cylinder and a scutate lid.

Summary and Comments

The ancient sites of Chan Chich, Dos Hombres, the Barba Group, and La Milpa provide significant data for tombs of the Terminal Preclassic as well as early and late phases of the Early Classic (Robichaux and Durst 1999). The painted Early Classic tombs of Rio Azul, especially Tombs 19 and 23, are primarily dated to the late phase of the period. The various burials, Preclassic (such as from Dos Hombres), and Early Classic along with ceramics of the TRR, and limited architectural developments all indicate important changes between the two periods.

While architecture, ceramics, and burials are among the data for interpretations of changes in Maya Civilization for these early periods, these artifacts also serve as indicators of continuity. Generally, change or transitions likely represent significant social and political change that is always a stressful and difficult adaptation for society. The successful changes from one period to another attests to the adaptive strategies and flexibility of ancient Maya society. These strategies are what allowed for the development and growth of “civilization”.

The success of early Maya Civilization may also be found in broader connections to neighboring areas as well as more distant contacts or influences. The most successful of civilizations are those that adapt to and develop external exchanges. The material culture of the Three Rivers Region inhabitants show connections regionally (trade items with Uaxactun) and internationally (adapting imagery from Teotihuacan). The various ideas and/or notions mentioned or hinted at in this paper are not unique to the Three Rivers Region, but the TRR may serve as a model of greater Maya developments and adaptations.

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Trein, Debora

Valdez, Fred Jr.

Valdez, Fred Jr. and Vernon Scarborough
15  SITUATING PRECLASSIC INTERMENTS AND FIRE-PITS AT SANTA RITA COROZAL, BELIZE

Adrian S.Z. Chase, Diane Z. Chase, and Arlen F. Chase

Excavations were carried out at Santa Rita Corozal from 1979 through 1985 by the Corozal Postclassic Project. Although the original project sought to excavate only Postclassic occupation, substantial Preclassic remains were also incidentally recovered and recorded during field investigations. This Preclassic data was mentioned in passing in subsequent publications, but was not fully illustrated or published because of the original focus on the Postclassic Period Maya. Approximately 31% of the burials recovered during 4 years of excavation at Santa Rita Corozal by the Corozal Postclassic Project dated to the Preclassic Period. A total of 41 Preclassic burials were recovered from Santa Rita Corozal; 5 of these dated to the early Middle Preclassic Period; 4 dated to the later Middle Preclassic Period; and 32 dated to the Late Preclassic Period. The majority of these interments were accompanied by one or more ceramic vessels that permitted the dating of the deposit. This paper presents the archaeological data relating to the Preclassic burials recovered at Santa Rita Corozal and also positions these interments in terms of the broader Maya world.

Introduction

Of all the practices carried out by ancient and modern peoples, ritual acts probably comprise the most conservative, meaning that, once ingrained in the social fabric, they are the hardest to change. Almost by definition, ritual becomes a codified form of action that is completed in a prescribed way and often at prescribed times, thus permitting researchers to identify these patterns in the archaeological record. Perhaps most significant to the ancient Maya were the ritual acts associated with death and burial. The living treated the bodies of their dead in particular ways, placed them in certain areas, in certain conditions, and with certain objects. It is likely that ritual acts were carried out that related to the memory of the dead, to the transition of the dead into some other state of being, and to their lasting relationship with the living (e.g., Metcalf and Huntington 1991). The Preclassic archaeological record of the ancient Maya has yielded a series of early burials, the patterning of which provides insights into early Maya ritual. In addition to helping understand early ritual behavior, parallels to some of these patterns can be established in later time periods in the Maya archaeological record. Among the more interesting of these parallels is the identification of an early ritual pattern that linked the use of fire – and fire-pits – to Preclassic burials, a linkage that we see as continuing in various modified form throughout Maya prehistory. Yet another area of interest relates to the primary and secondary nature of interments and the implications of these patterns for the interpretation of mortuary ritual, particularly in relation to the antiquity of double funerals (e.g., D. Chase and A. Chase 1996: 76-77).

The site of Santa Rita Corozal (Figure 1) has had a long history of intensive research: initially being dug by Thomas Gann at the...
transition of the 19th to 20th centuries (1900, 1918); being subject to test-pitting and limited excavations by several projects in the early 1970s (Green 1973; Pring 1973; Sidrys 1983: 124-158); then being the focus of four seasons of excavation by the Corozal Postclassic Project from 1979 through 1985 (D. Chase 1981, 1985, 1986; D. Chase and A. Chase 1988); and, more recently seeing further research during the course of stabilization by the Belize Institute of Archaeology in 2013. While the site is best known for its extensive Postclassic remains (D. Chase and A. Chase 1988, 2004a, 2008), Santa Rita Corozal has yielded spectacular Early Classic materials (D. Chase and A. Chase 2005) as well as some of the earliest evidence of settlement known from northern Belize (D. Chase 1981; D. Chase and A. Chase 1988, 2006; Reese-Taylor 2016). This paper builds on earlier research carried out by the Corozal Postclassic Project that was briefly presented in a two articles summarizing the Preclassic and Early Classic Period remains recovered at the site (D. Chase and A. Chase 2005, 2006). The earlier work served to establish the widespread remains at Santa Rita Corozal for both of these time periods. This paper seeks a more synthetic statement concerning the associations and implications of the 41 Preclassic burials recovered at the site (Table 1).

Contextualizing Santa Rita Corozal’s Preclassic Burials

Preclassic treatment of the dead at Santa Rita Corozal is relatively consistent throughout the site (see D. Chase and A. Chase 2006). A total of 41 interments may be assigned to the Preclassic Period with 3 more assigned to the Protoclassic era; of the Preclassic interments, 5 date to the Early Middle Preclassic, 4 to the Middle Preclassic, and 32 to the Late Preclassic Period. For all of the individuals interred during the Preclassic Period, 26 were in flexed position, 1 was in extended position (see Figure 2), 5 were disarticulated, and 9 were of indeterminate position. The majority of the interments were of a single individual, but two interments contained more than one individual. In both cases, a fully articulated individual was buried with the partial remains of either one or two others. These interments suggest that subsequent later (Late Classic Period) practices identified at sites such as Caracol, Belize – where multiple individual interments and two-part burial practices associated with double funerals are common (e.g. D. Chase and A. Chase 1996, 2011) – may have had great antiquity.

No clear correlation of body orientation with age, sex, date, or burial offerings exists within the Santa Rita Corozal dataset; the heads of the deceased were nearly evenly split between those with head to the north and south, with a more limited number with heads to the northwest and east. Twenty-nine burials were accompanied by one or more ceramic vessels; six burials had more than one vessel with one burial being accompanied by 8 vessels. In the Middle Preclassic a single smaller vessel was often set upright near or on the chest of the interred individual (Figure 3). In the Late Preclassic, very large shallow bowls or platters were inverted over flexed bodies, minimally capping the head and sometimes the entire body (Figure 4). Some aspects of the Late Preclassic burials show continuity with later periods; in the subsequent Classic Period at Santa Rita Corozal, inverted bowls were often used to cover the skull of both flexed and extended interments. The earliest Middle Preclassic burials recovered at Santa Rita Corozal were associated with a Middle Preclassic raised eastern construction, but most of the other recovered Preclassic burials were associated with open spaces and not with raised constructions. Given the research focus of the Corozal Postclassic Project, excavations generally did not focus on the penetration of Preclassic constructions; thus, further excavation at the site may yield other burial patterns typical of those found at other Preclassic sites in northern Belize.

When Santa Rita Corozal’s burials are compared to other sites with excavated Preclassic Period burials in northern Belize (see Figure 5), the variability in burial patterns among these sites is striking (Table 2). At Cerros, across the bay from Santa Rita Corozal, 32 Preclassic interments were recovered (Walker 2016: Table 3.1); 11 were interred in a seated position; 8 were encased in ceramic containers (see Cliff 1982 for the context of the burial vessels and Carr 1989 for an analysis of the associated faunal material in these vessels.
Table 1. Preclassic burials from Santa Rita Corozal (41 burials with 44 individuals; 3 individuals are associated with S.D. P10B-6 and 2 with S.D. P19A-10).

<table>
<thead>
<tr>
<th>Burial</th>
<th># Individuals</th>
<th>Body Position</th>
<th># Vessels</th>
<th>Phase</th>
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<tr>
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<td>Flexed</td>
<td>8</td>
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</tr>
<tr>
<td>P30D-11</td>
<td>1</td>
<td>Flexed</td>
<td>4</td>
<td>Late Preclassic</td>
</tr>
</tbody>
</table>
Preclassic Interments and Fire-pits at Santa Rita Corozal

[considered to be food]); 4 were in a flexed position; 2 were extended; 1 was disarticulated in a pit; and 6 burials were of indeterminate position. Only one of the seated burials appears to have used a large shallow bowl as a covering device (Walker 2016: Fig. 3.6). Walker (2016:70) noted that burials contained within ceramic vessels tended to be placed within buildings while seated burials usually derived from open spaces. For K’axob, 101 Preclassic burials were recovered (Storey 2004: Table 6.4): 26 were in extended position, 15 were seated, 10 were flexed, 3 were indeterminate, and 47 others were disarticulated. At Cuello, 157 burials can be assigned a Preclassic date (Robin 1989: Table 10; Hammond et al. 1991, 1992): 27 of these were interred in a seated position; 47 were extended; 26 were flexed; 18 were disarticulated bundles; 20 were simply disarticulated; 15 were indeterminate as to position; and, 4 consisted only of skulls (possibly caches; see Haviland 1990). However, aside from a semi-frequent placement of inverted bowls over crania, no additional correlations of body orientation with age, sex, date, or burial offerings emerge from the large sample of burials at Cuello (Robin 1989:152).

These data show the great variability in burial patterns found at sites in northern Belize during the Preclassic Period. K’axob also illustrates the interment of multiple individuals within a single grave pit during the Late Preclassic Period, signaling the retention of bundled remains to accompany the burial of, what has been interpreted to be, an individual of
Table 2. Comparison of Preclassic burial contexts between sites in northern Belize. Cerros data from Walker 2016: Table 3.1; K’axob data from Storey 2004: Table 6.4; Cuello data from Robin 1989: Table 10, Hammond et al. 1991, 1992; Santa Rita Corozal (SRC) data presented in this paper. The disarticulated total for Santa Rita Corozal does not include 2 disarticulated individuals placed with a flexed burial in S.D. P10B-6 or a skull placed with a flexed individual in S.D. P19A-10).

<table>
<thead>
<tr>
<th>Site</th>
<th>Seated</th>
<th>Ceramic Container</th>
<th>Flexed</th>
<th>Extended</th>
<th>Disarticulated</th>
<th>Indeterminate</th>
<th>Total Preclassic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerros</td>
<td>11</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>32</td>
</tr>
<tr>
<td>K’axob</td>
<td>15</td>
<td>0</td>
<td>10</td>
<td>26</td>
<td>47</td>
<td>3</td>
<td>101</td>
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<td>Cuello</td>
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<td>0</td>
<td>26</td>
<td>47</td>
<td>38</td>
<td>19</td>
<td>157</td>
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<td>0</td>
<td>0</td>
<td>25</td>
<td>1</td>
<td>3</td>
<td>12</td>
<td>41</td>
</tr>
</tbody>
</table>

Figure 6. Example of a sherd-lined fire-pit in the basal portion of Operation C3B in Structure 58 of Santa Rita Corozal.

higher status (McAnany et al. 1999; Storey 2004). While earlier arguments were made that seated burials represented individuals of some authority (e.g., McAnany et al. 1999:133), their widespread distribution in northern Belize and their co-existence with other patterns does not support this assertion. In fact, different segments of Preclassic Maya society may have practiced varying burial patterns. At Cuello, in contrast to the wide variety of interment patterns recovered during initial research (Robin 1989), subsequent excavations in more formal buildings of Middle Preclassic date, almost exclusively recovered extended individuals in cist burials (one interment in 1992 contained 2 flexed individuals), most with vessels covering their skulls (Hammond et al. 1991: Fig. 5; 1992). This association is likely significant and suggests that there may have been distinct societal divisions at this early date that to some extent may be correlated with burial type; two “rich” child burials (with multiple grave goods) in this sample also “suggest that some degree of social ranking existed in the Maya Lowlands by the later seventh century B.C.” (Hammond et al. 1991:362; 1992:961). At Santa Rita Corozal cist and simple burials both may be found to contain additional grave goods; however, as noted, the sample resulted from research focused on the Postclassic Period instead of focusing specifically on the recovery of early remains. Thus, at least some of the variability in interment patterns seen in the Preclassic archaeological record of northern Belize may correlate with differing social levels recovered at the various sites.

Fire-pits

One of the more interesting features at Santa Rita Corozal are a series of fire-pits associated with the Preclassic Period levels of the site (Figure 6). These features have a widespread occurrence in the archaeological records of northern Belize but are consistently associated only with Preclassic activity. Fire-pits generally consist of circular or hemispherical depressions lined by stones, ceramics, or both that usually show evidence of having been subjected to the high heat of a fire (the soil, rocks, and ceramics are discolored; in addition, ash may be present). The ceramics can be piece-meal in the feature or, alternatively, represent the almost intact base of a plainware vessel (at K’axob, a series of Sierra Red shallow bowls were recovered in a sherd-line pit [Berry et al. 2004:211]; nothing like this was found at Santa Rita Corozal). At Cuello, Gerhardt (1988:90-91) describes these features throughout her Preclassic sequence and originally assigned them a domestic function related to “cooking
and washing;” they were later recognized as spanning “a wider range of functions … and were not simply hearths” (Hammond et al. 1991:355). Some of these Preclassic features at Cuello do not appear to have been fired, leading to subsequent speculation of their uncertain function (Hammond 1991:236). Fire-pits are also known to appear at Cerros (Robertson, personal communication, 2015), Colha (Hester et al. 1981), Nohmul (Pyburn 1989), and K’axob (Bobo 2004).

The K’axob “sherd-lined pits” underwent intensive analysis by Victoria Bobo (2004:104), who argued that they were “involved in multiple functions involving steaming, soaking, and burning.” The assumption that these pits were used for domestic activities is clear from their earliest definition by Gerhardt (1988:90) and their explicit association by Pyburn (1989) to ancient Maya cuisine, although Bobo (2004:87) does say that they possibly could relate to “ceremonial undertakings.” Bobo notes that she had a difficult time with her analysis of “sherd-lined pits” because these features were referred to as either “hearth” or “fire-pits” at other sites; however, she (2004:89, 92) provides detailed information for 5 of these features from Colha, 26 of these features from Cuello, and 30 more sherd-lined pits from K’axob. Even though the one published picture of these features for K’axob shows them in association with a burial, Bobo (2004:93) did not engage in a discussion of their possible ceremonial nature. While Bobo (2004) argues that some of her pits occur within buildings, the majority of them are actually outside of constructions, a finding consistent with pits from Nohmul (Pyburn 1989), Cuello (Hammond and Gerhardt 1990), and Santa Rita Corozal.

For Santa Rita Corozal, 12 sherd-lined fire-pits were recovered in four distinct locales: one from a deep cut in the axial trench through Structure 58; two from the axial trench through Structure 35; five from an axial trench through Structure 134; and four from an axial trench through Structure 189 (see Figure 1). At Santa Rita, fire pits are broadly located at the site, but always in association with Preclassic stratigraphic levels. Given that the excavations undertaken by the Corozal Postclassic Project were focused on the Postclassic Period and often did not strive to open earlier levels, the amount of fire-pits recovered suggests that they were quite common. Intriguingly, the one areal excavation of a sizeable Preclassic construction (Operation 24) was not associated with a fire-pit (see D. Chase and A. Chase 2006:92). In only one excavation were the recovered fire-pits in direct association with structural remains; most were not clearly in association with Preclassic buildings. However, all recovered fire-pits at Santa Rita Corozal were found in areas of Preclassic interments, suggesting to us that these features may not have had a purely domestic function.

The one case in which fire-pits are clearly associated with a construction is in excavations of the earliest known structure at Santa Rita Corozal, dating from the early part of the Middle Preclassic Period (D. Chase and A. Chase 2006). The five fire-pits are on axis to the two earliest phases of Structure 135, which is associated with five Middle Preclassic interments. Three of the fire-pits in Structure 135 are directly above an Early Middle Preclassic burial and the other two are on axis to the construction. In our estimation, this constitutes a strong argument that the interment and the fire-pits were linked. Similar linkage is also seen in Structure 189 where another fire-pit directly overlies a Late Preclassic burial. Thus, we believe that these fire-pits are the Preclassic equivalent of the ritual burning that is seen throughout the Classic Period archaeological record in “ritual” contexts.

Burning within architectural contexts has been recorded for most excavated sites within the Maya lowlands and has often been conjoined with other ritualized acts within the Maya archaeological record. Many researchers have noted the association between fire and ritual buildings and contexts, often ascribing these acts to termination deposits (i.e., Mock 1998; Harrison-Buck 2012). While clearly dating to a different temporal era, Late Postclassic and historic contexts also incorporate the ritual destruction of items by burning (e.g., Tozzer 1941). But, there are differences in scale in these acts, as well. William R. Coe (1990:937) documented the extensive burning and scorching that was associated with Tikal’s North Acropolis and specifically commented on numerous empty burnt pits, noting that “an interesting coupling
also exists between ignition and several interments.” At Caracol, Belize burning was intimately associated with the interment of individuals; censers filled with burnt ash, probably derivative from some ritual related to interment, were sometimes placed within tombs and other burning occurred after the placement of the burial (e.g. A. Chase and D. Chase 1987a: 26-27); in other cases an entire burial was incinerated before being incorporated into the archaeological record (e.g., A. Chase and D. Chase 2011). In the Postclassic era, ritualized burning is sometimes literally incorporated within the body of the dead; one of the skulls recorded from the Cenote of Sacrifice at Chichen Itza had a circular hole in its top and had been repurposed as an incense burner (Coggins 2004). Thus, the association of purposeful fire with ritual activity and death has a long tradition in Mesoamerica.

Fire is not only associated with mortuary rituals, but also with other ceremonies, including world renewal activities that took place at regular temporal intervals throughout Mesoamerica (Christenson 2016; Elson and Smith 2001; Stuart 1998; Vail and Looper 2015). Evidence for the episodic deposition of both interments and caches associated with temporal cycles has previously been identified for Late Classic Period Caracol, Belize (e.g., A. Chase and D. Chase 2013; D. Chase and A. Chase 2004b, 2011). A future line of research may draw similarities between the Preclassic and Classic practices.

**Conclusion**

Maya ritual has shown great continuity and persistence over time, and analysis of Preclassic burial patterns provides insight into early Maya ritual patterns. Some of these patterns, such as flexed burials and the placement of inverted vessels over the individual’s head and upper body, continued into later time periods. Similarly, the few multiple individual interments with mixed articulation recovered at Santa Rita Corozal suggest that the curation of the dead and the double-funeral practices common in the Late Classic Period at many sites can trace its ancestry to practices already under way in the Preclassic Period. Given the persistence of burial ritual, differences and similarities within and among sites are significant. As noted above, Preclassic Period interments from Santa Rita Corozal, at least those thus far sampled, are somewhat less varied than those at some other Maya sites in northern Belize. While this may be due to sampling or wealth variations, it may also be due to greater cohesion in ritual practices among some sites and not others.

Initial data analysis and research on Preclassic burials in northern Belize attempted to identify correlations between measured categories that included age, sex, date, or burial offerings; often the results were inconclusive. However, the primary additional pattern identified at Santa Rita Corozal was the association between fire-pits and Preclassic burials. This linkage between fire and interment can be seen as continuing in various modified forms throughout Maya prehistory, although the fire-pits themselves are most evident in Preclassic contexts. Thus, we believe that these fire-pits are the Preclassic equivalent of the ritual burning that is seen in throughout the Classic Period archaeological record in “ritual” contexts. A question to be answered by later research is whether the conjoined burning and human interment activities were part of wider calendric and world renewal ceremonies that were continued in somewhat different form throughout the rest of Maya prehistory.

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16 CHETUMAL’S DRAGONGLASS: POSTCLASSIC OBSIDIAN PRODUCTION AND EXCHANGE AT SANTA RITA COROZAL, BELIZE

Max Seidita, Diane Z. Chase, and Arlen F. Chase

The reconstruction of patterns of obsidian production and exchange has been vital to increasing our understanding of ancient Mesoamerican economies. During the Postclassic Period (ca. 950-1532 C.E.) inhabitants of the site of Santa Rita Corozal, Belize participated in multiple exchange networks to provision themselves with the materials to produce and distribute obsidian artifacts. Analyses of obsidian artifacts dating to the Postclassic Period recovered by the Corozal Postclassic Project from 1979-1985 has demonstrated that Santa Rita Corozal’s population was engaged in the production of obsidian blades, likely from partially reduced polyhedral cores. Here we present information on 572 obsidian artifacts, including details relating to the tool production sequence and pXRF sourcing data. We further present the statistical distributions of objects in relation to hypothesized function or status of each structure. Procurement of these cores from at least six different obsidian sources likely occurred as a result of indirect trade carried out by non-specialist traders. The sources represented include Otumba, Mexico, a resource not previously identified in the region. Imported raw materials were transformed into finished artifacts and then distributed through a market system. These findings contrast with the patterns of procurement and production seen at neighboring sites thought to be members of the Chetumal polity, where prismatic blade production and number of sources being exploited were more limited. We conclude by discussing these findings in relation to neighboring sites and within our broader understandings the Postclassic Period regional economy.

Introduction

Obsidian is one of the most commonly recovered materials in the Maya region and some types of obsidian and obsidian artifacts, such as prismatic blades, were utilitarian goods used in everyday life and transported in bulk into sites across the lowlands (Braswell 2003; Edwards 1978; Smith 2003). A testimony to obsidian’s popularity and perhaps its unique characteristics, the ancient Maya imported obsidian into regions where other sources of chipped stone, such as chert, were easily accessible and commonly available to the general population. Since the early 1900s, Maya archaeologists have viewed the presence of obsidian as an indicator of interregional exchange and consumption, as well as one avenue by which to explore production (Chase and Chase 1989; Kidder 1947; Sidrys 1976). The persistent emphasis on obsidian by Maya researchers may be attributed to its ubiquity in the archaeological record, the resilient nature of both finished artifacts and production debitage, and its elemental properties which allow for the attribution of an obsidian artifact to a specific geological source (Ferguson 2012; Shackley 2011). With the recent upswell in the study of Maya market exchange, obsidian has become a vital component in any discussion of the various mechanisms of distribution employed by the ancient Maya. Obsidian has been included in market studies at sites throughout the Maya region including Caracol (Chase and Chase 2015; Chase and Chase 2014) and Xunantunich (Cap 2015; Cap, et al. 2015) in Belize; Tikal, Guatemala (Masson and Freidel 2012); Mayapan, Mexico (Masson and Freidel 2012); and Ceren, El Salvador (Sheets 2000). Many of these studies, including the one presented here for Santa Rita Corozal, rely upon data derived primarily from the excavation of households (see Cap (2015); Cap, et al. (2015) for a recent and notable exception). Less often discussed than the broader mechanisms of distribution across sites are the means by which the market itself is provisioned.

With the above in mind, here we present an updated study of the Postclassic Period obsidian economy at the site of Santa Rita Corozal in northern Belize. Through a combination of lithic analysis, a sourcing study utilizing pXRF, and statistical analysis of obsidian locations, we seek to understand the importation, production, and distribution of obsidian at Santa Rita Corozal during the Postclassic Period (ca 950-1532 C.E.). We argue that the Postclassic Period population of Santa Rita Corozal was importing partially reduced polyhedral cores from a variety of Guatemalan and Mexican obsidian sources,
producing blades locally, and then distributing the obsidian through market exchange. Through this research we aim to contribute information from the Postclassic provincial capital of Santa Rita Corozal to discussions of other obsidian economies in northern Belize. More broadly, we seek to demonstrate the value of considering the provisioning of local economies with non-local goods in conjunction with local methods of distribution, the importance of large sample sizes in the elemental sourcing of obsidian, and the value of existing collections.

**Santa Rita Corozal's Obsidian Economy**

Located in northern Belize, Santa Rita Corozal was situated along the coast at the western end of Chetumal Bay; the site is now largely subsumed by the sprawl of Corozal town and rising sea levels. Santa Rita Corozal and its surrounding areas have been continuously occupied since at least the early Middle Preclassic Period (Chase 1981:26) with an Early Classic prominence in the region (Chase and Chase 2005). However, Maya occupation at the site reached its peak population during the Late Postclassic Period when the population of the city itself is believed to have been approximately 7,000 inhabitants (Chase 1990), not including people in the surrounding landscape. The site was situated near the mouths of three major river systems: The New River and Freshwater Creek (which both have their head waters in central Belize) and the Rio Hondo (which reaches into the Peten of Guatemala) (Figure 1). These river systems would have served as important transportation routes and would have fostered communication and exchange between the coast and inland settlements (Chase and Chase 1989). Additionally, Santa Rita Corozal’s coastal location would have facilitated its participation in both circum-peninsular trade and exchange along the Belize coast (Chase 1986); seaborne trade has long been thought to be the primary means of long distance exchange amongst the Postclassic Period Maya (Sabloff and Rathje 1975).

Investigated by several projects since the early 1900s, Santa Rita Corozal was most intensively excavated by the Corozal Postclassic Project (CPP) from 1979-1985 under the direction of Diane and Arlen Chase (Chase 1982; Chase and Chase 1988). Excavations took place over the span of four years and consisted of the mapping of 200 features including structures, platforms, and chultuns, as well as the excavation of 46 of these features (Figure 2). The 572 Late Postclassic obsidian artifacts discussed here were recovered by the project...
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(information on 27 obsidian points recovered during these investigations may be found in (Marino, et al. 2015)). The CPP established Santa Rita Corozal as the likely location of Chetumal, the Postclassic Period provincial capital and the namesake of the Chetumal province (Chase 1982, 1985; Chase and Chase 1988, 2004, 2008). Chetumal was described in Spanish accounts as an economic center which participated in extensive trade networks and was known for producing and exporting honey and cacao (Chase 1986). The Chetumal province itself is thought to have occupied the area of modern-day northern Belize and southern Quintana Roo. While the relationship between Santa Rita Corozal and smaller sites in the region has not been fully explored, work by Marilyn Masson (2000) suggested that, during the Postclassic Period, Santa Rita Corozal sat atop a hierarchy of sites, which may have included Caye Coco, Laguna de On, Ichpaatun, and Sarteneja. Following Masson (2000), the “primary site” of Santa Rita Corozal was likely supported by smaller “secondary sites” such as Caye Coco, which were in turn supported by “tertiary” communities such as Laguna de On.

Importation and Production

Seidita (2015), undertook an initial study of the Santa Rita Corozal obsidian, focusing on finished artifacts and debitage in an attempt to understand the type and extent of production that had occurred amongst the Postclassic Period population of Santa Rita Corozal. Additionally, this analysis was able to establish the likely form of the obsidian prepared for transport – for example nodules, cores, or finished artifacts – as various stages of reduction result in diagnostic and finished artifacts indicative of where in the reduction sequence local production began (e.g., Clark and Bryant 1997). Understanding the forms that were imported allows for partial modeling of the social and economic relationships which drove the provisioning of obsidian to non-obsidian producing regions, such as the Maya Lowlands (Hirth 2008).

Our analysis of the obsidian assemblage shows that, unsurprisingly, Santa Rita Corozal’s primary industry was the production of final-series prismatic blades (Table 1). Of the 572 Postclassic Period obsidian artifacts, 498 are complete and segmented blades. Of these blades, over 95% are blade segments, most of which may be classified as purely or partially medial. The majority of these segments retain the “tongue” and “tongue facets” indicative of purposeful segmentation of blades (Hirth et al. 2006). De Leon (2009) has argued that selecting for medial segments, the flattest portion of the blade, makes blades easier to haft. This is supported by the presence of side notching on 15% of the blade assemblage. Most commonly blades were notched with a single unilateral side notch. While we do not discuss use-wear analysis here, this evidence suggests a preference for flatter blades that were more easily hafted, a claim supported by an earlier use wear study on Santa Rita Corozal materials by (Hartman 1980) that found that blade segments had been hafted for activities like those involving the repetitive cutting of a fibrous material. Additionally, two initial series blades, from early in the reduction sequence, were recovered; both have extensive edge damage that likely resulted from their use as tools.

Obsidian production debitage and refuse includes cores, blade errors, and error removals. Thirteen cores and core fragments dating to the Postclassic Period were recovered. Of these cores, only a single complete core was recovered. This exhausted core showed evidence of bipolar blade removal and is only 3.45 cm in length. If we consider the aforementioned complete final-series blades as indicative of the size of cores at Santa Rita Corozal, the average core would have been around 3.6 cm in length, with lengths ranging from 2.6 cm to 7.3 cm. The proximal section of the single complete core and the other proximal fragments indicate that cores were prepared by having their platforms ground. This method of preparation, while labor intensive, facilitates easier and more predictable blade removal (Crabtree 1968; Hirth et al. 2006). In addition to these cores, two platform preparation flakes were recovered. Other debitage and production errors include plunging blades, hinge fractures, and attempts at removing these errors through rejuvenation flakes.

Analysis of Santa Rita Corozal’s obsidian assemblage demonstrates that during the Postclassic Period the population of Santa Rita
Table 1. Table of quantities and frequency of obsidian sources present in the sample.

<table>
<thead>
<tr>
<th>Sources</th>
<th>El Chayal</th>
<th>Ixtepeque</th>
<th>San Martin Jilotepeque</th>
<th>Otumba</th>
<th>Pachuca</th>
<th>Pico de Orizaba</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>161</td>
<td>332</td>
<td>4</td>
<td>34</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>%</td>
<td>30%</td>
<td>62%</td>
<td>&lt;1%</td>
<td>6%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>

Figure 3. Hierarchical Cluster Analysis of the elements Mn, Fe, Zn, Rb, Sr, Y, Zr, Nb for chemical groups and known sources.

Figure 4. Bivariate plot of Sr/Rb by Zr/Rb PPM values, 90% confidence ellipses.
Corozal was consuming blades produced locally. The assemblage does not represent any loci of production, such as workshops, which are characterized by significant amounts of debitage and refuse with little in the way of finished artifacts (Clark and Bryant 1997). The debitage and refuse which is present are indicative of the importation of prepared polyhedral cores or partially reduced polyhedral cores. The lack of percussion debitage, and the limited number of initial-series blades indicate that cores were likely prepared for the pressure flaking of final-series blades prior to importation (Anderson and Hirth 2008; Hirth, et al. 2006). Lastly, the small number of cores and core fragments recovered could easily account for the blades present in the assemblage. By treating core fragments as unique individual cores, the thirteen cores from Santa Rita Corozal that date to the Postclassic Period could potentially produce 2,600 blades (Clark 1988; Clark and Bryant 1997). This is 4.5 times the number of blades recovered; if we were to include the distal portion of three plunge blades, this climbs to 5.5 times the blades recovered. We do not suggest, however, that the full ancient sample of cores and blades has been recovered.

To identify the obsidian sources and source regions present in the Postclassic Period assemblage a sample of 536 pieces of obsidian dating to the Postclassic Period were assayed via pXRF. The data presented here derives from a more recent and detailed analysis than that presented previously by Seidita (2015). Using a Bruker Tracer III-SD pXRF samples were assayed for 90 seconds, at 40kV max voltage, without a vacuum, utilizing Bruker’s 0.006” Cu, 0.001” Ti, 0.012” Al, “green filter.” The pXRF data was normalized via a Log10 transformation to reduce the potential for analysis to favor elements with larger values by transforming all the elemental values into the same order of magnitude (Millhauser, et al. 2015; Popelka-Filcoff 2006). Following normalization, data was subjected to two rounds of hierarchical cluster analysis to establish the number of distinct chemical groups within the data set and to offer preliminary identification of group sources. These preliminary assignments were then substantiated via bivariate plots of PPM data and ratios of PPM data, specifically Sr/Rb by Zr/Rb. Frahm (2016) demonstrated that bivariate plotting of ratios helps control for size induced spread resulting from samples of less than ideal dimensions. This type of plotting has
the additional benefit of adding a third or potentially fourth variable - in this case an element - to consider on a two-dimensional plot (Frahm 2016). Thus, through a combination of element ratios and standard bivariate plots it is possible to better characterize the sources present within the assemblage. To confirm the preliminary source assignments generated through the use of cluster analysis, confidence ellipses are generated at 90% confidence using reference material including source samples analyzed in an earlier pXRF analysis, published pXRF, and INAA data (Glascock and Cobean 2002; Millhauser, et al. 2015; Millhauser, et al. 2011).

The combination of hierarchical cluster analysis and bivariate plotting of ratios and ppm data was clearly able to distinguish between the sources present in the Postclassic Period assemblage (Figures 3, 4, 5). The initial round of cluster analysis identified six distinct chemical groups within the assemblage. The second round of cluster analysis preliminarily identified chemical clusters for all six groups within the Postclassic Period Santa Rita Corozal assemblage including: Pachuca (Group 1), Pico de Orizaba (Group 2), San Martin Jilotepeque (Group 3), El Chayal (Group 5), Otumba (Group 4), and Ixtepeque (Group 6) (see Figure 3). The bivariate plots of Sr/Rb by Zr/Rb confirm the preliminary assignments generated by the hierarchical cluster analysis (Figure 4). While Otumba and El Chayal have a slight overlap in this plot they may be separated by plotting Log10 Mn by Log10 Rb (Figure 5). These are the same sources, albeit with a substantially larger sample size, as documented in the earlier study. Significantly, the presence of Pico de Orizaba and Otumba were confirmed through this additional analysis; and, in the case of Otumba, the amount of obsidian attributed to that source increased in the second study. Along with green obsidian from Pachuca these sources represent the only Mexican obsidian sources documented at mainland settlements in northeastern Belize during this time.

Taken together these forms of analysis allow us to draw conclusions regarding the provisioning of the local obsidian economy. While the sample size of assayed materials dating to earlier periods at Santa Rita Corozal is too small to be conclusive, it appears that there is an explosion in the diversity of sources being exploited during the Postclassic Period. In particular, the presence, diversity, and quantity of Mexican obsidian were not expected, especially given the region’s pattern of source exploitation, which favored Guatemalan sources (Braswell 2003; Golitko and Feinman 2015). We attribute the diversification of sources to increased interregional exchange during the Postclassic Period, something Mayanists have recognized since the 1970s (e.g., Sidrys 1976b). This type of exchange would have had the added benefit of aiding in the provisioning of the growing population. Given the distributions, it does not appear that the provisioning was a result of the elite investing in social ties to bring obsidian into the site. In his modeling of obsidian provisioning in Central Mexico, Kenneth Hirth (1998, 2009) has described this type of provisioning as “unspecialized,” meaning that the obsidian is likely being exchanged along with other goods and not on commission or as part of a system of elite reciprocity. Furthermore, while it is possible that individuals were familiar with the regions from which the obsidian came, aside from skilled crafters it is unlikely that the average individual would have been able to distinguish between the various gray obsidian sources.

These assertions are supported by the production evidence which, while not from a formal workshop, are indicative of the local production of blades from polyhedral cores. Obsidian was being imported into Santa Rita Corozal in forms ready to produce blades. Given the length of the complete blades present in the assemblage and the general lack of initial series blades, it is likely that the population of Santa Rita Corozal was receiving cores that had already been reduced by having blades removed. If true, then it is highly unlikely that obsidian was being provisioned directly from the communities engaged in the extraction of obsidian. Directly procuring obsidian would result in obsidian artifactual remains that were earlier in the reduction sequence, such as nodules, percussion cores, or larger cores (see, for instance, Demarest et al. 2014: 202-203). Instead, the Santa Rita Corozal assemblage is
characterized by the presence of final-series blades and small exhausted cores. Therefore, we argue that, prior to entering local exchange systems, obsidian was being provisioned from a variety of sources and source regions as part of the general Postclassic Period interregional exchange and not directly from sources via the involvement of elite political networks.

Distribution

In addition to considering how the local obsidian economy was provisioned we sought to understand how obsidian was distributed and exchanged at the site level. This was accomplished through the application of Hirth’s (1998) distributional approach to assess the presence of market exchange. This method is well suited for the Santa Rita Corozal data, especially as the obsidian assemblage represents the end users of obsidian and not necessarily the loci of production, such as a workshop or marketplace. The distributional approach infers the mechanisms of exchange based on the expected distribution of artifacts. Thus, by testing to see how homogeneous the distribution of a specific commodity is across a site’s social statuses, it is possible to infer the method of exchange. Following this approach, a homogeneous distribution of non-local items is more indicative of a system where there is relatively equal access, whereas a heterogeneous distribution is indicative of a system where access is based on social status. Typically, these are conceived as market exchange and redistribution exchange, respectively.

In our study, we chose to employ surface area of excavations as the standard method of comparison between units. Due to the low lying “invisible” nature of architecture at Santa Rita Corozal and the complicated construction stratigraphy, we only consider structures and samples for which an unambiguous Postclassic date is available. In total, 25 domestic structures are included in our sample, and by using status designations generated within previous work (Chase 1992), we were able to consider two different scenarios. The first is a simple elite versus non-elite comparison of 13 high status structures against 12 non-high status structures; these were compared via a t-test (Table 2). The second was an ANOVA based on the classification of 13 structures as high status, 4 structures as middle status, and 8 structures as low status (Table 3). The results of these tests demonstrate that no statistically significant differences exist in terms of obsidian densities in either scenario. The average obsidian density of high status structures is 0.489 pieces per square meter while non-high status structures contained 0.242 pieces per square meter. A similar trend is seen in the second scenario where middle and low status structures contained 0.192 and 0.283 pieces per square meter, respectively.

While high status structures consumed slightly greater quantities of obsidian, they do not appear to have received privileged access to the method of distribution. We attribute these differences to either purchasing power or need. In particular, the elite residents of Platform 2 (Chase and Chase 1988:25-31), one of the most intensely investigated locations at the site, are

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**Table 2.** Table displaying the t-test results for high and other status structures.

<table>
<thead>
<tr>
<th></th>
<th>High Status (n=13)</th>
<th>Other Status (n=12)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obsidian Density</td>
<td>0.4896</td>
<td>0.2529</td>
<td>0.0926</td>
</tr>
</tbody>
</table>

**Table 3.** Table displaying the ANOVA results for high, middle, and low status structures.

<table>
<thead>
<tr>
<th></th>
<th>High Status (n=13)</th>
<th>Middle Status (n=4)</th>
<th>Low Status (n=8)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obsidian Density</td>
<td>0.4896</td>
<td>0.2832</td>
<td>0.1924</td>
<td>0.2229</td>
</tr>
</tbody>
</table>
believed to have participated in a variety of activities, both domestic and religious. On Platform 2, Structure 73 may have been the location of an activity that required greater quantities of obsidian as it’s density is higher than that of nearby Structure 74, where use-wear analysis has suggested that the structure was likely the location for specialized tasks perhaps in support of Platform 2 (Hartman 1980). The lack of a statistically significant difference in obsidian densities among social statuses suggests that obsidian was not being distributed by elites along a social hierarchy. Instead, following Hirth’s (1998) distributional approach, the relatively homogeneous distribution noted for Santa Rita Corozal Postclassic obsidian is more indicative of access to a market system where wealth and/or need impacted distribution.

Conclusion

Through this study we have been able to characterize the provisioning and distribution of obsidian at the Postclassic provincial capital of Santa Rita Corozal. The Santa Rita Corozal industry appears to be significantly different, in terms of both industry and source exploitation, from other Postclassic sites within the Chetumal province. Analysis of obsidian at Caye Coco and Laguna de On indicate that those populations were not primarily engaged in the production of blades; visual sourcing and limited chemical analysis at these sites suggests that their populations drew exclusively upon Guatemalan sources. We suggest that the local obsidian economy for northern Belize was provisioned through participation in the increased interregional exchange of the Postclassic Period. Access to locally produced obsidian blades was facilitated through a market system, possibly controlled by Santa Rita Corozal. However, because some obsidian production waste and debitage wound up in archaeological contexts with the consumers of the obsidian industry, potentially some individuals obtained prepared cores in the market and produced their own blades locally or purchased blades from itinerant crafters working in this economy. Santa Rita Corozal’s trade networks were also broader than other sites in the area. The center received significant amounts of obsidian form Otumba, Mexico — and this occurrence constitutes the only known instance of obsidian from this source in the broader region. While this may be due to Santa Rita Corozal’s advantageous geographic location on Chetumal Bay or to its political primacy as the Postclassic capital of Chetumal Province, it may also be the result of not a sufficiently large enough sample of obsidian being subjected to elemental analysis from other sites. It is clear that, with the increased availability of relatively inexpensive, rapid, portable, and archaeologically valid pXRF technology, large samples or entire assemblages of other sites should be assayed without assuming the sourcing of gray obsidian. Had the sample size for Santa Rita Corozal not been so large, it is entirely possible that we may have missed the presence of obsidian sources from Otumba, Pico de Orizaba, and San Martin Jilotepeque. This analysis provides not only greater refinement of obsidian analysis for Late Postclassic Santa Rita Corozal but also showcases the importance of sampling strategies and sampling sizes in obsidian analysis.

Acknowledgements

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Xunantunich: Virtual Reconstruction of El Castillo during the Late Classic Hats’ Chaak phase, showing the location of Tut Building on the northeast corner.

Xunantunich: Plan of southeastern room of Tut Building showing doorjambs, interior walls, bench surface, and earthquake damage. Excavated in MVPP 2016 Op 13w.
Xunantunich: Elevation of north wall of southeastern room of Tut Building showing locations of graffiti encountered in the field and through PTM.

Xunantunich: Illustration of the decapitator scene incised on the north wall of the southeastern room of Tut Building.
17 TAGGED WALLS: THE DISCOVERY OF ANCIENT MAYA GRAFFITI AT EL CASTILLO, XUNANTUNICH

Leah McCurdy, M. Kathryn Brown, and Neil Dixon

Investigations at El Castillo, Xunantunich, uncovered a series of Late Classic rooms on the eastern side of the acropolis. A small private stairway provided access to these rooms suggesting a special function. Our excavations of the southeastern room revealed that it was intentionally filled with clay and stacked stones in a reverential manner. The doorjambs and walls were covered with incised images and designs, ranging from simple sketches (graffiti) to more formal renderings. In this paper we highlight the methods that we used to document the corpus of incised images as well as present our preliminary interpretations of their meaning. We argue that some plastered walls served as canvases for sketching, artistic training, and learned scribal expression. Furthermore, we believe this room was a special place where an ancient Maya sage trained apprentices in the arts and sacred knowledge. Lending support to this interpretation, the walls were partitioned into sections and several images were repeated as if the designs were being practiced. This newly discovered room provides a glimpse into how ancient Maya sacred knowledge was passed on.

