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Cover

Re-signifying Identity in an 18th Century Antiphonary from Coixtlahuaca

The cover pages (see pages 25 and 56, respectively) present a baroque rendition of a double plumed serpent motif that illuminates the initial “S” in the word Salvum of Psalm 68, in a 1718 codex manuscript of psalms and songs (antiphonary) from Coixtlahuaca’s church in the Mixteca Alta of Oaxaca, Mexico. The local tlacuilo who painted it drew inspiration in part from the church sanctioned 16th century decorative program extolling the Passion and sacrifice of Our Lord as Savor (Vences Vidal 2000: 101). The emphasis on sacrifice fits well with ancestral native values and beliefs, while providing the inhabitants of this ancient realm with a new identity as Christian converts.

Thirty-four double serpents span the open-air chapel’s central archway built between 1544–1547 (Fig. 1). The serpents refer to the indigenous Creation myth (Rincón Mautner 1999: 302–305). Coixtlahuaca’s tutelary deities, Ehecatl Quetzalcóatl and Mixcoatl Tezcatlipoca, who, transformed into giant serpents, tethered the Earth Goddess in place over the primordial waters splitting her to create the earth and sky. The ancient sacred theaters for these events were a cave from which the deities emerged and the mountain which formed as a result of their collective sacrifice to become the Mountain of Sustenance. Both of these landforms located north of Coixtlahuaca were portrayed on several 16th century painted maps from this realm (Fig. 2a–b). The fusion of the transformed gods with the Earth Goddess made them rain gods contributing to the fertility of the land and the well-being of the people. Their collective, generous sacrifice at the beginning of time was commemorated with the lighting of a New Fire on the summit of this paramount mountain. This firelight would have been seen from the surrounding Basin settlements, uniting the people in commemorating the primordial sacrifice at Creation. The open-air chapel represents both landforms (Rincón Mautner 2012). Its looming presence and iconographic program sanctify the ancient belief system imbuing the space where it was built with the ancestral insignia of sacred order and power, aiding the conversion of the native population to Christianity, and providing Coixtlahuaca with a new identity (Fig. 2c–d).

The codex intended to accompany the divine service during Christmas, Lent and Matins to the Virgin Mary is now incomplete, its front cover was torn off. The artist may have been familiar with the Lienzo of Nativitas which presents a cord-like border (Fig. 2e) similar to the frame used around the illuminated capital letters of the cover and the song celebrating Christ’s birth (Fig. 3). The image above the final measures of the Lenten chant was inspired by an array of sculpted elements that resemble a pre-Hispanic Mixtec codex commemorating Christ’s Passion found on either side of an enormous rosette window above the north portal of the 1576 church (Fig. 4). The manuscript illustration differs from the sculpted program. The sun, moon and stars which had great significance for the early converts do not appear in the 18th century composition. Perhaps reflecting the local re-enactment of the Passion, two wooden crosses, another ladder,

Figure 1. The intertwined serpents of Coixtlahuaca’s open air chapel (Photos by Carlos Rincón Mautner).
flutes, a drum and trumpet and what appear to be a centurion’s sword and feathered helmet are depicted on the page.

The inscription in Nguiwa (Chocho) inside the back cover of the codex indicates that on Saturday, December 24, 1718, Don Andrés de la Cruz y Salazar, a local nobleman, donated the book he had commissioned for Sebastián de las Casas, then choir master at Coixtlahuaca. The inscription mentions Coixtlahuaca’s Mixtec and Chocho-speaking barrios (neighborhoods). The Mixtec barrio was located on the slopes of Cuxaga in the vicinity of the church complex (Rincón Mautner 1999: 189). While mass was celebrated in Latin, the sermon and instruction, and especially guidance for choir members, would have been in their native languages.

Upon reaching a population nadir in 1620, Coixtlahuaca’s council of nobles wrote the Viceroy imploring that their village be spared from abandonment. Approximately 99% of the population had perished as a result of the 16th century pandemics, the abuses and exploitation at the hands of the Spanish (Rincón Mautner 1999: 518–520). In addition, famine exacerbated by drought and rampant erosion contributed to the catastrophe. Those who had not succumbed to disease had taken flight and lived in the mountains without religious instruction and unable to generate revenue or pay taxes derived from silk and livestock raising and the harvest of cochineal.

The nobles justified their request against forced relocation by assembling a large number of witnesses and attaching their concurring testimonies to the petition. It emphasized the importance of preserving the village given the investment that would be lost since it had a well-built infrastructure and public works, including fountains, a hospital, inns, a cabildo building, [and] a sumptuous church and monastery. Furthermore, it was the center of Christian doctrine for the Mixteca Alta and Baja, and a miraculous image of the Virgin of Atocha, kept in
the church, performed miracles for Spaniards and Indians alike. Newcomers would be welcome to occupy the numerous empty houses of those who had perished and exempted from tribute (taxes) for a period of 50 years. Although no documentation has been found to date that establishes what was finally agreed to, the village survives to this day.

Leaving behind a century of economic depression and suffering, the surviving inhabitants emerged with a new identity firmly in place that reflected their conversion to Catholicism. They no longer appealed to Quetzalcoatl and Tezcatlipoca, gods of their ancestors for succor in times of need, these rain gods had been supplanted by the new patrons: Saint John the Baptist and Saint John Evangelist. The faith of the inhabitants in their patrons would be tested as Coixtlahuaca and its subject communities experienced severe protracted drought from 1709–1715, so disruptive in fact, that villagers once again abandoned their homes as they had done a century earlier, seeking to survive in the mountains making it impossible for the Crown to collect its tribute. Several earthquakes had occurred and the strong one of August 1711 damaged public buildings and churches throughout the province. Coixtlahuaca’s church, like many others, was in need of repairs. (Rosquillas Quiles 2010: 89–95). Nobles, church representatives, and civil government authorities convened in 1715 and agreed to provide funding and exempt the payment of tribute for 2 years. In the meantime, it would have been necessary to
maintain community cohesion through obligatory and active participation in religious instruction and continuous ritual observance of feast days.

With the church in disrepair and since, given its weakened structure, mass could no longer be celebrated in its interior, choir rehearsal may have been a way to keep the inhabitants engaged. Under the circumstances, the antiphonary would have been vital for this purpose, yet the 35 pesos the codex cost amounted to a considerable expense. Noble patronage of local craftsmen to produce sumptuous objects for sacred use in ritual, like this antiphonary, was vital and helped preserve the elite’s preeminent social position.

Only in May 1724 was a plan presented for making church repairs (Rosquillas Quiles 2010: 123). The proposed plan would involve Coixtlahuaca’s 90 tribute providers who were to be exempt from paying tribute to the Crown for a 3-year period, their contribution would instead pay a foreman hired to direct them in making the necessary repairs. A beautifully painted table organ built between 1720–1730 (IOHIO 2020) seems to have been acquired at about the time that repairs were completed, perhaps to celebrate the re-opening of the restored church. Painted on the external door panels are the village’s patron St. John the Baptist and, in contrast to the 16th century warrior, an antimilitant, angelic St. Michael holding a palm frond rather than a sword indicates the victory of the Faith (Fig. 5). The cultural legacy and identity of Coixtlahuaca’s 16th century inhabitants were re-signified in the 18th century with music and exquisite works of art, in vogue with the aesthetics of the time, adorning their sanctuary.

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Front Cover (page 25): Detail of the illuminated capital letter “S” with an intertwined serpent motif from Psalm 68 in the 1718 Antiphonary from Coixtlahuaca, Oaxaca (Photo by Carlos Rincón Mautner, digitally enhanced).

Back Cover (page 56): The page with Psalm 68 in the 1718 Antiphonary from Coixtlahuaca, Oaxaca (Photo by Carlos Rincón Mautner, digitally enhanced).