Introduction

Investigations at Xunantunich’s main acropolis, El Castillo, revealed a series of Late Classic rooms that belong to a vaulted building under Structure A-5, nicknamed the Tut Building. A private stairway provided access to these rooms, suggesting it may have had a special function. Our excavations of the southeastern room revealed that it was intentionally filled with clay and stacked stones in a reverential manner. The doorjambs and walls were covered with a dense concentration of incised images and designs of the kind usually called “graffiti,” quite possibly the largest corpus encountered in Belize. “Graffiti” is a catch-all term used to refer to graphic elements and designs incised into plaster surfaces. The term is used to describe a range of designs and does not necessarily implicate intentional vandalism or destruction, nor counter-cultural “tagging” that the term implies in modern contexts. The term has not been precisely defined. The images in the Tut Building ranged from simple sketches to more formal, detailed renderings. Through the documentation, analysis, and interpretation of this newly discovered corpus of graffiti, we hope to contribute to our understanding of Maya “graffiti.” In this paper we briefly discuss previous interpretations of graffiti, highlight the methods that we used to document the corpus of incised images, and present our preliminary interpretations of their meaning.

Studies of Ancient Maya Graffiti

For convenience, we use the term graffiti, despite some issues with it. Ancient Maya graffiti has often been defined as crude or haphazard incising on plaster surfaces, including walls and benches. Early interpretations of graffiti focused on the unrefined nature of the designs, and a perceived lack of foresight or planning in their execution. Edward H. Thompson and George Dorsey (1898) suggested that graffiti was drawn by “some young idler,” raising themes echoed by subsequent scholars. Along similar lines, Sir J. Eric S. Thompson (1954: 10) suggested that graffiti was the result of “doodling” by “bored or inattentive novices,” or was made by Maya novices before an initiation ceremony. These early considerations represent graffiti as unplanned, isolated renderings, executed by individuals and not part of a larger program or institution.

Graffiti is often set apart from more formal forms of art due to its seemingly simplistic or unplanned nature. As Kampen (1978: 167; also Trik and Kampen 2011) observes in his study of the graffiti of Tikal, “[O]n every stage of conception and execution, the graffiti appear to lack the logical and organized principles of construction characterizing other varieties of Maya art.” He argues that the Tikal graffiti were terminal acts of desecration of abandoned structures. He argues that examples found within sealed contexts dating to the Classic period represent terminal acts after the building was no longer in

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formal use, and that examples in final-phase, unfilled rooms were the work of later people who lived at the site in the Eznab phase (A.D. 850-925). We find this inference problematic, given that much of the final-phase graffiti has Classic-period iconography. Kampen (1978: 169) recognizes this, but he asserts, “The fact that certain themes and motifs of Late Classic art appear in the graffiti in no way proves contemporaneity.” Although it is plausible that some graffiti may represent terminal acts or desecration by post-abandonment squatters, we find Kampen’s explanation overly simplistic. Furthermore, his conclusion that graffiti represent terminal acts forecloses the need for further inquiry to understand the nature of Maya graffiti.

More recent interpretations have moved beyond these early explanations. Haviland and Haviland (1995) applied a psychological lens to graffiti and its production, suggesting that the haphazard nature and inferior quality derives from the mental/psychological state of the artists. They argue that graffiti would be produced under the influence of hallucinatory trances and most likely created by high status people within secluded interiors. Building on Haviland and Haviland (1995), Jason Yaeger (2010) interprets examples of graffiti found within a specialized room in the Late Classic palace of Xunantunich as possible examples of this type of ritual behavior.

A recent overarching consideration of graffiti as a subset of Maya material culture was written by Scott Hutson (2011), focusing on the graffiti documented at Tikal. Hutson outlines four previous explanations for the crudeness of graffiti. First, he discusses the possibility that graffiti are practice sketches executed by Maya artists to prepare for future works. In this case, the crudeness is a circumstance of their preliminary intention. Second, Hutson (2011) considers the arguments by Kampen (1978) and others that graffiti represents decadent art of post-abandonment squatters, and thus that graffiti should not be considered evidence of primary occupational periods. Third, Hutson reiterates Haviland and Haviland’s (1995) hallucinatory hypothesis. Lastly, Hutson focuses on the possibility that the interpreted crudeness of graffiti derives from the youth of its creators and therefore, lack of training. Hutson (2011) favors this last hypothesis, and argues that many examples of graffiti were created by ancient Maya children. Furthermore, he states “that people of different ages and skill levels left their marks on the same walls and that there was a dialogue between these different artists” (2011: 404). Hutson’s interpretations move us towards a more holistic understanding of graffiti and a framework for more systematic analysis.

Graffiti, Sages, and Sacred Knowledge

Ancient Maya graffiti may have served a number of functions, one of which may have been to facilitate learning and the transfer of specialized knowledge. Building upon Hutson’s work, we suggest that the newly discovered graffiti from El Castillo at Xunantunich represents specialized training of young nobles. Incised on the exterior and interior walls and bench of this room were nearly 200 graffiti. This room was intentionally filled and built upon as the foundation for a Late/Terminal Classic structure (Structure A-5). All graffiti was buried by this filling episode and thus, predated it. In addition, while the majority of elements in the room were crudely executed, there are a number of elements that cannot be labeled crude by any measure and could only have been created by accomplished and learned artists, or sages. Furthermore, there is clear evidence of practice through repeated designs. This diversity in a single room indicates that graffiti was not just produced by untrained artists, but at least in a few examples, was incised by highly skilled artists. These lines of evidence from Xunantunich lead us to suggest that this room was a place of learning and practice. We suggest that the graffiti found in Tut Building are practice and preparatory sketches executed by novices and sages within a scribal training and/or sage academy housed at El Castillo during the Late Classic period (Brown and McCurdy 2017).

As keepers of time, history, and sacred knowledge, Maya scribes and sages required long periods of training in arts and ideological traditions (Brown and McCurdy 2017). We see direct evidence of such training, in a mythological sense, on an unprovenienced Late Classic ceramic vessel housed at the Kimbell Art
Museum in Fort Worth, Texas. The vessel depicts two separate scenes of Itzamna instructing two pairs of juveniles or young men (Rossi 2017). This vessel provides a rare example of Late Classic pedagogy (Rossi 2017). Further, recent findings by William Saturno and colleagues (2012) at the Guatemalan site of Xultun provide evidence of noble training and education practices. At Los Sabios, a high status residence within one of Xultun’s administrative areas, Saturno et al. (2012) discovered a well-preserved room interior with intact wall murals. The room also features incised calendar notations projecting future dates, indicating that astronomical and calendrical training was primary in this space. This space “contains evidence of specialized knowledge being generated, curated and transmitted, alongside evidence for codex book creation and inscription” (Rossi 2017: 9).

An informative analogy for such education in Mesoamerican cultures can be drawn from the late Postclassic Aztec Calmecac (Berdan 2014; Calnek 1988), or academy for children of nobles and talented commoners. In the Calmecac, young males were schooled in sacred knowledge of religion, ritual, reading, writing, the calendar, and military tactics.
Figure 2. Virtual Reconstruction of El Castillo during the Late Classic Hats’ Chaak phase, showing the location of Tut Building on the northeast corner.

Figure 3. Plan of southeastern room of Tut Building showing doorjambs, interior walls, bench surface, and earthquake damage. Excavated in MVPP 2016 Op 13w.
Taking the Xultun case as a complementary example and the Aztec Calmecac as an analogy, we explore the idea that the southeastern room of Tut Building (and potentially the entire structure) was a space designated for specialized training of young nobles by learned individuals such as scribes and sages.

**Excavations and Findings at Tut Building**

In 2016, The Mopan Valley Preclassic Project (MVPP) expanded earlier investigations of the northeast corner of El Castillo acropolis where Tut Building is located (Figure 1). As shown in the virtual reconstruction (Figure 2), Tut Building sits on the Medial Terrace level of the acropolis and likely dates to the early parts of the Late Classic Hats’ Chaak phase (approximately 670-700 CE). We began excavations of Tut Building in 2012, with a preliminary 5-meter trench situated east-west along the southern wall. Previous work in the area was conducted by the Tourism Development Project (TDP) directed by Jamie Awe. We exposed TDP’s excavation area and expanded to the west to investigate the extent of the preservation. Though there was obvious loss to the structure on the east side, our excavations revealed good evidence of a well-preserved and intentionally blocked doorjamb leading into a room interior.

In 2013, we returned to investigate the doorjamb and interior. We documented some collapse to the south of the structure above a well-preserved series of platform surfaces supporting the Tut Building as earlier construction episodes (see McCurdy 2016). Our excavations centered on the fill behind the blocked entranceway, without entering the room interior. The fill consisted of dense marl deposits with relatively few artifacts. The only major distinctions we encountered within this fill were columns of dark, organic sediments on either side of the entranceway that continued into the interior fill. This fill reached from the interior floor to the center of the partially-surviving corbel vault, which we were able to quickly document before ending our season in 2013.

In 2014 and 2015, our efforts were diverted to the eastern architectural platforms that underlie Tut Building and to ceramic analysis (see McCurdy 2016). We returned to the southeastern room in 2016 with the goal of entering the interior and understanding the purpose of the dark, organic sediments. We hypothesized that these were intentionally placed to protect painted elements, potentially murals, on the interior plaster walls. We began by exposing the vault and corbels from above. We removed (after fully documenting and marking) only those corbels that posed safety threats as we continued excavations below. We revealed that the north vault half and the western gable wall survived almost in their entirety while the eastern gable wall suffered loss on its southern side. We installed as system of wood braces as we removed fill beneath the surviving vault to ensure safety and stability of the structure.

The room was intentionally filled through the sequential construction of eight retaining walls. Construction debris and sediments constitute the majority of fill materials. On the eastern side of the room (approximately 50 cm east of the eastern doorjamb along the southern wall), we encountered a concentration of orange/tan volcanic ash chunks with leaf and tree branch impressions placed approximately 1 m above the original floor surface. In addition, beneath this layer of intentionally cached volcanic material, we also encountered a thick deposit of fine orange-red dry clay. We believe that it is likely that these ash chunks were acquired via trade from a volcanic region to be used as temper in ceramic production with high-quality local clay.

After removing all fill, we were able to fully define this southeastern room of Tut Building. The interior space measures approximately 2.9 m (N-S) by 4.3 m (E-W) (Figure 3). The walls stand approximately 2.3 m in height, supporting the vault with an apex of approximately 4 m prior to partial collapse. The room contains a very large masonry bench that covers almost the entire floor area, with only a 75 cm area between the southern interior wall and the northern edge of the bench (see Figure 3). As indicated in Figure 3, there is a very large disturbance extending from the northwestern corner across the bench and into the southeastern corner of the room. This is most likely damage
**Figure 4.** Elevation of north wall of southeastern room of Tut Building showing locations of graffiti encountered in the field and through PTM.

**Figure 5.** Examples of graffiti from the southeastern room interior of Tut Building (not to scale): (a) full-body human figure dressed like a king; (b) anthropomorphic head in profile with fabric cap and ear ornament; (c) zoomorphic/dog in profile; (d) it’zaat glyph; (e) illustration of ballplayer engaged in play with twisted serpent images.
resulting from earthquake movement and subsequent settlement. The damage seen within the room and at the top of the vault may actually be the result of two separate earthquakes (Jorge Can personal communication 2016).

Despite this damage, the plaster within the room survives quite well. Our investigations of the interior plaster surfaces revealed a total of 192 incised elements and one painted element across both doorjams, all interior walls, as well as the face and surface of the interior bench. Additional graffiti elements were documented on the exterior walls during the field seasons of 2016 and 2017 and will be discussed in future publications. The western doorjamb contains the densest concentration of graffiti elements (40 elements over 1 x 2 m surface area). The western interior wall also contains a high concentration of designs with the concentration decreasing clockwise around the room.

In order to thoroughly document the incised images on the plaster walls and benches, we hand-mapped approximately 75 individual elements exposed within the southeastern room. Due to time constraints, we chose a core of significant elements to document through mapping. Our goal was to document these finds as fully as possible and develop a detailed record for future analyses of form, tool use, quality of line, and superimposition of elements. A team of four mappers used ¼ inch screen to construct scaled drawing grids that could be hung and/or stabilized on vertical and horizontal surfaces without damaging plaster. We mapped 1:1 renderings of each element, focusing on: (1) position, form, and proximity to nearby elements; (2) weight, quality, and differences in incised or gouged line; (3) layered sequences of superimposition; (4) contextual markings including scored panel lines; (5) damage to plaster as it affected the visibility and preservation of individual incised images and their surroundings. In addition to creating a detailed record, this mapping strategy offered the opportunity to study these elements in extreme detail. It was through this experience that many insights regarding content, style, and technique were developed.

In addition to the time consuming, but necessary, hand-mapping methods utilized for documentation, we completed a comprehensive photographic documentation of all plaster surfaces within the chamber. Figure 4 illustrates the elevation of the north wall showing 19 graffiti elements recognized in the field and the additional elements tentatively recognized in 2016 through analysis of the Polynomial Texture Mapping (PTM) models created by co-author Neil Dixon. PTM is a photographic technique using multiple light sources to construct differentially textured composite images of surfaces and allows for high resolution digital analysis. Sequentially firing camera flashes positioned full circle around a focal point (such as a section of wall with graffiti) creates a series of images that are merged by Dixon into PTM models. Our PTM analysis consisted of using an open source PTM/RTI viewer to digitally inspect these composite images of each major surface. Similar to raking light photography techniques, PTM/RTI software allows the user to digitally manipulate the light source to simulate passing a flashlight over something in real life. The changes in light direction allow for more clarity in viewing the incised graffiti designs. The PTM composites also serve as high resolution digital documentation of all surfaces in the room.

PTM analysis of the north wall after the 2016 field season resulted in recognizing over 49 potential graffiti elements that we did not recognize with the naked eye. In total, PTM analysis of all surfaces resulted in a catalog of 91 potential new elements. In 2017, we ground-truthed these potential new elements and found that 56 were indeed graffiti we had not recognized during our investigations in 2016. During the ground-truthing process, we also encountered an additional 17 elements previously unrecognized. These results will be fully documented in future publications.

The Graffiti: Content & Iconography

In terms of content, graffiti designs in the southeastern room of Tut Building include (1) full-body anthropomorphic figures (e.g. Figure 5a); (2) anthropomorphic heads with embellishments such as hats and ear ornaments (e.g. Figure 5b); (3) deity figures (e.g. Figure 9); (4) isolated anthropomorphic facial features such as noses; (5) isolated anthropomorphic body parts; (6) full zoomorphic figures (e.g.
**Figure 6.** Bar graph comparing the frequency of 15 categories of graffiti imagery, including unknown imagery.

**Figure 7.** Illustration of the decapitator scene incised on the north wall of the southeastern room of Tut Building.
Figure 5c); (7) zoomorphic heads; (8) isolated zoomorphic body parts; (9) zoomorphic facial features; (10) hieroglyphs (e.g. Figure 5d); (11) ritual scenes (e.g. Figures 5e, 7); (12) architectural features; (13) simple or decorated shapes; (14) line-based elements; (15) markings such as tick marks. Figure 6 organizes the collection of elements in terms of the frequency of each category. Anthropomorphic heads and anthropomorphic figures are the most commonly represented elements.

One of the most remarkable elements is the ritual scene on the west wall representing a ballplayer actively portrayed in a playing stance with a series of twisted serpent accompaniments and a potential associated sacrificial victim (Figure 5e). More direct images of sacrifice are included on the north wall where a pair of regalia-clad and masked warriors/priests armed with curved blades have already decapitated a victim placed between them (Figure 7). These decapitators carry the heads of their victims by the hair. There are several other depictions of warriors holding spears. This may indicate that the graffiti artists/novices were also engaging in military training, as in the Calmecac analogy described above.

While all room walls retain segments of red wall paint, the north wall features the only graphic element painted with black pigment that we have been able to identify thus far (Figure 8). While it appears that this element only partially survives, it is also possible that the image was never fully completed. This element is reminiscent of a large cartouche, however it does not appear to have enclosed a glyph. Instead, it serves as a frame for painted designs within its interior space. A zoomorphic or potentially avian figure is attached to the main outline in the upper left quadrant. There are additional decorative elements in the middle including potential representations of feathers, flowing water, and zoomorphic eyes. The preservation and/or incompleteness of the painting make identification of these elements difficult at this time. We are exploring options for techniques that will produce distinct views of this painted element so that we might assess the interior iconography.

Our interpretation of the meaning of each graffito is still on-going. There are patterns that can be distinguished from element content that may reflect the training agenda or primary goals of scribal education in this special place of learning. The Los Sabios chamber from Xultun, discussed above, appears to have focused on astronomical knowledge. The room within the Tut Building may have been a place where young nobles learned to depict anthropomorphic and zoomorphic forms as well as to render possible historic events. Many of the incised images within the room were the size that would adorn ceramic vessels and, therefore, may represent practice for renderings on a different medium. Although tentative, the volcanic chunks and fine clay found within the filled room, may lend support to this idea. Below, we discuss the lines of evidence that support our hypothesis that the graffiti may represent pedagogical activities within this specialized room.

**Indications of Training and Artistry**

First, several groupings of graffiti consist of repeated elements, often with slight variations between each element, and possible evidence for assessment. For example, the west wall features a series of at least four jaguar or puma heads drawn side by side within scored panels (see below). While it appears that this element only partially survives, it is also possible that the image was never fully completed. This element is reminiscent of a large cartouche, however it does not appear to have enclosed a glyph. Instead, it serves as a frame for painted designs within its interior space. A zoomorphic or potentially avian figure is attached to the main outline in the upper left quadrant. There are additional decorative elements in the middle including potential representations of feathers, flowing water, and zoomorphic eyes. The preservation and/or incompleteness of the painting make identification of these elements difficult at this time. We are exploring options for techniques that will produce distinct views of this painted element so that we might assess the interior iconography.

Secondly, the room features a series of gouged lines that appear to form separated workspaces for incising. On the north wall (see Figure 4), the artists scored vertical lines from the level of the bench surface almost to the vault spring and horizontal lines from the northeast corner to approximately halfway across the wall. This created a series of square segments that may have been partitioned for individual artists.
Figure 8. Painted frame element (likely partial) on the north wall of the southeastern room of Tut Building.

Figure 9. Calligraphic Chac Xib Chac rendering incised on the east wall of the southeastern room of Tut Building.
or may represent workspaces over a certain period of time. On the west wall, vertical panels were created by gouging a series of vertical lines across the wall, likely serving the same function. A further indication of training derives from the collection of isolated elements such as profile noses that appear to be abandoned for do-overs nearby. On the western doorjamb, there are a series of attempts to draw a nose in profile that appear to be abandoned. It seems that if a nose in its first rendering was unsatisfactory, the artist moved slightly over on the wall and began anew, oftentimes completing a full head in profile. A high concentration of do-overs is located on the west wall where artists were attempting to represent the twisted snake motif associated with the ballplayer (see Figure 5e). The overlapping snake bodies are difficult to render without crossing erroneous lines. It appears that a novice took great pains to practice this motif so as to properly detail the crisscross pattern and realistically end with snake heads.

Approximately eye-level on the western doorjamb, an artist incised the full-figure profile of a man dressed in kingly regalia with royal headgear (see Figure 5a). This representation was rendered at a scale and in a style commensurate with images of nobles painted on ceramic vases. What we refer to as graffiti may have been both a training mechanism and technique used by artists to plan for future artworks. As mentioned above, our findings of materials used in ceramic production may indicate that additional stages in art production processes occurred within close proximity of the Tut Building.

The technical qualities of incising into plaster may indicate that this preparation applied more to the subtractive arts, such as stone carving. Jamie Awe (personal communication 2017) reported that TDP encountered a small stone block carved with a standing figure in profile within the vicinity of Tut Building. Though we are unable to directly tie this carved stone block to the southeastern room, it is possible that it represents a discarded product from a later stage within a production sequence that began with incising into plaster.

As mentioned above, the collection of graffiti in the southeastern room evidences differential skill and the presence of talented and proficient artists. The most remarkable elements have been identified by Christophe Helmke (personal communication 2017) as the work of well-trained and experienced artists with specialized knowledge of iconographic and hieroglyphic form and content. For example, just above the bench surface on the east wall a deity rendering (Figure 9) was finely incised with a calligraphic quality similar to the “whiplash” style of ceramic decoration recognized by Coe (1973:91 cited by Doyle and Houston 2017). According to Helmke (personal communication 2017), this rendering represents the Chac Xib Chac figure known from Palenque in a highly decorative and evocative style. Just above this calligraphic rendering, a hieroglyph (see Figure 5d) was executed in a more straightforward style but represents a title very relevant to our hypothesis that this room served as a sage academy (Brown and McCurdy 2017). Helmke (personal communication 2017) translates this glyph as [i]tz’a-ta, or it’zaat meaning “wiseman” or “sage.” In addition to the knowledge of writing embedded in this element, it is a direct indication of the type of person who likely used this space and trained others to reach the status of sage.

Conclusions
In summary, we suggest that the southeastern room of Tut Building at Xunantunich may have functioned as a place of specialized training for young nobles. The practice and preparatory sketches incised on the plaster walls may have been educational tools and exercises to ensure that novices learned important skills and symbolism. While we can generally date the use of the room to the Late Classic Hats’ Chaak period (see McCurdy 2016), we have not yet determined how long the space was used. It is possible that the walls could have been used for months or even years. A fresh coat of limewash or plaster could fill-in previous incised areas and offer a brand-new surface upon which to work. We found indications of multiple plaster layers on the exterior walls of Tut Building in the 2017 field season and plan to follow-up with plaster coring to determine the number of resurfacings.

In addition, MVPP investigations supervised by Kit Nelson and Jennifer Cochran
in 2017 focused on several buildings of Group C located directly south of El Castillo. Building upon the Calmecac model, Brown hypothesizes that the novices being trained at Tut Building would have likely stayed for periods of time at the city center and thus would require accommodations (Brown et al. 2017). We are currently testing Group C structures for evidence that can link them to Tut Building and indications that they served as living spaces for novices. Our recent findings of graffiti and additional patolli boards on benches at Group C are very promising.

As an overarching conclusion to this paper and a beginning to renewed considerations of graffiti, we hope that our investigations at El Castillo add to the current dialogue surrounding the source, purpose, and significance of what we call graffiti today. Indeed, we encourage efforts to determine better and more appropriate terms for incised designs on plaster walls because we feel the term graffiti evokes negative connotations that are not evidenced in our findings at Xunantunich. The diversity, quality, and specific content in Tut Building, should motivate a revision of our understanding of this set of material culture and the behaviors that created it.

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Two Unusual Finds from Courtyard 3, Pacbitun, Belize

Sheldon Skaggs and Terry G. Powis

Recent investigations in a large, enclosed courtyard on the southwest corner of the ancient Maya site of Pacbitun, Belize, revealed evidence of successive emplacements of ritually important deposits within its plaza. Initial analysis of the stratigraphy and ceramic material suggests that the entire courtyard plaza has only one or two floors, with construction and use during the Late Classic period (AD 550 – 800). Graves with slate capstones were found west of the central excavation unit. Either these were initially intrusive through the plaza floor, or subsequent revisiting of the burials breached the plaza floor. A burial on top of the western-most slate capstones was particularly interesting, with associated fragments of a partially restorable Ulua Valley-style carved marble vase and a pair of carved shell atlatl finger loops as grave goods.

Introduction

During renewed excavations into what is believed to be an elite residential and administrative area of Pacbitun, i.e. Courtyard 3, we encountered two unusual artifacts. Neither the Ulua Valley-style carved marble vase, nor carved shell atlatl finger loops, have ever been found before at Pacbitun. In fact, these are rare finds for any site in the Maya Lowlands. Since these artifacts were found together in a single burial, they help identify the social status of the individual interred and stylistically date the burial to the latter half of the Late Classic Period (Coc Phase, AD 550-800).

Description of Pacbitun

Pacbitun is a medium-sized site located along the southern rim of the Belize Valley and on a limestone plateau adjacent to the Maya Mountains. The site core is located three kilometers to the east of San Antonio village in the Cayo District, Belize (Figure 1). Its position intersects two ecozones with resulting access to a wide variety of economic and ritual resources including granite, slate, pine, springs, and fertile agricultural land (Healy 1990:248).

The habitation zones are archaeologically defined as three separate areas based on presumed function and population density: the Epicenter, the Core, and Periphery Zones (Healy et al. 2007:17). The Epicenter is the location of the main religious and administrative structures. It sits on an artificially-leveled hill, oriented east-west, and has 41 known masonry buildings, three main plazas, and an additional two plazas that are adjacent to the north side, labeled Plazas A to E (Figure 2; Healy 1990:250). An additional architectural group located to the northeast of Plaza A was designated as the Eastern Court (Cheong 2013). A large reservoir is located just north of this architectural complex.

The Core Zone encompasses the Epicenter and a one-square kilometer buffer around it (Campbell-Trithart 1990). The area beyond the Epicenter is dotted with small mounds, although a few larger structures, courtyard groups, agricultural terraces, springs or reservoirs, and four sinkholes are also present (Healy et al. 2007:18, Figure 3; Richie 1990; Spenard et al. 2012; Sunahara 1995).

The Periphery Zone is estimated to cover nine square kilometers around the site. It is the agricultural area for the site center, consisting of several hundred small house mounds spread over the landscape, as well as several smaller (~5 m tall), hill-top pyramidal structures, plaza groups, minor centers, and terraces (Spenard 2011; Turner et al. 2015; Ward 2013; Weber 2011; Weber and Micheletti 2016; Weber and Powis 2014).

Previous Excavations of the Pacbitun Courtyards

At the southern end of the Epicenter are three enclosed courtyards, flanked by 13 structures (Figure 3). These courtyards and surrounding structures are generally described as the “palace” of the Epicenter, due to the surrounding range structures, the sequential elevation differences from Courtyards 1 to 3, and the restricted access to each courtyard. Investigations into the northern structure of Courtyard 2 (Structure 23) were carried out by Cassandra Bill and Paul Healy in 1986 (Bill 1987; Healy 1990; Healy et al. 1995; Healy et al.
Two Unusual Finds from Courtyard 3, Pachitun, Belize

Figure 1. Map of Belize Valley showing location of Pachitun, and all the sites mentioned in the text. Red arrow highlights location of Pachitun, Belize.

Figure 2. Map of Pachitun Site Core including Structure 10.
Figure 3. Map of Pacbitun Site around Courtyards 1 to 3 showing all excavation units (Unit numbering in zoomed portion leave off the initial 17-B-CT3 of all unit name).
Additional excavations of the eastern most structure (Structure 25) in 2016 (Skaggs et al. 2017), the northern end of Courtyard 3 (Structures 22 and 33) (Pierce and Skaggs n.d.), and the centers of Courtyards 2 and 3 in 2017 (Skaggs and Cherico n.d.) provide additional evidence on the nature of the “palace” area.

Excavations into the plazas of all three courtyards reveal only one or two plaster floors above bedrock. The courtyard plaza construction differs considerably through time as each courtyard required differing amounts of leveling before the first plaster floor was laid down. A 3 m by 3 m excavation unit was placed in the center of Courtyard 2, revealing a wall that measured 0.7 m high. It was six courses high and two courses wide running NE to SW across the northern side of the unit (Figure 4). A midden-like layer containing animal bone, jute, ceramics, and a few pieces of jade was found covering the wall. Preliminary ceramic analysis suggests the midden is the same late Middle Preclassic (600-300 BC) depositional event that occurred in Plazas A and B. This midden was ultimately covered by the first limestone plaster floor (Skaggs and Cherico n.d.). Bill’s (1987) trench into Courtyard 2, under Structure 23, and into Plaza B also encountered a single course wide wall around 0.7 m high; however, in her operations the wall ran directly north to south, and the facing was east in Courtyard 2 and west under Structure 23 and in Plaza B. The proximity of the east-facing wall in Bill’s (1987) operation and the south facing wall in the center of Courtyard 2 excavation from 2017 suggests these may be part of the same construction. The west facing walls under Structure 23 and Plaza B suggest there is more than one structure, and covering a larger area than the earliest structures in Plaza B (Crow and Powis n.d.). A single radiocarbon date, in material Bill characterized as similar to but not midden, from next to the wall returned a date range of 40 BC – AD 220 (Bill 1987:123-128) suggesting the wall was covered in or before the Terminal Preclassic (Ku Phase, 100 BC – AD 300). Courtyard 2 clearly had early occupation of some sort, and in buildings unlike those found in either Plaza A or B.

Excavations in Courtyards 1 and 3 show little evidence of such early occupation, however. In Courtyard 1, under the north end of Structure 25 and presumably under Structure 24, evidence of a Preclassic midden was encountered, but no charcoal useful for dating purposes was found. Just above the midden on the north end, a fill layer was found containing a Puote Brown, Hermitage Complex ceramic dish with sooting located on its interior surface. A sample of the sooting was submitted for radiocarbon dating. Results indicated a Late Classic (AD 550-650) date. Furthermore, charcoal found in a unit just above bedrock centered in front of Structure 25 yielded a radiocarbon date of AD 640 – 675. In these central units, the first plaster floor sits on top of core. Limestone boulders ranging from 0.6 m to 1.5 m in diameter were stacked nearly two meters high before ballast and plaster was laid down on top. Structure 25 was built on top of
this first plaster floor surface. A facing found in the core suggests there may have been an earlier platform built directly on bedrock, which was subsequently covered by later core (Skaggs et al. 2017).

Courtyard 3 has no evidence at all for construction before the Late Classic Period. The central excavation unit revealed only one preserved plaster floor located above a thick white marl layer that sat directly on bedrock. Charcoal from two primarily Dolphin Head Red, Spanish Lookout Complex ceramic caches cut into this plaster floor dated to AD 552-648 and AD 545-645, respectively (Skaggs and Cherico n.d.). These caches were between graves in Unit 17-B-CT3-1, both of which will be discussed in future publications.

2017 Excavations in Courtyard 3

Over the course of the 2017 field season at Pacbitun, we conducted operations in the plaza of Courtyard 3. From an elevation point of view, Courtyard 3 is the deepest of the three courtyards making up the ‘palace’ area of Pacbitun. We placed a large 3 m by 3 m excavation unit (17-B-CT3-1) in the center of the plaza to get its chronological history. During our investigations, we identified five caches and two burials in this initial unit. The graves extended outside the unit, so we continually expanded to the west in order to fully expose the haphazard capstone cist graves (after Welsh 1988). During the expansion, we found additional graves above and below slate slabs. These additional burials were found in highly disturbed contexts. The two unusual artifacts, forming the basis of this paper, were found during the investigations into these special deposits.

To the west of the capstone cist burials in Unit 17-B-CT3-1, we found two long (1.3 m) slate slabs (Figure 5). While defining the extent of the slabs, we encountered smaller slate slabs and a 1 m wide column of burnt limestone rocks (Figure 6). These smaller slabs were laid down horizontally to form the top of a haphazard cist under the column of limestone rocks. The column itself was covering part of a burial which sat on top of the slate slabs. We are labeling this column of burnt limestone rocks a ‘cairn capstone cist’, making the grave a dual cist arrangement (Figure 7 and 8). Previously, slate capstones have only been associated with elite Tomb 1-9, found in Structure 1 at Pacbitun (see Figure 2). There are similarities in the presumed status of the individual found in Tomb 1-9 and our burial based on the artifacts we found. Tomb 1-9 was placed 5 m below the axial stair in Structure 1, and is the only vaulted tomb ever found at the site (Healy 1990; Healy et al. 2004). In the tomb, the skeleton of only one individual was found under a layer of thousands of chert flakes and cores, with the head and torso also covered in cinnabar. The burial contained 19 slipped vessels, with a quarter of them having polychrome designs. Additionally, one painted marine valve, three polished jade beads, one pyrite tube, a pair of circular shell earspools, five...
Two Unusual Finds from Courtyard 3, Pacbitun, Belize

2017 Unusual Finds in Courtyard 3

The first unusual artifact was found across multiple excavation units. Fragments of it started appearing about 40 cm below the ground surface in the northwestern corner of the 3 m by 3 m unit. The artifact is an Ulua Valley-style carved marble vase (Figure 9). These vases were carved during the Late Classic Period (AD 650-850) from white marble blocks located in the Ulua Valley of Northwest Honduras (Luke et al. 2006). The vase was broken and scattered across the plaza, but most fragments were found among the rocks of the cairn capstone cist. Other pieces of the marble vase were found in association with, and under the skeletal material of the cairn capstone burial CT3-2, which was just above the horizontal slate slabs (Figure 10).

These vases are rare finds, with only 153 fragmentary or whole vessels in museum collections, and only 53 were excavated by what was considered professional archaeologists at the time of discovery (Davis-Salazar et al. 2007; Wells et al. 2014). Only one whole vase, from a burial in Palmarejo, Honduras (Wells et al. 2014), has been recovered and analyzed with the full suite of modern archaeological techniques. Pacbitun now joins one of only four sites in the lowland Maya Region where fragments of these vases have been found. Fragments from the other find sites (Altun Ha, Chac Balam, San Jose, and Uaxactun) have stylistic elements similar to the vase found at Pacbitun. These features, such as taller cylinder height to diameter dimensions, frontal zoomorphic heads, feline handles, and borders with voussoire (half-moon) motifs, date to the latter half of the production time range (Luke 2010). Through isotopic analysis of a number of these marble vases, the source of these luxury craft goods has
been correlated to production in Travesia (Luke et al., 2006; Luke and Tykot, 2007). The locations of lowland Maya vase finds are associated with elite locations, such as temples and palace area caches or burials, dating to Late Classic or Terminal Classic Periods (Luke 2010).

The Pacbitun vase, although not complete, was reconstructed in order to determine its dimensions. It stands at a height of 24.5 cm (although it may be up to 5 cm taller as there is evidence of a ring base that broke off), and an outside diameter of 15.2 cm. The walls of the vase are carved to 0.8 cm thickness, smoothed on the inside with a pattern of volutes (swirling scroll like patterns around a central dot) in bas relief on the exterior. An anthropomorphic face with a headdress dominates the center of the vase with hints of profile faces along the sides. Borders across the top and bottom of the vase are overlapping voussures. The obverse and reverse of the vase are separated by two protruding handles, which, unfortunately, were not recovered. These handles are important in stylistically dating the piece. Evidence remains around the blank area of the vase where the handles connected to mammalian feet carved into the bas relief pattern. Therefore, the animal portrayed was prone with all four feet resting on the vase itself, unlike earlier style vases with bat heads or animals connected by the back instead of the feet to the vase. The form of the feet appears to suggest a feline form, which correlates with the other late (AD 750-850) style elements (Luke 2010).

The other unusual artifact is also a unique find for Pacbitun. It consists of a pair of carved marine shell (cf. West Indian chank - *Turbinella angulata*), crescent-shaped lunates (Figure 11). The lunates are sometimes mistaken for ear spools, pendants, or bracelets/adornments; we believe the artifacts were actually part of an ornate atlatl that was buried with the individual. Ekholm first suggested that “U” shaped stone or shell carvings such as these were the finger loops of an atlatl after he observed an intact loop on a historically collected atlatl from Mexico housed the British Museum (1962). The pair from Pacbitun were found close enough together (Figure 10) that they certainly could have been
lashed to an atlatl. Unfortunately, no other parts of the atlatl were recovered.

The finger loops were found where the skull of the cairn capstone cist burial’s head should actually have been located. The finger loops were found in the darker burial soil at the very southern edge of the grave, along with two thin jade beads and a tooth filed to form the “T” symbol (Romero classification C3; Romero 1986). While there is some debate, Williams and White’s study (2006) suggests that there may be a relationship between filed teeth and elite status. They also found that the C3 modification was exclusive to males at Lamanai. The relative locations of artifacts, bones, and jade beads are shown in Figure 10 and Figure 12. There were a number of other finds with this burial which are similar to artifacts from Tomb 1-9 such as a fine limestone bead and a carved bone tube. Interestingly, the lower burial (CT3-3) below the slate slabs contained no grave goods at all.

The finger loops from archaeological contexts in Mexico examined by Ekholm were housed in the American Natural History Museum and the Museum of the American Indian, Heye Foundation. He examined a total of 3 complete pairs and 17 single loops (Ekholm 1962). Of all potential Maya Lowland examples, there is only one other shell atlatl finger loop, which was found at Uaxactun (Kidder 1947:66). Intact specimens of whole wood atlatls, including the wood finger loops, were found in a cenote at Chichén Itzá (Coggins and Shane 1984:108), and in situ carved bone finger loops were found in a burnt layer of Tikal palace Structure 5D-51 (Harrison 2003:105). Another archaeologically excavated Maya atlatl comes from a possible Early Classic shell atlatl hook found in a Caracol burial, Special Deposit C117F-1 (Chase and Chase 2011:11). Beyond these examples, evidence of atlatl use by the Maya comes from comparison of different projectile points to try to determine darts from arrows (Aoyama 2005; Ciofalo 2012). Maya atlatl use is also clear from evidence based on iconography, with examples ranging from AD 378 to the Postclassic period at sites like Tikal, Ucanal, Naranjo, Caracol, Uaxactun, and Chichén Itzá (Chase and Chase 2002:43; Hassig 1992; Schele and Freidel 1990:156-157). From these contexts, it is clear that elites used atlatls, and that the atlatl might even have been a symbol of power.

**Conclusions**

These unusual finds from Courtyard 3 at Pacbitun come from the same burial (CT3-2), but the context is quite disturbed, as evidenced by the Ulua Valley-style carved marble vase fragments being found in different layers and up to 2 m away from the grave itself. All the finds from this burial certainly could have come from a Late Classic period interment that was later revisited or intentionally desecrated. There are also other artifacts, like fragments of fine ground stone bowls and a figurine head, found less than 2 m away from the grave. All of these may have once been part of the same burial. However, pending radiocarbon analysis of the bone, teeth, and charcoal fragments found in the burial, it is uncertain exactly the age of the burial. The stratigraphy and preliminary ceramic analysis suggest Late Classic Period for the burial fill, but that only tells us that the grave was likely placed through an early Late Classic plaster floor (which the caches were cut into), and some of the contents removed at a later time. The Ulua Valley-style carved marble vase stylistically dates the burial to the latter half (AD 750-850) of the Late Classic period (Coc Phase, AD 550-800). The individual buried was elite, as shown by the elite grave goods, filed teeth, and the placement of the grave in the center of the courtyard. The burial arrangement, with one
cist grave on top of another is unusual as well, and the cairn of burnt stone covering the top individual might be quite rare, since we can find no references of this burial pattern.

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FROM PHOTOGS TO MODELS: DIGITAL ARCHAEOLOGY OF PRE-HISPANIC PACBITUN, BELIZE

Jon Spenard, Michael Mirro, George J. Micheletti, and Terry G. Powis

Since its inception, the Pacbitun Regional Archaeological Project (PRAP) has experimented regularly with an array of digital technologies for more comprehensive documentation and better data presentation than has been possible with traditional recording methods, such as hand-drawn maps, photographs, and written descriptions. In this paper, we discuss our use of photogrammetry and virtual site tours. Specifically, we focus on the benefits of this technology for archaeology in a variety of commonly encountered contexts including, architectural and landmark mapping, unit and archaeological feature modeling, rock art identification, and artifact analysis. This discussion is centered on three sites at Pacbitun—Slate and Crystal Palace caves, and the El Quemado structure—and archaeological materials and features associated with them. At Slate Cave, we employed photogrammetry for unit and feature mapping, modeling artifacts, and documenting the only known rock art panel in the Pacbitun region. At Crystal Palace, we used this technique for modeling the entrance chamber, mapping small stone wall terrace features and a vessel cache, and for modeling and illustrating a ceramic bowl from that offering. Lastly, in Pacbitun’s site core, we used it to document the El Quemado structure, a Middle Preclassic period ceremonial structure.

Introduction

Since its inception in 2008, the Pacbitun Regional Archaeology Project has experimented with an array of digital technologies for more comprehensive documentation and better data presentation than has been possible with traditional recording methods, such as hand-drawn maps, still photographs, and written descriptions. As well, over the last several years with the use of aerial LiDAR and terrestrial laser scanning, and more recently with great technological leaps in digital photography, archaeological methods have been undergoing a digital revolution. This paper details several of the ways we use photogrammetry at the pre-Hispanic Mays site, Pacbitun, Cayo, Belize. Specifically, we discuss our use of this technology, and the benefits and limitations we experienced employing it in a variety of commonly encountered archaeological contexts from architectural and comprehensive landmark mapping, to artifact analysis, rock art identification, and unit and archaeological feature modeling. Our discussion is centered on two caves around Pacbitun—Crystal Palace, and Slate Cave—and the recently uncovered Late Middle Preclassic structure, El Quemado, in Pacbitun’s site core, discussed in further detail by Crow et al. in this volume. Throughout this discussion, we attempt to demonstrate how using these technologies helps convey a phenomenological sense of the places we investigate, while also making them broadly accessible for interested audiences. In that regard, we favor including Internet links to the models discussed in this paper in lieu of static, captioned figures, although we do provide some of the latter. Thus, this paper is best read on an internet-connected device where the reader can navigate to the models and interact with them as they proceed through the text.

By using photogrammetry as a cartographic tool, we achieve a higher level of detail, accuracy, and precision, increased measurement resolution and content in our cave maps while reducing field time spent on recording and measuring features, all resulting in more archaeological data collected in a single season. Our ultimate goals for this paper are critically analyzing and advancing newly accessible digital methods for studying and documenting archeological sites.

Introduction to Photogrammetry

Photogrammetry is the art and science of obtaining precise geometric measurements of an object, including position, shape, and surface attributes, without making physical contact with them. Traditionally, photogrammetric processes results in three-dimensional, mathematically computed positions using two or more overlapping photographs of a subject taken with cameras located in known unique locations. Early processes required location of cameras and control points within the scene for the aerial triangulation algorithms used to compute model positions. Structure from motion (SfM) is a recent advance in photogrammetry where no
reference information is required, resulting in a relatively unscaled and non-oriented model. Using SfM methods and software, an object is photographed with an overlapping series of digital images from which the software determines the geometry of 3D positions and camera locations (Westoby et al. 2012). A 30 percent overlap in photos is ideal. Models may be subsequently referenced using 3D similarity transformation based on a small number of control points and then exported for further post-processing in GIS, 3D, and graphic software programs.

Photogrammetric and SfM techniques used at Pacbitun can be categorized as Close-Range Photogrammetry, which is defined by an object-to-camera distance less than 300 meters (Mathews 2008). In contrast, Aerial Photogrammetry is typically aviation based and requires ground-control survey and results in highly accurate surface terrain models and orthoimagery. Close-Range Photogrammetry in combination with SfM provides a high degree of flexibility in choice of cameras, camera mountings, photographic techniques, ground-control (if required), and software, making these methods ideally suited to archaeological fieldwork.

Taking advantage of high-resolution digital single lens reflexive cameras (dSLR) capable of producing sharp, high-resolution photographs, producing models with minimal ground sample distances (GSD), or pixel resolution of the object surface is possible. For example, models generated using a 10 megapixel dSLR with a 20 mm lens can produce a GSD less than half a millimeter with a shooting height of 1.4 meters (Mathews 2008). There is a direct correlation between the increased resolution of photographs and GSD of resultant models. With the affordability of dSLR cameras capable of capturing images in excess of 30 or 40 megapixels, producing extremely detailed models with GSD below 0.1 millimeters or even 0.01 millimeters is possible depending on the camera height. While such resolution may exceed requirements of mapping features exceeding one meter, it is of great benefit to artifact documentation, where the resolution allows for modeling of individual temper grains in ceramics and flaking patterns in lithic artifacts allowing for hands-off analysis.

Close-Range Photogrammetry results in a variety of products, ranging from simple 3D models to printed solid models. During the 2016 PRAP field season, we created several photogrammetric work-flows to capture 3D data, each of which were determined by specific mapping goals we created for each of the subjects. When illustrating a feature for presentation purposes, we generated unreferenced moderately high-resolution 3D models of the subject. For the most part, we uploaded these models to the senior author’s SketchFab website, https://sketchfab.com/jonspenard, exported them as PDFs, added them as interactive figures in reports, and used them in presentations for conveying a sense of place to the audience (Spenard et al. 2017). With mapping grade models, we produced a low resolution spatially referenced 3D model, which were converted to orthoimagery and elevation models, and used to generate plan and profile maps of individual features. Archival and analytical 3D models are generated in high-resolution and could be used to document artifacts removed during excavations, unmovable or threatened features, and/or objects with fine or complex details. Such models allow analysts to take measurements on the digital object, out of the field, potentially alleviating the need for export permits. The high resolution of this last class of models also permits accurate 3D printing that can provide tangible representations of artifacts for use in the classroom, in museums, or Archaeology Day celebrations, and other public venues.

A second photogrammetric visualization tool, photosphere, was used to create virtual tours of several caves surrounding Pacbitun. Virtual tours, created using linked and spherically projected panoramic photographs, can provide a practical way to convey, scale, feeling, morphology of the environment, and a sense of place, both large and small. Much like Google Streetview, a virtual tour consists of a series of interactive photospheres allowing a user to “look” around the cave and “walk” from one sphere to the next with the click of a mouse. Within each sphere, a user can select hotspots...
containing informational text, photographs, close-range 3D models, maps, video, sound, and other media providing details on objects within view.

We created photospheres using a tripod mounted dSLR camera with a fisheye lens. Photographs were taken every 60 degrees at three inclinations (-45, 0, and +45 degrees) as well as nadir. Using panorama software, each set of photographs representing a sphere was stitched together into rectangular images with a spherical projection that appears highly distorted. When loaded into a viewer, the images lose their distortion and provide an accurate view of the subject cave chamber. Photographs were taken with a relatively high-resolution camera resulting in the production of a very high-resolution panorama allowing users to zoom in on details in the scene. In addition to viewing virtual tours on a computer monitor or television screen, tours can be viewed using the stereoscopic headsets such as Google Cardboard viewer or Oculus, creating a more immersive virtual environment. Ambient sounds recorded from the location of the camera can also be added to these tours, increasing the phenomenological sense of place.

We reiterate here, such models are comprehensive photorealistic representations of everything in the environment photographed, including potentially highly sensitive archaeological features such as burials, caches, whole ceramic vessels, rock art, etc. Therefore, great care and attention to preservation and protection must be taken when creating and, and especially distributing such models, as they do show exactly where these archaeological materials are located and how to navigate to them. Placing password protections on online models can help alleviate some of that concern, yet hosting websites often retain irrevocable perpetual rights to any models uploaded. For example, Sketchfab, the website we use for hosting models, states in its Terms of Use, Section 4.2, “By using the Services, you grant Sketchfab a worldwide, non-exclusive, royalty-free, perpetual, irrevocable, sub-licensable (through multiple tiers) right and license to use and adapt the User Content for the purposes of developing, distributing, providing, improving, and promoting the Services” (emphasis added) (Sketchfab 2017). Thus, while the archaeologist may use passwords to protect such models from being openly accessible, we cannot guarantee the hosting company will follow suit.

One of the benefits of photogrammetry is that it is relatively cheap, in fact, most of us now carry around with us the basic tools necessary for doing it. For starters, all that is required is a decent digital camera, preferably a dSLR, but it can be successfully executed with a smartphone. For the photogrammetric models in the caves, we used a Nexus 6p smartphone with 12.3 mega pixel camera, an iPhone 7 also with a 12-mega pixel camera and, a tripod mounted Nikon D3000 dSLR. All photogrammetry lighting was achieved with diffuse sunlight or LED video lights placed out of site yet positioned to illuminate chambers in their entirety. This latter technique required a significant time investment, sometimes several hours, for determining the best position for ensuring comprehensive coverage, and invisibility of the light panels. During the 2017 field season, we experimented with placing two, slightly side-facing LED light panels on a dual bracket mounted to the top of the camera as suggested by Dominic Rissolo of the Cultural Heritage Engineering Initiative of University of California, San Diego (Dominic Rissolo personal communication). Employing this lighting technique proved to be a great success and recuperated several hours of the work day for photography and other archaeological endeavours. Since the lights were placed above the camera, shadows were no longer an issue, and the scene was always perfectly lighted for each image captured with only minor adjustments for brightness needed.

For the models of the El Quemado structure, we used a Nikon D800 DSLR and diffuse sunlight. For software, we used AgiSoft Photoscan to make photogrammetric models, which runs $550 for an education license, and Pano2VR for the virtual tours, costing $350, a total budget of $900 dollars (US).

We believe one of the common frustrations of archaeology is offering compelling and satisfying descriptions. Due to technological limitations, cave descriptions in the archaeological literature and presentations, are commonly restricted to a few lines noting total length and/or depth, number of chambers,
height of ceiling for each, presence of archaeological features, etc. of the landmarks studied. These narrative descriptions are bolstered with a few representative photographs and a plan view map. Yet, in our experience, we have found that such descriptions lack the ability to truly capture and convey the character of the underground places we investigate. But, with the digital recording technologies such as those we discuss here, we are able to provide a visual aid that brings the caves alive.

**Crystal Palace Cave**

Traditionally we would describe Crystal Palace cave as a collapsed, ovular-shaped sinkhole with six chambers, each separated by
large collapse boulders or walls of columnar formations (Figure 1). The ceiling ranges from about 1.5 m tall at the entrance, to nearly 8 m tall at its highest. The entrance slopes sharply downward, but the Maya constructed several terraces and low walls, forming a path through the entrance. Beyond the entrance, the cave floor is covered in mud, and several modern stacks of Late Classic period sherds can be found along elevated ledges. Though this may be an adequate overall description, it fails to capture the essence of the cave.

We are currently working on completing the virtual tour of this cave, but we have also spent a great deal of time modeling these features using photogrammetry, which we will be incorporating into the virtual tour once the models are processed. One of those we have processed from the 2016 field season is a five-piece ceramic bowl cache on a newly discovered ledge (Figure 2). Not only do we see the vessels in the cache, but by exploring the model online (https://skfb.ly/6vyYK), the reader can move it around to observe the topography of the ledge, study the positioning of the vessels in relation to one another, zoom in or out onto specific details, etc. We also note here the chamber ceiling is about 0.5 m above the bowls, and is heavily populated with cave formations, but we were able to mask those out, allowing for more unfettered viewing of the entire feature than is possible in reality. Simply put, none of these actions are possible with a simple photograph, a series of them, or plan-view map of the ledge.

Returning to the model of the ledge, the reader can see a few of the issues with this technique (https://skfb.ly/6vyYK; see also Figure 2). Notice that all the bowls have large holes in them. These could have been caused by a number of factors, either there was not enough overlapping coverage with the photos, or as is more likely the case, the computer program was unable to find any common points in those areas between the series of photographs, and thus simply could not reconstruct them. This point leads us to another downside of photogrammetry, which is that complex models require a significant amount of computer processing power, in some cases more so than is commonly available in field laptops. This has often meant that all but the simplest models must be processed after returning back home from the field. Thus, any issues with the photography can result in data loss if modeling an excavation or in the case of a surface feature, would need to wait until the next field season to reshoot.

Slate Cave

In Slate Cave, we experimented with photogrammetry in a variety of contexts, demonstrating its utility on multiple scales. This cave was chosen for modeling because it has the only known rock art in the Pacbitun region, a series of simple faces and geometric shapes carved into an active flowstone formation protruding from the ceiling near the cave’s entrance (Figure 4, see also https://skfb.ly/6vyYG). Most 3D viewers allow the user to rake light across the model, and in doing so, we discovered a here-to-for previously unrecognized figure carved into the formation, likely a spider monkey.

As the opening of this cave received ample daylight, and we were excavating in it, we also modeled the floor and entrance area. With these data, we created an orthophoto, digital elevation model (DEM), and hillshade, all of which were used as base layers for a new true-to-form map of the Entrance Area. The photography took approximately one hour, while processing the different maps and drawing the final map took a total of about three hours. A similar hand-drawn field map with equal
Figure 3. Vessel profile produced from 3D digital photogrammetric model of one of the Crystal Palace Ledge 1 cache vessels.

Figure 4. Screen capture of digital model of Slate Cave petroglyph panel. Tags 1-8 show the monkey's head, left fist, left elbow, tip of tail, right elbow, crotch, left foot, and right foot respectively.
precision and detail of this area would have taken at least a full day in the field to produce. With the ability to draw the map in the lab after the field season, we were able to devote more time to our excavations. As well, a side-by-side comparison of our original hand-drawn map and our new map of this area shows the level of accuracy and detail using photogrammetry is unmatched (Figure 5).

Photogrammetry excelled in mapping unit excavations in this cave. We excavated a pit feature in a low alcove against the cave wall containing a human cranium surrounded by a cluster of bone tubes. The pit was covered by slate and limestone slabs with possible human remains found beneath (https://skfb.ly/6vz79). Each layer and mapped object was documented using photogrammetry in lieu of creating hand-drawn maps. The models were then imported into ArcGIS and these features were digitized into highly precise plan and profile drawings of the feature.

We also used the technique to make a fully navigable model of the entrance area. Such models can be uploaded to software and apps for use with virtual reality goggles, which allow the user to become fully immersed in the scene. Nevertheless, the end product was less than desirable. Many spots in the chamber walls were unable to be reconstructed by the software, leaving large, vacant holes. Moreover, due to changing light conditions as we moved from direct to indirect sunlight, the resulting photographs of the same areas varied in color, leaving the model appearing blurry.

**El Quemado Structure**

Exposed in 2013 beneath the main plaza at Pacbitun, the large ceremonial platform, El Quemado, or Q, has been the primary focus of the site core investigations up to the 2017 field season. Radiocarbon dates indicate the platform was constructed in the Middle Preclassic period around 600 BC and was eventually terminated around the onset of the Late Preclassic period (ca. 400 BC) (Powis et al. 2017). Sealed below marl and dirt filled task units and capped by several plaza floors, El Quemado had been entombed for over two and a half millennia. Excavations to this point have revealed an architectural layout unlike any other documented in the Belize Valley region (Micheletti et al. 2017; Micheletti et al. 2016; Micheletti and Powis 2015). The structure’s pristine state of preservation is likely owed to the severely burned plaster surface derived from either a single termination event or long-term ritual use. Because of Q’s rare architectural form, nearly flawlessness, and condition, and buried state, we decided to digitally curate the structure as first exposed. A three-dimensional model of Q will allow us to further investigate its construction methods, structural attributes and features, as well as the unusual method of deposition. A model will also aid those researching early monumental architecture of the ancient Maya and can serve as a visual aid in educational and public settings.

Our first efforts at the digital preservation of El Quemado was in 2013 through the use of terrestrial laser scanning (TLS) (Weber and Powis 2014). While this was an effective method, it proved to be too costly, and thus not a practicable means of annual documentation. As a low-cost alternative, yet just as effective method, we decided to use photogrammetry. In 2015, after excavations had uncovered the south face of El Quemado, project members Jeff Powis and Andrew Vaughan photographed the sub-plaza structure and produced the first 3D photogrammetric model using Agisoft Photoscan software (Vaughan et al. 2016). As the project resumed excavations in 2016, we planned to continue producing photogrammetric models of the newly exposed areas (Figure 6).

Our ultimate goal was to add these newly-exposed areas to the model of Q produced in 2015, which could be done by either processing photos in the Photoscan software or by manually connecting each of the models using other 3D processing software.

After the 2016 excavations located and exposed Q’s east and west sides and southern plaza floor, each of these areas were photographed and modeled. To ensure that each model would join together, back dirt was removed from previously excavated areas to re-expose modeled architecture adjacent to the newly exposed 2016 units. Doing so uncovered recognizable features and attributes used to align the previous photos with the new ones. Another strategy we experimented with was creating a photogrammetric modelled path that would
Figure 5. Side-by-side comparison of (a) portion of hand-rendered plan view map of Slate Cave’s entrance area, and (b) plan view map produced from digital model. Note that the maps are oriented in different directions.
Figure 6. Photogrammetric models of El Quemado’s architecture exposed in the 2016 field season (a) east side, (b) west side.

Figure 7. Composite digital model of El Quemado from 2015 and 2016 field seasons.
serve to spatially link each of the 2016 units. This helped to preserve the spatial (orientation and scale) integrity of the separately exposed areas of architecture to aid with the processing. It would also aid in the manual connection should the alignment not work in Photoscan. In this case, any manual processing would be done using the 3D processing software, 3DReshaper. The primary purpose of the 3DReshaper software was to integrate the photogrammetric models with the TLS data acquired in 2013.

After processing each year’s photosets in Photoscan, we were able to successfully align the east edge of Q with the south face model. This was likely due to the re-exposed cut limestone blocks of the south facing wall, photographed in both 2015 and 2016. The only visible issues were minor changes in lighting and soil color. The poor preservation of the summit had also resulted in gaps in the final model. On the other hand, the west edge had completely failed to align due to an insufficient number of photographs in overlapping area. Simply stated, there were not enough recognizable, overlapping points in this area in either photoset for Photoscan to properly merge the two models. Also, while the modelled path linking each exposed area was able to create an accurate spatial layout of the exposed architecture, Photoscan was unable to properly orient the west edge due to the lack of overlapping points.

Although there were only minor issues with the eastern edge and the south face of Q, we experimented with manually attaching each of the models using 3DReshaper. After re-orienting, scaling, and cropping and smoothing edges, each of the models fit together and were able to be merged into a single compound mesh. Nonetheless, minor issues with light and soil coloring, and small gaps in unpreserved areas remained. Although the results were not as detailed and defined as with the model produced with Photoscan, the manually attached model created in 3DReshaper was more expedient and could be physically manipulated (Figure 7).

All in all, with our photogrammetric work of Q, we learned that models from multiple years were able to be reconnected with sufficient overlap between excavated units; however, a more effective approach would be the creation of permanent, completely immobile datum markers the software can use as recognizable points. Moreover, recreating similar lighting conditions over the years, (photos taken during the same time of day, in the shade, beneath tarp, etc.) would allow for the creation of cleaner models.

Conclusion

To sum, we have found that photogrammetry excels with small-scale commonly encountered archaeological contexts such as surface caches, rock art, and unit excavations. Producing mapping grade models saves valuable field time, increases map accuracy, and produces moderate quality models that are easily sharable electronically. This ability to share electronically, and online, as we hope to show with virtual tours and photogrammetric models, allows us to bring our work to the public, and make it as accessible to as wide an audience as possible. Additionally, while photogrammetry worked well for modeling settlement architecture, it only fared moderately well mapping cave chambers. Even smaller rooms and chambers required many photographs to ensure proper overlapping, and lighting had also proved to be a challenge initially. Nevertheless, maps with higher detail and precision than are able to be drawn by hand could be created from the models, saving significant field time for other endeavors.

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References


20  SETTING THE STAGE IN CENTRAL BELIZE: 30,000 YEARS OF TROPICAL CLIMATE, LANDSCAPE TRANSFORMATION, AND HUMAN INTERACTION

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The Maya engaged in a sustainable manner with a tropical environment for millennia beginning c. 12,000 years ago. This interaction endured even when the population was at its peak c. 500-800 CE. Disruptions did occur, especially between c. 800-900 CE when several prolonged droughts ultimately led to an urban diaspora. The Maya, however, adapted and continue to do so. Preliminary evidence from diverse datasets collected by the Valley of Peace Archaeology (VOPA) project in central Belize provides a window into at least 30,000 years of climate and landscape histories and human immigration. In this paper, we present varied datasets from different sites in central Belize from individual farmsteads (between Yalbac and Cara Blanca) to a civic-ceremonial center (Yalbac) to a pilgrimage destination (Cara Blanca) to show that the Maya had an enduring relationship with the forested landscape, indicated by evidence for biodiversity and a healthy forest. This project provides a unique regional perspective of a tropical environment with the goal of understanding the natural-human dialectic and explores adaptive responses and strategies.

Introduction

Human-natural ecosystem relationships are always changing, reflecting human adaptation, as well as naturally-occurring regional and global climate change. However, we now live in the Anthropocene, the first epoch of our own making, with potentially detrimental consequences, especially if we do not adapt a more sustainable manner. We can learn from our forebears, especially those who have shown millennia of sustainable adaptation, like the ancient Maya. For the Maya, we posit that their immigration into the area now known as the Maya area did not bring about destruction, but co-existence. The lowland Maya adapted beginning c. 12,000 years ago (Lohse et al. 2006; Prufer et al. 2016; Rosenswig et al. 2014) in a diverse tropical environment with high but dispersed biodiversity. A sustainable way of life endured even when population was at its peak between c. 500 and 800 CE in the Late Classic period. In fact, population density at present in the southern lowlands “remains about one to two orders of magnitude less than the density of the Late Classic Period” (Turner and Sabloff 2012:13912). This astounding fact not only demonstrates a long-term sustainable interaction, but also potential solutions to current day issues.

The long-term goals of the Valley of Peace Archaeology (VOPA) project in central Belize are to provide a regional perspective on the natural-human dialectic by exploring adaptive responses and strategies from the perspective of archaeology, paleobotany, dendroecology, palaeolimnology, paleontology, isotopic paleoecology, and ancient human genetics. Ideally, results will provide insights and solutions for the present and future in tropical areas where over 40% of the current population resides and where, due to global climate change, the tropical belt is likely to expand. Here, we present preliminary findings on a subset of these datasets, namely Pleistocene megafauna fossils, tree specimens, archaeological materials and human remains, and what they indicate about the world in which the Maya lived and adapted.

Once the Maya adopted the use of domesticated plants by c. 2000 BCE, they began to settle in farmsteads and small communities (Rosenswig et al. 2015). Over time, population size increased to the extent that eventually kingship emerged to cope with increasingly complex needs by c. 100 BCE. The Late Classic period witnessed the rise of powerful kings and the highest population size; the Maya lived in one of the 100’s of centers as well as in non-center areas or hinterlands (Lucero 2006). Each of the 100’s of centers had its own king, though some were more powerful than others, namely those at Tikal and Calakmul, largely due to their location in areas with large plots of fertile soils. These areas, however, lacked permanent surface water because much of the seasonal rain percolated through the porous limestone bedrock. To sustain year-round access to water,
early leaders built what eventually became massive reservoirs (Scarborough 1993; Scarborough et al. 2012). Urban planning and layout increasingly became interlinked with reservoir systems; the more rulers relied on progressively more complex reservoir systems, the more vulnerable they became to any disruptions or change (i.e., path dependent).

Without extensive irrigation systems, the Maya relied on seasonal rainfall to grow cultigens, to replenish reservoirs, manufacture plaster and ceramics and for other daily needs, especially potable drinking water. In the intensive farming period during the rainy season, farmers lived in hinterland farmsteads and communities and worked their fields, relying on a mix of small-scale, localized subsistence features such as terraces, dams, channels, raised fields and others to grow diverse crops in a dispersed pattern, mirroring the mosaic distribution of fertile soils and other resources (Ford and Clarke 2016). In the dry season, many farmers came to centers to use royal reservoirs and participate in markets and large public ceremonies (Lucero 2006). In exchange for access to center amenities, farmers contributed tribute in the form of labor, goods, and services.

Eventually, the reservoir systems resulted in an anthropogenic landscape of centers and interlinked farmsteads interspersed with forests. Kings served as water managers, affording them the means to acquire tribute to fund the political economy because not only did they provide dry season water, but clean water through designing and maintaining constructed wetland biospheres (Lucero et al. 2011). Their role was tested in the face of changing climate, specifically, several prolonged droughts between c. 800 and 900 CE (Douglas et al. 2015; Kennett et al. 2012; Medina-Elizalde et al. 2010) that exacerbated existing problems at centers, which, depending on the polity, consisted of the overuse of resources, deforestation and erosion, population growth and expansion, and disrupted trade networks. Even centers without problems struggled as water sources dried up. Ultimately, most farmers in the southern lowlands abandoned kings, centers, and eventually hinterlands (Lucero et al. 2015). This urban diaspora, where population declined c. 90% in the interior southern lowlands (Turner and Sabloff 2012), had a lasting impact as Maya emigrated in all four directions in search of new land, water, and opportunities. “In the end, the different histories of kings and farmers relate to the different constructs in which they existed: inflexible vs flexible strategies; a reliance on massive vs small–scale diverse water systems; and entrenched and rigid vs resilient and adaptable systems” (Lucero et al. 2015:1151). They moved to coastal areas and along major rivers where market towns and trade thrived, especially in the northern lowlands (e.g., Graham 2011; Masson and Freidel 2012; Sabloff 2007). Those that did not abandon the interior lived in smaller communities. The Maya never re-occupied southern lowlands centers—the northern lowlands are another story for another time.

Maya World Management
Throughout their history, the Maya interwove their lifeways in accordance with their cosmocentric worldview, which differs from an anthropocentric one because it situates objects, humans, animals, land, water, everything in an analogous manner—each plays a role in maintaining their place in the world and the world itself (Lucero 2017, in press). This melded worldview meant that they made use of and maintained the world, as well as relationships with other world parts. This is not to say that this relationship was perfect—the overuse of resources and deforestation happened and readjustments were made. While deforestation was localized, its extent is not agreed upon (Fedick 2010). Whatever the case, the millions of Maya today speak to their sustainable worldview and way of life, even in the face of the last 500 years of colonial and post-colonial histories.

Another means of management was through their treatment of sacred places, namely caves and pools, many of which were isolated from settlement. Their isolation promoted conservation because flora and fauna flourished, unencumbered by human habitation. This strategy, in addition to diversifying what they planted in their fields and forest management, together provided them the means to live for millennia without destroying their environment.
This cosmology of conservation promoted a sustainable human-environment relationship—and perhaps still can. This system—a mosaic of built, managed and untouched areas noticeably differs from current practices of clear-cutting and mono-cropping throughout the tropics (Ford and Nigh 2015). Land clearing not only provides conditions for stagnant water to collect, but also can result in the spread of pests, as well as land-atmosphere interactions including increasing temperatures and decreasing precipitation (D’Almeida et al. 2007). Further, increasing temperatures decrease photosynthesis, which slows CO₂ absorption (Meineke et al. 2016). Human encroachment in the natural world is undeniable, but how we proceed in the future may mean the difference between hard choices and long-term survival vs. short-term solutions and disaster.

Maya World Management in the VOPA Area
To assess human-natural ecosystem relationships over the long term, we first need to set the stage and determine what this tropical world was like before and during Maya occupation. We attempt to do so by focusing in several areas in the 115 km² VOPA research area: 1) Cara Blanca, a sacred landscape and pilgrimage destination (Figure 1); 2) Yalbac, a medium-sized center (Figure 2 and 3) dispersed...
Figure 2. A 3D rendering of Yalbac. Top left: cleared fields south of Pools 7-9 and northeast of Yalbac; white smears against the dark soils are ancient mounds and the clusters of green vegetation are unplowed mounds. VOPA.

hinterland farmsteads between Yalbac and Cara Blanca (see Figure 2).

Cara Blanca is comprised of 25 pools along an east-west fault, the north of which consists of a steep escarpment c. 100 m high; most pools are *cenotes* five to 60+ m deep, while others are lakes c. 2-18 m deep (Lucero and Kinkella 2015). We find noticeable settlement near the western pools or lakes (e.g., nos. 7-9), but much less so near the central pools or *cenotes* (e.g., 1-5), which is interesting given that water levels of *cenotes* do not drop much, even by the end of the dry season. We posit that the absence of noticeable human interference promoted biodiversity where the Maya neither farmed nor hunted.

Even though Cara Blanca has plentiful water and fertile soils, the Maya did not change much in the area—at least until between c. 800 and 900 CE when the droughts struck and the Maya constructed ceremonial buildings at *cenotes* as a pilgrimage destination (Lucero et al. 2016). Maya consider such openings in the earth as portals to the underworld and a place through which they supplicated gods, such as Chahk the rain god, as well as ancestors for rain,
critical in this rainfall-dependent society. The Maya left offerings at thousands of portals, many of which were pilgrimage destinations, most commonly jars, as well as exotic items, and the ultimate offering, people. These short-term responses were to no avail; visitors to Cara Blanca became part of the diaspora out of the southern lowlands along with most everyone else.

Pool 1, 100 x 70 m in size, is a 60 m deep cenote isolated from settlement and farming. We have presented results elsewhere on our excavations at the water temple and ceremonial platform indicating people visited from throughout the Maya lowlands (e.g., Lucero and Kinkella 2015; Lucero et al. 2016). Increasing evidence suggests that Pool 1 may have been one of several visited, likely as part of a ceremonial circuit comprised of sacred features with little or no residential settlement. But the cenotes have a history long before humans came onto the scene.

In 2014, divers recovered several *Eremotherium laurillardi* fossils from Pools 1 and 20, an extinct giant sloth species that can reach 6 m or 20 feet in length (McDonald 2015). Human immigration c. 12,000 years ago may have contributed to the extinction of regional megafauna and the establishment of the modern biota (Roberts et al. 2017). These fossils are the first of this species found in Belize, though they are found from Brazil up into Florida. Larmon and colleagues recently conducted carbon and oxygen isotope analyses of the inner orthodentine of a giant sloth tooth recovered from a fossil bed c. 21 m below the surface of
Pool 1 by paleontologist H. Gregory McDonald of the Utah Bureau of Land Management that dates to 26,975±360 cal. BP (Larmon et al. 2016, n.d.). Intra-tooth isotopic analysis of a 9-cm-long fragment of the *E. laurillardi* molar tooth illustrates the potential of these cenotes as archives of paleoenvironmental information. Through the study of carbon and oxygen isotopes, and using methods that Larmon and colleagues refined to produce the most accurate data possible from non-enamel bioapatite, they were able to reconstruct how the diet of the extinct giant ground sloth shifted from the wet season to the dry season c. 27,000 years ago. This isotopic record of a year in the life of a giant sloth shows a tropical savanna with a long dry season that stands in stark contrast to the modern dense tropical forest with a seven-month wet season. Despite the increasing aridity, Cara Blanca pools likely have been providing fresh water for tens of thousands of years. In fact, what are now the deepest cenotes would have likely been the only water sources in the vicinity during this arid period; giant sloths and other megafauna climbed down into the sinkhole, drank water, could not climb out, became stuck, and became part of the cenotes' geological history; this scenario likely occurred at Pool 20 as well, a 40 m deep cenote also with a megafauna fossil bed.

Divers also noted masses of trees in the pools. Samples collected in 2014 by dendroecologist Brendan Buckley of the Lamont-Doherty Earth Observatory of Columbia University, have all been identified so far as broadleaf species, mostly from the Meliaceae family (e.g., mahogany); none, however, have been dated (Buckley 2015). Divers also collected a wood specimen, possibly a broadleaf species, from a fossil bed c. 25 m below the surface of Pool 1 that dates to almost 9000 years ago (8930±20 BP) (Lucero 2011). If it is a broadleaf species, it would suggest a wetter period than does the sloth tooth nearly 18,000 years prior.

The second type of settlement is the center of Yalbac. The Maya built this medium-sized center on a plot of fertile land along Yalbac Creek that includes at least one small reservoir, three large plazas, several range structures, a ballcourt, six pyramid temples 8-16 m high, and an acropolis over 20 m tall (Graebner 2002). Test pits in two of the plazas revealed several floors that yielded ceramics dating from c. 300 BCE through c. 900 CE (Conlon and Ehret 2002). Dispersed farmsteads are found in the immediate vicinity. For present purposes, we just want to note that the Maya resided here for at least 1200 years, suggesting an enduring, sustainable relationship with the local environment.

The third kind of settlement is that found between Yalbac and Cara Blanca—scattered farmsteads that mirror the distribution of fertile soils. In 2016, the Spanish Lookout Corporation permitted us to conduct a salvage archaeology program in recently cleared stretches of land where we focused our efforts in several different areas (Benson 2017): 1) near Pool 7, a lake and the western-most pool with residential settlement; 2) near Yalbac; and 3) the intermediate area between Cara Blanca and Yalbac. We excavated eight residential units, from small solitary mounds to a platform compound that yielded residential artifacts and eight burials with 14 individuals, most with grave goods. While most of the excavated materials near the surface indicate Late Classic or Terminal Classic occupation, we do not know how much history has been sheared off during clearing and plowing. At a small mound near Pool 7, for instance, we recovered two Postclassic projectile points dating to c. 900 and 1100 CE or later, suggesting the area might have been occupied post-urban diaspora.

Carbon ($^{13}\text{C}/^{12}\text{C}$, δ$^{13}\text{C}$) and nitrogen ($^{15}\text{N}/^{14}\text{N}$, δ$^{15}\text{N}$) isotope values provide information about human diet, specifically, C3 vs. C4 plant consumption and protein sources (Ambrose 1990). Maize, a C4 plant, was the main dietary staple for the Maya (Friewald 2011). Analysis of teeth and bones from 2016 excavations (Carbaugh 2017) confirm that over half of the individuals’ diet consisted of C4 plants, likely maize, while nitrogen values indicate terrestrial herbivores were the predominate source of protein. All 13 individuals sampled appear to have had similar dietary habits regardless of mound type and including two of the individuals interred in Structure 3, a ceremonial platform at the edge of Pool 1.
Table 1. Strontium results of 2016 VOPA human remains.

<table>
<thead>
<tr>
<th>Field</th>
<th>Mound</th>
<th>Burial/ Human Cache</th>
<th>Individual</th>
<th>Age</th>
<th>Sex</th>
<th>Tooth</th>
<th>$^{87}\text{Sr}/^{86}\text{Sr}$</th>
<th>Modified Teeth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pool 7 MF</td>
<td>1</td>
<td></td>
<td>A</td>
<td>Young Adult (18-24 years)</td>
<td>Male</td>
<td>LM$_1$</td>
<td>0.70804</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LM$_3$</td>
<td>0.70773</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>B</td>
<td>Mid Adult (35-40 years)</td>
<td>?</td>
<td>RP$_2$</td>
<td>0.70838</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>C</td>
<td>Adolescent (15-20 years)</td>
<td>?</td>
<td>RM$_1$</td>
<td>0.70794</td>
<td>Yes</td>
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<td></td>
<td></td>
<td></td>
<td>D</td>
<td>Young Child (3-4 years)</td>
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<td>Rdm$_2$</td>
<td>0.70777</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>E</td>
<td>Adolescent (12-15 years)</td>
<td>?</td>
<td>RM$_1$</td>
<td>0.70786</td>
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</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RM$_2$</td>
<td>0.70790</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>F</td>
<td>Adolescent (16-20 years)</td>
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<td>LM$_1$</td>
<td>0.70808</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>LM$_3$</td>
<td>0.70802</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>G</td>
<td>Young Child (3-4 years)</td>
<td>?</td>
<td>Rdm$_2$</td>
<td>0.70801</td>
<td>No</td>
</tr>
<tr>
<td></td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td>A</td>
<td>Infant (3 years +/- 12 months)</td>
<td>?</td>
<td>Ldm$_2$</td>
<td>0.70778</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>A</td>
<td>Adolescent (16-20 years)</td>
<td>?</td>
<td>LM$_1$</td>
<td>0.70800</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>High Rb/Sr</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MF 4</td>
<td>East Str.</td>
<td>5</td>
<td>A</td>
<td>Adolescent (15 years +/- 3 years)</td>
<td>?</td>
<td>LM$_1$</td>
<td>0.70818</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LM$_3$</td>
</tr>
<tr>
<td>North Str.</td>
<td>8</td>
<td>A</td>
<td>Young Adult (18-22 years)</td>
<td>Male</td>
<td>LP$_1$</td>
<td>0.70836</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Pool 1</td>
<td>Str. 3</td>
<td>2</td>
<td></td>
<td>Adolescent - Young Adult (18-22 years)</td>
<td>Male</td>
<td>RP$_1$</td>
<td>0.70779</td>
<td>No</td>
</tr>
</tbody>
</table>

Strontium isotope ratios ($^{87}\text{Sr}/^{86}\text{Sr}$) were also assessed, a method that examines individual and population level migration. Results for 11 of the individuals recovered from the hinterlands during the 2016 field season ranged from 0.70773 to 0.70838 (Table 1). This tight range suggests that all these individuals are local to the Yalbac hinterlands. In fact, the strontium ratio for several individuals fall within the “local” baseline established for sections of the Belize River Valley (Freiwald 2011). Specifically, VOPA individuals overlap with the Belize River Zone (3 teeth) and the Vaca Plateau Zone (4 teeth). For two individuals, their first molar fell outside of range for these zones, while the third molar fell within this range (Md 4 BU 1 Ind A and Md 1 BU 5). For example, the Pool 1 individual, buried in the ceremonial platform.
(Str. 3), fits within the range of strontium ratios for individuals from the Yalbac area, perhaps indicating a local individual. We cannot say for certain if there was migration into the area or not since we do not have an established baseline for these sites as of yet. Ceramic forms and styles suggest visitors from the Petén, the northern lowlands, and eastern Belize (Ferree and Benson 2017; Kosakowsky 2017).

Ripan Malhi and his PhD student Alyssa Bader at the University of Illinois at Urbana-Champaign (UIUC) have conducted preliminary ancient DNA analysis to explore population history, including migration and relatedness. Over the last decade ancient DNA analytical techniques has undergone a dramatic transformation with improvements in technology (e.g., Lindo et al. 2016). Whereas prior to these recent innovations researchers were limited to sequencing only a small segment of the mitochondrial genome, at present only a few labs worldwide are able to sequence complete mitochondrial and nuclear genomes—transforming the field of ancient DNA to the

Figure 4. DNA damage pattern of one of the teeth analyzed showing extreme damage and authenticating the results as ancient DNA and not contamination. R. Malhi/VOPA.
field of paleogenomics. This includes Malhi’s lab at UIUC. Specific protocols and measures are taken to minimize contamination and detect it when it does occur. The ancient DNA lab at the Institute for Genomic Biology has positive pressure, hepa filtered air; and researchers have strict protocols to minimize and detect contamination. Dr. Malhi has begun assessing familial relationships through ancient DNA analysis using the program ANGSD or Analysis of next generation sequencing data (Korneliussen et al. 2014). Preliminary runs of two teeth and two calculus samples from Late Classic burials from Mound 4 near Pool 7 (Figure 3) demonstrate acceptable DNA preservation with characteristic signs of DNA damage (Figure 4). In addition, the genomic data were compared with populations worldwide, and one individual shows closest affinity to Maya, and the other individual exhibits the closest affinity to Pima—both Native American populations (Figure 5). As far as we know, this is one of the first successful DNA extractions from pre-Columbian Maya human remains. It is only the beginning, and we plan further ancient DNA analysis pending funding.

Concluding Remarks

While these results are preliminary, they have one factor in common: they show the potential a regional interdisciplinary project has to understand human-nature relationships. They also hint of a changing environment that ultimately gave rise to what we witness at present—a healthy tropical forest with high biodiversity. The last few centuries of implementing a different interaction may soon change this fact (e.g., clear cutting large areas, mono-cropping, widespread use of chemical fertilizers and pesticides, etc.). The Maya, even though immigrating into the area c. 12,000 years ago, adapted for millennia without destroying their home because of the sustainable strategies they used. They left a managerial, sustainable imprint on the forested landscape.

In conclusion, some of the challenges the Maya faced at the end of the Classic period are similar to our own current struggles with accelerating global climate change. The more
we reveal about past decisions, the more ammunition we have to proceed in the long-term to avoid destroying the place we call home. Humans, after all, as Aldo Leopold stated in 1939, are just one link of many in the biotic world (Leopold 1991[1939]:268).

Acknowledgments We gratefully acknowledge the Institute of Archaeology for their support over the years. We also want to thank Forestland for their generous support, as well as the University of Illinois Center for Latin American and Caribbean Studies for a travel grant. Our foremen (Ernesto Vasquez and Cleofo Choc) and field assistants, as usual, were of great help. Finally, we want to thank Yalbac Ranch, especially Jeff Roberson, for allowing us to continue exploring Cara Blanca, and Spanish Lookout Corporation for allowing us to conduct salvage archaeology on their property.

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Rosenswig, Robert M., Amber M. VanDerwarker, Brendan J. Culleton, and Douglas J. Kennett

Sabloff, Jeremy A.

Scarborough, Vernon L.


Turner, B. L., and Jeremy A. Sabloff
This paper presents the results from the exploration of the three previously unexplored pools in the hypothesized ceremonial circuit of Cara Blanca, central Belize. During the 2017 field season, the Valley of Peace Archaeological project surveyed the far eastern pools of the Cara Blanca 25 (Pools 22, 23, 25) in order to explore the role they might have played in the Late to Terminal Classic ritual landscape. During the Classic period (250-900 CE) many Maya rulers garnered power by exploiting their followers’ reliance upon rain. When several prolonged and severe droughts struck the Maya area during the Terminal Classic period and the rains failed, so too did rulers’ power. Despite periodic droughts, the Cara Blanca pools in central Belize remained a consistent resource for freshwater. Data collected over many years of research at Cara Blanca suggest that the 25 pools are part of a ritually prescribed path, or ceremonial circuit, which developed in part as a response to rulers’ failures. Ceremonial circuits are paths that Maya walked connecting built architecture in a way that makes explicit their relationship to that space—including both the architecture and sacred, unbuilt spaces. This paper explores how these three pools, as well as two of the other Cara Blanca pools (Pools 1 and 15), may have played a unique role in the ritual landscape.

Introduction

During the Classic period (250-900 CE) many Maya rulers garnered power by exploiting their followers’ reliance upon rain. When several prolonged and severe droughts struck the Maya area during the Terminal Classic period and the rains failed, so too did rulers’ power (Lucero 2006). Despite periodic droughts, the Cara Blanca pools in central Belize remained a consistent resource for freshwater. Data collected over many years of research at Cara Blanca suggest that the 25 pools, which formed along an east-west axis, are part of a ritually prescribed path, or ceremonial circuit, which developed in part as a response to rulers’ failures (Lucero et al. 2016, 2017). Ceremonial circuits are paths that Maya walked connecting built architecture in a way that makes explicit their relationship to that space—including both the architecture and sacred, unbuilt spaces (Vogt 1969). Often a ceremonial circuit follows the path of the sun—moving from east to west (Astor-Aguilera 2010:131-143; Ashmore 2009). During the 2017 field season, the Valley of Peace Archaeological project surveyed the far eastern pools of the 25 (Pools 22, 23, 25). Because these three pools are the eastern-most in the system, they may have been a point of departure for the ceremonial journey. Additionally, if multiple ritual processions were undertaken at Cara Blanca, investigation of the final three pools’ integration into the landscape is essential to understanding the space. This paper presents the results from our survey and

Figure 1. Map of all 25 Cara Blanca pools showing soil class. Courtesy of VOPA.

the role the pools might have played in the Late to Terminal Classic ritual landscape.

Cara Blanca, Belize

Cara Blanca, in Central Belize, is a system of 25 pools, both shallow lakes and cenotes, steep sided water filled sinkholes (Figure 1). These pools line the base of a steep limestone cliff, which rises up 100 m above the pools. The blue, sometimes muddied waters stand in stark contrast to the white limestone cliff and the dense primary and secondary jungle vegetation. Each pool is unique, with the cenotes ranging from 5 – 60 m deep and the lakes from 2 – 18 m. The western-most pools, Pools 7-9, are lakes and have ancient Maya settlements on their southern sides. The central pools, Pools 1-5, which are all cenotes, have a noticeable dearth of residential
settlement and a handful of hypothesized ceremonial structures. The clear juxtaposition of pool use, particularly the lack of residential structures near the cenotes, which would have retained water regardless of drought conditions, suggests a specialized use of the cenotes. It was only when the Maya experienced several prolonged droughts c. 800-900 CE (Medina-Elizalde et al. 2010) that they built anything of a substantial nature in these previously ‘untouched’ areas near the central pools, constructing what we argue might be pilgrimage destinations (Lucero et al. 2016, 2017).

Lucero and colleagues have hypothesized that these pools were part of a ceremonial circuit, accessed by the Maya during the late Late (700-800 CE) and Terminal Classic (800-950 CE) periods (Lucero and Kinkella 2015). The importance of surveying the final three Cara Blanca pools lies in both completing the survey of the Cara Blanca area, as well as, collecting further data to inform our hypothesis. Here, we present the results of the 2017 survey and previously collected data at Cara Blanca Pool 1 (Lucero et al. 2017; Larmon 2017), which, taken in concert, might offer further insight into the significance of the Cara Blanca space.