News

Stela 87 of Tak’alik Ab’aj: Its discovery and study

(Christa Schieber de Lavarreda, Parque Arqueológico Nacional Tak’alik Ab’aj, Ministerio de Cultura y Deportes, Guatemala). Stela 87 of Tak’alik Ab’aj, which was discovered in September 2018, is “an early example of the development of writing in Mesoamerica,” according to Nikolai Grube (University of Bonn). “Tak’alik Ab’aj was a place of experimentation with writing.” Experts are still struggling to decipher the hieroglyphs on the stone, but recent collaborative work on an international level has resulted in an important preliminary analysis. Tak’alik Ab’aj was originally founded as a link-city of the long-distance trade route during the hegemony of Olmec culture, before it was part of the precocious Early Maya development in the Southern Maya Area in the last centuries of the Preclassic period. In 2012 archaeologists discovered there the tomb of a powerful king, who may have led the transition from Olmec to Mayan cultural expression between 350 and 100 BC. It is important to stress out, that, based on studies of the local “Ocosito” ceramic tradition led by Marion Popenoe de Hatch, it can be said that it was the same population of the ancient city of Tak’alik Ab’aj that endured during its long history of occupation over 1700 years (800 BC–900 AD), nonetheless, it underwent transcendent cultural and political changes.

Stela 87 (Fig. 1) was found face-down as the first step in the western staircase of Structure 89 at the site. Dedicated to the construction of the second version of this residence at the

Figure 1. Stela 87, Tak’alik Ab’aj (Photo: David Claudio, 2018, courtesy of Parque Arqueológico Nacional Tak’alik Ab’aj).
beginning of the Early Classic (Phase Alejos 150–300 AD), it was situated immediately south of Structure 6 and Structure 7 on Terrace 3 of the Central Group of Tak’alik Ab’aj.

The date of the ceremonial reuse of Stela 87 together with over 20 offering vessels with triturated jadeite pieces (Fig. 2) at the beginning of the Early Classic suggests that the stela was first erected in the Late Preclassic. The study of the development of the sculptural tradition and its stratigraphic relation over time at Tak’alik Ab’aj, taking into consideration the archaeological context, style, sculpting technique and formal characteristic of the sculptures, as well the glyphs, points to Stela 87 being situated more precisely in the first phase of the Late Preclassic, at the beginning of the Rocío phase (ca. 100 BC–50 AD).

Stela 87 of Tak’alik Ab’aj represents a ruler clothed in elaborate regalia and symbols of early royal power. He stands in profile under the sky band crowned with the Principal Bird deity. In front of the dignitary, to his left, is a vertical sequence of four complete head variant glyphs looking in the same direction, each inside its own cartouche.

The dignitary carries in his right arm a rigid scepter, on top of which an unusual young personification of the dancing “Maize God” poses animatedly. The facial features of this little personage are reminiscent of the Olmec cultural tradition (analogically represented in the north and west mural of San Bartolo). The large, eye-sized grains around the peculiar form of the head with its skull modification appear more likely to be cacao beans than maize grains. This suggests a deity personifying cacao, which has been grown down to the present day on the Gulf Coast, in the Isthmus of Tehuantepec, and in the Pacific coastal region.

The contribution of this stela, the glyphic text of which is written in a vertical sequence, to the inventory of the still few inscriptions from the earliest period in the history of Maya writing, lies in it being not just one more text, but a text with “context”. This means that the text refers not only to the name and titles of the personage represented on the stela, but also to his regalia.

The iconography and writing on Stela 87 have now been the subject of an international collaborative study, involving archaeologists and epigraphers from Germany (Nikolai Grube, Sven Gronemeyer, Christian Prager, Elisabeth Wagner, Alejandro Garay), Russia (Albert Davletshin), the United States of America (David Mora-Marin, Oswaldo Chinchilla) and Guatemala (Christa Schieber de Lavareda, José Pineda, Omar Alvarado, Miguel Orrego Corzo, Federico Fahsen). The objective of this collaborative study has been to bring
together a group of specialists, each with a particular strategy and research focus. The result is an essay that combines the areas of agreement in order to strengthen the interpretation and reading of the stela and provide a firm basis for future research, while at the same time indicating areas of disagreement that require further discussion. Of particular interest in this study is the contrasting perspectives of experts on classic writing and specialists on early writing.