We argue that Cara Blanca was home to a ceremonial circuit, or ritual processions. This is indicated by the synchronic distinction of residential and ceremonial spaces by isolating the sacred spaces of the pools from residential areas (Lucero et al. 2017). In this case, both the built and unbuilt spaces are essential. As visitors walked the paths connecting the constructed ceremonial spaces they passed through the jungle, an unmodified space, in effect tying together “anthropogenic” and “natural” spaces in a way that deconstructs the dichotomy between the two.

Traditionally, the Maya walk ceremonial circuits to reaffirm their relationship with and to sacred, forested places (e.g. Vogt 1969:144, 149, 390). As community members, or perhaps members of multiple residential communities, processed through the Cara Blanca space, they might have followed the path of the sun, from east-to-west (Astor-Aguilera 2010:131-143; Ashmore 2009) or they might have been processing multiple ceremonial paths at Cara Blanca. Based upon ceramic chronologies, the Cara Blanca space was visited most formally during the late Late and Terminal Classic period (Kosakowsky 2017). As several, prolonged and severe droughts struck the region and political turmoil encouraged people to migrate out of centers to the hinterlands, the Cara Blanca circuit was formalized with the construction of ritual structures (Larmon 2017; Larmon and Amin 2017; Larmon and Nissen 2015; Lucero et al. 2016, 2017; Lucero and Kinkella 2015).

The importance of surveying the final three Cara Blanca pools lies in both completing the survey of the Cara Blanca area, as well as collecting further data to inform our hypothesis that Cara Blanca was home to a ceremonial circuit, or set of ritual processions. Pool 1 and its associated structures would have served a pivotal role in the Cara Blanca circuit, perhaps acting as a locus of ritual for those taking part in the procession. We will first present evidence for water related rituals at Pool 1 and its associated structures. Then, we will introduce the final three pools, which were surveyed this summer, as well as discuss our attempts to explore a previously unknown sinkhole near Pool 15. Finally, we consider how Cara Blanca may have been one large ceremonial circuit, as well as how each pool might have played an important role in independent ritual processions.

Previous Fieldwork at Pool 1: 2014-2016

Located on the southern edge of Pool 1 is a ceremonial complex comprised of three structures (Str. 1, 2, and 3) built around a plaza with the cenote situated on the northern side of the plaza (Figure 2). A number of other structures are located nearby and are likely related to the ritual events which took place at Pool 1. Archaeological excavations at Pool 1 began in 2012 when the VOPA crew excavated Str. 1, a hypothesized water temple on the edge of Pool 1, which is the deepest of the cenotes at 60+ meters. Excavations by Lucero and colleagues uncovered a collapsed corbel-vaulted building measuring 20 x 7.5 m, 3.5 m tall, atop a 2-m wide stepped platform (Lucero et al. 2016; Lucero and Kinkella 2015). With fill of tufa (a rock formed by the accumulation of calcium carbonate around organic materials in the water), an unusually high number of water jars (72.1% of the recovered vessels), and water-laden
symbolism (see Lucero and Kinkella 2015), Str. 1’s connection to water and water ritual’s is evident. The temple appears to have restricted access, with narrow hallways and small doorways. Based upon ceramic chronologies, it was constructed rapidly, either as one event or multiple, diachronically close events.

Just across the plaza and 22 meters from Str. 1, Str. 3 may have acted as the loci for water related rituals. The structure itself is roughly 7.46 x 3.65 m, though the east and south edges of the platform melt into the landscape, and 0.8 m tall (Larmon 2017). During the 2014 season, we began excavations on the structure. We exposed nearly the extent of the structure, including a layer of medium-to-large-sized boulders that had been placed over a burned plaster surface covered in a sheet of smashed, partial ceramic vessels (Larmon and Nissen 2015).

During the 2016 season, we conducted additional excavations to explore beneath the burned plaster surface of Str. 3 and found that, based upon ceramic chronologies and like Str. 1, the structure appears to have multiple construction events within a relatively short time frame in the late Late Classic/Terminal Classic period. Several features of Str. 3’s construction suggest that this platform played an important role in the ritual process. On the center edge of the north side c. 1 m from the water, they built a step from which visitors to the structure likely made offerings into the pool. Just south of this step, and between the uppermost ballast and fill on the north end of the structure, we exposed a feature of flat stones that could have served as additional support for multiple processions to the edge of the pool and concomitant rituals.

In total, we recovered 6792 ceramic sherds from Str. 3, the majority of which came from the surface, with layers of burned sherds on top of a burned plaster surface. The vessels represent styles from different regions, overlapping with those of the Belize Valley, northern Belize, and the eastern Petén. This diversity does not necessarily indicate that the ceramics were imported, but rather that sites in the region might be peripherally linked to other regions (Kosakowsky 2017). The low percentage of rims (8.3%, n=563) suggest that the Maya either smashed vessels and removed vessel parts, or brought pieces to Pool 1 from elsewhere. Although we cannot determine ceramic origins without petrographic analysis,
the lack of complete vessels demonstrates the significance of the pieces themselves. Pool 1 visitors might have brought connections to and representations of their home and community in the form of vessels or sherds to tie them from this threshold to the otherworld.

We also exposed three individuals buried in Str. 3 (Carbaugh 2017). Each of the three individuals was interred in the ceremonial structure without any grave goods, suggesting that the three ‘burials’ could have served as deposits or even caches in a dedicatory ceremony, designating the space as sacred. Maya visitors would have walked over these three buried caches as they proceeded to the step from which they threw offerings into the cenote. Each individual was interred in different strata and progressively getting closer to the surface near the northern edge of the platform, pulling the visitor along the platform, towards the otherworld, as they traverse the structure.

Just 400 m to the west of Pool 1 is the hypothesized sweatbath, M-186. Initial investigations at M-186 revealed a “squircle”-like building that abuts the west end of a long-range structure that itself has two or three looters trenches. Measuring exactly 3.66 x 3.66 m, the western-most room resembles a sweatbath. It has rounded corners and a semi-domed roof (which was nearly completely destroyed both by looters and by 2010 Hurricane Richard), characteristics that have been noted in numerous other sweatbaths throughout the Maya region (see Larmon and Amin 2017). Though the ceramic assemblage of the sweatbath dates to the same periods as Pool 1, late Late and Terminal Classic periods, the composition is different. Only seven of the 16 rims recovered (or 43.8%) were jar rims, compared to 57.7% from Str. 3 and 72.1% jar rims from Str. 1. This difference suggests a use of the sweatbath distinct from the other excavated structures at Pool 1. We hypothesize that the sweatbath was used by visitors to cleanse themselves before participating in rituals at the edge of Pool 1 (Larmon and Amin 2017).

The 2017 Survey: Final Unexplored Sinkholes

If Cara Blanca served as a ceremonial circuit, each cenote along its path could have functioned as the focal point for the performance of water related and other ceremonies. From 1998 – 2014, Andrew Kinkella (2008, 2009, 2015) conducted an extensive and thorough survey of the Cara Blanca area, identifying the 25 pools and areas that were in need of further study. Though Kinkella had been able to reach 22 of the Cara Blanca pools he did not reach the three eastern-most pools. Survey conditions to these three were particularly strenuous because of complete inundation with swampy waters, a prevalence of Black Poisonwood trees, and various hazards that accompany swampy jungle conditions. Pool 21, the last pool reached by Kinkella, lies at the western-most edge of the swamp. He had attempted the survey from the east, choosing the shortest path from the Yalbac road. In order to avoid some of the issues that he ran into, he suggested that we try to approach the pools from the north, first reaching Pool 21 and then moving east-ward to Pools 22, 23, and 25 (Table 1). Our exploration began by cutting our way south from an overgrown side road off of the main Yalbac road. Figure 3 shows our attempted path to each pool.

Pool 21 (Figure 4), approximately 60 x 60 m and 13 m deep, was muddied by the recent rains. Swimming around the edge of the pool we noted an outflow with a strong current on the east side leading to Pool 22, which is just c. 100 m to the east. Unfortunately, just east of Pool 21, the landscape becomes completely inundated.

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### Table 1. Measurements of the final three pools (22, 23, 25) and Pool 21.

<table>
<thead>
<tr>
<th>Pool</th>
<th>Diameter</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>c. 60 x 60 m</td>
<td>c. 13 m</td>
</tr>
<tr>
<td>22</td>
<td>c. 30 x 30 m</td>
<td>c. 6 m</td>
</tr>
<tr>
<td>23</td>
<td>c. 30 x 30 m</td>
<td>c. 11 m</td>
</tr>
<tr>
<td>25</td>
<td>c. 25 x 25 m</td>
<td>c. 9-10 m</td>
</tr>
</tbody>
</table>
swampy jungle terrain imposed itself upon us, making clear that any who try to navigate the landscape are at once enveloped and appreciative of the journey.

Because of the conditions surrounding the pools, it was difficult to get adequate photos of them while on land. Instead, we sent up the drone to get aerial images. We used a Phantom 3D Professional drone often during survey to correctly orient ourselves to the pools for which we had no GPS points. Pool 22, approximately 30 x 30 m in diameter and 6 m deep, and Pool 23 (see Figure 4), approximately 30 x 30 m in diameter and 11.2 m deep, are nestled within dense vegetation and an inundated flood plain.

Dr. Ed Boles, an Aquatic ecologist and environmental consultant for various Belizean institutions (Belize Center for Environmental Studies, Belize Audubon Society, Belize Electric Company, Belize Department of the Environment, United Nations Development Programme, The Nature Conservancy, University of Belize, CATIE), accompanied us for the Pool 22 and 23 survey, and was able to provide us with an assessment of their biodiversity. As he mentioned in an email (June 23, 2017), these pools are particularly interesting for a number of reasons. The presence of red mangroves inland suggests that these pools could be remnants of a time when the sea level was much higher—mangroves are tolerant to salt and mineral rich water. The fact that these stands survived in isolation suggests that the pools are heavily fed by groundwater that is mineral rich. This is further evidenced by the presence of tufa in both Pool 22 and 23, and iron oxide coatings on clam shells, tufa, and so on. Both pools had water lilies, which act as ecosystem engineers, providing habitat quality control and funnel oxygen from the atmosphere into the sediments. Dr. Boles also noted that the pools had abundant amounts of wood, often whole trees that have likely been deposited by hurricanes over the years. The trees had “a thick, dense layer of periphyton (algae, fungi, bacteria, cyanobacteria, protozoans, microinvertebrates) that represents a production system.” In his preliminary survey of these two pools, Dr. Boles noted a number of species of fish, crabs, and clams (Table 2). We also noted
turtles and crocodiles. His survey highlights the resource richness of these pools.

The last pool that we visited was Pool 25 (see Figure 4), the eastern most in the Cara Blanca system. This pool, c. 400 m east of Pool 23, ended up being the most difficult to access. Based on aerial images, we planned to hit an “open” area c. 200 m from Pool 25. Our drone flights the previous days had shown us that the expansive grasslands that encompass Pool 25 had been recently burned, except for a strip along the edge of the forest. The burning around Pool 25 was caused by arson—poachers coming into the area at night and advertently or inadvertently setting fire to the property. We expected to hit this “open” grassland and burned landscape and be able to see the pool. Instead, the “opening” that we had seen in the aerial images was cutting grass that rose well over our heads, the densest vegetation that we had encountered yet. In addition, the ground was completely inundated and deep unseen watery holes often caught us unawares, making traversing the area difficult. Finally, we reached Pool 25, c. 25 x 25 m and 9-10 m deep. There was an input on the west side of the pool, likely connecting Pool 25 to Pools 23, 22, and so on.

But, again, the area in between these two pools was completely inundated.

Ultimately, we did not note any additional Maya settlement with this survey, but this would have been near impossible given the field conditions. In order to better understand how these pools are interwoven in Cara Blanca’s history, we need to assess their condition in the dry season. We can, however, attest to their resource richness and their magnetic qualities, the perfectly round pools that might have been tucked away in dense and harsh vegetation—a sort of haven.

**Sinkhole near Pool 15**

On our final day in the field, we attempted to revisit Pool 15 and associated caves. Kinkella had previously identified three caves just 500 m northwest of Pool 15 (Kinkella 2009). These caves are small and were used for rituals indicated by the Terminal Classic (c. 800-900 CE) jar sherds recovered. In addition, Kinkella noted on the escarpment above Pools 14 and 15 that the Maya built seven structures, a possible water shrine (Kinkella 2009:138-142). During a 2016 fly over, Tony Rath noted an additional, large cave or sinkhole that sits just below the

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**Table 2. Biodiversity table constructed by Dr. Ed Boles.**

<table>
<thead>
<tr>
<th>Taxa</th>
<th>Pool 6</th>
<th>Pool 22</th>
<th>Pool 23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pesudothalphusidae (Crab)</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Characidae</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central Tetra (Astyanax aeneus)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Mayan Tetra (Hyphessobrycon compressus)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poeciliidae</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mosquito fishes (Gambusia sp?)</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Mollies (Poecilia sp.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cichlidae</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern Checkmark Cichlid (Cichlasoma intermedium)</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Redhead Cichlid (Cichlasoma synspilum)</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Mayan Cichlid (Cichlasoma urophthalmus)</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Bay Snook (red phase) (Penetia splendida)</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>PLANTS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cabombaceae</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fish Weed (Cabomba palaeformis?)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Nymphaeaceae</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White Lily (Nymphaea ampa)</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Lentibulariaceae</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bladderwort (Utricularia sp.)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Cyperaceae</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jointed Flatsedge (Cyperus articulates)</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
lookout with the water shrine and above Pool 15 (Figure 6). There is a chance that the large cave extends down into the pool, though this is speculative. Unfortunately, we choose the wrong route to access the cave. Though we were able to access a road that brought us south to just 0.6 km from the cave, we ended up traversing the escarpment to the east of the cave and about 200 m out hit the escarpment’s steep edge which we could not descend safely and had to turn back. While we did not reach the cave, we did come up with a better access point for future exploration.

The Pool 15 area could provide important insights regarding the presence and use of ceremonial circuits in the Cara Blanca region. As Reese-Taylor (2002:159-163) mentions, one of the most common ethnographic ritual circulations is from the base to the summit of a mountain, through which participants are considered to be uniting the three worlds: the underworld (from the cenote), the human world (from the surface of the water up the cliff, perhaps through the cave), and the heavens (on the hill-top shrine). Pool 15 might represent an ancient example of this contemporary ritual.

In a future field season, it would be worth following the drainage ditch down to Pool 15 or walking over from Pool 2. From there, it might be possible to explore the large cave and move up to the hilltop shrine. Otherwise, it will be easiest to approach the water shrine from the west, the path of least resistance.

**Discussion and Conclusions**

Cara Blanca’s use as a ceremonial circuit has been explored previously by the VOPA team (Lucero et al. 2016, 2017; Lucero and Kinkella 2015). Cara Blanca has a number of purely ritual structures and spaces, including the Water Temple, Str. 3, and the sweatbath. As evidenced by ceramic styles, visitors to these pools appear to be coming from all over Belize and beyond (though this will have to be confirmed with petrographic analysis). The timing of the use and material footprint at Cara Blanca all suggest its sacred nature. The pools themselves, as watery portals to the underworld, signify a sacred space. Vogt (1969) writes of the importance of rituals at “water holes” in ethnographic examples of ceremonial processions to cross-shrines on caves, hilltops, and in households (at Cara Blanca, that would be cenotes, ceremonial structures, and hilltops...). Finally, no residential settlement was imposed upon the Cara Blanca space. Certainly, the treatment of the Cara Blanca landscape would corroborate its use as a space for ritual procession. What we should consider, however, is that it was not a single procession taking place at Cara Blanca.

Kathryn Reese Taylor (2002) notes that while it is common for there to be more than one type of ritual (in this case procession) in a particular geography, this fact is often overlooked when considering ritual circuits. She proposes that “there are distinct types of ritual circuits and that the incorporation of one or more of these ritual circuits is requisite to the design of a proper Maya civic center” (Reese Taylor 2002:144). And, again though it is often overlooked, it is not just primary stops within a circuit that are important but also the circuits themselves, the journey. Cara Blanca was visited most during the Terminal Classic period, as civic centers lost their power and Maya began to migrate away from cities. Therefore, in this analysis Cara Blanca plays the role of the center of power and we consider the multiple processions that may have taken place in the watery landscape.

The first type of processions discussed by Reese Taylor is ritual circumambulation. This consists of all participants moving in a counter-clockwise procession from one point on the landscape to designated other points (Reese...
Ceremonial Circuit(s) at Cara Blanca

Taylor 2002:145). It is in this procession that the three pools explored during the 2017 field season play a role—as the eastern-most pools they would have been the point of departure for this procession (Astor-Aguilera 2010:131-143; Ashmore 2009). The landscape within which Pools 21, 22, and 23 are nestled is completely inundated. Participants in the procession would have been emerging from the water, the lower world, and moving west-wards to the rest of the ceremonial circuit. It is this circuit that would have encompassed the entire landscape. Ritual circumambulation has been used to define and maintain boundaries, and this procession might have been a means of further setting apart the ritual landscape from surrounding utilitarian activities, as well as a means of connecting more deeply to the landscape.

It is possible, too, that additional smaller processions were carried out within the landscape. The next type of procession that Reese Taylor defines is a banner procession, which moves from the periphery to the center. These processions are “a mechanism to strengthen integration and social solidarity within towns or villages comprised of dispersed settlements” (Reese Taylor 2002:152). At Cara Blanca, Pool 1, the locus of ritual activity, might have acted as the central point of the circuit. As the deepest of the cenotes, it is the portal that would bring visitors closest to the underworld. We have previously hypothesized that there was a procession from the sweatbath, just c. 400 m to the west of Pool 1, to the Water Temple (Larmom and Amin 2017; Lucero et al. 2017). Visitors to the space cleansed themselves at the sweatbath before engaging with the rest of the landscape. Here, the sweatbath would be considered the periphery and the processions would have been a means of integrating the landscape—highlighting the idea that the entire landscape, not just the ceremonial stops, is essential. Ethnographically, these processions have been a way to indicate rotating political authority and social integration—perhaps the procession at Cara Blanca Pool 1, when accessed by diverse visitors, acted to disseminate “authority”, “all of our feet share this path”, and integrate a diverse community.

The final procession type discussed by Reese Taylor are processions from the base to the summit of a mountain, which connects the three realms of the cosmos (Reese Taylor 2002:159). In these cases, the procession moves from the south (often a depression or body of water) to the north (the hilltop). At Cara Blanca, this type of procession might have been a part of the Pool 15 space. As mentioned above, at Pool 15, there is a cenote to the south, sitting just below a cave on a hillside that opens up to a hilltop upon which Kinkella (2009) noted a possible water shrine. If the Maya emerged from the cenote, perhaps through the cave, and processed to the shrine on top of the hill, they would have symbolically been connecting the watery underworld, the human realm, and the heavens. This act imbues the Cara Blanca landscape with the sacred essence of the otherworlds and integrates the landscape so as to facilitate supplication and communication.

In conclusion, though we did not identify additional Maya architecture that can inform us directly of how the Maya were interacting with the final three pools at Cara Blanca, the material recovered from other pools, particularly from Pool 1 and the potential for ambulatory use near Pool 15 suggest that Cara Blanca served as an active circuit. If this is the case, and visitors to the space followed ethnographic examples (from east-to-west), then the three most easterly pools would likely have been the beginning of a ceremonial journey, with the trials of traversing the spaces between constructed features contributing to the significance of the experience. Here, we move beyond a singular consideration of the Cara Blanca space and explore the diverse ways in which the landscape was a materially experienced example of the integration of the worlds, the physical and the spiritual. The processions discussed above are not exhaustive and certainly there are additional ways that visitors to Cara Blanca may have connected to the landscape. Whether the space served as a cohesive circuit, each pool impacting the way another is experienced, or each pool and path was accessed separately and for distinct reasons, the weight of the journey resided in the process and nature of the mutually experienced human and environment interaction.
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Lucero, Lisa J.

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Lucero, Lisa J., Jean T. Larmon, and Aimée E. Carbaugh

Medina-Elizalde, Martín, Stephen J. Burns, David W. Lea, Yemane Asmerom, Lucien von Gunten, Victor Polyak, Mathias Vuille, and Ambarish Karmalkar

Reese Taylor, Kathryn
Ceremonial Circuit(s) at Cara Blanca

Vogt, Evon Z.
22 PRECERAMIC CULTURAL HISTORY IN SOUTHERN BELIZE AND ITS ENVIRONMENTAL CONTEXT

Keith M. Prufer

This paper presents the environmental context for Early Holocene cultural developments in southern Belize and describes three archaeological sites that are producing evidence of human activities starting at the end of the last ice age and continuing until the advent of agriculture. It is well known that humans colonized Central America by at least 10,500 BC, and likely earlier (Chatters et al. 2014; Kennett et al. 2017). Central America formed a bottleneck for humans migrating from North to South America, and given its diverse geology, climate, and tropical resources it is not surprising that people successfully exploited this region throughout the Holocene. We focus this discussion primarily on the context for early humans in southern Belize, but also draw broadly on well-documented archaeological accounts from elsewhere in the region.

Figure 1. Map showing the locations of the three preceramic sites located in southern Belize as well as better known Classic Period Maya centers. The central topographic feature in the region is the Maya Mountains, which are not as well-known as the more accessible foothills sites.

Introduction

Humans have been active agents in southern Belize throughout the Holocene. Their presence dates back to the initial colonization of the New World. The first Mesoamericans arrived in the region 10 millennia prior to the development of urban populations, and some of them settled in southern Belize. The earliest known communities in southern Belize are Ek Xux located in the Maya Mountains, Uxbenká in the foothills (Prufer et al 2017), and small coastal trading communities (McKillop 1996), with the earliest occupations in the Late Preclassic. Other centers did not develop until the end of the Early Classic period ca. AD 400 (Nimli Punit, Pusilhá and Quebrada de Oro) or the Late Classic ca. AD 700 (Lubaantun, Xnaheb, Muklebal Tzul, and a host of smaller centers). By AD 750 there were at least 40 centers with public architecture in southern Belize, with largely independent rulers and significant populations dispersed across the agriculturally rich hills and valleys.

However, a growing body of research suggests that human presence in the region is much older and that the cultural adaptations in the Classic Period built on the strategies used by people throughout the Holocene. Below we provide background for the physical and climate context of the arrival of humans into the region, and preliminary results of work in several rockshelters in southern Belize that are expanding our knowledge of the first people to arrive in Central America.

Geographical Setting for Southern Belize

Southern Belize (Figure 1) is a geographically distinct region in Central America with a diverse set of geological and biotic resources that has facilitated a 13,000-year history of human occupation. Physically, the region is circumscribed by the Maya Mountains to the west, a series of swampy bajos to the south along the Temash and Mojo rivers, the Caribbean Sea to the east and inhospitable pine-barrens to the north. It is one of the wettest places in the Americas, receiving over 4000 mm of rainfall annually, more than double the precipitation of the Petén and seven times as much as the northern Yucatan Peninsula (Douglas et al. 2015). It is also a seasonal desert (Haug et al. 2003) where for several months each year there is little-to-no rainfall and evaporation exceeds precipitation.
Geologically, the region is complex. The central topographic feature, the Maya Mountains, were formed by Devonian sub-aerial volcanic activity characterized by lava flows, pyroclastic activity and volcanoclastics, some locally altered hydrothermally, and by the Pennsylvanian-Permian Santa Rosa Group of argillaceous and arenaceous sediments and carbonates. The eastern slope, bounding the Bladen River, is aproned by Tertiary and Cretaceous limestones of the Coban Formation (Petersen et al. 2012). Combined with high precipitation during the quaternary the result is a hydrologically carved network of caves and cockpit karst overlaying earlier volcanics that have been central to the lives of all people who have lived in these landscapes. The interior valleys of the Maya Mountains also have a complex geological history. The upper reaches of many tributaries have volcanic and metamorphic float, and soil pedogenesis in the alluvial valleys incorporates sedimentary as well as volcanic materials, making them a rich agricultural landscape, often surrounded by near vertical mountains hosting different biotic communities and productive potentials (Dunham and Prufer 1998).

The foothills region, which was home to many of the Classic Period centers as well as most of the modern Maya speaking agricultural villages, has a different geological history. Known as the Toledo Formation (or the Toledo Uplands), these rolling hills are composed of Late Cretaceous-Early Tertiary turbidite conglomerates with interbedded sandstones, mudstones, volcanics, and volcanoclastics, with sediments likely originating from the Coban volcanic arc migration (Cornec 1986). In some portions of the Toledo formation, particularly near several major Classic Period centers (Uxbenká, Lubaantun, and Nim Li Punit), hilltops are dominated by soft interbedded tertiary bedrock exposed through weathering and human mediated agricultural clearing. When cleared of vegetation as part of an agricultural cycle pedogenesis is rapid, with calcareous sandstone and mudstone breaking down rapidly (over a scale of weeks to months) as it is exposed to temperature and moisture differentials and rootlet activity (Culleton 2012). The result is an almost renewable source of high quality soils for farming and there is little need to engage in landscape intensification techniques like terracing to conserve soils (Prufer et al. 2015).

Interspersed across this hilly landscape are massive karst ridges rising over 250 m above the Toledo Formation. These limestone remnants are late Tertiary – early Cretaceous La Cumbre carbonate megabreccias (Cornec 1986), possibly formed during the collapse of the platform paleoscarp immediately following the KT-boundary Chicxulub impact event (Bralower, Paull, and Leckie 1998). The coastline and pineforest to the north are quaternary in age and are composed of chert/quartz terraces as well as alluvial river terraces and sand bars. Pleistocene and Holocene karstification of the Cretaceous-Tertiary limestones have produced some of the key features used by humans as they colonized and modified these landscapes in southern Belize. These include the rockshelters occupied during the Paleoamerican and Archaic periods and the incredible subterranean cave landscape that formed a key component of the Mesoamerican worldview (Prufer and Brady 2005).

Climate Setting for Southern Belize

The climate context provides a critical framework for understanding past cultural adaptations (Figure 2). Annual rainfall in southern Maya lowlands is primarily controlled by the seasonal migration of the inter-tropical convergence zone (ITCZ) with marked meridional contrast (Haug et al. 2001), whereby southern Belize receives considerable rainfall each year, often in excess of 4,000 mm (Ridley et al. 2015). Mean annual temperature is approximately 26 degrees C. During the winter dry season (February-May) evaporation frequently exceeds precipitation. Given its location relative to the equator, at the northern margin of the annual ITCZ migration, southern Belize is sensitive to even small variations in the mean position of the ITCZ and its rainfall distribution (Lechleitner et al. 2017; Ridley et al. 2015). Other climate modulators that play significant roles in the precipitation variability of the region include changes in the strength of the North Atlantic high and variability in El Nino–Southern Oscillation (ENSO). High sea level
pressures (SLP) in the North Atlantic High lead to stronger trade winds. This results in cooler than normal sea surface temperatures (SST) and reduced Caribbean basin precipitation that has decadal scale variability through the North Atlantic Oscillation (NAO, Proctor et al. 2000). This variability is clearly exhibited in our records covering the past 2000 years (Lechleitner et al. 2017; Smirnov et al. 2017). At shorter timescales, ENSO exerts strong inter-annual precipitation variability in the Central American tropics, establishing a zonal seesaw SLP and SST pattern across the eastern Pacific and western Atlantic region. The result is that during ENSO+ (lower SLP and higher SST) periods it is usually dryer and warmer along the Central American coastline during the rainy season (Zhu et al. 2012), resulting in drought conditions on severe but short time scales.

Paleoclimate data strongly suggest that climate conditions are significantly different today than when the first humans arrived in the region. The Cariaco shallow marine record off the coast of Venezuela (Peterson et al. 2000; Haug et al. 2001) provides a proxy for changes in the position of the ITCZ. The Cariaco reflectance and Ti concentration data suggest that the climate context for the first human movements into the neotropics was during a period that was dryer (Haug et al. 2001) and cooler (Grauel et al. 2016) than conditions during the Holocene. Shallow lake records from Petén (Escobar et al. 2012) also show a dry Late Pleistocene to Younger Dryas interval. This is supported by numerous studies in lower Central America and tropical South America (Piperno 2011a; Piperno and Jones 2003).

Two rainfall reconstruction records provide a general paleoclimate backdrop for the Late Pleistocene, and there is one continuous record through the Holocene, though it cannot be considered a “local” record but rather a more general indication of low latitude rainfall patterns in the sub-tropical Americas (Figure 2). The Cariaco Basin Ti (Haug et al. 2001) concentration data reflect hydrologic changes in the Orinoco River drainage basin of the northern coast of South America. These result from shifts in the position of the ITCZ driven by insolation variability. The other common feature is a shift towards wetter conditions during the early Holocene and then a trend toward drier conditions, especially the Cariaco Ti record, later in the Holocene related to insolation variability.
changes in the strength of the regional monsoon. This record is relevant for understanding changes in rainfall distributions in the late Pleistocene through late Holocene and is the longest continuously resolved ITCZ record for the New World. The Juxtalahuaca δ¹⁸O speleothem record (Lachniet et al. 2013) from Central Mexico is a bit closer to southern Belize and is one of the few records of the North American Monsoon covering parts of the late Pleistocene and Younger Dryas. Although it is discontinuous, it shows general agreement with the Cariaco ITCZ reconstruction as being drier prior to 10,000 BC, reflecting broad hemispheric trends of low latitude paleoclimate.

Mesoamerican Foragers before agriculture

The initial New World colonists that arrived in Central America by at least 12,500 BC (Braje et al. 2017) encountered a very different, and far less tropical, environment than today. At that time the landscape was comprised of “heterogeneous, even patchy, vegetation across small distance scales; and stretches of forest alongside water courses in regions where forests were significantly reduced” (Piperno 2006:286). Pollen and macrofossil plant data suggest the structure of forests may have already been tropical, but the distribution of these was less than in the modern climate regime and vegetation was more diverse than simple Pleistocene grassland/Holocene forest dichotomies would suggest (Piperno 2011a). Confronted with a greater diversity of large mammals and a wider range of riparian forest and grasslands humans would have initially adapted to ecosystems that were far different than today. By 9,000 BC conditions were becoming wetter and warmer and, in the Petén, there is evidence that closed canopy forests were undergoing anthropogenic burning (Renssen et al. 2009; Anderson and Wahl 2015) with mixed herbaceous and woody plants being represented in charcoal records. Pre-agricultural burning peaks between 6,000 and 4,000 BC (Schüpbach et al. 2015) during the Holocene Thermal Maximum, arguably the warmest and wettest period of the Holocene (Renssen et al. 2009), and likely reflects increased anthropogenic burning. After 8,500 BC the abundance of higher-ranked plant and animal resources declined as rainforest overtook many Pleistocene open areas where game would have fed on scrub and grasses (Piperno and Pearsall 1998).

The Paleoamerican Period (> 13,500 BC – 7,000 BC) is the least understood period in the Maya region. Initial colonists into the New World arrived in North America prior to 13,500 BC, spreading rapidly along the Pacific coast, and reaching southern Chile by 13,000 years ago (Braje et al. 2017; Dillehay et al. 2017). This rapid southward migration was accompanied by significant eastward movements in North America, evidence of which has recently emerged in Florida and Montana (Halligan et al. 2016; Rasmussen et al. 2014). The now well documented early colonization of tropical South America, perhaps as early as 12,500 BC (Brandini et al. 2017; Suárez 2017) necessitated the movement of people through middle and lower Central America. Human presence has been well documented in Panama (Ranere and Cooke 1991) and Costa Rica (Swauger and Mayer-Oakes 1952; Snarskis 1979), Nicaragua (Waters 1985), Honduras (Kennett et al. 2017; Scheffler et al. 2012a), and Highland Guatemala (Brown 1980; Gruhn et al. 1977).

In Mesoamerica, drier conditions to the north of the tropical Maya lowlands have facilitated the identification of Paleoamerican surface sites, including locales in central, west, and north Mexico (Ochoa 2012; Gonzalez et al. 2015; Sanchez and Carpenter 2012). In the Maya Lowlands, with high precipitation and extensive tropical foliage, fewer surface sites have been identified and almost no stratified sites are known. One exception is El Gigante rockshelter (Kennett et al. 2017; Scheffler et al. 2012a), a large rockshelter in western Honduras on the periphery of the Maya Lowlands. There, stratified deposits document occupation from 7,000-9,000 cal BC, and include well preserved macrobotanical remains as well as evidence of hunting and food preparation. In the northern Yucatan peninsula, a near-complete human skeleton was found with extinct fauna in a submerged cave (Chatters et al. 2014). The minimum age of this skeletal material is 10,000 BC based on U-series dates of small calcite florets that had precipitated on bone before the skeleton was submerged by rising sea and ground water levels. Those dates are supported
by an abundance of Pleistocene faunal remains also found in the submerged chamber.

The Archaic Period is better documented, particularly outside of the Maya area in central and western Mexico, where studies have examined the origins of agriculture, diet changes in coastal settlements, and the emergence of social complexity (Flannery 2002; Kennett et al. 2010; Leslie 2011; MacNeish and Nelken-Terner 1983; Rosenswig 2014; Rosenswig et al. 2015; Smith 1997; Voorhies et al. 2002). In the arid regions of northern Mexico, where ground visibility and site detection is not hampered by dense tropical vegetation, there is a long history of research into Archaic Period adaptations (Guadalupe and Carpenter 2012). In the tropical Maya region however, far less is known about tropical adaptations during this time (Kennett et al. 2010). Recent studies suggest a gradual adoption of domesticated plants by 4,000 BC (Rosenswig et al. 2014), although in the Soconusco full-scale maize agriculture may not have been adopted before 1,000 BC (Rosenswig et al. 2015) even though sedentary agricultural communities are present by 1,500 BC. Between 8,000 – 3,000 BC the gradual processes of plant domestication were underway in Central America with evidence for human cultivation of native crops including maize (Zea), manioc (Manihot), arrowroot (Maranta), and yams (Dioscorea) in parallel with the exploitation of wild resources by transitional hunter gatherers (Greaves and Kramer 2014; Piperno 2011b). Recent studies have also emphasized the importance of the transition to the Archaic as a time of mixed and flexible subsistence economies, as evidenced by a broad range of wild plant foods and early domesticates at El Gigante rockshelter in Honduras (Scheffler et al. 2012b; Kennett et al. 2017).

As noted by Rosenswig (2014:142) the “spotty nature of Archaic-age archaeological data from Mesoamerica means that what we know is likely not representative of the range of peoples and the variety of adaptations that existed across the region” particularly the broadleaf forests of the tropical Maya lowlands, and especially for the Early Archaic (8,000-5,000 BC). A wide range of cultural changes occurred during the Archaic, with a general trend towards increased reliance on plants as a source of food and changing environmental conditions that may have favored plant tending and agriculture. Thus, social changes were likely mediated by subsistence changes, and these were driven by demographic pressure, environmental change, and socioeconomic competition (Winterhalder and Kennett 2006). The period from 8,000 to 6,000 BC is generally considered to have been wetter and warmer, prior to a drier interval lasting until 3,500 BC (Mueller et al. 2009). This suggests that the transition to agriculture spanned several phases of significant climate and environmental change with the relationships between them poorly constrained.

**Preceramic Foragers in Southern Belize**

Three sites largely define what we know about the preceramic foragers in southern Belize. All three are rockshelters. All three are located near to permanent sources of water, and all three have evidence of food processing, tool making and tool use, and mortuary activities (Figure 1). Here, work at these shelters is summarized and in future volumes of the RRBA we will present more detailed accounts of the data analysis and interpretation.

Mayahak Cab Pek and Saki Tzul are two large rockshelters located in an interior valley of the Maya Mountains in the Bladen Nature Reserve (BNR), a protected wilderness area where there has been minimal human disturbance of archaeological sites. These rockshelters are located over 30km from the nearest modern settlements. Their remoteness along with the protected status of the BNR (access to the Nature Reserve is limited to only scientific researchers with required permits) has greatly facilitated preservation of the archaeological record.

Both rockshelters were first investigated in 1998 by the Maya Mountains Archaeological Project (MMAP). At that time, shallow excavations at both sites produced shallow burials (Figure 3), abundant faunal remains, evidence of stone tool production, and were thought to be local mortuary sites used by residents of two nearby Classic Period sites, Ek Xux and Muklebal Tzul (Saul et al. 2005; Dunham and Prüfer 1998). The 1998 excavations at both rockshelters were
Figure 3. Photo of Prufer and archaeologist David Goldstein in excavation Unit 34/35 in 1998. This Protoclassic burial was generally the deepest level reached prior to the start of the BPAAP.

Constrained by a short field season and were limited to the top 100 cm of sediments and did not penetrate below ceramic levels (Prufer 2002).

From 2014 to 2017 the Bladen Paleoindian and Archaic Archaeological Project has revisited both sites and conducted more extensive excavation. Both rockshelters have deep deposits of cultural materials dating to the period prior to 10,000 BC (Figure 4) and continuing through the Classic Maya collapse at ca. AD 800-1000. Though the two rockshelters are located 1.4km apart, both have similar stratigraphic sequences and contain similar assemblages of artifacts and biological remains dating to the late Pleistocene. Both rockshelters have dry sediments and large overhangs, reflecting that little if any direct rainfall affects their contexts. Sediment formation differs significantly from surface sites in that water transport is not a major contributing factor. Sediments are deposited as a result of microbial and physical breakdown of the limestone cliff, wind-blown pollens and plant materials, animal activity, and anthropogenic activities, with the bulk of the Holocene deposits likely resulting from the latter. The dry aeolian nature of the rockshelters also helps to explain the excellent preservation of unburned bone, other organic materials and the very minor presence of root activity in a tropical environment (Figure 5).

Mayhak Cab Pek is an east facing shelter with approximately 160 m² sheltered, while Saki Tzul has a south aspect and has approximately 890 m² sheltered. Both have approximately 3.5 m of deposits that primarily consist of midden fill replete with faunal bone, carbonized plant
Figure 5. Profiles drawings from both Maya Hak Cab Pek and Saki Tzul showing similar stratigraphic sequences and across all times period.

The excavations at Mayahak Cab Pek and Saki Tzul complements previous work we conducted in the Rio Blanco Valley, near to the Classic Period center Uxbenka. There, excavations in the small rockshelter Tzib te Yux from 2012-2015 documented an Archaic to Paleoindian chronology and cultural materials dating to before 10,500 BC (Prufer et al. 2017). Combined with geomorphological testing we have evidence of an occupation lasting well over 10,000 years in that small interior valley. Unfortunately, the record from Tzub Te Yux is truncated and the top 5000-6500 years were removed, likely as an effort mining the jute shell middens by residents of the Classic Period center.

Combined, these three records suggest strongly that the signal of pre-ceramic human activity is well preserved in some rockshelter deposits that are not affected by fluvial or erosion. It also indicates that there can be excellent preservation of some organic materials, primarily bone and carbonized plant materials. With ongoing analytical research, we will present more detailed interpretations of these shelters in future RRBA publications.

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23 PLASTERED: CAVE CONSTRUCTIONS AT LAS CUEVAS

Erin E. Ray, Holley Moyes, and Linda Howie

The ancient Maya site of Las Cuevas, in Western Belize features a cave system that runs beneath the main plaza. Investigations by the Las Cuevas Archaeological Reconnaissance project suggest that the site functioned as a Late Classic ritual pilgrimage venue and that the cave was used for large public centrally-organized performances. The cathedral-like cave entrance contains monumental architecture consisting of at least 76 plastered platforms. We expect that the level of managerial oversight should be correlated with the consistency of building materials employed in their construction. Plasters from both cave and surface contexts were analyzed using geochemical methods including XRF (pXRF), XRD, SEM-EDS and FTIR to examine their chemical composition. Results demonstrate considerable variation in plaster recipes in the cave and on the surface.

Introduction

Las Cuevas, a small to midsized site, is located in the Chiquibul Forest Reserve in the Cayo District of Western Belize. It lies north of the Maya Mountains and west of the Vaca Plateau 14 km southeast of the larger Caracol polity (Figure 1). The site was first investigated in 1957 by then commissioner of the Department of Archaeology A.H. Anderson and Adrian Digby from the British Museum (Digby 1958)) and more recently by the Las Cuevas Archaeological Reconnaissance project (LCAR) under the direction of Dr. Holley Moyes.

Las Cuevas consists of 26 structures that include temples, a palace, long linear constructions, and a ballcourt. The structures are organized on an east/west axis facing two plazas A and B. The layout encircles a dry sinkhole leading to the entrance of an extensive cave system (Figure 2). Based on five field seasons of chronology building through excavation and test pitting (Kosakowsky et al. 2013; Moyes et al. 2012; Moyes et al. 2015), 25 AMS dates suggest that the surface constructions occurred in the later part of the Late Classic period between AD 640-985 at the 2-sigma range. Ceramic cross-dating places all building phases at the site into the later part of the Late Classic period (Tepeu 2/ Spanish Lookout 2), which agrees well with the radiocarbon dates. Temple I, the eastern structure of Plaza A was constructed in 4 phases, but all appear to date to this time period based on their ceramic chronology (Kosakowsky 2012, 2013, Kosakowsky et al. 2013). A small ceramic deposit located below the platform upon which the ballcourt sits suggests that people were present in the area as early as the Late Preclassic (250 BC - AD 250), though no formal constructions or evidence of cave use date to this earlier period.

Despite its proximity to the colossal site of Caracol (14 km to the southeast), Las Cuevas bears little resemblance to its neighbour and no evidence uncovered thus far demonstrates any formal relationships between the two (Kosakowsky 2013; Moyes et al. 2015). Rather, Kosakowsky argues that the ceramics found at the site represent a number of ceramic spheres with styles from the Peten, Belize Valley, and Southern Belize. As Moyes and her colleagues have argued elsewhere (Moyes 2012, 2015,
Kosakowsky et al. (2013), Las Cuevas likely functioned as a Late Classic pilgrimage site. It is likely that the cave was first utilized in the early part of the Late Classic period, prior to the construction of the surface components of the site (Moyes et al. 2017).

The cave system at Las Cuevas consists of ten chambers (Moyes 2011, 2012, 2015). The Entrance Chamber is massive, measuring approximately 105 meters in length and 40 meters in width. At the rear of the Entrance Chamber a constructed wall with a small doorway that occludes the opening to the tunnel system (Figure 3). The 315 m tunnel system winds through a series of small constructed walls and blockages culminating at Chamber 8, which terminates at a small window overlooking the entrance chamber approximately eight meters above the ground surface of the cave (Moyes 2012).

In the center of the Entrance Chamber is a cenote lined with a cut stone block retaining wall that descends to an underground river, which surfaces at its base. The water level rises and falls with heavy rains. The chamber is heavily modified with monumental architectural constructions including terraces, retaining walls, stairs, and platforms that are topped with layers of thick plaster. The project mapped and recorded 76 plastered platforms, seven staircases and three sets of terraces thus far, though is likely that additional platforms are located beneath the chamber’s muddy floor in the northern areas. Terraces are at the cave entrance and within the cenote itself. Though they are in poor condition, some plaster was noted on terraces near the southwest corner of the cave mouth (Ray 2018) and thick plaster still covers the stairways as well. Platforms are arranged in clusters that are interconnected via staircases to facilitate navigation between individual platforms and platform complexes. Some complexes consisted of several tiers, reminiscent of a wedding cake, with the largest tier at the bottom and one to two smaller platforms on top usually built against the cave wall. It is currently unclear if these were built in a single phase, though replastering occurred on some platforms as evidenced by visible separations between burned and stained floors such as on Platform 42 (Figure 4). Preliminary radiocarbon dates from the platforms have dated constructions between AD 670 - AD 950.

These large-scale constructions suggest that the cave was used for well-organized ceremonies that could be viewed by many observers supporting a large number of participants. Based on their spatial areas, 200-500 people could have been easily accommodated either sitting or standing on the platforms (Moyes et al. 2015:243). Based on the size and scale of the constructions, Moyes and her colleagues argued that this massive performance space was created and maintained for the benefit of elites, sub-elites, and possibly their retinues (Moyes et al. 2015: 246).

Structure 1 is an 11 m tall eastern temple in Plaza A that is positioned directly above the cave entrance. Based on the number of plaster floors present, Structure 1 was built in at least four construction phases as indicated by four plastered floors (Carpenter 2013; Robinson 2012). The structure was constructed using dry-laid fill and contained very few ceramic artifacts. Those that were present date to the late facet of the Late Classic (700-900AD) (Kosakowsky 2012; Kosakowsky 2013). The floors were underlain by small cobbles to create smooth surfaces to accommodate the plasters (Carpenter 2013; Robinson 2012).

Methods
Of the 76 platforms located in the Entrance Chamber of the cave at Las Cuevas, 16 platforms were selected for at least one type of geochemical analysis and 8 were swept and
Figures 3 and 4. Map of the Entrance Chamber. Note the walled construction at the rear of the entrance chamber.

Figures 3 and 4. Evidence of multiple plastering episodes from Platform 42.

Additional, those with multiple plastering episodes and clear edges were targeted. Excavation and clearing (sweeping) of the platforms yielded artifacts, including jute (*Pachychilus* sp., freshwater gastropod), animal bone, potsherds, and obsidian blades. Samples were also taken from each of the four construction phases from Structure 1 in Plaza A. Samples were removed using a hammer and trowel and wrapped with foil to retain shape and orientation for transport to the lab.

All of the methods utilized provide different yet complementary results. Portable X-ray fluorescence or pXRF was used to identify both light and heavy elements on the plaster surface and subsurface. A Fourier Transform Infrared Spectrometer, or FTIR, was used to determine the structure of the elements on the surface. This method of analysis allows researchers to obtain information about crystalline and amorphous materials as well as
organic materials. FTIR was used in conjunction with the pXRF data in order to get the “big-picture” view of the chemical composition of the plaster surface. A Bruker Tracer III-V handheld XRF and a Bruker Alpha Diamond-ATR FTIR on loan from California State University, Long Beach courtesy of Dr. Hector Neff was used for analysis. An X-Ray Diffractometer in the Imaging and Microscopy Lab at UC Merced was used to specifically identify the crystalline compounds present in the plaster matrix. Visual identification at a larger scale (microscopical analysis) and small scale (electron microscopy) of binders, aggregates, particle size, and surface treatments round out the analysis of the plaster matrix and recipes.

In situ pXRF analysis was performed on Platforms 14, 29, 59, 60, and 61 using the Bruker Tracer Handheld pXRF. All of these samples were run on high energy and Platform 14 was also run on low energy following the same specifications listed below. Running the samples at low energy provides information about light elements (Mg to Cl). Physical samples were collected from each intersection from the platforms, with assistance from Andrew Neff, Daniel Neff and Hector Neff. These samples were brought back to the field lab and were homogenized and analyzed on both high and low energy. Bulk samples were collected from platforms 4, 5, 26, 30, 32, and 48 and brought back to UC Merced for high energy analysis with a Bruker Tracer handheld pXRF. The high energy was run using a green filter at 40 kV and 26 µA and the low energy was run using a blue filter at 15 kV and 27 µA with a

Table 1. List of all samples taken for analysis.

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256
vacuum pump. Samples for FTIR from platform 14 were systematically collected in the field and were homogenized and analyzed in the lab.

Preparation for XRD consisted of homogenizing sample using a gate grinder. They were then placed in a sample holder and compacted into the sample holder with a small pestle. This was done to try to ensure that each orientation of crystals found within the sample are represented so that the diffraction can identify each of the orientations making it easier to identify the phases present. Plaster samples from 13 unique contexts were analyzed using XRD. Seven different platforms and one surface structure were examined. The samples were run at 45 KeV and 40 μA using a PANalytical X’Pert Pro Theta. Analysis of the spectra was completed using X’Pert HighScore Plus software with an automated ‘Search & Match’ to identify the different phases, or crystal structures, present in each sample.

The Scanning Electron Microscope was utilized to provide information about the binder and aggregate particle sizes. The particle sizes of the carbonate binders are a reflection of the firing temperatures. Powdered samples from Platforms 14, 31, and 42 were prepared on carbon tape and then sputter coated with gold. Small bulk samples from Platform 14 were selected based on size in order to fit inside the sample area within the SEM. To stabilize small samples, they were attached to carbon tape on an SEM stub. Finally a bedrock sample was placed directly in the sample chamber for SEM-EDS analysis. Powdered plaster samples were run in high vacuum mode using an FEI Quanta 200 ESEM with a tungsten filament. On average vacuum pressure was $10^{-5}$ Torr. Using secondary electrons, the surface morphology of the samples were examined and the particle sizes measured.

Plaster and bedrock samples were sent for petrographic analysis conducted by Dr. Linda Howie. Platforms 14, 26, 29, 30, 42, and 48; stairway 3; terrace 2; and Structure 1 floors 1, 2, and 4 were sent for analysis. Before preparing thin sections, samples were first examined under a stereomicroscope in cross section to document structural, textural, and compositional characteristics. The structural and textural examination looks for the overall homogeneity, presence or absence of voids, microstrata or layers, overall appearance, and possible presence of any surface treatments such as paint. The compositional analysis identifies presence of different carbonate, mineral and organic constituents that occur as particles and rock and mineral clasts through microscopic analysis before and after effervescence as the result of interaction with dilute hydrochloric acid solution. The full petrographic analysis has not been completed so only data from the preliminary report is included here (Howie 2016).

**Results**

Preliminary analysis of plaster samples sent for petrographic analysis demonstrated a high amount of variability. This included differences in the color of clasts present, ranging from pink to green; the presence of yellow, amorphous or gel-like areas which could indicate hydraulic properties; and differences in clast shape, size and composition suggesting variation in aggregates and source material (Howie 2016). Microscopic analysis also
identified several painted surfaces that were not recognized macroscopically in addition to replastering events.

High iron content on Platform 14’s plaster surface was present on large portions of the platform. We initially suspected that this might be due to clay minerals mixed into the plaster matrix. However, analysis of surface and subsurface samples from the same location show a lack of iron subsurface. Additionally, iron content was lower underneath the overhang (Figure 5), suggesting the iron was not part of the plaster fabric, but was deposited through activity on the platform.

FTIR data was interpreted using the comparative data published by the Kimmel Center for Archaeological Science Infrared Standards Library from the Weizmann Institute of Science (2014). As expected, the most predominate material came from the calcite mineral from the calcium carbonate plaster matrix. However, one large peak and several smaller peaks, around the 1050 cm\(^{-1}\) wavelength, were not easily identified (Figure 6). This particular wave number can be related to either phosphates or silicates. Similarly, these peaks were completely absent from subsurface samples suggesting that a different source of the iron had been introduced onto the platform surface.

Though many of the samples produced the same or almost identical XRD spectra, several of the samples from the cave were not homogenous. Two samples showed peaks at 31°, one from the cave (Platform 62) and one from the surface (Structure 1 Floor 2). This indicates the presence of dolomite instead of the normal calcite. Though both are forms of calcium carbonate they are often associated with different source material.

Analysis of the three platforms showed a distinct difference in particle size distribution. Platform 31 had a more varied and larger...
particle size. This is suggestive of a lower firing temperature that would not allow the limestone to slake properly.

Platform 42 exhibited smaller particle sizes but some small variation. Using the bulk sample from Platform 14, crystals of many sizes were examined though again they appeared to be more homogenous in size (Figure 7).

Several points of interest were examined using the EDAX Genesis energy-dispersive x-ray spectrometer though in the bulk plaster sample both the surface and subsurface. On the surface, several pieces of lead and possibly iron and zinc were identified. Though the presence of iron and zinc were already identified in the bulk XRF analysis, lead was a new discovery. The origin of the lead is currently unknown. No lead was found in analysis of bat guanos from Chechem Ha, also located in Western Belize (Moyes 2006). The subsurface of the plaster appears to be homogenously constructed of calcium carbonate. These findings are supported by previous XRF analysis.

Finally EDS was used to analyze a bedrock sample from the surface. The bedrock is likely calcite though further tests should be used to determine the phase since XRD results suggest the presence of dolomite elsewhere (Figure 8a). On the surface of the bedrock, a small titanium sphere was identified (Figure 8b).

Discussion

Results of the FTIR analysis suggest that the peaks at 1050 cm$^{-1}$ wavelength represent a phosphate mineral created through the interaction between phosphoric acid from bat guano and the plaster surface (Ray 2018). As explained by Hutson and Terry (2006), residues can remain imbedded in the plaster in the ‘reactive zone’ just below the surface by migrating there through trampling of the plaster surface. Though in the case of the cave,
trampling is not the only type of post-depositional modification; acidic-bat guano and drip water interacts with the basic calcium carbonate plaster. Therefore, the results suggest that it is a phosphate mineral created through the interaction between phosphoric acid from bat guano and the plaster surface. According to cave research from Romania conducted by Giurgiu and Tămas (2013) and Dumitras and colleagues (2008), hydroxyapatite is the most common phosphate mineral in bat guano deposits especially in drier caves as could be considered the case with the cave at Las Cuevas. Shahack-Gross (2004) and colleagues also acknowledge the prevalence of Fe-rich phosphates in degraded bat guano.

Preliminary petrographic analysis of the plaster surfaces suggests that many of the platforms may have been painted red. Additionally this pigment appears to be of different manufacture, as indicated by differences in color and morphology of particulate material relating to the colorant. So far it is evident on all of the earlier phases (when two construction phases are present). This suggests that either this was an earlier practice that was later abandoned or the presence of the pigment on exposed surfaces has since disintegrated. It is likely to be the latter and the iron on exposed surfaces associated with the phosphates derives from these pigments. The petrographic analysis proved to be the most useful in identifying the variability of the plaster recipes.

pXRF and FTIR data did not identify any differences between the plasters. Chemically the plasters are all very similar and the high carbonate content masked some of the variability. However, XRD analysis demonstrated variation in carbonate phases meaning that different source material was utilized for cave and surface constructions. Although the petrographic analysis is not yet complete, preliminary results from the thin sections, suggest that multiple types of carbonate rock and carbonate-rock derived materials were used in the plaster recipes. While this is supported by other evidence from the XRD analysis this new data demonstrates that multiple carbonate-rock-derived ingredients were used within one batch of plaster perhaps suggesting the use of specific kinds of carbonate rock that produce hydraulic properties. Finally, the observed variation in overall textural and compositional characteristics as well as the size, quantity and composition of clasts and aggregates reveal the differences in plaster recipes.

At the site of Copan Abrams and Rue (1988) analyze deforestation in the context of the Late and Terminal Classic in the site core. They argue that the main driver of deforestation was the acquisition of wood for domestic use (i.e. cooking hearths in the home) and that the wood used for plaster construction and building domestic structures and clearing for residence and agriculture was negligible. Using estimates of labor and wood use for the construction of the extent of the Late Classic site core, and an estimate of total available wood, they argue that ultimately the Copan landscape was not sufficient to satisfy the needs of the population. What this doesn’t take into account though is the pine used for ritual contexts or plaster used to cover large plazas. At Chan, pine was most commonly found in ritual contexts (Lentz et al. 2012). Also their argument against plaster production uses a model in which they split the production of plaster into a 50 year cycle but this may not be that simple. If they are trying to plaster one temple or large public works over a very short period this large-scale event may prove to have even more detrimental effects on the overall forest. Also what this neglects to demonstrate is the change through time from the Early Classic into the Late Classic. It has been noted elsewhere that during the later construction phases plaster became thinner thus suggesting a mitigation of resources (McNeil et al. 2009). Neither does this account for plaza plaster which may have been thicker than on the surface of the temple as it is repeatedly used and walked on. Other sites see a switch to sascab as a way to preserve resources (Villaseñor 2009).

At Las Cuevas a change in firing temperature could produce the variation in particle sizes present in the plaster (Ray 2018). Particle sizes can be quickly and accurately measured using a laser scattering technique and a powdered sample. Future work will employ this technique to definitively measure
differences in particle size distribution amongst the samples.

The identification of many unique plaster recipes at the site was an unusual and unexpected find. The bedrock that has been examined near the cave and the calcium carbonate that has been analyzed thus far from the cave has all been calcite rather than dolomite. This suggests that some of the source material, at least at some point in time was coming from elsewhere. It could be that these materials were found in a nearby outcrop that was used for building materials elsewhere at the site core, especially since the cut stones used in Plaza A are visually distinct from the underlying bedrock.

Geologic maps of the country are not highly resolved. We would expect to see homogeneity in raw material based on the assumption of local procurement. Though it is likely that procurement was still local, the results of the microscopic and XRD analyses suggest variation in the landscape. Geological survey of the area around Las Cuevas began in the 2017 field season which confirms this variability. The variation that has been identified is likely the result of small batches of plaster (Ray 2018).

There are a number of competing explanations for this finding. Moyes et al. (2015) argued that the cave was constructed by and for elite use which should produce consistently similar plaster recipes, which suggests a conscripted labor force. However, these results may not support this model. Although it is obvious based on the organization of the constructions in the cave that the architectural modifications were planned and that some sort of centralized authority oversaw platform and plaster manufacture, work groups may have been cooperative rather than conscripted. This is not at odds with other examples of ritual constructions such as the construction of European cathedrals that were labors of devotion and civic pride using voluntary labor.

However it is also possible that the sampling strategy employed for this project may have masked some of the similarities in plaster recipes if the architecture was built up in sections. Additionally, although our chronologies are quite good for archaeological timeframes, it is possible that the platforms were built as an accretionary process over time. This would easily account for differences in plaster recipes.

To summarize the variations in plaster recipes and source material from these data could be the result of:
1. small workgroups bringing in different material from the local area. Plaster could be created either as a type of offering or as individual contribution to the religious project.
2. accretionary building practices. There could be considerable variation between clusters rather than within clusters that our sampling strategy would not have identified.

**Conclusion**

Las Cuevas was only occupied for a short time during the Late to Terminal Classic Period (AD 750- AD 850). It was a politically tumultuous period for the ancient Maya across the lowlands and the elite were losing power and control at many Classic Period sites. The scale and organization of the constructions despite the variation in plaster recipes suggest a centrally organized design.

Because there is a clear organization to these constructions it seems unlikely that it was the result of individuals building their own platforms. The most parsimonious explanation for the variability in plaster recipes as well as evidence of multiple construction phases for individual platforms is that the architecture was augmented over time. Structure I consisted of at least four construction phases, the project obtained only relative dates for the floors based on the stratigraphy alone as the ceramic materials could not be further refined other than to say they dated to the late facet of the Late Classic Period. Except for the dolomitic source material, none of these recipes seem to match with recipes from the cave. It is possible that the cave and the surface site were constructed at different times. Alternatively cooperative or lineage groups may have supplied the labor and construction efforts necessary to erect the massive temples and complex network of platforms in the cave contributing their own source materials from the site’s periphery. This could account for variation in the source
materials. Further research should involve mapping variation of limestone sources in the local landscape and could help to sort this out.

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CONTINGENT MULTI-CRAFTING, SURPLUS HOUSEHOLD PRODUCTION, AND THE MAYA QUEST FOR SALT

Heather McKillop

Addressing the location of residences for ancient Maya craft workers is important in order to evaluate the organization and control of production of commodities with restricted distribution but wide appeal, such as obsidian, chert, and salt. Wooden buildings at the Paynes Creek Salt Works include salt kitchens, where brine was evaporated in pots over fires to make salt. Similar salt kitchens also were likely used at other salt works along the coast of Belize and Pacific coast of Guatemala that have briquetage but lack preserved wood. Stone architecture associated with some Yucatecan coastal salt works and with Salinas de los Nueve Cerros beside an inland salt spring in Guatemala suggest elite control or oversight of production. Spatial patterning of wooden architecture and artifacts at Site 7, the largest of the Paynes Creek Salt Works, suggests some of the buildings were used for multi-crafting or as residences, perhaps by elites.

Introduction

From at least the Late Preclassic period, the Maya sought sources of salt, a commodity that was biologically necessary, but also valued for preserving fish and meat, tanning skins, enhancing the flavor of food, and for medicinal and other uses. Paleoindian and Archaic people obtained enough dietary salt from hunting wild animals. The quest for salt began with increasing reliance on domesticated plant foods, especially carbohydrate-rich corn which was the dietary foundation that supported large sedentary populations throughout the Maya area. This pattern is mirrored in other areas world-wide where staple carbohydrates deficient in salt underwrote large populations and the rise of civilizations (McKillop n.d.). In the Maya area, salt was obtained from solar evaporation along the arid coasts of the Yucatan and by evaporation in pots over fires along the coast of Belize, Pacific coast of Guatemala, and at inland salt springs. Household production of salt and other commodities for personal use works with communities located near sources of salt water. The restricted distribution of salty water in the Maya area required strategies for those not near salty water to acquire salt (Figure 1; McKillop 2005a).

By the Classic period, even small communities such as Ceren, El Salvador, had household specialization in different commodities for marketplace trade in several other communities (Sheets et al. 2015): Householders produced surplus commodities in the course of regular subsistence and home maintenance. Surplus household production took place within the home or at varying distances from the home. In some cases, there were workshops at the source of resources with a restricted distribution for the extraction or production of the resource, including salt, high-quality chert, jadeite, and obsidian. The high-quality outcrops of chert in northern Belize were exploited from the Middle Preclassic to the...
Early Postclassic at Colha (Shafer and Hester 1983) by surplus household production of stone tools and tool blanks. Jadeite was extracted from outcrops along the Motagua River by non-elites (Rochette 2009). Obsidian was quarried from outcrops in the volcanic highlands of Mexico, Guatemala, and Honduras and shaped into macrocores for trade.

Household production often included multi-crafting—production of a variety of crafts, and sometimes included contingent, multi-crafting—production that required additional tasks (Hirth 1998). Householders were accustomed to multi-tasking in their daily lives in house construction, from extraction and transportation of wood and leaf for pole-and-thatch structures, to procurement of temper and clay for making pots, and production of farming implements. Contingent, multi-crafting is an extension of subsistence activities: Inland trade of salted fish required fishing or otherwise acquiring the fish, as well as sun-drying or salting the fish. Salt-drying fish required making or otherwise acquiring salt. Both sun-drying and salt-drying fish required outdoor or indoor racks.

Chert, jadeite, and obsidian objects were available in marketplaces at lowland cities and towns (Chase et al. 2015). In some cases, householders brought their goods and resources for trade at marketplaces in various communities. Sometimes traders transported commodities greater distances. Coastal trading ports such as Moho Cay (McKillop 2004), Wild Cane Cay (McKillop 2005b), Isla Cerritos (Andrews et al. 1989), and Xcambo (Sosa et al. 2014) as well as inland ports such as Cancuen (Demarest et al. 2014) provided safe harbor, accommodations, and warehousing. They also added maritime and other commodities, such as salt, stingray spines, and salted fish, or further manufacturing, such as jadeite at Cancuen (McKillop 2007, n.d.).

In this paper I evaluate the conditions and significance of extraction and production of restricted resources carried out as part of household production. In some cases, extraction and production of restricted resources was carried out as part of surplus household production at home. In other cases, surplus household production was spatially segregated from homes. Independent factory or attached specialization for the state are situations in which the extraction and production of restricted resources was not directly tied to household production. With household and surplus household production, labor is controlled by the householders. In contrast, labor is controlled by factory owners. State control of corvée labor for public works removes both the worker and control of labor from the household. Attached specialization to produce commodities for the state at the Maya city of Aguateca consisted of elite household production where highly-trained specialists produced goods for the royal court, but also some goods they produced and traded themselves (Inomata 2001).

Surplus household production is carried out in catchment zones that vary by the localized abundance of resources. Some resources are seasonally abundant, such as deer, manatee, and green sea turtles. Other resources are naturally restricted in distribution, such as obsidian, chert, and jadeite. Some resources are suitable for extraction or production in specific conditions, including chocolate, cotton, and scarlet macaws. There are limits to daily travel to extract and produce commodities, with distances significantly greater by boat than by land.

Modern salt makers live near their salt kitchens or salt pans, either year-round or seasonally. At Sacapulas, Guatemala, up to 30 salt kitchens are located near a salt spring, with the homes located farther back. Production takes place year-round, although most production is carried out in the dry season when the salt spring is accessible (Reina and Monaghan 1981). On the southeast coast of China in Shandong Province, salt works were located along the coast, with residences located farther back (Flad 2013). State-sponsored overseers were located still farther back. In central Mexico, salt works were located a few km from the salt workers’ residences. Residences were suspected of being nearby Zhongba, a large salt works flooded by the Three Gorges Dam in China (Flad 2011). Northern River Lagoon was a village and trading port where salt was produced to salt fish for inland trade (Masson and Mock 2004: 372-373).
dry season to the coast to make salt, setting up temporary homes (Williams 2003).

The Paynes Creek Salt Works
The Paynes Creek Salt Works include 110 sites over a five square km area in a salt-water lagoon system on the south coast of Belize, north of the modern town of Punta Gorda (Figure 2; McKillop 2005a, n.d.). During the dry season, the shallow lagoon system becomes a natural solar evaporation pond, concentrating the salinity, thereby reducing the time for evaporating brine in pots over fires to make salt, as compared with the open sea. Furthermore, less wood fuel is needed. As indicated by excavations at two sites with earthen mounds that are not underwater, the salt water was poured through salty soil to enrich the salt content before the evaporation process (Watson et al. 2013). The canoe excavated at the Eleanor Betty site was held in place by stakes and had a pottery funnel below (McKillop et al. 2014). Sediment chemistry research at Chan bi’ (Site 24) suggests that salty red mangrove peat may have been cut from the seafloor or land (Sills et al. 2016). Pouring brine through salty soil is documented in historic times at Sacapulas, in the highlands of Guatemala (Reina and Monaghan 1981), in West Mexico (Williams 2003), and elsewhere. With the preservation of wooden buildings, a canoe, and abundant briquetage not subject to breakage from trampling after the sites were abandoned, the Paynes Creek Salt Works are a model for salt production elsewhere along the coast of Belize.

Transect excavations along the interior walls of salt kitchens at 10 sites revealed high percentages of briquetage, from 90-98%, indicating that salt production was the main activity (McKillop n.d.; McKillop and Sills 2016, 2017). The salt works may have been the location of surplus household production, with the possibility that some of the wooden buildings were houses. Alternatively, the salt workers lived nearby in the coastal area, perhaps at Wild Cane Cay, a short canoe paddle from the salt works. Wild Cane Cay was a 10-acre village and trading port, originally settled in the Early Classic that expanded in the Late and Terminal Classic (McKillop 2005b).
Mass-production of Salt as Indicated by Standardization of Briquetage

Standardization of briquetage at the Paynes Creek Salt Works suggests mass-production of salt. However, the results indicate differences among individual salt works, suggesting there were work parties that may have consisted of families from nearby communities or seasonal residents from inland cities. In addition to calculating the co-efficient of variation, which is commonly used in standardization studies in archaeology, I also reported the average median variation to evaluate the standardization of briquetage from three sites in the Stingray Lagoon area: Stingray Lagoon, David Westby, and Orlando’s Jewfish sites (Figure 2; McKillop 2002:127-132, Tables 4.1-4.6). The average median variation (AMV) statistic was used instead of the coefficient of variation (CV) because some of the samples have distributions significantly different from normal. The AMV reduces the effect of outlying values in a distribution, unlike the CV. To calculate the AMV, each value is subtracted from the median. The absolute value of this number is divided by the median. The average of this number is then multiplied by 100 to produce the AMV.

The diameters of jars and bowls of Punta Ycacos Unslipped, as well as the diameters of the salt pot vessel supports—solid clay cylinders—were standardized, as compared to a sample of pots from Wild Cane Cay (McKillop 2002: Table 4.1). The differences were statistically significant. Interestingly, the average median variation of the briquetage from the three salt works was different for each site, and the results were statistically significant (McKillop 2002: Tables 4.4, 4.6). The standardization of briquetage was further supported by findings at Chan bi’ in the East Lagoon (McKillop and Sills 2017: Table 4.1). The statistically significant differences in standardization of Punta Ycacos bowls, jars, and vessel supports at the three main salt works in the Stingray Lagoon area indicate the salt workers at each of the sites likely made their own salt pottery.

Multi-crafting at the Salt Works

Salt production required a variety of supporting activities, so it can be evaluated in terms of contingent multi-crafting (Hirth 1998). In addition to salt production, other activities at the salt works included making the salt making pottery, collecting posts and sharpening the ends, and other wood-working. The sand and clay for making the salt-production pottery is available widely within the lagoon system. Clay is exposed in the cut banks where the lagoon abuts the broken pine ridge (savannah) in many locations. Quartz sand is available in thick lenses below the sea floor in multiple locations. Punta Ycacos Unslipped pottery was poorly formed and fired at low temperatures, making it friable and not viable for transporting from the place of production. Posts for building construction were obtained from nearby locations in the mangroves, from the nearby deciduous rainforest to the south, but not from the adjacent broken pine ridge to the north. Some deciduous hardwoods such as Sapodilla grow in dry patches within the mangrove ecosystem. Palmetto palms are ubiquitous on higher ground behind the mangroves, so would have taken little effort to obtain. Post diameters indicate that most hardwood trees were young, with diameters rarely exceeding 18 cm. The hardwood posts were cut and sharpened at one end, before they were driven into the ground. Other wood working included making canoes, paddles, and other wooden objects.

Living at the Salt Works?

Although most of the salt works have one or two wooden buildings, a few sites have significantly more, prompting the question whether some of the buildings may have been residential. Excavation of two buildings at Site 74 indicate both were salt kitchens, with extremely high densities of briquetage compared to other pottery (McKillop and Sills 2016). High densities of briquetage also were discovered in transect excavations at other salt works (McKillop n.d.). Site 7 and 60 are large sites, each with multiple buildings. The possibility of residential use of Site 7 will be evaluated using the spatial patterning of wooden buildings and artifacts that were individually mapped on the surface of the sea floor.
Site 7 is an underwater site at the entrance to the West Point area of the lagoon system (Figure 2). We used flotation survey in order to protect the wooden posts that protruded from the seafloor and not trample on the artifacts embedded in the sea floor (McKillop 2005a). The entire site area was systematically traversed by flotation survey, with the team on Research Flotation Devices (RFDs), back and forth across the site and beyond in all four directions. During survey, all wooden posts were marked with pin flags. All diagnostic pottery, all stone artifacts, and a selection of briquetage were flagged by pin flags (Figure 3).

Few of the wooden posts were visible on the sea floor, which is covered by a thin layer of silt. In cases where the posts protruded slightly above the sea floor, they are worm-eaten and decayed. The palmetto palm posts retain the outer shell of bark. Posts were embedded in solid, red mangrove peat that was virtually indistinguishable from wooden posts. When discovered, posts were cleared around the exterior in order to define the post for a diameter measurement, and to verify the post was indeed a post and not a mangrove root or mangrove peat. Certainly, some wooden posts were not found.

The flagged posts and artifacts were labeled, with each post and artifact location mapped using a total station. The locations of buildings were not evident during survey, but only became evident after the digital data were downloaded and added to the project GIS. Mapped posts include a line of palmetto palm posts and hardwood posts. Most of the palmetto palm posts form a closely-spaced line interpreted as a land-retaining wall on the east side of the site. In contrast to most of the other underwater sites that consist of one or two wooden structures, Site 7 has over 400 wooden posts that define the outlines of 10 or more wooden buildings around three plazas (Figure 4). Several of the buildings have distinct rectangular footprints, including Structures B, C, and G. Most buildings are oriented slightly northeast to southwest. Most buildings are single-room structures, similar to the salt kitchens at Site 74 (McKillop and Sills 2016). Structure 3 has at least two rooms, as well as an anteroom.

None of the wooden buildings had stone foundations or plaster floors, typical of structures at other Maya sites. The wooden structures provide form to “invisible architecture” described at other sites, where there are no visible remains of pole and thatch buildings on the modern ground surface (Johnston 2004; Somers and McKillop 2005). However, just as wooden structures built of pole and thatch form the majority of buildings in traditional Maya villages, pole and thatch buildings likely formed the majority of houses, workshops, and other structures in antiquity. The wooden structures at the Paynes Creek Salt Works are the only preserved pole and thatch buildings from ancient Maya times.

The temporally diagnostic Belize Red, Pantano Impressed (also called Warrie Red), and other non-briquetage pottery support the main
use of Site 7 in the Late (600-800 C.E.) to Terminal Classic (800-900 C.E.). Unit-stamped decorations occur on the exterior of jars around the shoulder and sometimes extending farther down the body of the vessel, as with the single example from Site 7 (Figure 5). The surface finish and color are eroded and the calcite temper is dissolved by the acidic peat.

Other pottery corroborate the Late to Terminal Classic age of the site and point to multi-crafting and perhaps residential use of some buildings. A partial vase with incised glyphs below the rim on the exterior is typical of the Terminal Classic elsewhere. The surface finish and paint are eroded, so the vase has not been assigned to a pottery type. A miniature vessel described by other researchers as a snuff bottle, also was recovered. Vases with glyphs and snuff bottles were not recovered from any of the other underwater sites. A perforated potsherd disk used as a spindle whorl is typical of the Classic period and suggests spinning cotton for clothing or fishing lines or nets. The only notched sinker, which was made from a pebble, was found at Site 7. Sherds from large incense burners, as well as candeleros, were recovered from Site 7. The presence of incense burners, candeleros, Belize Red, snuff bottle, and the vase with glyphs, point to residential use of one or more buildings at Site 7.

Spatial patterning of artifacts suggests buildings were used for different purposes, including some dedicated to salt production, other crafts or residential use (Figure 6). Most artifacts are found along the interior walls of buildings. This pattern was observed at the Ceren Site, which was rapidly abandoned due to an imminent volcanic eruption that covered the sixth century village with volcanic tephra, which also sealed the remains (Sheets et al. 2015). The interpretation for Ceren was that artifacts were stored in the rafters or on shelves along the walls and dropped during the volcanic eruption. They represent evidence of household activities but are not activity areas. There is a different distribution of briquetage and non-briquetage pottery, suggesting different uses for buildings. Buildings B, C, and G include Belize Red and Pantano Impressed pottery but no briquetage. The lack of briquetage in the three wooden buildings at Site 7 suggests they were not salt kitchens, but were instead used for other purposes, including as residences for the salt workers. Structures C, H, and I include briquetage but no other pottery types. Mangrove Unslipped jars occur in limited numbers with the briquetage.

The distribution of artifacts indicates most activity was indoors instead of the plazas. The three plazas are virtually devoid of artifacts. Artifacts do not extend beyond the line of palmetto palm posts that form the east side of the site.

The missing element in salt production at Site 7 is any trace of the brine enrichment process. Only Site 50 and Killer Bee have earthen mounds that represent discarded, soil
leached of its salt (Figure 2; Watson et al. 2013). The wooden canoe raised by wooden stakes with a funnel below from the Eleanor Betty Site represents the brine enrichment process, in which salty water was poured through a container of salty soil, with the enriched brine collected below (McKillop et al. 2014). Earthen mounds were likely associated with each salt kitchen, as they are in modern salt works (Williams 2003). Sea-level rise and wave action have deflated the earthen mounds and spread the leached soil over the sea floor at the Paynes Creek Salt Works. The Placencia Lagoon Salt Works (Sills 2016, 2017) further corroborate the hypothesis that earthen mounds were once common at the Paynes Creek Salt Works. The Placencia Lagoon Salt Works lack known wooden structures and are known by the presence of earthen mounds.

Other salt works along the coast of Belize, the Yucatan coast of Mexico, and the Pacific coast of Guatemala, also likely had perishable structures of pole and thatch. Salt works along the coast of Belize and the Pacific coast of Guatemala had salt kitchens associated with briquetage. Excavations at the single earthen mound at the Guzman Site indicates it was a discard mound from the brine enrichment process (Nance 1992). Salt works elsewhere along the Pacific coast of Guatemala also had salt kitchens, but are only known by the presence of earthen mounds and briquetage (Coe and Flannery 1967). On the Mexican coast of the Yucatan, where salt was produced by solar evaporation due to the arid climate, temporary housing may have consisted of pole and thatch structures that have not preserved.

The Quest for Salt

The restricted distribution of salt sources in the Maya area did not coincide with centers of population. The ancient Maya quest for salt resulted in salt works associated with inland salt springs and salty ocean waters. On the arid climate along the Yucatan coast, salt water was collected in salt pans where it was evaporated by solar evaporation. The resulting salt was collected for local use and transport elsewhere. The earliest known salt production in Belize is during the Late Preclassic at Cerros, using evaporation of brine in pottery vessels to make salt (Robertson 2016). Elsewhere in Belize, salt production was associated with briquetage during the Late and Terminal Classic at Wits Cah A’Kal (Murato 2011), Marco Gonzalez (Aimers et al. 2016), Northern River Lagoon (Masson and Mock 2004), Placencia Lagoon (Sills 2016, 2017), and at the Paynes Creek Salt Works (Figure 1).

The widespread availability of salt works along the coast and at inland salt springs during the Late and Terminal Classic underscores the likelihood that salt was produced for local use and regional distribution, but not for long-distance trade. During the expansion of circum-Yucatan trade in the Terminal Classic, Itza Maya traders based on the Gulf Coast of Mexico evidently took control of north coast salt works and Chichen Itza, some 100 km inland from its coastal port of Isla Cerritos (Andrew and Robles 2004). Some researchers have argued that other inland centers controlled salt produced in salt flats in coastal estuaries along the Yucatan coast. Komchen may have controlled salt production on the north coast of the Yucatan and its distribution elsewhere during the Late Preclassic.

In some cases, elite residences at salt works suggest control or oversight of production, as at Salinas de los Nueve Cerros, Xcambo, and Emal (Figure 1). Salinas de los Nueve Cerros has elite residential stone architecture located beside salt production facilities where brine was evaporated in large jars to make salt (Woodfill et al. 2015). The site dates from the Preclassic through Classic period and may have supplied salt for nearby cities and smaller communities in the interior of the southern lowlands (Figure 1). Northern River Lagoon, Marco Gonzalez, and Moho Cay are coastal trading ports where salt was produced, so presumably the residents of the trading ports controlled salt production and trade (Figure 1). Some of the salt works likely had wooden architecture and leaching mounds as at the Paynes Creek Salt Works. Although wooden architecture was used for salt kitchens at the Paynes Creek Salt Works, it may also have been used for residences for the salt workers, as suggested by the spatial patterning of wooden buildings and artifacts at Site 7.
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### ASSESSMENT OF THE SHELL MIDDEN AT THE ELEANOR BETTY SALT WORK, BELIZE

Valerie Feathers and Heather McKillop

The underwater site of Eleanor Betty is part of a network of Classic period (A.D. 300-900) salt production sites located along the coast of southern Belize (Feathers et al. 2017; McKillop 2002a, 2017b; McKillop and Sills 2017). Most of these sites lay under 0.5 to 1.5 m of water due to sea-level rise. An inundated shell deposit was discovered during the 2011 field season. The deposit was excavated by the authors during the 2013 field season to assess the nature of the deposit (cultural or natural) and to determine the use of the shell (ritual or dietary). The midden was located between 16-30 cm below the sea-floor and extended both inside and outside of the underwater wooden structure. The shells were exported to Louisiana State University for macroscopic and microscopic analyses. Approximately 3,979 fragments were identified as *Crassostrea rhizophora*. A total of 198 minimum number of individuals (MNI) of *Crassostrea rhizophora* were present. Evidence for predation was determined using the Height-Length Ratio (HLR) for complete shells. Butcher marks were analyzed and assigned to classes based on their break patterns.

#### Introduction

Analyses of a large underwater marine shell deposit were carried out to evaluate the role of shell at the Eleanor Betty Site, one of the Paynes Creek Salt Works, in southern Belize (Feathers et al. 2017; McKillop 2005a, 2017a, 2017b; McKillop and Sills 2016, 2017). Shell remains frequently are recovered from coastal and inland Maya sites. However, only a few shell middens have been excavated, including Cancun (Andrews et al. 1975), Moho Cay (McKillop 1984, 2004), Frenchman’s Cay (McKillop and Winemiller 2004), Butterfly Wing (McKillop 1996, 2005b: 141), the Eleanor Betty site (Feathers et al. 2017), and five Paynes Creek Salt Works in deep water (McKillop 2017a). Analyses of the Eleanor Betty shell deposit focused on evaluating if the deposit was natural or cultural, whether there was evidence of modification as artifacts, and whether there were butchering marks indicating the shells were collected for food.

#### Importance of Marine Shell in the Maya Area

Lange (1971) hypothesized that the Classic period inland population of the northern Yucatán and Belize was larger than what could be supported by agriculture. He argued that the exploitation of marine resources and the preservation of marine fish for inland trade increased the nutritional quality of the inland diet. Although lacking evidence of nutritional quality of the inland diet, Lange’s hypothesis of inland transport of seafood continues to be evaluated.

The coastal Maya traded marine shells to inland communities for ritual and food (Figure 1). Excavations at Isla Cancun revealed that thousands of shells had been butchered for subsistence purposes, including *Strombus gigas*.
The Shell Midden at Eleanor Betty Salt Work

The Shell Midden at Eleanor Betty Salt Work

(queen conch) and Melongena corona (crown conch; Andrews 1969: 57, 58). Abundant Strombas gigas shells from Tancah, a coastal site along the western coast of the Yucatán just north of Belize, suggest marine exploitation for export as well as local consumption (Miller 1977). Remains of Dinocardium r. vanhyningi (cockle shells) excavated at Dzibilchaltun were used for food (Andrews 1969: 59).

“Working” Shell for Trade and Utilitarian Use

Marine shells were modified to make jewelry, scrapers, and other items for coastal and inland use. Microwear analysis of stone tools and the presence of an incised shell in Structure 4A, indicates shell manufacturing at Pook’s Hill, Belize (Stemp et al. 2010) and at Aguateca, Guatemala (Emery and Aoyama 2007; Inomata et al. 2002). At Aguateca, marine shell ornaments were made using chert flakes, bifacial thinning flakes, oval bifaces, bifacial points, and obsidian prismatic blades.

Leaders of the Chan community were involved in the production of Strombus shell beads and other shell ornaments (Robin et al. 2014). Marine shell ornaments may have been produced by members of the royal family or attached specialists at Copan (Aoyama 1995). Evidence for the elite control of marine shell production and trade was found at Piedras Negras and Aguateca (Sharpe and Emery 2015). Several thousand marine mollusks were recovered from the primary center of Aguateca, whereas only four shells were recovered from Punta de Chimino, a secondary center located downstream from Aguateca. Elite caches contained more marine mollusks than other caches at Aguateca and Piedras Negras, suggesting the elite controlled the distribution of marine items to the secondary centers.

Evidence for non-dietary use of marine shells also can be found at coastal sites. Shells were carved into tinklers and discs for non-utilitarian purposes at the trading ports of Wild Cane Cay and Moho Cay (McKillop 2004:269, 2005b: Figure 6.32). Gastropods from Moho Cay were used as scrapers, sinkers, whorls, gorgets, beads, hammers, and as cutting tools (McKillop 1984:30-32). Queen conch remains, along with a large amount of worked and unworked shells from Ek Luum on Ambergris Caye, Belize, indicated that Ek Luum was a processing station where shells were prepared for inland trade (Shaw 1995). Few shells at Ek Luum exhibit breaks indicative of meat removal. The absence of breaks could indicate inland trade for consumption or trade of a non-manufactured shell for ritual purposes. Worked shells were recovered from other locations on Ambergris Cay, including shells cups from Ek Luum, San Juan, and Chac Balam as well as tinklers, pendants, and beads (Garber 1995:126-133, 135).

Coastal-Inland Maritime Trade: Ritual and Status

The most common instances of coastal-inland trade of marine shells occur in the archaeological record with the recovery of Spondylus shells. Elite households excavated at Tikal (Moholy-Nagy 1963), Caracol (Teeter 2004), and Aguateca (Emery and Aoyama 2007; Inomata et al. 2002) revealed Spondylus shells. Over 30 marine shell species were recovered from Chichén Itzá (Cobos 1989). The abundance of shell remains suggests a reliance on local shell.

Excavations at Lubaantun uncovered the remains of a worked queen conch used to produce shell-disc blanks along with other marine shells (Wing 1975). Excavations at Altun Ha, Belize, revealed caches with a Spondylus disc and tubular shell beads, a Spondylus notched pendant, and Oliva beads, as well as many other shell adornments (Pendergast 1979). Remains of pendants made from Spondylus americanus and tinklers made from Oliva sayana were recovered from Dzibilchaltun (Andrews 1969 54:55). Spondylus shells were included as grave offerings in Structure10L-26 tomb at Copan (Beaubien 2004).

Kidder et al. (1946:145) reported that “shell formed part of the mortuary furniture in every tomb…” at Kaminaljuyu. Shell remains included Spondylus, Oliva, Olivella, and Marginella shells in the form of trumpets, tinklers, and pendants. Spondylus shells, a carved Strombus shell, and unidentified shell “teeth” from a jadeite mask were recovered from the burial of Yúkom Yich’ak K’ak at Calakmul (Vargas et al. 1999). Other sites where marine shell has been recovered from inland burials
included Paebitun (Healy 1990), Caledonia (Healy et al. 1998), Bats’ub Cave (Prufer and Dunham 2009), Dos Pilas (Emery 2008), Buenavista del Cayo (Yaeger et al. 2015), Chan (Robin et al. 2014), and Lamanai (Pendergast 1981). Shells were used as jewelry, music, tools, or musical instruments (Chase 1981; McKillop 1984, 1996:59, 2004: 269; 2005b: Figure 6.32).

Ancient Maya Shell Middens

Marine shells were important to the coastal and inland ancient Maya for food, tools, and ornaments. Marine shells have been recovered from shell middens and construction fill at coastal sites, in burials and caches at coastal and inland sites, and in household refuse deposits (Andrews 1969; McKillop 1984, 2005b; McKillop and Winemiller 2004; Pendergast 1992). Few ancient Maya shell middens have been excavated (Andrews et al. 1975; Feathers et al. 2017; McKillop 1984, 1996, 2005b:36, 37, 39, 141; McKillop and Winemiller 2004).

Mollusks were an integral part of the coastal Maya diet. Isla Cancun, a Preclassic Maya settlement in Quintana Roo, Yucatán, had a large midden containing a variety of marine remains, including 6,547 shells, from 99 species (Andrews 1969; Andrews et al. 1975). About 28.6% of the midden was comprised of queen conch (Andrews et al. 1975:186-187).

Shells recovered from Frenchman’s Cay were analyzed to provide an in-depth look at the diet and landscape of the Maya who occupied the site (McKillop and Winemiller 2004). Three mounds are present on Frenchman’s Cay – Great White Lucine, Crown Conch, and Spondylus. Excavations indicated Frenchman’s Cay was a Late Classic to Early Postclassic site (A.D. 600-1000; McKillop 2005b). Fifty-eight genera of shell were recovered for a total of 2,785 shells with a weight of 13,528.46 g. Ninety-eight species, including Isognomon alatus and Crassostrea rhizophorae (mangrove oysters), and 1,315 minimum number of individuals (MNIs) were identified. Butchering for meat removal was indicated by the presence of a circular hole in the spire of queen conch shells. Almost all species recovered were edible and likely contributed to the coastal diet (McKillop and Winemiller 2004).

A large midden was discovered on the northern end of Moho Cay near Belize City (McKillop 1984). The midden contained predominately marine shells and manatee bones, but also pottery sherds, broken chert, obsidian, as well as the remains of deer, shark, and green turtle (McKillop 1984, 2004). Small holes for meat removal were found near the muscle attachment point of the Queen Conch shells recovered from the site.

Marine shell at the trading port of Wild Cane Cay included abundant shells from midden deposits, as well as modified shell from burials (McKillop 2005b). An infant burial from Fighting Conch mound included a carved Spondylus shell disk (McKillop 2005b: Figure 6.32a). A carved Melongena shell disk was found in a Late Classic burial in household middens (McKillop 2005b: Figure 4.8).

Butterfly Wing is a Protoclassic (75 B.C – A.D. 400) shell midden located by the mouth of the Deep River in southern Belize (McKillop 1996, 2002: 11; McKillop et al. 2004:349). Strombus pugilis, Crassostrea rhizophora, and Isognomon alatus shells dominated the shell midden, all edible species. The recovery of a Strombus gigas celt indicates the ancient Maya at Butterfly Wing also were using the sea as a resource for utilitarian items (McKillop 1996:59).

In an attempt to categorize marine resource use and trade, Andrews (1969:41) divided shell remains into two categories. The first concerns shells from coastal middens, which would have been used for local consumption and perhaps for meat extraction for inland trade, whereas the second focuses on shells at inland sites, which were not used for subsistence purposes, but rather for ritual events. He suggests that sites close to the coast, such as Dzibilchaltun, imported shell for ritual and as a food delicacy.

The Eleanor Betty Shell Deposit

An underwater shell deposit was unexpectedly discovered at the Eleanor Betty site during excavations in 2011(Aucoin 2012; Feathers et al. 2017). Excavations were carried out in 2013 to map the extent of the shell
deposit, to evaluate if the deposit was natural or cultural, and to analyze the shells for evidence of butchering for food or modification as artifacts. The sediment was expected to be alkaline and preserve bone, since shells have calcium carbonate (CaCO₃).

Four transects were added north and south of the 2011 Transect to define the extent of the shell deposit (Feathers et al. 2017). A total of 19 new units were excavated in 10 cm levels to a depth of 30 cm below the sea floor. The shell deposit was mapped and excavated separately from the rest of the unit. Transect 6, Unit 3-4 m, was excavated in two-centimeter levels from 16 cm to 30 cm depth due to the concentration of shells. Two-centimeter levels were possible because most of the shells were broken and small. The deposit was compact with little sediment. A wall of Transect 4 was cleaned to see the depth of the deposit (Figure 2). The presence of charcoal, ceramics, and briquetage above, within, and below the shell deposit indicates it was associated with the Eleanor Betty salt works. Shell was exported under permit to the Archaeology Lab at Louisiana State University (LSU) for further study.

**Laboratory Methods**

The minimum number of individuals (MNI) and the number of individual species present (NISP or fragments), weight, presence/absence of butcher marks, and height-length ratio (HLR) for human predation were determined for the recovered shell, following methods used by other researchers (Andrews et al. 1975; Claassen 1998; Kent 1988; McKillop and Winemiller 2004). The MNI assessment used a trait unique to the shell, in this case the umbone (the raised protuberance located posteriorly to the hinge on a bivalve shell; Figure 3) and counting the number of umbones on one side of the shell.

All shells were included in the counts for NISP. Weights for the shell were obtained using a Delta Range® Mettler PE 3600 electronic balance in the Archaeology Lab at LSU. A plastic container was used to hold the shell on the scale during the weighing process. Shell weight can vary according to the environmental setting. For example, a shell of one taxa found in less acidic soil has more calcium carbonate than that of the same taxa of shell from more acidic soil. Thus, the weight of the shells will be different. Shells were counted and sorted by species in the lab at LSU, in the field, and at the field base camp in Belize. Complete right and left umbones were used to obtain an MNI count. The umbones were sorted by side.

Measurements of the shell height (maximum dorsal-ventral) and shell length (anterior-posterior) were converted into height-length rations (HLR) to assess predation and

Figure 2. Schematic profile drawing of shell midden excavation. Drawing by V. Feathers.

Figure 3. Photograph of Crassostrea rhizophora from the Eleanor Betty site. The circle indicates the umbone. Photo by V. Feathers.
identify if the shell deposit at Eleanor Betty was a multiple or one-time deposit (Gunter 1938; Kent 1988:28; Figure 4). Archaeologists use shell size to determine the impact of human predation and meat yield. Shell size is also determined by age and can be substituted for age. The height-length ratios for both complete right and left valves were obtained by dividing the height by the length. Only shells with a complete umbo, ventral, anterior, and posterior margins were used. Measurements were obtained with sliding calipers.

Butcher marks were identified and classified into six categories: 1) L-shaped, 2) V-shaped, 3) horizontal break, 4) vertical break, 5) slanted break, and 6) notched break based on Kent’s (1988) methods for opening oysters (Figure 5). There are several opening methods which result in the different break patterns. The first method involves heating, steaming, or boiling the oyster to easily open the valves and cook the meat. This method does not leave a butcher mark on the shell. The second method is stabbing. A blade-like object is forced between the valves along the posterior margin in order to cut the abductor muscle. A U-shaped notch usually forms parallel to the muscle scar on the margin of the shell as a result. Marks of this nature are classified as “notched” (Category 6). The third method, hammering, involves striking the oyster. A hammer stone is used to lightly strike the shell valve above the abductor muscle. This impact stuns the oyster, allowing the harvester to open the valves and retrieve the meat. A small abrasion mark is usually located on the valve as a result of hammer stone use. The cracking method involves breaking the ventral edge of the shell in order to remove the meat with a blade. A hammer stone is usually employed with this method. This method results in a straight break along the ventral margin. Categories 1-5 could be a result of the cracking method.

Results
Approximately 4,733 shell fragments weighing 2,304.24 g were recovered from the excavated units. Eighty-three percent (n=3,933) of the recovered shell were associated with the shell midden. The most abundant species was *Crassostrea rhizophora* (n=3,979), red mangrove oysters, which form beds along the roots of red mangroves in intertidal, brackish waters beside the underwater site. Transect 6, Unit 3-4 m contained the most oysters (n=3,204).

Assessment of the right and left umbones of *C. rhizophora* resulted in an MNI of 198 shells (198 left, 64 right). A total of 57 left valves and 43 right valves was measurable (complete; Table 1). Seventy of the 100 complete valves had complete dorsal-ventral and anterior-posterior margins and were used for HLR measurements. The average for the left and right valves was 1.89 cm and 1.87 cm, respectively. The maximum HLR was 2.84 cm for the left and 2.92 cm for the right. The minimum was 1.22 cm for the left and 1.35 cm for the right. The range was 1.62 cm for the left and 1.57 cm for the right. The standard deviation was 0.34 cm for the left and 0.33 cm for the right. Twenty-four of the 100 shells could be measured for length and not height. Six could be measured for height but not length.

Butcher marks were present for 57 of the 198 shells assessed for MNI. The most abundant break was a notch (n=17; Figure 5, Table 2). No hammer stone abrasions were observed. However, the outside layer of the shell was fragile and flaking, which may have obscured the hammer stone scar. The notch marks could have resulted from the use of a tool, such as a piece of chert, inserted parallel to the abductor muscle in order to open the shells and collect the meat. The cracking method appears to be the most employed method for opening.
Figure 5. Photos of break patterns on Eleanor Betty *Crassostrea rhizophora* shells based on Kent (1988). A) Notch; B) Horizontal; C) Vertical; D) V-Shape; E) Slanted; and F) L-shape.

Table 1. Height-Length Ratio (HLR) Measurements for Shell from all Excavations.

<table>
<thead>
<tr>
<th>Height cm</th>
<th>Length cm</th>
<th>Left</th>
<th>Right</th>
<th>HLR left cm</th>
<th>HLR right cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total #</td>
<td>57</td>
<td>43</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum</td>
<td>2.66</td>
<td>1.19</td>
<td></td>
<td>1.22</td>
<td>1.35</td>
</tr>
<tr>
<td>Maximum</td>
<td>7.7</td>
<td>3.78</td>
<td></td>
<td>2.84</td>
<td>2.92</td>
</tr>
<tr>
<td>Average</td>
<td>4.69</td>
<td>2.47</td>
<td></td>
<td>1.89</td>
<td>1.87</td>
</tr>
</tbody>
</table>

Table 2. Classification of *C. rhizophora* break patterns from the Eleanor Betty Shell Midden.

<table>
<thead>
<tr>
<th>Break Pattern</th>
<th>Number Present</th>
<th>Processing Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-shaped</td>
<td>14</td>
<td>Cracking</td>
</tr>
<tr>
<td>V-shaped</td>
<td>6</td>
<td>Cracking</td>
</tr>
<tr>
<td>Horizontal Line</td>
<td>8</td>
<td>Cracking</td>
</tr>
<tr>
<td>Vertical Line</td>
<td>10</td>
<td>Cracking</td>
</tr>
<tr>
<td>Notch</td>
<td>17</td>
<td>Stabbing</td>
</tr>
<tr>
<td>Slanted</td>
<td>2</td>
<td>Cracking</td>
</tr>
</tbody>
</table>
shells based on the vertical, horizontal, V-shaped, and L-shaped breaks. If these breaks are considered as one class, then this combination would result in the most abundant break pattern (n=38).

**Discussion**

The shell midden was determined to be a cultural midden for several reasons. An abundance of briquetage (3,721 g) and charcoal (6,248.48 g) was found intermixed with the deposit. No human remains and only two unidentified animal bones were recovered during excavations. However, the absence of skeletal material is not surprising since Eleanor Betty was a salt production workshop. There is no evidence the shells were used as jewelry, music, tools, or musical instruments as seen at other Maya sites (Chase 1981; McKillop 1984, 1996:59, 2004a 269; 2005b: Figure 6.32). Approximately 55% of the recovered shell was located within the shell midden feature (Transect 6, Unit 3-4 m).

Based on the height-length ratio averages for the left and right valves, the oysters for Eleanor Betty are bed oysters (Kent 1988). The average salinity for *C. rhizophora* habitats is 7.2 to 28 practical salinity units (PSU). Growth can occur in areas with 0 PSU to 40 PSU (Galstoff 1964; Nascimento 1991). The underwater environment is ideal for growth and harvesting of mangrove oysters. The Eleanor Betty site is in an intertidal, brackish area surrounded by red mangroves that have *C. rhizophora* oysters growing on the prop roots in the water.

Shell height and length were measured to determine if there was evidence of overharvesting. If the measurements showed a large difference in the average height-length ratio, then this difference would suggest the salt makers were regularly harvesting, and possibly over-harvested, the oysters. The shells would not have matured into adulthood, resulting in a difference of shell height and length throughout the midden. Alternatively, if the average HLR measurements do not differ, then human predation by the salt makers likely did not occur. The HLR measurements showed no major differences as the averages were 1.87 cm and 1.89 cm for the right and left, respectively, indicating a lack of predation by humans.

However, several shells were porous in appearance, suggesting predation by animals such as sponges, mud conchs, oyster borers, or barnacles (Galstoff 1964; Kent 1988; Figure 6).

Figure 6. Porosity of *Crassostrea rhizophora* shell due to predation by sponges, mud conchs, oyster borers, and/or barnacles from the Eleanor Betty 2013 excavations.

Although the shell midden was small compared to other shell middens, several of the shells had butcher marks. The butcher marks indicate the shells were used for food. A hammer stone likely was used to open the shells. The pressure of the hammer stone would have broken the ventral edge of the shell and “stunned” the oyster (Kent 1988). The salt makers would have removed the meat for consumption at this point. Although butcher marks are clear evidence of modification for subsistence, heat also may have been used to open the oysters.

The shell midden may have been part of a ritual prior to the start of salt production season. The shell feature and associated ceramics lay 16 to 30 cm depth below the seafloor. About 40 g of Warrie Red and Mangrove Unslipped jars were associated with the shell midden feature. The water jars likely would have stored brine. A few Belize Red sherds from serving vessels (14 g) were recovered. The associated briquetage is composed of sand temper and not shell, so shell clearly was not used as temper. No ceramics, shell, charcoal, or botanicals were encountered below 30 cm depth, indicating this deposit was the initial layer of the site. Ocarinas and serving vessels recovered at other Paynes Creek Salt Works indicate the occurrence of ritual activities (McKillop 2002). Rituals are performed prior to salt production season at Sacapulas (Reina and Monaghan 1981). Temple platforms, shrines, and large wooden crosses attest to the sacred
nature of Emal, Yucatán, (Kepecs 2003:128). A central ball court in addition to burnt offerings of cacao was discovered near the epicenter of Salinas de los Nueve Cerros (Woodfill et al. 2015).

Once the ritual was complete, the salt makers at Eleanor Betty could have built their hearth on top of the initial offering. Due to the shallow nature of the site (55 cm below the water table at its deepest depth on the western edge of the excavated units), the hearth (located in Units 2-3 m and 3-4 m of all transects) did not survive due to the slow inundation process. The changing tides would have spread the shell north-to-south and east-to-west, creating a shallow, elongated shell midden rather than a smaller, heaped deposit. Sea-level rise has inundated the site and most of the other Paynes Creek Salt Works (McKillop et al. 2010).

Conclusions

Eleanor Betty was one of the Paynes Creek Salt Works located along the coast of southern Belize during the Classic period. The midden consisted of a single species of shell, *C. rhizophora* (MNI=198). The recurrence of a single species underscores the interpretation that the shell midden was a single-use event. In contrast, at the nearby trading port of Wild Cane Cay, there were more than 45 species of shell (McKillop 2005b). At Frenchman’s Cay, there were 98 species of shell (McKillop and Winemiller 2004). Butterfly Wing was dominated by several species, including *C. rhizophora, Isognomon alatus,* and *Spondylus pugilis* (McKillop 2002). The Cancun shell midden also had a variety of shells (Andrews 1969). The Classic period midden on Moho Cay was dominated by *Strombus gigas,* but also contained manatee and other animal bones (McKillop 1984, 2004).

Single-species reliance on nearby available shell at Eleanor Betty suggests the shell midden was a single meal or feast perhaps eaten as part of an opening ceremony prior to the salt production season. The presence of a few Belize Red sherds – the remains of painted serving bowls tempered with volcanic ash – also suggests that a small feasting event took place, as proposed for the nearby Stingray Lagoon site (McKillop 2002:95). Sea-level rise and fall, in conjunction with the changing motion of the tides, likely spread the shell midden across the site over time, obscuring the midden’s original greater depth and more concentrated location.

Available data for the Cancun, Butterfly Wing, Frenchman’s Cay, Moho Cay, and Wild Cane Cay middens indicate a heavy reliance on marine resources, supporting, in part, Lange’s (1971) hypothesis that marine fauna were an essential part of the Maya diet. The presence of butcher marks on 57 of the recovered shells from the Eleanor Betty shell midden indicate they were used as part of a meal, once again supporting, in part, Lange’s (1971) hypothesis that the coastal Maya had a heavy reliance on marine fauna. Unlike shells recovered from sites such as Aguateca, Piedras Negras, Wild Cane Cay, and Moho Cay, the shells at Eleanor Betty do not provide additional evidence for shell modification for musical instruments or utilitarian items. Although true for the coastal Maya, more evidence exists for the support of marine fauna as status indicators when incorporated into the inland Maya diet than as a stable dietary resource. Most marine shell was imported for ritual purposes and not for subsistence.

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KING K’AK [U TI’?] CHAN K’AWIL OF PUSILHA: AN ANCIENT MAYA KING

Andrew D. Somerville, Christian M. Prager, and Geoffrey E. Braswell

It is often assumed that the individual is invisible in archaeological research, but it is possible to construct person-centered accounts of past lived experiences. In this paper, we adopt a developmental approach to sketch out the life history of a single individual who ruled Pusilha, Toledo District, Belize, during the middle of the eighth century. We call him Ruler G, but he probably was named K’ak [U Ti’] Chan K’awil K’ul Un Ajaw. We adopt a conjunctive approach using epigraphic, biological, and archaeological data. We examine his childhood, adulthood, death, and afterlife to better understand the role of Pusilha in the ancient Maya world.

Introduction

Pusilha was an important city for the relatively brief period of AD 574 until around AD 751 (Prager et al. 2014). Our excavations, conducted between 2002 and 2005 (Braswell et al. 2004, 2005), uncovered the remains of 22 individuals within and among the structures of the Gateway Hill Acropolis (Figure 1), the elite administrative and ceremonial center of the city (Pitcavage and Braswell 2009). The wide range in the quality and quantity of goods included in the burials implies great differences in social status. Of all the interments, Burial 8/4 stands out as unique due to the prominent size and location of the tomb, which was found within the largest freestanding platform of the city and at its highest point (Braswell and Gibbs 2006). Moreover, the tomb is one of the richest burials excavated in southern Belize. The stylistic dating of ceramics, the recent translations of hieroglyphic texts from the site, and bioarchaeological studies together suggest that Burial 8/4 probably contained the remains of the king nicknamed “Ruler G,” one of the last ajaw of Pusilha. If it is his tomb, as we think, this is the first royal burial of a Maya king of Belize whose exploits are known from hieroglyphic texts. To gain a fuller picture of what life was like for the Maya elite, we situate Ruler G within different scale contexts (Bronfenbrenner 2005), which were relevant to individual development in southern Belize during the Late Classic period.

Childhood of Ruler G

The only known monument erected during the reign of Ruler G is Stela E (Figure 2), whose front portrays him with two seated captives. The reverse of the monument is better preserved and includes a hieroglyphic account of his ancestry. Sadly, his name can only be partially read. Nonetheless, it includes both K’AK’ and CHAN, perhaps with an infixed K’AWIL. All three are exceedingly common elements in royal names and titles throughout the Maya lowlands. The first ruler of Pusilha was named K’awil Chan K’inich (‘Heavenly Radiant K’awil’) and the second was called K’ak’ U Ti’ Chan (‘Fire is the Mouth of Heaven’), a name he shared with the contemporary 11th Ruler of Copan. Ruler
C’s name ends with that of his predecessor. Ruler D’s name also contains Chan, and Ruler E’s complicated title sequence contains the phrase K’ak’ U ... K’awil. Thus, what we can read of Ruler G’s name and titles is consistent with those of his predecessors, and it is entirely possible that the missing portion is U Ti’. We therefore speculate that his full name and title was K’ak’ [U Ti’?] Chan K’awil k’uhul Un Ajaw, ‘Fire is the Mouth of the Heavenly K’awil, Divine Lord of the Avocado [or Pusilha]’ (Prager et al. 2014).

Stela E also names the mother of Ruler G and identifies her as an ajaw or divine ruler in her own right, whom we call Ruler F. This is a rarity in the Maya world and may indicate that she ascended to the throne during a crisis of succession. Ruler G’s father was a foreign lord who married into the ruling family. Ruler G’s paternal grandfather was called Junew Chak Muyal Chan Yopat K’ak’ Ti’ K’awil, which includes the theonym Chan Yopat, best known from Copan and Quirigua, but also from Naranjo. Just south of the pyramid in which Ruler G’s remains were found, we excavated Late Classic Burial 3/1, which contained a man whose strontium and oxygen isotope signatures are consistent with Copan, accompanied by a reliquary tooth-cache of a second individual also from there. It is purely speculative, but this could be the burial of Ruler G’s non-royal father and his own ancestor, both from the Copan region. It is unusual that Ruler G’s father had foreign roots. Most typically, the Maya practiced female hypogamy and neolocality. In this case, a lord from the Copan region seems to have moved to Pusilha to marry a powerful local woman who would be or already was a queen in her own right.

As the son of a local female ruler and a foreign lord, Ruler G grew up in a position of privilege. This is reflected in his physical remains. Isotopic studies of strontium, oxygen, and carbon from Ruler G’s second molar provide information about his life between the ages of about two and seven years. Strontium and oxygen isotope ratios demonstrate that Ruler G spent his childhood at Pusilha. Stable carbon isotope ratios, which reflect the proportion of maize in the diet, also were obtained from the second molar. These results imply that the childhood diet of Ruler G included exceptional amounts of maize, with perhaps upwards of 85% of his calories coming from maize, maize-fed animals, and maize-derived products. This was the third highest value of the sample from Pusilha, indicating that the childhood diet of Ruler G was even more maize-focused than many of his elite peers, who also consumed high-maize diets (Somerville et al. 2016).

Of the 18 analyzed skeletons from Pusilha, five (28%) display some evidence of cranial modification, a cultural practice that may be closely tied to concepts of identity. Analysis of Ruler G’s cranial bones show no evidence of modification, which indicates that this was not a requirement for a potential king. Ruler G also displays no evidence of linear enamel hypoplasia, which is typical of the population. Just two of 18 individuals, or 11% of the sample, show this sign of childhood disease or poor diet. No evidence of porotic hyperostosis, a sign of anemia, was observed on Ruler G’s skull, supporting the notion of good health in childhood (Pitcavage and Braswell 2009).

In sum, epigraphic and bioarchaeological data suggest that Ruler G was the child of a queen of Pusilha and a foreign lord, and that he...
spent his childhood years at the site. At the microsystem level, his family and servants fed Ruler G meals that included large amounts of maize-based foods. The diet appears to have been nutritious and reliable. Exosystemic factors also influenced Ruler G’s childhood. He was born during a long period of political crisis and instability at Pusilha that began after AD 672 and continued for 40 years. In AD 711, a founder of a new dynastic line and holder of the ochk ‘in kalomte’ title, became king (Prager et al. 2014). But within the next 20 years, the female Ruler F—whose parentage is unknown—and her son, Ruler G, were both inaugurated as ajaw of Pusilha. Thus, Ruler G assumed power during a long period characterized by multiple crises of succession. This uncertainty could have created a potentially unstable political environment during his earliest years.

Cultural and social factors common across the Maya world and Mesoamerica more broadly shaped certain aspects of Ruler G’s development. Cranial modification was widespread in the Maya world as a means of embodiment and socialization, and the decision not to modify Ruler G’s head may have been influenced by a number of factors operating at the societal level. Such factors could have included onomastic features of the child’s name, traditions associated with a particular birth date, and ritual requirements of the parents. Duncan and Hofling (2011) argue that cranial modification was closely tied to rituals designed to protect infants from harm, particularly soul-loss and evil winds. The absence of modification may mean that a child was not viewed as in need of such special protection. It is intriguing to note that the foreigner in Burial 3/1 who grew up in the Copan region also lacks evidence of cranial modification. If our speculation that this is the burial of the father of Ruler G is correct, it may be that their lack of cranial modification reflects a shared identity.

Adulthood of Ruler G
We lack detailed epigraphic data concerning the adult years of Ruler G, but we can place his accession in the 20-year window before his dedication of Stela E in AD 731. The text of Stela E states that Ruler G performed a “stone-binding” ritual, which Stuart (1996) interprets as a ceremony in which stelae would be wrapped in cloth. This was performed to mark the end of the k’atun. The two sitting and bound prisoners on the front of the monument suggest that Ruler G was a warrior who took captives, another common practice of Maya kings. As the last certain ajaw of Pusilha who used the emblem and whose name we can read, Ruler G may have lived during a politically tumultuous period. Nonetheless, the depiction may be regal propaganda or evidence that a vassal from another site presented prisoners to Ruler G.

Many ancient Maya people underwent dental modification as young adults, perhaps as a rite of passage. Modification would have served throughout adulthood as a symbol of identity and perhaps status. All four of Ruler G’s upper incisors were filed sometime after his childhood on both the lingual and buccal sides, creating a sharp ridge running mesio-distally along the midline of the tooth (Pitcavage and Braswell 2009). This form is Romero’s Type A-4. Oddly, Ruler G does not have inlayed teeth. Such inlays of jade or pyrite were commonly encountered at Pusilha.

Additional data on Ruler G’s adult years can be derived from his teeth and oral health. Four of Ruler G’s teeth (26.7 %) had dental caries (Pitcavage and Braswell 2009). All exhibited mild to moderate amounts of dental calculus. Although multiple factors contribute to tartar formation, diets high in protein and carbohydrates often correlate with higher calculus levels. Privileged access to maize and animal products, therefore, is consistent with the calculus and isotope data obtained from the remains of Ruler G. Arthritic lipping was observed on two of his cervical vertebrae, evidenced by the presence of osteophytes around the circumference of both the superior and inferior aspects of the vertebral bodies. His age at death cannot be precisely determined either from the hieroglyphic texts or his remains, but arthritis and the condition of his teeth are consistent with old age.

At the broadest cultural scale, social and ideological norms influenced many of the details of Ruler G’s daily life. The stylistic choice of A-4 dental modification, for instance, shows engagement with a broader Maya trend of
An Ancient Maya King

aesthetic modifications of the teeth. Curiously, Williams and White found that Type A-4 is a very rare form with only two out of 922 individuals (0.2%) exhibiting this type of modification. At Pusilha, Type E-1 modification, with inlays of jadeite and pyrite, was the most common form of dental modification (30%; Pitcavage and Braswell 2009). The dental modification of Ruler G, then, was exceptional both within his home city and across the Maya world. This rare form of dental modification may have signaled his privileged status as an ajaw.

Death of Ruler G

Ruler G died sometime before the k’atun ending in AD 751 (Prager et al. 2014). We believe Burial 8/4 is his tomb (Figure 3). This identification is based on several factors. First, the presence of royal diadems and the central location of the tomb in the highest pyramid of the royal acropolis imply that the occupant was a king. Second, pottery dates to the middle of the eighth century AD. Third, the individual is an elderly male and not a female, and hence, cannot be Ruler F. Although we cannot completely rule out individuals who are named as kings on undated monuments, Ruler G is the best fit (Braswell and Gibbs 2006; Prager et al. 2014).

The tomb of Ruler G is by far the most elaborate at Pusilha, and one of the richest known from southern Belize. It was located at the top of the tallest free-standing structure at the site, itself on top a series of terraces that rise some 79 m above the Machaca River and the ancient Maya bridge. The location of the tomb at the highest point of Pusilha served to remind people of the ongoing presence and legacy of this important ajaw. His monument, Stela E, was located across the river in the center of the city and in the middle of a line of stelae erected by his predecessors. This too, would have maintained his memory and situated him literally at the center of the dynasty.

Examination of his remains tells us nothing about the circumstances surrounding Ruler G’s death. There are no other signs of disease or trauma. In contrast, Burial 8/4 tells us much about the preparation of Ruler G for the afterlife. Outside of the tomb, we found several broken cache vessels suggesting the presence of dedicatory offerings placed in the pyramid fill. Nearby, we also found an anthropomorphic chert eccentric. This form of eccentric is well documented in the Maya region, and a second
more elaborate version was recently recovered in Tomb 5 of Nim li Punit (Figure 4; Braswell 2017; Borrero et al. 2016).

The stone tomb was accessed from the south and was closed by large capstones rather than a vault. The tomb was opened before we excavated it, probably in antiquity. There is ample evidence that objects and bones were disturbed. Ruler G was the only body within Burial 8/4. He was placed in an extended, supine position with his head to the north. This burial position is common in southern Belize and is the opposite of the Belize Valley pattern of head in the south, prone burials. His face was turned to the east. For the ancient Maya, the north was the direction associated with the sun at its zenith and the heavens, and the east was associated with the rising sun and, hence,

rebirth. It may be that Ruler G—as well as others at Pusilha—was buried in this position to reflect a belief in resurrection and afterlife.

Ruler G’s face was covered with two *Spondylus* shells (Figure 5). Many simple burials in southern Belize have a stone slab covering the cranium; it may be that the head of the deceased was viewed as needing protection. Above the head, we found three lunate eccentrics of obsidian and chert. A large trilobe obsidian eccentric was recovered just below waist level. All three obsidian artifacts are visually consistent with Mexican sources and seem to be imports. A jade earflare was found next to the head on the east side, and Ruler G wore a small necklace or choker made of dozens of small jadeite beads. Four pyrite tesserae were recovered, as was a single pierced pearl found near the chest of Ruler G. His body was not coated with cinnabar.

A total of 197 jadeite or other greenstone items were found in Burial 8/4. Most of these, including 43 large to medium size jade beads, were found within a crude cache vessel to the northwest of Ruler G’s head. These probably formed a necklace. Sixty-five small, flat pieces of jade, two small curved pieces, and other
carved jadeite elements may have formed a small mosaic, perhaps a mask. A total of eight additional fragments of jadeite earflares also may have been part of this posited mosaic, or, alternatively, portions of earflares left for Ruler G to wear in the afterlife. All were found in such a jumbled condition within the cache vessel that there is no hope that they can be reconstructed. Indeed, it is possible that these assorted pieces were repurposed simply as valuable raw material to be placed in the tomb.

Three jade artifacts are of particular importance. They are the diadems worn by a king (Figure 6). Two examples, which are single-sided, were found in the cache vessel, as was a small fragment of the double-sided pendant. Most of the double-sided pendant, however, was found against the east wall of the tomb. This suggests that the tomb was disturbed in antiquity.

Thirteen ceramic vessels were found along the eastern side of the tomb, but nothing was placed on the western wall. Interestingly, some sherds of a tripod polychrome plate were found scattered to the west of Ruler G’s head, but most of the vessel was placed against the eastern wall. This provides further evidence of tomb entry in antiquity.

There is an interesting pattern in the arrangement of the 13 vessels. There are two clusters on the eastern wall: seven in the north and six in the south (Figure 3, shown in orange and brown). With one exception, all of those in the northeastern cluster are brightly colored polychrome plates, dishes, and cylinders. All of those in the southwestern cluster are monochrome polished black/brown cylinders. We suggest that the number and arrangement of the vessels is deliberate. It may be that the vessels represent the 13 divisions of the heavens. They are placed in the east because this is the direction of rebirth, associated with the rising sun. The arrangement of polychrome vessels in the north and dark vessels in the south suggests their association with day versus night, and the heavens versus the underworld.

A total of 766 obsidian blades, flakes, and chunks were found throughout the tomb. Recent XRF analysis sourced 764 pieces to El Chayal, one to Ixtepeque, and one was too small to assign to a source. These artifacts may have been placed above the capstones, only to have fallen inwards when the tomb was opened in antiquity. Such deposits are well documented, if poorly understood, at sites such as Tikal.

In sum, the nature and contents of Ruler G’s tomb place him in the local cultural system of Pusilha and, more broadly, within the Maya world. His body was positioned in a manner that is common at Pusilha and southern Belize, but different from sites in other areas, especially the Belize Valley. The use of capstones rather than a vaulted roof also links the tomb to local practices; there are no “Maya vaults” in southern Belize. Nonetheless, the arrangement of his body and the ceramic offerings that accompanied him may have broader cosmological significances that tie him to religious practice throughout the Maya region. The composition of the tomb suggests that north was associated with the heavens and light, that the south was associated with darkness and night, and that the east was the direction of rebirth. Moreover, the practice of sealing the top of the tomb with obsidian is related to Peten burial practices. The presence of a great quantity of jade is consistent with the burial...
practices of kings throughout the Maya region. The three obsidian eccentrics found within the tomb point even further afield. The lunates and, especially, the trilobe form are common at distant Teotihuacan, and the obsidian appears to be imported from a source in central Mexico. Finally, although not present in the tomb itself, a figurine head wearing the goggles of the Teotihuacan storm god was recovered several meters away in the fill of the structure. Ruler G, then, may have had indirect exchange or ideological ties with distant central Mexico.

**Conclusion: The Afterlife of Ruler G**

After Ruler G died, Pusilha again seems to have entered a political crisis. The final stela of the city (Stela F), erected in AD 751, bears the name K’ak’ Kalaw, but he does not employ an emblem glyph. By the end of the eighth century, most of the city was abandoned. The outlying group called Moho Plaza was occupied during the Terminal Classic period, and a hieroglyphic stair there—the only one ever discovered in Belize—dates to AD 798.

Burial 8/4 was opened at some point in antiquity. It was entered from the top. Giant capstones were found shifted sideways and left on the partially collapsed walls of the tomb. We are not certain why the tomb was opened. The cache vessel full of jade was left in place, but part of one of the three diadems—which already may have been broken—was moved to the opposite side of the tomb. Broken pottery was moved. Some skeletal items also were disturbed. Perhaps the tomb was opened to remove bones to be used as reliquaries; we found no identifiable elements from the lower half of Ruler G’s body. But if this was the case, why was the tomb left improperly sealed, and why were no new offerings left?

The next disturbance of Ruler G’s tomb took place between 1992 and 2001 (Figure 7a). At that time, inhabitants of San Benito Poite, a village that straddles the central portion of
Pusilha, began extensive looting of the site. Virtually every mound greater than one meter in height has been trenched. During this activity, several royal burials in the northernmost structure at the top of the Gateway Hill Acropolis were looted. Locals search only for jade and have many stories about muñecas like the three diadems discovered with Ruler G. In addition to destroying some of the most important royal burials at Pusilha, looters also came very close to discovering the tomb of Ruler G. We chose that pyramid for excavation because it was so thoroughly looted that our work was a salvage operation. When we finally cleared six trenches and a tunnel at the top, we realized that a major tomb had been missed by looters by a matter of centimeters.

The discovery was not without problems. The day it became clear a royal tomb had been found, we placed two armed guards there. At 3 A.M. and after a terrific storm, one of them ran to the village to tell us that the tomb had been looted. It appears that only one person entered the tomb, and he had no hand tools. He scooped out pottery along the eastern wall and left it in a line of piles along the tomb wall, directly above from where they were taken (Figure 7b). We do not know what, if anything, he took from the tomb. But the discoveries made the next day—including the cache vessel filled with jade, the eccentrics, the remains of Ruler G, and additional undisturbed vessels in the southeastern corner of the tomb—suggest to us it was very little. This was a sad intrusion in the life history of Ruler G, and we cannot know what knowledge, if any, was lost. Many local people are now learning that the past of Toledo District is their own history. Nonetheless, a few still see only the economic potential of looting. In this regard, the Q’eqchi’ are no different from other impoverished and disenfranchised people around the world.

The remains of Ruler G were excavated and he currently reposes at the Belize Institute of Archaeology in Belmopan. Select jade items from his burial, including two of his royal diadems, are now displayed in Belize City. The excavation of Burial 8/4 was a major discovery in the archaeology of Belize. If our identification is correct, this is the first Maya king in the country whose tomb has been excavated and whose exploits are described in carved hieroglyphs. No such kingly tomb has ever been identified at Caracol. Although not as powerful as K’inich Janaab’ Pakal of Palenque, Jasaw Chan K’awil of Tikal, or K’inich Yax K’uk’ Mo’ of Copan, K’ak’ [U Ti’] Chan K’awil of Pusilha occupies a similar role in modern Belize as the first known ancient ruler of this nation whose remains have been identified. Thousands of Belizeans and foreign tourists now see objects from his royal tomb and learn about his life history each year at the Museum of Belize. We hope that these new interactions with Ruler G—an ongoing dialogue with the dead—will positively impact the life histories of modern Belizeans.

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“SOME LESSONS CAN’T BE TAUGHT, THEY SIMPLY HAVE TO BE LEARNED”: EXPERIENCES FROM THREE SEASONS OF INVESTIGATIONS AT ALABAMA, STANN CREEK DISTRICT, BELIZE

Meaghan M. Peuramaki-Brown, Shawn G. Morton, Cristina Oliveira

From 2014 to 2015, the Stann Creek Regional Archaeology Project (SCRAP) completed a preliminary survey of the ancient Maya site of Alabama in the southern reaches of the Stann Creek District, and initiated a program of settlement testing in 2016. Located in the material culture sub-region of East-Central Belize, Alabama appeared relatively rapidly during the late facet of the Late Classic to Terminal Classic periods (ca. 700-900 CE). The two phases of SCRAP research thus far have helped to reinforce lessons learned from previous research in the region, as well as introduce new lessons regarding the nature of ancient Maya material remains in East-Central Belize and how to pursue their archaeological recovery. This paper presents the lessons SCRAP members have learned—ranging from issues dealing with the adoption of old maps and excavation notes, effaced earthen-core architecture, granite as construction materials, poor pottery preservation, etc.—and how they will help to shape and direct future investigations.

Introduction

As the title quote by Picoult (2007:74) suggests, this paper examines eight lessons learned by, or reinforced for, members of the Stann Creek Regional Archaeology Project (SCRAP) during the first three years of investigations at the ancient Maya site of Alabama in the southern end of the Stann Creek District of Belize; in particular, we are sharing those lessons we had previously been taught in one form or another but had to experience firsthand in order to truly appreciate. The version of the paper presented at the 2017 BAS was intentionally light-hearted. Our aim, here, is to present these lessons in a somewhat more formal context, as they might prove useful in the work of other archaeologists, students, teachers, tour guides, etc. For many, these lessons are not new, but they are ones that we should be reminded of from time-to-time, as a form of self-reflection as practitioners of Maya archaeology. Each lesson starts with the original quote(s) provided by a project member, and the lesson is discussed as it relates to our ongoing work in the Stann Creek District.

Lesson 1: There are Significant Maya Archaeological Sites in the Stann Creek District

“It’s interesting that there are certain areas of the country that are underrepresented and understudied. I never fully realized some of the potential bias in what we learn almost exclusively coming from major centers in the ‘heartland’, and how important it is to look at smaller settlements and surrounding habitation” (SCRAP Team Member #1, personal communication, 2017).

The presence of ancient Maya archaeological sites and material culture in the Stann Creek District typically comes as a surprise to many people, despite an entire book
written on the subject by Elizabeth Graham (1994; see also Graham 1976, 1978, 1982, 1986, 1987, 1989, 2001), who is considered the progenitor of Stann Creek District archaeology. Public or professional, many would be hard-pressed to name a single pre-Columbian site in the region. Prior to her extensive survey and testing in the 1970s, little archaeological work had been conducted in the district, limited to the inland sites of Pomona (Kidder and Ekholm 1951; MacKie 1985), Kendal (Gann 1918; Price 1899), and Pearce (Joyce 1931), and some of the offshore cays (Mitchell-Hedges 1931).

The known sites of the district can be divided into two broad categories (Figure 2): the inland sites, where the majority of settlement and civic-ceremonial life was focused among the broadleaf forests of the alluvial valleys, and the coastal sites where specialized activities took place, such as limemaking in the Early Classic, saltmaking in the Late Classic, and waystations along the coastal sea trade route during the Postclassic (MacKinnon 1986, 1989a, 1990; MacKinnon and Kepecs 1989; MacKinnon and May 1990; Sills 2016; see also many of the aforementioned publications by Graham).

In terms of sites open to the public, there is but one: The Mayflower Sites (Mayflower, Maintzunun, Tau Witz) located in the Mayflower-Bocawina National Park (Stomper et al. 2004). Many of the sites in the northern half of the district, including Pomona and Kendal, have their origins in the Preclassic with occupation extending into the Postclassic (Graham 1985), while sites in the southern half appear limited to occupation spanning from the Late Classic to Early Postclassic, such as Pearce and Alabama (Dunham et al. 1995; MacKinnon et al. 1993).

For three seasons, SCRAP has been working at the small major centre of Alabama, and to-date, occupation of the site appears to have dramatically increased in the late facet of the Late Classic, perhaps even originating at this time, and extended into the early facet of the Early Postclassic (Peuramaki-Brown 2016, 2017; Peuramaki-Brown et al. 2017). From 2014-2015 we concentrated on resurveying the monumental core of the site and producing the first systematic settlement survey in all of the Stann Creek District. In 2016, we then initiated testing of settlement sites within a naturally
bounded area of the settlement zone in order to
develop a sense of the architecture outside of the
monumental core, as well as to begin refining
the settlement occupation chronology and
characterizing resident households. In 2016, we
also extended our research focus to the north at
the Pearce Sites in the Cockscomb Basin Forest Reserve (Peuramaki-Brown and Morton 2016).

Lesson 2: Producing Field Reports with
Explicit Methods is Essential

“I always knew it was important to file
both a preliminary and final report, as well
as copies of all field documentation as
soon as possible after a research season,
but I never truly understood how important
these documents could prove to be”
(SCRAP Team Member #2, personal
communication, 2017).

“We learned not to assume that because
we've done archaeology in one region that
we know exactly what we’re doing in
another” (SCRAP Team Member #3,
personal communication, 2017).

Prior to our research at Alabama, the
Point Placencia Archaeological Project (PPAP)
conducted preliminary mapping, extensive
testing, as well as consolidation work in the
epicentre of the site in the 1980s (MacKinnon 1988a, 1988b, 1989c; MacKinnon and May
1991; Walters 1988). When we began our
background research on Alabama in 2013, our
first goal was to go through reports from the
period to determine what exactly had been done
at the site, how we could build from the results,
and to ensure that we would not be redoing what
had already been done. Unfortunately, the few
reports on file in the Belize Institute of
Archaeology (IA) archives were limited in
content with regard to investigation methods and
details, and no original field notes were
included. Additionally, only a limited number
of previous project members were available to
discuss their memories of details regarding this
research conducted some 30 years ago. The
ability to retrace the past work of archaeologists
is critical and underlines the requirements that
permit holders have in Belize regarding annual
documentation and report filing. This is an
important fact of which all Belizians should be
made aware: the results of any archaeological
research (data) are required to stay in Belize.
SCRAP team members spend much time, effort,
and money preparing both preliminary and final
field reports, and copies of all of our field
documentation, along with copies of all
presentations and publications, are put on file at
the IA each year. Additionally, much of our
data is shared in open access format on our
project website (www.scraparchaeology.com).

An important part of this reporting work is
simply explaining our applied methods and
techniques in terms of survey, excavation, and
preliminary artifact analysis. The yearly need to
explain our methods, no matter how ‘standard’
they may seem in archaeology, also helps us to
continually reflect on our procedures; Are they
actually suitable for what we are doing or are we
just doing them because ‘that is how it has
always been done’?

Lesson 3: Map Making is an Interpretive Act

“The degree of interpretation involved in
map making seems to be correlated fairly
heavily to the familiarity with the subject
matter. The difference lies in drawing
what you see vs. what you interpret. This
reinforces the fact that all map making is
subjective” (SCRAP Team Member #4,
personal communication, 2017).

Due to changes in standards, technologies,
and personnel over time, including the particular
experiences of individuals, long-term mapping
of archaeological sites can be a complicated
affair. This must always be remembered and
respected, especially when dealing with older
project maps and drawings. In the 1980s, the
PPAP mapped the monumental core at Alabama,
beginning with a simple tape and compass map
before moving to a transit-produced coarse
topographic map (1 m resolution) and rectilinear
interpretation (Figure 3). When we returned to
the site in 2014, these maps were an essential
source for aligning the work of the PPAP with
our own. By measuring buildings and
comparing our results to the maps, which were
typically spot on, we were able to plan and
contextualize our present operations. However, there is no such thing as a definitive site map, and new technologies, opportunities, and hindsight encouraged us to remap the monumental core.

When it comes to archaeological mapping, it is important to start with what is physically visible on the ground—although, this too can be extremely subjective—vs. what is understood or interpreted from the ground. Our new combined epicentre map was made using a total station, which includes fine topographic detail (shots taken approximately every 2 m on a grid) along with our rectilinear interpretation. Our epicentre reconnaissance identified 20 major structures (the tallest, Str. 3, measuring 7.5 m), 4 plazas, and a sacbe, as well as 14 uncarved granite monoliths, presumably monuments of some sort. The area covers 2.48 hectares, not including the surrounding borrow pits or Sts. 19 and 20, making the monumental core of Alabama slightly larger than that of Nim Li Punit in Southern Belize following the calculation process presented in Houk (2015).

Our understanding of Alabama, represented as sequences of maps, will no doubt change over time as new visualization techniques are applied and we are able to incorporate more past and future excavation detail.

Lesson 4: Effaced Earthen-Core Architecture Represents a Unique Challenge

“Meaghan told me we would probably be digging an empty pile of dirt. She wasn’t lying” (SCRAP Team Member #5, personal communication, 2017).

Our 2016 season focused on test excavations at settlement sites presumed to represent commoner domestic buildings and associated spaces (Peuramaki-Brown, ed. 2016). As most of the Alabama settlement is located in an active citrus orchard, vs. the monumental core which is covered in broadleaf forest, we were prepared for significant disturbance related to the original preparation of the orchard and earlier banana plantation, as well as continued disturbance from various maintenance processes. What we were not entirely prepared for was the destructive ability of ants, spiders, and other
borrowing creatures within the relatively loose sediments, in addition to the very large taproots from a particular vine that commonly appears in citrus orchards (Figure 4). In addition, armadillo hunting as a form of illicit excavation made an appearance in the monumental core. Each of these taphonomic agents and effects played a significant role in our applied methodologies and hence our documentation strategies.

Previous work in the district mentioned the presence of predominantly sandy-clay for the construction core of monumental construction platforms, mined from surrounding alluvial plains, and faced with granite or other non-limestone facing blocks and the use of crushed granite as a flooring material at some sites (e.g. Graham 1994; MacKie 1985; Price 1899). Little to no plaster is found in the architecture of the district, likely related to the lack of significant limestone deposits in the region; rather, blocks of slate and granite are often used as paving for the surfaces of monumental platforms. The lack of plastering agents on non-monumental platforms also means pebble/cobble ballast layers are typically absent; this makes identifying the actual surfaces of smaller platforms, if they survive, quite difficult to distinguish from overburden sediments, including colluvium. Most platforms also lack artifacts within their construction core, and were often missing their granite facings, either partially or completely removed in antiquity, if present to begin with. Thus, resulting in only minimal fallen or slumped stone material at some sites, making it even more difficult to distinguish the actual surfaces of platforms.

At the largest platform that we tested in the Alabama settlement, just over 2 m tall, these issues required us to develop a compaction test to approximate where exactly the platform stratigraphy started within the mound (Figure 5). At the smallest platform, the careful noting of where artifacts were and were not encountered also helped to delineate the exterior from the interior of the platform. Additionally, recording even the most minute of details in stratigraphy was at times our only key to understanding a domestic platform. On the other hand, other platforms were very clearly discerned based on the intact granite facings—easily located by ‘probing’ with a machete to find intact alignments—and crushed granite lenses (former surfaces). In upcoming seasons, we will better test the methodology for dealing with effaced earthen-core architecture that was recently proposed by Brouwer Burg et al. (2016). After our season of testing in the citrus orchard, it was determined that, despite difficulties, these excavations are worthwhile as there appears to be far more in the way of material culture
Experiences from Three Seasons of Investigations at Alabama

(artifacts) associated with settlement mounds and non-mounded areas than is typically encountered with the monumental architecture of the district.

Lesson 5: Pottery is Still Valuable without Type-Variety

“Elizabeth Graham always told me that the pottery of Stann Creek was horrible. I didn’t really believe her. I do now” (SCRAP Team Member #2, personal communication, 2017).

“I’m super jealous. Probably the first time anyone has ever said that about the Stann Creek Assemblage” (SCRAP Team Member #6 commenting on recent petrographic study results, personal communication, 2017).

Since we first contemplated work in the Stann Creek District, we were warned to be prepared for no artifacts in construction core material (as mentioned above) and for really poor pottery due to the highly erosive, acidic soils of the district. The pottery we found during our 2015 surface collection was in tolerable shape, with some surviving slips and decorations; however, materials below ground surface typically have no surviving surface treatments. Pottery materials from the predominantly clay occupation horizon—the surface atop of which the domestic platforms were constructed—is often reduced to red smears that have the shape of a pottery sherd, but no consistency. As a result, type-variety analysis, which depends heavily on surface treatment, is difficult if not impossible with the Alabama assemblage. The forms can provide us with an idea of time period, as can some wares/fabrics; however, the most useful information comes from source characterization and technology studies.

Since 2015, we have been working on preliminary petrographic studies of both clays collected from the Alabama area and pottery recovered from surface collection. This study has proven helpful in providing preliminary macrovisural, microvisural, and technological descriptions of the most common pottery fabrics recovered at Alabama, and has demonstrated the presence of locally-manufactured (within 10 km) wares and the use of local clay-like sediments for construction daub; non-local wares include one that originates to the south in the Bladen as well as one to the north near the Hummingbird; and even grog from vessels produced in the Belize Valley, used in another possible locally-manufactured ware (Peuramaki-Brown and Howie 2017). Ongoing petrographic analysis will help us to create a typology for the area, and to better understand certain human-resource relationships of the Alabama Maya to compare with resource use by the modern Maya of the Alabama area (Toledo Maya Cultural Council & Alcaldes Association 1997:112-113).

Lesson 6: Responsible Use of Appropriate Visualization Techniques is Essential

“The Care Bear drawing? More information would be nice” (SCRAP Team Member #7, personal communication, 2017).

In addition to more intensive artifact studies, such as our pottery petrography, basic artifact analysis and documentation is critical to any archaeology project. We have learned that the visualization of artifacts, particularly through illustration, photography, and 3D model generation, is critical to capturing as much data as possible. It is also in critical to our ability to convey information regarding special finds to our colleagues and community members. Unfortunately, multiple visualization methods have not always been employed in the district, for a variety of reasons; previously produced ‘illustrations’, such as the ‘Care Bear’ stone, leave much to be desired and many questions unanswered (see MacKinnon 1988a: fig. 1).

The SCRAP team has made a point of using multiple visualization methods for our small finds documentation and analyses, including photography, illustration, and 3D scanning, alongside standard measuring, colour designations, and other quantitative and qualitative description (Figure 6). Starting in 2018, we will also be incorporating 3D scanning of excavations into our 3-prong visualization strategy. In addition to serving analysis and
outreach purposes, these visual aids will be used in the creation of an online artifact catalogue, as well as an Open Education Resource called the Athabasca University Virtual Archaeology Lab that consists of basic introductory lab exercises for new archaeology students.

**Lesson 7: Archaeology Isn’t About Finding “Temples in the Jungle”**

“I didn’t really realize that some centers are overgrown and difficult to access. I had seen photos of ancient Maya centres and assumed they always looked that way, but seeing the centre at Alabama made me realize how much work goes into making a site ‘tourist ready’” (SCRAP Team Member #1, personal communication, 2017).

One of our favourite lessons to-date, because it is one we often forget, was from a project member who came to the Maya area for the first time. They had been previously taught about Maya archaeology in the jungle, but the only images ever shown in class or in textbooks were of consolidated buildings within the jungle. Seeing what is actually meant by “temples in the jungle”—completely covered platform-mounds—was new to them, and reminds us of what tourists to the region might expect to see vs. some of the reality of archaeological sites in Belize. As a result, we believe it is very important to convey both the nicely consolidated buildings of sites such as Cahal Pech alongside those still ‘in the bush’, such as many of the amazing platform-mounds of sites such as El Pilar. Making sure tourists visit both types of settings helps to emphasize this lesson and to demonstrate how much work goes into tourism development in Belize.

It is also worth noting that in a study by Ramsey and Everitt (2008) involving interviews with tourists and Belizeans regarding site development in the Cayo District, the most common observation was the need for more educational value when it comes to visiting sites, but that this did not necessarily go hand-in-hand with the need or desire for more consolidation. In fact, the ability to see sites “in nature” as opposed to consolidated was identified as important, and that simply increased amounts of tour guide information, museums, and maps were what was actually desired for more quality, educational experiences. These possibilities could easily be extended to the use of augmented reality applications at sites, where original buildings could be ‘seen’ using portable tablets or smartphones at trigger points on the landscape; thus, eliminating the need for increasingly expensive consolidation efforts. We are currently applying for funds to test such emerging technology at Alabama, for the purpose of locally-oriented education and outreach.

**Lesson 8: Archaeology is a Team Effort**

“Just because you don't speak the same
language as someone else doesn't mean you can't learn from each other” (SCRAP Team Member #3 commenting on working with older Maya field assistants, personal communication, 2017).

“Building relationships with people in the area where you are working is just as important as the actual archaeology” (SCRAP Team Member #8 commenting on our community outreach and engagement efforts, personal communication, 2017).

Our final lesson is acknowledging how much of a team effort archaeology really is. Not only among the archaeologists themselves, but with our entire crew, collaborators, local community members and leaders, property owners, government representatives, cultural associations, wilderness societies, etc. The list is never ending and we wish to make it clear that none of our research is possible without this team approach. We look forward to expanding our networks in upcoming seasons when we have our first archaeological field school at Alabama in 2018; continue expanding our focus toward the site of Pearce and understanding its relationship with the Alabama Maya; and new incorporations of geomorphological and botanical studies in both areas.

With this paper, it is not our intention to be patronizing or to diminish the work of our colleagues. Rather, we hope that these few lessons that we ourselves have had to re-learn, through their specific contextualization within the aims and operations of the Stann Creek Regional Archaeology Project, can serve to remind us and others of some of the little-discussed realities of archaeological field work.

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INVESTIGATING ANCIENT MAYA SETTLEMENT, WETLAND FEATURES, AND PRECERAMIC OCCUPATION AROUND CROOKED TREE, BELIZE: EXCAVATIONS AND AERIAL MAPPING WITH DRONES

Eleanor Harrison-Buck, Mark Willis, Satoru Murata, and Jessica Craig

Between 2014-2017 the Belize River East Archaeology (BREA) project conducted archaeological survey in the areas between the large Maya centers of Chau Hiix and Altun Ha. Unlike the uplands, we have found that settlement in this low-lying coastal zone is situated in relatively isolated pockets of higher ground. These sites are all circumscribed by marginal land inadequate for farming. For this reason, we argue that these sites were heavily reliant on the adjacent wetlands for agriculture, building ditched and drained fields, while also relying on these biologically-rich environments for hunting and aquaculture. Here we report on our 2017 fieldwork, which investigated the sites of Chulub and Crawford Bank located on Crooked Tree island and its adjacent wetland features in the Western Lagoon, which were mapped using drones. Our investigations have revealed a long history of human-wetland interaction, beginning in the pre-ceramic period and continuing through ancient Maya times. Wetland modifications are typically attributed to the ancient Maya. Yet, it appears that preceramic groups were the first to intensively manage these environments. We suggest, particularly in the context of aquaculture and the construction of fish weirs, that these later modifications may represent a continuum of preceramic activity, rather than a break from it by the Preclassic Maya.

Introduction

The BREA project study area encompasses the eastern Belize River watershed between Belmopan and Belize City, a roughly 6000 sq. km area (Figure 1). Over the course of seven years (2011-2017), our investigations of the BREA study area have identified a dense occupation and a long history of settlement in the eastern Belize Valley, extending from Formative to Colonial times, ca. 900 BC-AD 1900 (Harrison-Buck, ed. 2011, 2013, 2015a, 2015b; Harrison-Buck, Murata, and Kaeding 2012; Harrison-Buck, Kaeding, and Murata 2013; Harrison-Buck et al. 2015, 2016, 2017; Runggaldier et al. 2013). In recent years, we have extended our investigations to the easternmost part of the Belize River Watershed, which comprises a low-lying coastal zone with numerous small creeks and tributaries along with sizeable tracts of perennial wetlands. Altun Ha and Chau Hiix are the two largest sites in this part of the BREA study area. The latter is situated along the Western Lagoon Wetland, the largest inland wetland in all of Belize. Between 2014-2017, BREA conducted archaeological survey in the areas between the centers of Chau Hiix and Altun Ha (Harrison-Buck et al. 2015, 2016, 2017; Norris et al. 2015 [see inset on Figure 2]). Unlike the uplands, we have found that settlement in the coastal zone is situated in relatively isolated pockets of higher ground. For instance, Jabonche—one of the largest sites that we identified and mapped between Chau Hiix and Altun Ha—is positioned on one of the few areas of high ground found along Black Creek, a tributary of the Belize River (Harrison-Buck, Brouwer Burg et al. 2016 [refer to Figures 1 and 2]).
Ancient Maya Settlement, Wetland Features, and Preceramic Occupation

The areas around Jabonche and other neighboring sites, such as Chulub, Chakan, Waxak Nikte', and Kunahmul are surrounded by marginal land inadequate for farming (Figure 2). For this reason, I have argued that these sites were heavily reliant on the wetlands for agriculture, building ditched and drained fields (visible in satellite imagery), while also relying on these biologically-rich environments for hunting and aquaculture (Harrison-Buck 2014).

The results of our fieldwork in 2017 build on a long-term, interdisciplinary research project involving a human-wetland study. During the 2017 field seasons, BREA focused on mapping these wetlands using unmanned aerial vehicles (UAVs), otherwise known as drones, revealing numerous ditched fields and drainage canals that we believe were constructed by the ancient Maya. BREA also conducted an excavation in one of the pond features thought to possibly function as a fish weir in the Western Lagoon Wetland that connects to one of the east-west canal features. This sizeable canal feature extends from the site center of Chau Hiix eastward across the Western Lagoon, cutting through the southern end of Crooked Tree island just south of the site of Chulub. During the January 2017 field season, BREA mapped the site of Chulub and performed several test excavations at this site. In addition, during the summer 2017 field season, our team identified what appears to be an extensive pre-ceramic site running along the eastern shoreline of the Crooked Tree island and we performed one test Excavations.
excavation of this pre-ceramic site at Crawford Bank. Below, we summarize these finds.

**Ancient Maya Occupation and Human-Wetland Interactions**

*Drone Mapping of the Western Lagoon Wetlands*

Our efforts to investigate the perennial wetlands in the BREA study area continued in 2017. Examining satellite imagery publicly available on Google Earth, BREA detected a large network of water features in the form of ponds or wells connected to a series of long, linear canals in the adjacent Western Lagoon wetlands, which we believe were constructed by the ancient Maya. During the summer 2017 season, we carried out an expansive mapping project of the wetlands using drones. We have shown elsewhere that drone mapping is a very efficient and cost-effective means of mapping large-scale archaeological landscapes (Harrison-Buck, Brouwer Burg et al. 2015; Harrison-Buck, Willis, and Walker 2016; Willis and Walker 2015).

One of the largest and longest canals in the Western Lagoon wetlands extends east from the site center of Chau Hiix and stretches across the Western Lagoon wetlands and bisects the southern tip of Crooked Tree island just south of Chulub (Figures 2 and 3). The geospatial mapping with drones offered an efficient and cost-effective means of mapping a huge area of the wetlands in a short amount of time. In less than a week, our drone operator Mark Willis mapped over 10,000 acres of the Western Lagoon wetlands that is an area over 40 km². To put this into perspective, the aerial extent mapped is equivalent to 75% of Manhattan (Figure 3a). A close-up of the longest canal extending from Chau Hiix across the Western Lagoon wetlands reveals the channel and other subtle topographic details that the drone was able to detect (Figure 3b).

**Wetland Features in Western Lagoon (Operation 34)**

We carried out one small test excavation of a pond feature positioned along the axis of this main linear channel in the Western Lagoon wetlands (see Figure 3b). Operation 34 was a small 1 x 2 m unit placed on the western edge of the pond. Apparently, the pond feature still had standing water the week prior so we timed the excavation perfectly at the very end of the dry season.
season and the unit did not become inundated until we were almost a meter in depth. We hypothesized that this feature may have been used as a fish weir by the ancient Maya. However, aside from a piece of chert debitage, our excavations yielded virtually no other cultural material, only mud and organic material.

Mapping the Sites Adjacent to the Wetlands: Ek Tok and Chulub

During the 2017 January and summer field seasons, we continued the survey, mapping, and excavation of select Maya sites located adjacent to the wetlands in the lower reaches of the BREA study area. Using a Total Station and GPS, we devoted three weeks in January 2017 to mapping the site core of Ek Tok, located on the western shores of the Western Lagoon, the perennial wetland discussed above (Figures 2 and 4). The survey and mapping has allowed us to record detailed topographic information for the site core and more accurately tie in the site to our existing GIS map of the BREA study area. Ek Tok is located about a kilometer and a half north of Chau Hiix. Several sacbes or roads were identified during reconnaissance that radiate out from Ek Tok, including one that extends to the south and may in fact link up with the Chau Hiix site core. Further reconnaissance is needed to confirm this and is planned for future field seasons. Ek Tok is a sizeable satellite center, comprising several pyramidal structures and three discrete plaza groups, as well as numerous isolated mounds.
During the January 2017 season, we focused most of our attention on mapping Chulub. This modest-sized Maya settlement is located on the southeastern end of the Crooked Tree island near the shore of the Crooked Tree Lagoon, a seasonal wetland (see Figure 2). Our survey team mapped with a Total Station the site center of Chulub, which consists of a main plaza group and other outlying mounds that were associated with a series of pond and canal features that appear to link to the nearby lagoon (Figure 5). These outlying mounds oriented toward the water features may not be residential, but rather, production-oriented (see further
below). The area around the site center is a cohune ridge suitable for farming, but circumscribing the site is a fringing wetland forest inadequate for farming. For this reason, the inhabitants of Chulub likely relied on the lagoon and nearby wetlands for additional sources of food, such as turtles and fish, and may have built the canal and pond features to facilitate aquaculture and other production and processing activities.

Excavations at Chulub (Operations 31, 32, and 33)

BREA conducted several test excavations at the Maya site of Chulub, including Operations 31, 32, and 33 (Figure 5). Preliminary analysis of the artifacts from all excavations suggests that Chulub was primarily occupied during the Early Postclassic period (ca. AD 900-1200), with small amounts of material suggesting an earlier Terminal Classic component at the site. Below I briefly describe the results from each excavation.

Operation 32 was placed over an all-stone mound identified on the southwest side of the main plaza group and revealed a poorly preserved rectangular-shaped shrine building. Although an earlier Terminal Classic phase was identified lower down in Operation 32, the final construction phase dates no earlier than the Early Postclassic (ca. AD 900-1200). The preservation was very poor, making it difficult to reconstruct the building’s original configuration, but it may have consisted of upright slab construction typical of the Postclassic that has since collapsed. I believe the configuration of this structure may have originally been in the form of a radial shrine with a series of outset staircases, perhaps similar to one BREA investigated at Saturday Creek several years ago, which also dated to the Postclassic (Harrison-Buck and Flanagan 2015).

Two other 1 x 2 m test units (Operation 33a and 33c) were placed on the sides and back of the largest mound in the main plaza in an effort to recover midden (trash) deposits.

Figure 6. Artifacts from Chulub: a. polished axe head; b. arrow point; c. net weights (photos by E. Harrison-Buck).
Figures 7. Crawford Bank Op. 35 (looking east) and three examples of lithic tools found in the excavation (photos by E. Harrison-Buck).

associated with the main plaza group at Chulub. In both excavations, remains of faunal material, including turtle, fish and other wetland taxa were present in the archaeological record. Remains of larger land animals, such as deer, were also identified in large quantities in all excavations at Chulub. Several significant artifacts were recovered, including a small Postclassic arrow head point (Figure 6a). While David Pendergast and others have long argued that these small points were used for hunting birds, Joel Palka has suggested to me (based on his studies of hunting and fishing practices among the contemporary Lacandon Maya in Guatemala) that these points were more likely used for spearing fish.

Operation 31 was a 2 m x 10 m excavation unit positioned on an outlying mound to the north of the main plaza, located adjacent to one of the water features. The goal of the excavation was to better understand the function of these pond and canal-like features found in between these outlying structures. One hypothesis that we wanted to test was whether these water features, which become seasonally inundated but retain some water throughout the year, were used by the Maya for aquaculture. The excavation revealed an intact terrace wall and yielded a high density of lithic material, including a number of specialized tools, such as polished axes which suggest wood-working (Figure 6b). One possibility is that this area was used for carving dugout canoes and the canal features facilitated the movement of these vessels from the workshop to the open lagoon waters. In addition, our investigations revealed a relatively high density of animal bone compared to the other two excavations. Faunal material included deer, turtle, and fish remains, as well as net weights that may have been used for netting fish (Figure 6c). Although the water feature itself needs to be tested, the fauna
combined with the net weights and lithic material suggest that multiple production activities may have occurred at this locale, including wood carving and the processing of meat and fish.

**Pre-Ceramic Occupation at Crawford Bank**

The Crawford Bank site is located on the east side of the island on the property of the Crooked Tree Lodge adjacent to the Crooked Tree Lagoon (Figure 7). Operation 35 comprises a narrow 1 x 12 m strip trench with the long axis running east-west so as to bisect a limestone feature running along the shoreline of the Crooked Tree Lagoon. We initially wondered whether the limestone was some kind of historic feature as there were sizeable concentrations of historic artifacts found in this vicinity, including fragments of glass bottles, ceramics, and clay pipes. While most of the material appeared to date to the nineteenth and early twentieth centuries, there were two intact bottles that the owner showed us that were identified as dating to the mid-to-late eighteenth century and were among the earliest historic material we had seen anywhere on the island so we decided to test the feature for historic remains.

The 1-x-12 m unit was initially divided into six 1- x-2 m squares (A-F). We started to remove the thin layer of topsoil that covered the limestone surface and found only a handful of historic artifacts, but a plethora of *pomacea* shell and lithic debitage mixed with a few chipped stone tool fragments. With so much lithic material we started to wonder whether the limestone feature was an ancient Maya feature, but noticeably absent were any Maya ceramic sherds. We decided to extend the excavation unit another eight meters (G-J) to the east in the direction of the shoreline to catch the eastern edge of the limestone feature, which we did in Square J. It was here that we found some of our most exciting finds, including a lithic tool referred to as a Lowe point that is diagnostic of the preceramic period (Figure 7, bottom left).

In addition, we found dense concentrations of freshwater *pomacea* shell in direct association with the lithic tools and debitage identified throughout the excavation. The barbed point noted above was found just below ground surface in the far eastern end of Square J, closest to the shore of the lagoon. It was lying on or just above a clearly defined gray sandy, occupation surface that was associated with a dense shell midden heap found in the far western end of Square J. Notably, on this gray sandy surface near the barbed point we also found several pieces of slate that appear to be worked.

Through the course of our excavations, it became clear that the limestone feature was likely a natural outcrop, perhaps the remains of an ancient shoreline or a natural bedrock outcrop, although a dense yellow clay matrix appears to run underneath some of the rock outcrop, as seen in Sq. J. We also found in this yellow clay a few more pieces of lithic debitage and at least one tool, which would stratigraphically pre-date the shell midden and barbed point also found in Square J.

**Pre-Ceramic Occupation in Belize: Crooked Tree and Beyond**

No pre-ceramic occupation has ever been reported from Crooked Tree, but there are numerous sites surrounding the area around northern Belize where similar points have been reported (Lohse et al. 2006:Fig. 2). Similar projectile points with barbed edges, including the so-called Lowe and Sawmill points, were first defined by the Belize Archaic Archaeological Reconnaissance (BAAR) project directed by Scotty McNeish between 1979-1982. Into the 1980s and 90s, their work continued as part of the Colha project. In the decades since the BAAR project quite a bit of new data has been collected on the preceramic period in Belize that have been published more recently. For instance, Lohse and colleagues (2006) published a comprehensive report of finds with a typological framework of diagnostic lithic forms for the preceramic period in Belize. At Crawford Bank, we seem to have most of the assemblage rendered in their typology, including the barbed point, pointed unifacial tools, macroblades and small blades, and hammer stones (see Figure 7; cf. Lohse et al. 2006: Fig. 8). Lohse and colleagues (2006:217) suggest these types date to the Early Archaic (ca. 3500-1900 B.C.).
Over the last decade since Lohse et al. published their article, more preceramic sites have been recorded in Belize, including a series of rock shelters in the Rio Blanco valley of southern Belize investigated by Keith Prufer and his team (2017). Prufer and colleagues have presented a revised preceramic chronology for southern Belize based on a series of preceramic burials and stratified contexts with jute shell middens and barbed points found in these stratified contexts dating as early as 9,000 years B.P. Based on a large series of radiocarbon dates from these stratified deposits they have convincingly argued that the barbed Lowe points date as early as the Paleoindian period, rather than the Early Archaic as has been previously suggested. Prufer and his team (2017:321) conclude that by at least 10,500 BC the exploitation of nearby stone tool resources and the processing of freshwater snail were a major part of the use of the rock shelter.

Similarly, it appears that preceramic groups who visited the Crawford Bank site in Crooked Tree also exploited the local resources, which includes an abundance of *pomacea* shell, which are a plentiful resource in the wetland environments that characterize Crooked Tree. We suggest the procurement and processing of *pomacea* shell represents a major activity for the preceramic groups at Crawford Bank.

The barbed point from Crawford Bank is by far the most diagnostic piece found in our excavation and is arguably our most important find. To date, there have been less than a hundred such points reported from Belize. It bears the strongest resemblance to an example reported from a preceramic site near Ladyville, which is in the BREA study area and not too far from Crooked Tree (Stemp et al. 2016:Fig. 2c). According to James Stemp and colleagues (2016:292-293), the seriated edges of the barbed points suggest they were meant to stay lodged in an animal, rather than be easily pulled out. He concludes that the barbed points would not be conducive for stabbing or thrusting big game animals, but more “advantageous for hunting aquatic prey” (Stemp et al. 2016:293). That the barbed Lowe point from Crawford Bank was found right at the edge of the lagoon shoreline lends support to this interpretation. In fact, the day we were excavating Sq. J and found the Lowe point, fisherman walked by to hunt fish near Crawford Bank and on their way back stopped by our excavation and showed us their catch. When we showed them the Lowe point, one remarked that they had found a similar point in the middle of the lagoon. This is where one would expect to lose a hafted barbed point if you were using it for hunting aquatic prey, as James Stemp and others suggest.

That said, our excavations were dominated by an abundance of *pomacea* and we were surprised by the utter lack of fish or other small water-bodied faunal remains that would require a barbed spear. It seems almost inconceivable that the early humans coming to Crooked Tree would only gather *Mollusca* and not take advantage of the other rich and biologically diverse resources, namely fish that are available in the surrounding lagoon and wetlands. It may be simply a matter of preservation. This shoreline is seasonally inundated by lagoon water. That only the shell and lithic materials were found is perhaps because only materials that are more impervious to water have survived. Further excavation farther away from the water’s edge may help to clarify this issue and also hopefully present deeper stratified deposits than we exposed in the Op. 35 strip trench.

**Concluding Thoughts**

Compared to the ancient Maya civilization, very little is known about the preceramic occupations in Belize. However, early use of wetland environments has been documented in northern Belize. For instance, wetland investigations in the Rio Hondo area by Mary Pohl and Kevin Pope identified early deposits of unifacial tools as well as a barbed Lowe point and suggested an Early Archaic date for these deposits. Although more recent investigations by Prufer and others are bringing into question the traditionally accepted chronology for the preceramic, these data demonstrate that wetland environments have a long history of use and were attractive not only to the Maya, but also to the preceramic groups as well. Pohl and colleagues (1996) suggest that wetland modification with the building of drainage canals in the northern Belize area
began as early as 1000 B.C. (cited in Lohse et al. 2006:223). While scholars have attributed most of the wetland modification to the ancient Maya, it appears that preceramic groups were the first to intensively manage these environments and it may be worth considering these later modifications, particularly in the context of aquaculture and the construction of fish weirs, as perhaps a continuum of preceramic activity, rather than a break from it by the Preclassic Maya.

Jon Lohse and colleagues (2006:221) observe that many early preceramic sites may exist in these “perennially wet environments” but their seasonal inundation “[poses] severe logistical challenges to researchers.” This is certainly the case for Crawford Bank, where the preceramic deposits we uncovered were found along a shoreline that is seasonally inundated by the rising waters of Crooked Tree Lagoon during the rainy season. Fortunately for us, we decided to conduct our 2017 investigations at the tail end of the dry season during the first week of June. The full extent of the site is unknown, but local informants indicate that the limestone outcrop extends the length of Crawford Bank. If the preceramic occupation follows the bedrock outcrop it may well extend for a kilometer or more along the eastern shoreline of Crooked Tree island. In the future, we plan to continue our research on the preceramic of Crooked Tree and the deep history of human-wetland interactions in this area.

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COMMUNITY ARCHAEOLOGY AT AVENTURA: ARCHAEOLOGY ABOUT COMMUNITIES AND ARCHAEOLOGY FOR COMMUNITIES, RESULTS OF THE 2016 FIELD SEASON

Cynthia Robin, Laura Kosakowsky, Kacey Grauer, and Zachary Nissen

This paper examines community archaeology at Aventura through the presentation of the results of the 2016 season of the Aventura Archaeology Project. Aventura is a community with a five millennia history spanning forager-horticulturalist, Pre-Columbian Maya, historic, and contemporary periods. The Aventura Archaeology Project addresses community at many levels. Research undertaken at Aventura in 2016 includes site core survey and excavations, pocket bajo excavations, and ceramic analysis. New research in 2016 focused on expanding our understanding of the Pre-Columbian Maya community of Aventura. In tandem with studying the many past communities that inhabited the place Aventura, the project also works with local cultural heritage leaders to promote archaeology and site protection today. While this paper focuses on the results of the 2016 archaeological research that further knowledge about the Pre-Columbian Maya community of Aventura, it is the theoretical thesis of this paper that the combined goals of studying past communities and working with contemporary communities enriches archaeological research on communities, both ancient and modern. The 2016 season of the Aventura Archaeology Project saw the inauguration of two annual community programs. Through the mutually beneficial goals of archaeological research and archaeological education, the Aventura Archaeology Projects seeks to develop richer understandings of past and present communities through archaeology.

Introduction

Community archaeology, archaeology about community and archaeology for communities, in its broadest sense is a key goal of the Aventura Archaeology Project. The project seeks to undertake an archaeology that both investigates the many ancient communities that inhabited Aventura across its long five millennia history and promotes community collaboration today. We begin this paper by outlining our theoretical premise: the combined goals of studying past communities and working with contemporary communities enriches archaeological research on communities, both ancient and modern. We then focus on how the results of the 2016 field season at Aventura expand our understanding of the Pre-Columbian Maya community at Aventura. The 2016 archaeological research at Aventura included site core survey and excavations, pocket bajo excavations, and ceramic analysis. This research underscores the ecological and ritual underpinnings of community at Aventura and the duration of the Pre-Columbian Maya community of Aventura. We conclude by highlighting the project’s community programs initiated in 2016 that demonstrate the mutually beneficial goals of archaeological research and education. An archaeology about and for communities illustrates the unique ways that archaeology, with its access to the long-term history of human societies can address issues of community.

Community Archaeology: Archaeology about Communities and Archaeology for Communities

The project we propose of an archaeology about and for communities is indebted to a long history of research within two related fields of archaeology: the archaeology of community and community archaeology (e.g., Ashmore and Wilk 1988; Atalay 2012; Colwell-Chanthaphonh and Ferguson 2007; Flannery 1976; Kolb and Snead 1997; Marshall 2002; Pyburn 2009, 2011; Yaeger and Canuto 2000). Community is a key aspect of human societies past and present that is a primary context for social, political, economic, and religious interaction and identity formation.

While archaeologists have long discussed the ancient community, Canuto and Yaeger’s edited volume, Archaeology of Communities: A New World Perspective (2000) brought renewed critical thinking on defining and analyzing communities in the archaeological record. Archaeology of Communities sought to untangle the definitions of an archaeological site (a location on the landscape where past human activities occurred) and an ancient community. An archaeological site can be many things and it may or may not be coterminous with an ancient community. Archaeologists must determine if the site they are excavating is a community. If it
Community Archaeology at Aventura

is, understanding it as a community requires attention to how past people created community through agency, practice, materiality, interaction, and identity formation.

A community brings together “people, place, and premise” (Watanabe 1992). It is both a place and a group of people who create a salient social identity based upon that place: a “dynamic socially constituted institution that is contingent upon human agency for its creation and continued existence.” (Yaeger and Canuto 2000: 5). Because of the dynamic and historically contingent nature of communities, interaction and identity are central to a definition of community (Yaeger and Canuto 2000). People constitute communities through repeated interaction. Across their lives people may identify with one or more communities.

In contrast with the archaeology of community, community archaeology, defined broadly as an archaeology that is engaged with local communities, is a relatively recent addition to academic archaeology (Marshall 2002). This addition has demonstrated that “public involvement, heritage management, and collaboration with communities are now central issues in archaeology receiving scholarly attention” (Atalay 2012). Scholarship in archaeology is expanding not just on the findings of archaeological research, but also on the importance of community archaeology and how engaging with local stakeholders produces a better archaeology, both for professional archaeologists and local communities alike (e.g., Atalay 2012; Colwell-Chanthaphonh and Ferguson 2007; Marshall 2002; Pyburn 2009, 2011; Wylie 2002, 2008). Community-engaged archaeology produces better knowledge exchanges, better archaeological preservation, and also better science, as the involvement of academic and non-academic voices in all aspects of the archaeological process expands the rigor of hypothesis generation and testing (e.g., Wylie 2002, 2008). Within Maya archaeology, Ren (2006) argues that collaboration with local stakeholders offers new perspectives to framing Maya history that attends to stakeholders’ relationships with archaeological materials.

Community-based archaeology creates community between archaeologists and the local constituents they serve. Community archaeology brings the collaborative aspects of doing archaeological research to the foreground through interaction and engagement. It is agentive, practice based, and creates shared identities and knowledge around the importance of archaeological protection and education.

At the heart of both the fields of “the archaeology of community” and “community archaeology” is the idea that communities are socially constituted, dynamic, and historical contingent: they are created and recreated through human agency. It is the premise of this paper that archaeologists and their collaborators, with their access to the long-term history of human societies, can uniquely and fruitfully conjoin the fields of “the archaeology of community” and “community archaeology” to enrich our understanding of community both today and in the past.

The archaeological site of Aventura has long been central in the lives of members of adjacent communities in northern Belize due to its visibility along the northern highway. This centrality and the activity of local cultural heritage leaders was as much an impetus for the initiation of the Aventura Archaeology Project in 2015 as was the academic goal of understanding a long-lived community. Given the limited nature of research at Aventura prior to the inception of the Aventura Archaeology Project, the site is best known as the ancient Maya site whose main temple is easily visible as you drive up the northern highway approaching Corozal Town. Aventura is situated today in an area of sugar cane farming. As the largest architecture at the site is inaccessible for sugar cane farming,
it remains shrouded in forest canopy standing in clear contrast with the cane fields that surround it. Most visible is Aventura’s main temple, Structure 1 in Group A, which stands 20 meters (66 feet) in height. Less visible from the northern highway perspective is that this site was a community, an urban center with six central civic-ceremonial groups, which form the core of a Pre-Columbian city with a dense urban settlement of 206 buildings per square kilometer (Robin et al. 2017). Understanding Aventura as a community has implications for ancient studies and modern communities alike.

Aventura as a Site and Community through Time

The Aventura site is located 10 km southwest of contemporary Corozal Town and adjacent to the village of San Joaquin, 10 km southwest and 10 km west, respectively, of the better known sites of Santa Rita and Cerro Maya (Figure 1). It is part of the Bay of Chetumal region, which spans what is now the northern part of Belize and the southern part of Quintana Roo, a region that today is divided by the modern national boundary between Belize and Mexico (Walker 2016).

Previous research at Aventura prior to the inception of the Aventura Archaeology Project in 2015 included a rough map of the site core and eight test pits conducted by Raymond Sidrys of UCLA in 1974 (Sidrys 1983) and excavation of three residences by Rafael Guerra, Sherilyne Jones, and Melissa Badillo of the Institute of Archaeology in 2007. Based on this research, we were aware that Aventura had a long occupation history spanning the Middle Preclassic to the Spanish Conquest. Sidrys identified occupation and use of Aventura spanning the Middle Preclassic to the Late Postclassic and identified Aventura’s peak in the Late Classic to Early Postclassic periods. The 2015 research of the Aventura Archaeology Project added further chronological depth to the history of the site with the identification of Archaic artifacts and Historic Era sites (Kosakowsky 2015; Robin et al. 2017). This evidence suggests the potential for an even longer five millennia occupation of the site potentially going back to the Late Archaic around 3400 BC.
Aventura’s central ceremonial complex consists of six plaza groups, Groups A to F, which contain seven temples ranging in height from six to 20 meters. The combined settlement survey research at Aventura in 2015 and 2016 identified 119 mounds in a ½ km² area around the central precinct of the site (Figure 2; Nissen 2016).

Aventura’s long history extending over 5000 years across the Late Archaic, Pre-Columbian civilization, and Historic periods indicates that the place of Aventura has always been dynamic and changing. Aventura played a role for diverse communities through time, and here we present a few snapshots of those communities and their relationship to the place of Aventura.

During the Late Archaic period (post 3400 BC), the community that came together at Aventura was mobile. Based on the location of archaic surface finds, forager-horticulturalists may have first been attracted to Aventura due to the presence of pocket bajos (Figure 3). Pocket bajos are small non-draining karstic depressions that are less than 2 km² (Dunning et al. 2006; Grauer 2016). They are seasonal wetlands today, but may have consistently held water in the past. Mobile forager-horticulturalist communities may have come together at Aventura’s pocket bajos due to their resource potential.

By the Preclassic period, agriculturalists had established a permanent community at Aventura which grew and expanded through time, seeing its heyday in the Terminal Classic to Early Postclassic period (750 – 1100 AD). Certainly by the time of its heyday that community consisted of six civic-ceremonial plazas and seven temples and provided for the political, religious, economic, and social needs of community members (see Figure 2).

We do not yet know the exact timing of the abandonment of the Pre-Columbian city of Aventura, but during and after the War of Castes in Yucatan (1847 – 1901 AD), Maya and Mestizo immigrants, British colonialists, and Africans toiled in multi-ethnic communities of sugar production work at Aventura. Survey has identified the presence of two sugar mills and one Caste War church (Figure 4; Jones 2015; Robin et al. 2017).

Today, communities of sugar cane farmers and residents of San Joaquin work and live in and around Aventura, as well as alongside the remains of the now defunct US American commercial papaya venture of the Fruta Bomba company located 250 meters north of the PreColumbian community center.

**2016 Research at Aventura: Investigating the Duration, Ecological, and Ritual Underpinnings of Community**

Archaeological research during the 2016 field season at Aventura focused on the period of Pre-Columbian Maya civilization and expanded our understanding of the Pre-Columbian Maya community at Aventura. The 2016 research accomplished four research goals. (1) Survey research continued within Aventura’s civic-ceremonial core. This research mapped the B and C plazas, portions of the A plaza, and patio group (Group 48) adjacent to the C plaza (Figure 5). The survey work was conducted using Total Station, GPS, and GIS technologies (Nissen 2016). (2) Operation 1 investigated two of the three pocket bajos located in Aventura’s civic core, Bajos 1 and 2 that flank Aventura’s main temple (Structure 1 in Group A). This research examined the use of pocket bajos at Aventura and collected environmental data (Grauer 2016). (3) Operation 2 investigated the northernmost mound in Aventura’s B plaza. This research examined chronology, construction history, and subsurface preservation (Robin et al. 2016). (4) Laboratory analysis of ceramic material was undertaken for the 2016 survey and excavation work as well as from the 2007 salvage excavation work by Rafael Guerra, Sherilyn Jones, and Melissa Badillo the Institute of
Figure 5. Map showing the location of the 2016 survey at Aventura. Map by Zachary Nissen.

Archaeology at 3 structures to the north of the city center (Kosakowsky 2016).

**Operation 1: Pocket Bajos as Ecological and Ritual Foci of Community**

The 2016 and 2015 survey at Aventura, directed by Zachary Nissen and Kacey Grauer respectively, documented the central precincts of the site that are situated around three pocket bajos (see Figure 2). In 2016 Kacey Grauer directed the first test and trench excavations in the two pocket bajos that flank Aventura’s main temple (Structure 1 in Group A), Bajos 1 and 2 (Operation 1), with the goal of evaluating the ecological environment at Aventura, the relationship between ecology and community, and assessing preservation of paleo-ethnobotanical remains for future analyses (Grauer 2016).

Trench excavations at the pocket bajos were placed upon the edges of the pocket bajos to determine the form of their edges and the presence of human modification. The surface of the bedrock in the trench at Bajo 1 was undulating from erosion with cut lines from plowing machines. The irregularity of the undulations and the gradual, sloping nature of the edge of Bajo 1 suggests the form of this pocket bajo was the result of natural formation processes (Figure 6; Grauer 2016: 25). In contrast, the two nearly right-angled drop-offs along the edge of Bajo 2 suggest residents modified the edge of this karstic depression, forming large step like terraces (Figure 7). The higher edge to the west appears that it could...
have been carved out by water (eroded away). However, the second edge is much more square and the bedrock between the two is quite flat. This bedrock stands in stark contrast to the clearly natural bedrock encountered at Bajo 1. These drop-offs are too large and spread apart to have served the function of stairs; however, their presence may have made accessing Bajo 2 easier. The modification of the edges of karstic depressions for access has been documented elsewhere in the Maya region (Grauer 2016: 28-29; Munro-Stasiuk et al. 2014).

Kacey Grauer’s 2016 excavations additionally identified that the pocket bajos not only played an important role in the ecological underpinnings of Aventura’s diverse communities, but they played a ritually important role as well. Excavations revealed a concentration of burned ceramic fragments along the edge of Bajo 2. Laura Kosakowsky (2016) determined that the 28 ceramic fragments were burned on the interior and came from the same incensario, suggesting that ritual practices involving the burning of incense were taking place at the edge of the pocket bajo. Water worn stone found in Bajo 2 provisionally suggests the presence of standing water in these karstic depressions at some point in time. Intriguingly, several marine shell fragments were also found in Bajo 2. While the marine shell fragments may have entered the pocket bajos through a variety of pathways, some of which may have involved unintentional incorporation, it is possible that they were intentionally incorporated in the pocket bajo as references to watery places. Evidence from Grauer’s 2016 excavations suggests water rituals were potentially occurring on the edge of Bajo 2. Thus, pocket bajos would not only have been critical for the ecological underpinnings of Aventura’s diverse communities, but may have been central places for community water ritual as well (Grauer 2016: 27-28).

Operation 2: Defining the Civic Nature of Aventura’s Community Center

Operation 2, directed by Zachary Nissen and Melissa Jones, investigated the northernmost structure (Structure 1) in Aventura’s B plaza (Figure 8). Structure 1 in the B plaza is a range-type structure that stands 3.4 meters tall and is one of the smaller structures in Aventura’s central precincts. Excavations consisted of a single eight-meter long trench located on the western edge of the structure in a heavily damaged area of the structure. Operation 2 research examined chronology, construction history, and subsurface preservation (Robin et al. 2016).

As expected for an excavation in the area of modern damage, the architecture of Plaza B Structure 1 was disturbed and we encountered mostly collapsed material and structure fill. Excavations uncovered the eroded dry core fill of the structure, but this structure fill was not excavated. Once excavations continued below the area of modern damage, we identified a well preserved sequence of three plaza floors. Given that dry core fill formed the construction material for Plaza B Structure 1 few artifacts were encountered in Operation 2 excavations making chronological assessment difficult (Kosakowsky 2016). As is the case across the site of Aventura, Terminal Classic/Early Postclassic (750 – 1100 AD) material predominated. Early Classic material was found in Fill 3, the fill of Plaza Floor 3, the initial plaza floor constructed in this area of Group B, but the small ceramic assemblage was too eroded to assign a time period with certainty (Kosakowsky 2016). Given the dry core construction fill and lack of domestic artifacts it is plausible that Plaza B Structure 1 was an administrative building, although additional work would be needed to test this hypothesis. The northern location of this structure initially suggested that it might have been a residential structure, as northern structures in Maya civic plazas are often residential buildings (Ashmore 1991; Ashmore and Sabloff 2002). If Plaza B Structure 1 is indeed an administrative building and since it is one of the smaller structures in Aventura’s civic core, this evidence may suggest that Aventura’s community center was fully dedicated to civic-ceremonial activities and residential functions were located beyond Aventura’s six central plaza groups.

Ceramic Analysis and the Duration of Community at Aventura

Ceramic analysis conducted by Laura Kosakowsky (2016) continued to identify that
Aventura’s period of largest expansion is during the Terminal Classic to Early Postclassic period (750 – 1100 AD). Up until 2016, Chen Mul/Kol Modeled censors of the Late Postclassic period had only been found in Aventura’s main A plaza (Kosakowsky 2015; Sidrys 1983). Raymond Sidrys suggested that this evidence indicated that Aventura was abandoned as a residential community in the Late Postclassic period and became a pilgrimage destination. New archaeological research at Aventura does not refute the claim that Aventura became a pilgrimage center in the Late Postclassic period but it does complicate the original model. In the 2016 season, Laura Kosakowsky analyzed the ceramics from the 2007 salvage excavations by Rafael Guerra, Sherilyn Jones, and Melissa Badillo of the Institute of Archaeology at three households located 250 meters north of Aventura’s civic-ceremonial core. Kosakowsky’s (2016: 38) analysis of the Institute of Archaeology’s 2007 salvage excavation ceramics identified the first evidence of Chen Mul or Köl Modeled censer fragments outside of Aventura’s A plaza and within domestic contexts, suggesting the possibility of domestic occupation at Aventura across the Postclassic, although further research is necessary to test this hypothesis. As Zachary Nissen (2017) notes pilgrimage and residence are not necessarily antithetical to one another. Residential communities who inhabit pilgrimage locations can provide critical support for visiting pilgrims and pilgrims can provide long distance connections for residents (Masson 2002, 2003; Milbrath et al. 2008).

Community Collaborations
The 2016 season at Aventura also saw the inauguration of the project’s annual community programming in collaboration with local cultural heritage leaders. Collaborative community programming through the Aventura Archaeology Project seeks to facilitate communities of engagement with archaeology today. All public archaeology events were developed with our partners the Institute of Archaeology, Institute of Social and Cultural Research, Corozal House of Culture, and San Joaquin Village Council. Every member of the Aventura Archaeology Project, local and foreign, is involved in the design and production of the project’s public archaeology events. Two annual events were initiated in 2016.
In San Joaquin, the community adjacent to Aventura, in collaboration with the San Joaquin Village Council, Institute of Archaeology, and Institute of Social and Cultural Research, we initiated an event called Aventura Archaeology Day. In 2016, Aventura Archaeology Day attracted over 150 visitors, from children to grandparents. Geared to all age groups, Aventura Archaeology Day includes exhibits, posters, demonstrations, arts and crafts, sports, and face painting, promoting archaeological and cultural education and preservation.

Debra Wilkes, Director of the Corozal House of Culture, inaugurated Ancient World Week at the Corozal House of Culture along with the Institute of Archaeology and Aventura Archaeology Project. This week long event was geared towards teachers, principals, and tour guides and presented talks, workshops, demonstrations, and a site tour of ongoing research at Aventura.

Building upon the success of Aventura Archaeology Day and Ancient World Week, in 2017 the Aventura Archaeology Project created a third partnership with Angelita Magana, Director of the San Joaquin R.C. Church summer school to provide an on-site field experience for primary school students at Aventura.

As much as Archaeology Day and Ancient World Week provided residents of Belize’s northernmost Corozal district with an opportunity to learn about and engage with archaeology, they provided Aventura Archaeology Project members an opportunity to become better archaeologists and do better research. Foreign and local project members alike were afforded new ways of interacting with archaeological materials through these events. These events were venues for the active creation of communities of archaeological engagement that brought together people united by an interest in the archaeology of Belize. Through the mutually beneficial goals of an archaeology about and for communities the Aventura Archaeology Projects seeks to develop richer understandings of past and present communities and illustrate the unique role that archaeology can play in this process. Both today and in the past the place of Aventura has an important role to play in the creation of a diversity of communities.

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30 THE MAYA OF AMBERGRIS CAYE AND THEIR NEIGHBORS
Scott E. Simmons, Tracie Mayfield, James J. Aimers, and W. James Stemp

Ancient Maya occupation on Ambergris Caye has been documented from Preclassic through Postclassic times. Work at the sites of San Pedro and Marco Gonzalez has concentrated on several structures in which solid evidence has been found for connections to Maya polities in northern Belize and beyond. Other sites on the caye have also yielded evidence of these connections. Nonetheless, relationships between island communities, as well as those between island and mainland communities, changed substantially over time. There is evidence that connections with northern Belize in particular intensify in Terminal Classic times and continue through the Postclassic. All of the communities on both the caye and the mainland of northern Belize were well integrated into a larger, macroeconomic system encompassing different areas of Mesoamerica. Here we discuss the material evidence for these connections through time, focusing primarily on the Late and Terminal Classic Periods as well as Postclassic times.

Introduction

One of the most promising yet still understudied areas of inquiry into the ancient Maya world is the role of the sea in linking and integrating peoples living in coastal and island communities with those residing in interior mainland communities. In addition to connecting peoples throughout their world the Maya viewed the sea as a special place for a number of other reasons. Perhaps most important was how the sea figured so prominently into the Maya worldview. It was the place where the Sun was reborn each day, and so it was a symbol of life itself and viewed as a source of great supernatural power (Miller and Taube 1993). The sea also provided a wealth of economic benefits, including vitally important commodities such as salt, fish, shellfish, stingray spines, seashells and bones from marine mammals (McKillop 2007). It was used to move all manner of crafted items made of hard stone, pottery, and metal, among others. The Caribbean Sea, Gulf of Mexico, and their associated river systems played critical roles in facilitating the movement of goods, commodities, products, and raw materials, as well as people and ideas, throughout the ancient Maya world. But recognition of the centrality of the sea in the Maya worldview has been slow to emerge (Finamore and Houston 2010). Here we review some of the archaeological evidence for various kinds of symbiotic connections between island and mainland Maya groups in northern Belize. We also examine various social and economic linkages that appear to have existed between Maya peoples in these communities over time, focusing on evidence from Classic and Postclassic sites on Ambergris Caye, including Marco Gonzalez, San Pedro and other sites as well as those on the mainland of northern Belize, specifically that area north of the Belize River. Here the main focus is on Late and Terminal Classic communities, and those few occupied through Postclassic times, where we have solid evidence for the exchange of material goods as well as ideas between island and mainland communities in northern Belize and beyond.

The Sea and Coastal Maya Canoe Trade

Coastal canoe trade has been documented from the Late Preclassic Period through European Contact, although it appears to have reached a peak in intensity during Terminal Classic times (McKillop 2010). Perhaps the most well-known account of a Maya trade canoe and its contents comes from the son of Cristóbal Columbus on his fourth voyage to the New World. This sea-going canoe, which was encountered near the Bay Islands of Honduras, was described as being roughly 8 feet wide and 50 feet in length, with a cabin amidships, carrying various sorts of passengers, almost certainly including merchants, and propelled by 25 paddlers (Colón 1959 [1502]:231-232). The Spanish description of goods they observed matches the material remains found by researchers at Classic and Postclassic sites throughout northern Belize and beyond. It appears that Maya mariners were successful in facilitating the spread of certain kinds of cultural materials as well as culturally and socially
specific ideas among both island and mainland Maya groups in northern Belize. The results of archaeological research at sites on Ambergris Caye indicate that the Maya who lived there were quite well integrated into what has been termed the “Mesoamerican World System” (Smith and Berdan 2003). These coastal Maya not only participated in a well-developed and extensive trade network that stretched around the Yucatan Peninsula and deep into its interior, they also specialized in the production of certain key commodities and objects, some of which are discussed below.

Settlement and Research History of Ambergris Caye and its Sites

Ambergris Caye is located on the east coast of the Yucatan Peninsula, and the island is 39 km long and no wider than 4 km at any point (Figure 1). Thomas Gann was the first to survey Ambergris Caye nearly a century ago (Gann 1926). Roughly sixty years later Tom Guderjan and the other members of the Ambergris Caye Archaeological Project conducted the first truly comprehensive archaeological survey of the island between 1983 and 1990 (Guderjan 1995). They identified 22 separate sites and 2 canal complexes, but more recently three additional sites have been documented by Simmons (see Belize Institute of Archaeology site files), bringing the total of known sites on the island to 25, although the actual number of Maya settlements is certainly higher. Marco Gonzalez, located near the southern tip of the island, appears to be the largest site on the caye, measuring approximately 6.6 ha in size. It was first investigated between 1987 and 1993 by Liz Graham and David Pendergast and more recently from 2010 to present by Graham and Simmons (see Belize Institute of Archaeology site files). The great majority of the 25 known sites on the island were occupied most intensively during Late and Terminal Classic times. Only one of these, Marco Gonzalez, shows definitive evidence of occupation from Late Preclassic through Classic and Late Postclassic times (Graham and Pendergast 1989:13-14). Two other sites, Los Renegados and San Juan, appear to have been occupied into the early part of the Postclassic Period.

Maya Sites on Ambergris Caye Sites and Mainland Maya Sites in Northern Belize: both Similar and each Different

Broad similarities as well as specific differences exist between mainland Maya sites and coastal island sites dating to the Late/Terminal Classic and Early Postclassic Periods in northern Belize. Here we outline some of these, focusing first on architecture and site layout, the general characteristics of ceramic and lithic assemblages, and mortuary behavior.

Architecture and Site Plan

During the Classic Period sites on Ambergris Caye and on the mainland of northern Belize share similar arrangements of substructural platforms supporting several structures surrounding at least one and sometimes several small patio groups. These substructural platforms most likely supported pole and thatch perishable superstructures. The main differences between island and mainland sites appear to be related to the scale of both individual structures and the sites themselves. Maya communities on Ambergris Caye tend to be somewhat smaller in overall area than those on the mainland, probably due at least in part to the limitations of the coastal geography of the
island. The largest of these, Marco Gonzalez, measures roughly 355 x 185 m in size, while moderate-sized sites, such as Chac Balam and Burning Water, measure approximately 150 x 60 m and 150 x 50 m in size, respectively.

Many Late and Terminal Classic sites on the mainland of northern Belize include both domestic and non-domestic structures (monumental architecture), the latter being erected on elevated platforms. In contrast, just over one-quarter (7 of 25) of the sites on Ambergris Caye exhibit what Guderjan (1995:9) calls ‘formal architecture,’ which he defines as “…any substructural construction which may or may not be formally arranged.” Four of these six sites - Marco Gonzalez, Laguna de Cayo Francesa, San Juan and Chac Balam – are found on the leeward side of the island, and all were most intensively occupied during Late and Terminal Classic times.

The same arrangement of generally small structures (<3-4 m in height) erected on low platforms and situated around a small plaza is seen at other sites on the caye, including Ek Luum, Santa Cruz, Chac Balam, Laguna de Cayo Francesa, and San Juan. Near the southern tip of the island at Marco Gonzalez six separate patio groups were constructed. To the north at Chac Balam four large substructural platforms are grouped around a rectangular patio or courtyard. In comparison, other Classic Period sites on the caye, including Ek Luum and San Juan, are comparatively smaller with fewer patio groups. Recent work at the San Pedro site has shown that by the end of the Postclassic Period small residences may have been arranged around patios, but this has yet to be determined.

Unlike the Classic and Early Postclassic limestone structures on the mainland of northern Belize, those on the caye were not uniformly constructed of limestone. In the central and northern part of the caye limestone outcrops do exist, but are largely absent in the south. As a result, formal architecture at sites in the north, such as San Juan and Chac Balam, includes limestone marl and earth platform fill that was faced with either unmodified or shaped upright limestone blocks. At Marco Gonzalez, most structures were faced with a hard, dense conglomerate of sand, shell, and dead coral called ‘reefstone’. This facing concealed platform fill comprised of varying quantities of shells, earth and midden material. Recent excavations at the San Pedro site indicate that by the end of the Maya occupation sequence on the caye, probably by the early-mid sixteenth century, domestic structures were built directly on beach sand with lime marl and packed sand floors and pole and thatch superstructures; they were not faced with any kind of limestone or reefstone.

Ceramic Assemblages

Because most of the pottery on Ambergris Caye appears to be imported, connections to the mainland are clear from the earliest pottery on the caye. However, the probable sources of pots and styles changes from the central/southern Maya lowlands in the Preclassic and Classic periods to northern Belize and the northern Maya lowlands in the Terminal Classic and Postclassic periods. Both the Late and Terminal Classic ceramic assemblages from island and mainland sites in northern Belize reveal the breadth of trade connections between communities in this area with those in more distant parts of the Maya world. Many coastal communities such as Marco Gonzalez, as well as some on inland rivers and lagoons like Lamanai, certainly functioned in some capacity as hubs in a circum-peninsular exchange network that brought a wide range of ceramic vessel types to northern Belize. This included Early Classic Tzakol I vessels recovered just above the water table at Marco Gonzalez (Figure 2). Late Classic Achote Black, Daylight Orange, Roaring Creek Red, and Kik Red slipped vessels found at Lamanai are also found at Ambergris Caye sites including Marco Gonzalez, Ek Luum, Chac Balam, and San Juan. In the northern part of the mainland these types are also present at Laguna de On and Caye Coco on Freshwater Creek, the Northern River Lagoon site, Colha, Patchchacan, Sarteneja, Cerros, Santa Rita, and Saktunja (Boxt 2005:400; Chase and Chase 1987:61; Masson and Mock 2004:392-394; Mock 1994:242-314; Sidrys 1983:211). During the Late Classic connections with the Belize Valley and Petén are evident given the presence of Palmar Group vessels at Marco Gonzalez and San Juan, as well as Subin Red sherds, which have been found at Marco
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Figure 2. Tzakol I polychrome vessels from Marco Gonzalez, Ambergris Caye, Belize.

Gonzalez, Ek Luum, San Juan and Chac Balam (Aimers et al. 2017; Valdez et al. 1995:Tables 10-14). Subin Red vessel fragments and occasionally whole vessels also have been recovered at Northern River Lagoon, Colha, and Kichpanha (Mock 1994; Potter 1982) as well as in the Three Rivers Region of northwestern Belize at the sites of Dos Barbaras and Dos Hombres (Sullivan et al. 2007).

Unslipped types found in Late Classic contexts include Encanto striated and Coconut Walk Unslipped, which were most likely used in the production of salt, possibly as early as the 6th century AD (Graham et al. 2015:4). This crude, quartz sand tempered vessel type is ubiquitous in Late Classic contexts along the coast of Belize, including Ek Luum, Chac Balam, Taab Ha, Guerrero, San Juan, and Marco Gonzalez on Ambergris Caye, as well as on mainland coastal sites including Northern River Lagoon, Potts Creek Lagoon, Rocky Point, Saktunja and the Last Chance site (Graham 1983:379; Mock 1994:82-92). The production of salt using the sal cocida method was likely an important economic activity that bound the Maya of Ambergris Caye to consumers in mainland communities. It appears that the production and shipment of salt from Ambergris Caye to the mainland reached a peak in Late Classic times, but by the end of the 8th century it declined just prior to the Maya collapse (Graham et al. 2015:4). Late and Terminal Ceramic vessels from the Petén, northern Yucatán, and the Pacific coast of Guatemala have been found at most leeward sites on the caye (Guderjan 1995). Polychromes, generally simple in design, are present but give way to monochrome wares such as Fine Orange and Plumbate Ware, as well as Augustine Red, and possibly Teabo Red.

Types of Plumbate Ware have been found at several sites on Ambergris Caye, including Marco Gonzalez, San Juan and Ek Luum (Graham and Pendergast 1989; Valdez et al. 1995). A small number of mainland sites in northern Belize have yielded Tohil Plumbate sherds or whole vessels, including Aventura and Santa Rita Corozal (Chase 1982). The arrival of Tohil Plumbate vessels at other sites on the caye as well as on mainland sites in northern Belize and beyond is roughly contemporaneous, between AD 850/900 and AD 1100 (Cobos 2004:522). Plumbate’s common co-occurrence with Fine Orange ware points to the great breadth of commercial interaction that was taking place throughout the region, beginning in Late Classic times, and becoming greatly amplified by the Early Postclassic Period. Fine Orange ceramic sherds are not found in abundant quantities at Marco Gonzalez, or at the other sites on the caye, nor are pieces of Trickle ware, except at San Juan. Fine Orange was produced in the Gulf Coast region and the similarities of some of the Postclassic pottery forms and design motifs at Lamanai, Cerros, and Marco Gonzalez suggest that northern and coastal Belize had some sort of connection to the Gulf Coast (Aimers 2014).
Ceramic evidence suggests that integration of communities in northern Belize with those in other parts of the Maya world was occurring at both local and regional levels during Terminal Classic and Early Postclassic times. Some evidence for this close contact is seen in two nearly identical orange-red slipped vessels recovered from Marco Gonzalez and San Juan that may be an undesignated composite type from the Augustine group (Figure 3). In the Terminal Classic sites on the caye begin to receive the kinds of pottery that characterize the circum-peninsular sites, including the Fine Orange, plumbate, slate wares, and trickle wares.

As the Early Postclassic approaches, probably in the late 10th century, vessels in the Zakpah Group appear, but the production and distribution of these wares appears to be a regional phenomenon that is restricted to northern Belize (Masson and Rosenswig 2004:379). Some of these flanged, pedestal-based jars were probably produced at Lamanai, but others come from different areas of northern Belize; they are found mostly as sherds at Cerros, Caye Coco, Altun Ha, and Chau Hiix (Ting 2013:Figure 3.10). The distinctive incised surface designs, as well as the shapes of these vessels, were defining characteristics of what Graham (1983) first termed Buk ceramics, many of which were found accompanying burials in Early Postclassic structures at Lamanai. Fragments of these vessels found in surface contexts at Marco Gonzalez, though, are more variable in terms of their compositions than those from Lamanai. The local production of these gouged and incised decorated ceramics seems to represent a flurry of activity in northern Belize and some areas to the south, but the pottery is not seen in Yucatan. Stylistically distinctive Late Postclassic Tulum Red Ware fragments (e.g. Payil Red and Palmul Incised) and Chen Mul Modeled ceramic system sherds are found only in surface contexts at Marco Gonzalez. But these ceramic types have been recovered during excavations at a number of sites on the mainland of northern Belize including Santa Rita Corozal, Patchchacan, and Sarteneja (Boxt 2005; Chase 1982; Sidrys 1983), as well as at Ek Luum and Los Renegados on Ambergris Caye (Valdez et al. 1995).

Lithic Assemblages

The flaked stone assemblages of sites on Ambergris Caye as well as on those on the mainland of northern Belize are dominated by tools made of chert from the northern Belize chert bearing zone (CBZ), centered around the manufacturing center of Colha (Stemp 2001). Stemmed macroblades, large oval and thin bifaces, and general utility bifaces were some of the most common forms found at both Ambergris Caye and mainland sites in northern Belize during the Late Classic Period. Comparisons of the relative percentages of chert formal tools from several sites on the island, including San Juan, Marco Gonzalez, Chac Balam, and Ek Luum, indicate that tools made from chert from the CBZ made up over 85% of all the stone tools found at those sites (Stemp 2001:Table 1). A number of sites on the mainland of northern Belize, including Pulltrouser Swamp, Cuello, Cerros, Nohmul, El Pozito and Kichpanha, have produced large numbers of Colha manufactured utilitarian tools (Chiarulli 2012), and percentages of tools from the CBZ at these and other mainland sites in the area are similarly high, averaging over 75% (Stemp 2001:Table 2).

It appears that the residents of a number of communities on Ambergris Caye were regular consumers as well as distributors of finished chert tools originating from Colha, and they facilitated their movement as part of a pan-Mesoamerican exchange network that operated at macro-regional, sub-regional, and local levels. Chert tools produced at Colha served not only local needs on the island, but their presence at other communities along the Belizean coast, such as Moho Caye, located at the mouth of the Belize River, and Placencia Caye, situated nearly 100 miles (160 km) to the south, suggests that chert tools were moved along the coast as trade items along with other goods and materials (MacKinnon 1990; McKillop 2010). This movement was facilitated by generations of Maya living on Ambergris Caye, who engaged in economic exchanges with coastal merchants and mariners and were thus integral parts of a vibrant economy that spanned Early Classic through Late Postclassic times. Recent preliminary analyses of the chert tools and debitage from 2017 excavations at the
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Postclassic-Spanish Colonial Period site of San Pedro revealed that over 70% originated from the Colha area. The San Pedro Maya relied heavily on the acquisition of finished formal tools, specifically lenticular and lozenge bifaces of the same forms as Early to Middle Postclassic tool types from Colha. There is not enough debitage, specifically early stage reduction debitage, to support formal tool production at San Pedro, but it appears that San Pedranos also acquired some nodules/cores of CBZ chert, which they used for basic or expedient flake production. Many of the chert bifaces from sites on the caye were heavily used and recycled as hammerstones (Stemp 2001).

Obsidian found on the island was derived from highland sources located some distances away from northern Belize. Recently completed XRF analysis of 111 pieces of obsidian from various contexts at Marco Gonzalez indicates that this important material was obtained from eight different sources found throughout Mesoamerica. Just over 80% of the assemblage comes from El Chayal and Ixtepeque, while lesser amounts of central Mexican obsidian from sites like Pachuca, Ucareo and Paredon are present (Simmons and Graham 2016). Based on visual sourcing of 309 obsidian artifacts (99% of which were prismatic blades) from the San Pedro site the Maya of Ambergris Caye continued to acquire Guatemalan obsidian through Postclassic times, primarily from the Ixtepeque source (Stemp et al. 2011). It appears that throughout Classic and Postclassic times trade in ceramic, lithic, and other materials continued to play an important role in connecting the Ambergris Caye sites to those on the mainland.

Mortuary Behavior

Maya burials encountered in Late and Terminal Classic contexts at the Ambergris Caye sites as well as those on the mainland in northern Belize share a number of similarities. Typically buried beneath house floors, individuals have been found in flexed, seated, and extended (supine and prone) positions. At several sites on both the caye and on the mainland some burials have been recorded in either supine or prone positions with legs flexed and knees bent back toward the pelvis (Figure 4). Terminal Classic burials at Chac Balam and Marco Gonzalez were found in this manner, and the practice continued at least through the early sixteenth century at San Pedro (46 of the 48 burials found thus far).

At Marco Gonzalez the origins and kinds of grave goods found accompanying many of the 38 sub-floor burials in Str. 14 indicated that its residents had enjoyed some elevated level of social standing in the community. Perforated jaguar canines, shell mosaic wristbands, pendants and ear ornaments as well as carved olive shell faces were found accompanying these burials. In some cases individuals were interred with a range of artifacts, including an individual of indeterminate sex found in 2010 that was interred in a dorsally placed, legs flexed position (Figure 3). The left arm of the individual was bent at the elbow, where a group of nine objects had been placed, including two exhausted El Chayal obsidian cores, a bone spatulate-shaped object, and a shell quincunx with five perforations.

At Colha several burials excavated in the eastern part of Structure 41 appear to have been interred in the same way, lying prone with their...
legs bent back toward the pelvis (Hammond 1975:174-180). These burials likely date to Terminal Classic times based on stratigraphy and associated ceramics, so they are coeval with the burials at both Marco Gonzalez and Chac Balam. Barton Ramie is the only known Maya site other than the Ambergris Caye sites and Colha where the prone, legs bent back over their pelvises burial type has been found in Late or Terminal Classic contexts (Willey et al. 1965). This same burial style was noted by Pendergast at Lamanai; fifty-two have been found thus far at nine different structures at the site (Graham et al. 2013:15). Based on the presence of associated orange-red monochrome slipped ceramic vessels identified as Zakpah Orange-Red and Zalal Gouge-incised the Lamanai burials date to several centuries later than those found at Barton Ramie, Colha and the Ambergris Caye sites, probably beginning in the late tenth century AD. But the mortuary behavior persisted even after it waned and disappeared at Lamanai. At the San Pedro site 96% (46/48) of the skeletal remains found were interred in these same two unusual types of positions, indicating a degree of longevity in this particular cultural behavior spanning at least 500 years.

Integration of Sites in Northern Belize and Beyond

Sites on Ambergris Caye appear to have been linked to those on the mainland of northern Belize in a variety of ways. Shared similarities in artifact types, site layout, burial characteristics, and occupation histories exist between Marco Gonzalez, other sites on Ambergris Caye, and those in northern Belize. The presence of Chicanel pottery indicates that Marco Gonzalez was occupied during the Late Preclassic—to be conservative perhaps around 100 B.C., but very possibly earlier. Early Classic and specifically Tzakol 1 deposits have been delineated in test pits excavated in 2013. These Early Classic deposits at Marco Gonzalez are reasonably substantial, and have produced thousands of fish bones and shells that were apparently food refuse, as well as a great deal of debris from chert knapping. Some of this chert knapping may be related to the production of shell tools and ornaments at the site. Shell tool and ornament production has not been studied formally at any of the Ambergris Caye sites. But the abundance of shell debris, finished objects, and blanks found at Marco Gonzalez suggests that Maya artisans there were producing shell objects for exchange with other Maya communities (Figure 5). Some of the shell ornaments found at Marco Gonzalez are very finely made, and there are a variety of designs, several of which are similar to those found at other sites in northern Belize. The Maya of Marco Gonzalez were heavily involved in marine resource extraction but were also involved in trade, with a main item being polychrome pottery, which was also transported up and down the coast and then to inland trade networks.

By the beginning of the Late Classic Period we see a remarkable change at coastal sites on both Ambergris Caye and the mainland as relationships with Maya sites throughout northern Belize and beyond intensified. Large quantities of Coconut Walk Unslipped sherds are found layered with spreads of ash and charcoal at Marco Gonzalez. Substantial numbers of these sherds have also been reported from San Juan, Ek Luum, Chac Balam and San Pedro (Valdez et al. 1995). The sherds were part of poorly fired ceramic bowls, which initially were thought to have functioned as moulds for salt cakes. The bowls seem to have been used to contain brine as the water was driven off by heating (McKillop 2007). Large quantities of these sherds have also been found at several coastal sites on the mainland of northern Belize, including Northern River Lagoon and Saktunja, and Mock (Masson and Mock 2004:381; Mock 1994:85) notes that sherds of what Bennyhoff

Figure 5. Shell ornaments from Marco Gonzalez, Ambergris Caye, Belize.
and Meighan (1952) called Potts Creek Plain and Salt Creek Plain wares are identical to Coconut Walk Unslipped. These sherds, along with over 400 clay cylinder fragments, were found during surface reconnaissance of the Potts Creek Site, located just west of Hicks Caye. These cylinder fragments, which may have been used to support saltmaking vessels, were also found with Coconut Walk vessel fragments at Rocky Point and the Last Chance Site (Mock 1994:86, 89). Certainly, there was a huge market for salt throughout the Maya world, particularly as population densities rose throughout the Classic Period, and coastal sites on Ambergris Caye and the mainland of northern Belize may very well have supplied salt to a number of sites throughout the interior of Belize and beyond, possibly into the Petén.

After the great need for salt at inland centers had diminished to virtually nothing by AD 900, coastal trade became a prominent part of economic life in northern Belize once more. While maritime trade had its origins in Preclassic times, when similar polychrome ceramic types appear along the Belizean coast, it was in the Late Classic and then throughout the Terminal Classic and Postclassic Periods that coastal trade in goods and commodities increased exponentially. The earlier part of this sequence, particularly the end of Classic Period, coincides with Chichen Itzá’s hegemony over much of Yucatan. Cobos (2016:329) has recently argued that the main function of the Ambergris Caye sites was as “trans-shipment stations that were managed or controlled by Chichen Itzá.” The larger, leeward sites on Ambergris Caye, including Marco Gonzalez, Chac Balam and San Juan, almost certainly were coastal transshipment ports, where cargo was transferred both onto and from canoes of the kind encountered by Columbus. These sites also served as stop-over points where merchants and crew could rest, share news from both local and distant places, and conduct business. But the idea that these coastal sites were ‘controlled’ by Chichen Itzá is worth discussing further. The similarities in artifact types, and the round structure reported at San Juan that is Yucatecan in style, provide some level of support for at least the influence of Chichen Itzá on these and other coastal sites (Driver et al. 1995). But it is equally likely that the Maya of Ambergris Caye enjoyed some degree of autonomy in managing their own economic affairs during Classic times and beyond.

By Middle and Late Postclassic times only a small number of sites identified thus far on Ambergris Caye were occupied, and the level of activity, including waterborne trade, appears to have diminished. The only site occupied through the Postclassic and into early Spanish Colonial was San Pedro, where investigations in 2017 revealed at least two separate domiciles identified by thin marl and sand packed floors punctuated by numerous post and pit features and sub-floor burials. Earlier work at the site yielded evidence of other house floors and sub-floor burials, almost all of which were found in the unusual prone position of legs drawn back over the pelvis, or dorsally placed with legs flexed and crossed at the feet (Pendergast and Graham 1991). The persistence of this particular burial pattern could reflect some kind of shared worldview among the Maya of Ambergris Caye, as well as some Maya residing on the mainland of northern Belize, that endured for at least five centuries. Clearly, the investigation of other cultural behaviors that were shared between the island and mainland Maya of northern Belize and beyond is warranted, and hopefully forthcoming.

The Belizean cayes played a vital role in the developmental histories of both island and mainland Maya peoples. Islanders provided many valued commodities to mainland Maya communities. Both the larger polities on the mainland of northern Belize and the Ambergris Cay Maya settlements profited in numerous ways from their mutually beneficial relationships, economic and otherwise. Diego de Landa (Tozzer 1941:94) stated “the occupation to which they had the greatest inclination was trade…” Judging by the wealth of locally available goods and materials as well as those acquired via long-distance trade at both mainland and island sites, the Maya who lived in these communities in northern Belize enjoyed strong and long-lasting social and economic relationships over time. By the time Landa had written those words in the mid-sixteenth century, the movement of goods, commodities, people, and ideas over the course of many centuries had
effectively bound the Maya of northern Belize together for millennia. In the end, this constant interaction and interdependence made island and mainland Maya communities more similar to one another than they were different.

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31 **NAPOLEONIC SHAKOS AND THE ORDER OF THE GARTER: WEST INDIA REGIMENTS ON ST. GEORGE’S CAYE**

James F. Garber, Jacob H. Bentley, and Lauren C. Springs

Archaeological excavations and archival research have indicated the presence of West India Regiments on St. George’s Caye. These regiments were formed in Jamaica and were composed of slaves from Africa to meet the demand for more troops to defend the Empire. They were deployed in various parts of the British world including the English Settlement on the Bay of Honduras that was to become known as Belize. Several artifacts associated with this military presence on the Caye have been recovered—the most interesting of which is a brass Napoleonic shako hat badge of a West India Regiment. In this chapter we explore the fascinating history of an obscure Middle French inscription on this badge “Honi soit qui mal y pense”.

**Introduction**

St. George’s Caye played a vital role in the history and development of Belize as an independent nation. This small caye is one of hundreds of islands off the coast of Belize that are part of large reef system, the second largest in the world. Its predominant role in the early history of the English settlement was due to its position and shape. The reef system forms an offshore barrier that protects the coast. Because of the difficulties of navigation, these waters provided safe haven for merchants, buccaneers, and pirates that sailed the Caribbean. To access the mainland and harbors at the mouths of the rivers, one must navigate narrow passages through the reef and then follow a complex system of channels. In order to reach the Belize River, the country’s main river system, one must pass by St. George’s Caye, thus its strategic location guarding the port (Figure 1). Additionally, the caye is crescent shaped making it ideal for careening ships on its leeward side. Because of these critical factors, St. George’s Caye functioned as the settlement’s first capital up to the 1880s when the capital was shifted to Belize City. Due to its strategic location controlling access to the mainland it was the focal point in the Settlements defense in the Battle of St. George’s Caye on September 10, 1798.

In the late 1700s, Brittan was defending its Empire in various parts of the world and thus there was a severe shortage of troops. Troops shipped over from Brittan did not do well in the tropical environment of the Caribbean and casualties resulting from climate adjustment and disease were high. In 1795 to meet this shortage, commissions were issued to Colonels of the British army to raise 8 regiments (more regiments were added later). These initial 8 regiments were formed in Jamaica, the British stronghold in the Caribbean. These were commanded by white officers and NCOs and consist of black troops many of which were slaves purchased for that purpose (Dyde 1977).

Uniforms of the West India Regiments were basically the same as all other infantry line regiments in the British Infantry, the most notable feature being the distinctive “Red Coat”. Each regiment was differentiated with its own details and cuff and collar facings (Figure 2).

![Figure 1. Map showing location of St. George’s Caye.](image-url)
scarlet line 1802; white with black and yellow line 1814; officer’s lace was silver) edged the collar, shoulder straps, top of cuffs, and was used for the button holes of the half lapels and collar; sergeants had same jacket but in scarlet with white silk lace; accoutrements in black; pants were white duck gaiter-trousers from 1795 to July 7, 1810, after that pants changed to blue serge gaiter-trousers; hats were black round with whole brim until 1803, followed by black stovepipe shakos, followed by ‘Belgie’ shako issued after 1812; officers wore black bicorn hats in dress uniform and round hats in undress uniform (Chartrand and Chappell 1996).

Soldiers of the West India Regiments were deployed to Belize in the late 1700s to assist in the defense of the settlement in the Battle of St. George’s Caye (Dyde 1997:68). Subsequently, West India Regiments were active in border disputes in the north and west during the 1800s (Dyde 1997:173,177; Palacio 1976).

**Excavations**

Texas State University has conducted archaeological excavations on the Caye from 2009 to the present. Shovel testing has shown that the greatest concentration of historic material is in and adjacent to the cemetery. The upper levels of the cemetery have been badly damaged by hurricanes and storm surges (Garber et al. 2010, 2011; Springs et al. 2016). Despite these disturbances, excavations have revealed the presence of several military artifacts in the uppermost layers of the western edge (back) of the cemetery as well as areas outside the cemetery to the west. These remains appear to be midden materials associated with encampments of the West India Regiments. Archival research suggests that the headquarters of the military encampments were located to the west and northwest of the Cemetery.

Recovered artifacts associated with a military presence on the Caye include: buttons...
of the 7th and 5th West India Regiments, button of the 2nd Regiment of Foot, lead musket balls, iron cannon balls, musket barrel fragments, Brown Bess musket flint lock mechanism, gun flints, and miscellaneous brass buttons and buckle (Figures 3-6). Additional material from this sheet midden presumably associated with the military include bone gambling die, clay smoking pipes, silver coins, and wine, rum, and gin bottles (Figures 7 and 8) (Bentley et al. 2017; Garber 2015; Garber et al. 2013, 2014; Sullivan et al. 2012). The most notable find however is a brass plate from a stovepipe Napoleonic shako (Figure 9). This style of headgear was adopted by the West India Regiments in 1803 (Chartrand and Chappell 1996). The shako was made of beaver felt and featured a small brim, colored plume, braided band, and a central brass plate (see Figure 2). The plate is decorated with a variety of symbols as well as an inscription.

At the center of the plate is the cypher GR (Georgis Rex - Latin), topped by a crown, referring to King George III. On both sides are flags, regimental colors, muskets, and bugles. Surrounding the central element is a buckled belt inscribed with the motto “Honi soit qui mal y pense”. This is the motto of the Most Noble Order of the Garter (Begent and Chesshyre 1999; Cox 1999).

Order of the Garter

The Order of the Garter was founded by King Edward III. Most historians place this founding date in 1348 although some have suggested an earlier date of 1344 (Begent and Chesshyre 1999). This is the era in which King Edward III was making claims to the French throne. According to one legend, the beginnings of the order and its motto were inspired by an event that occurred at a court ball in Calais, France. While on the dance floor, a garter slipped from the leg of the Countess of Salisbury. Courtiers snickered at this embarrassment and King Edward is said to have picked up the garter returned it to the Countess and said “Honi soit qui mal y pense!” This is in
an archaic form of French known as Middle French and translates “Shame on him who thinks ill of it!” It has become the motto of the Order. The Order of the Garter is the most prestigious British order of chivalry and is England’s 3rd most prestigious honor overall (Victoria Cross 1st, George Cross 2nd) (Cambell 1989; De la Bere 1964). Membership is limited to the Monarch, the Prince of Wales, and no more than 24 members. New appointments are announced on St. George’s Day. Rulers from throughout Europe and other regions have been inducted as members. The order is associated with elaborate vestments, badges, and accoutrements (Cox 1999). The motto and its belt have been incorporated into a wide array of the royal insignia and crests of its various members.

Conclusion
The West India Regiments were an important element of Britain’s defense of its empire throughout the 1800’s including the English Settlement on the Bay of Honduras which was to eventually become British Honduras and then Belize. Although the historical archives record their presence and activities, very little physical evidence of their presence remains. Archaeological excavations on St. George’s Caye represent the largest sample of physical remains. Continued archaeological and historical research will hopefully shed additional light on this important element of Belize’s history.

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