Besides confirming the themes and basic universal elements of the pattern of representation of the Preclassic royal figure of the personage (Fig. 3), a consensus has been achieved on the reading of the title ajaw for the third glyph (A3). Whether the first glyph (A1) represents the ancestor/grandfather MAM remains a point of debate, but there is general agreement to go one step further on the identification of a young cacao deity in animated pose as instead an equally young dancing “Maize God”. The iconographic scene sculpted on the natural surface of the rock without altering it is an open allusion to the institution of the historical rulers perpetuated in early Maya iconographic code with all their regalia. Short texts refer to their ancestral lineage, titles and names, and invoke their relationship to earlier Olmec culture.

**Discovery of Aztec bathhouse leads to information on Tenochtitlan’s Temazcaltitlan district** (INAH) Archaeologists have uncovered an Aztec temazcalli, or bathhouse (Spanish temascal), in Mexico City. The bathhouse (Fig. 4) was found in the historic district La Merced. The find was dated to the 14th century and was located in an ancient district of Tenochtitlan called Temazcaltitlan. The archaeological find is instrumental in confirming the location of this district, previously known only through historical maps.

![Figure 4. The newly discovered temascal in La Merced, Mexico City (photo: INAH).](image)

**9000-year-old human remains found in Yucatan cenote reveal syphilis-related disease** (PLOS ONE) During explorations of a cenote near Tulum in 2016, divers came across human remains. One of the individuals they encountered was named Chan Hol 3 after the name of the cenote. Further analysis has shown that the remains were of an adult woman who likely met a violent end. The cranial morphology of the individual differed from coeval crania. Furthermore, isotope analysis hints Chan Hol 3 had a different diet compared to her known contemporaries. The authors of the study have therefore concluded that at the end of the Pleistocene Mexico was inhabited by at least 2 distinct groups of people.

**Mexico repatriates three Mesoamerican objects from Germany** (INAH) Mexico has retrieved three artifacts that were situated in Germany and believed to have been brought into the country illegally. Thanks to the efforts of the Mexican embassy in Germany, it was possible to recover the pieces without recourse to legal action. The artifacts comprise a Late Classic anthropomorphic fragment from Mexico’s Gulf Coast, a Zapotec anthropomorphic urn dating to the Early Classic, and a figurine believed to originate from Campeche. The authenticity and origin of the latter object still needs to be examined.

**Lidar scan sheds new light on sacbe between Yaxuna and Coba** (JOURNAL OF ARCHAEOLOGICAL SCIENCE) The sacbe, or causeway, between Yaxuna and Coba is the longest known from the Maya area. A lidar scan has yielded new data on this important causeway. When the sacbe was first mapped in 1930, it was presumed to follow a straight line between Yaxuna and Coba. The new study has illustrated that this is not the case. Instead, the road was positioned in such a way as to incorporate existing towns and cities along the route. Rather than just connecting Coba and Yaxuna, the sacbe connected numerous smaller settlements as well.

**Analysis of cranial features indicate new origin for first inhabitants of the Americas** (INAH/PLOS ONE) Morphological analysis of nine skulls has yielded new clues to the first people who populated the Americas. The nine skulls were found in various caves in Quintana Roo and date between the Late Pleistocene and the Early Holocene.

Four of the skulls reveal distinct features that can be tied to modern populations. The “Naharon” skull was shown to exhibit characteristics comparable to the modern-day populations of Greenland and Alaska. Surprisingly, the “Hombre del Pit 1” showed evidence of a relationship to modern-day Europeans, while the remains of “Muknal” could not easily be related to present-day populations, although there could be some parallels with American groups near the Arctic. The “Las Palmas” cranium had strong correlations with paleo-American peoples. This skull could be related to the contemporary population of Lagoa Santa (Brazil), Chubut (Patagonia), or even Japan. The ongoing research should aid in developing our understanding of how the Americas were originally populated.

**New museum on indigenous clothing in Valladolid** (MUREM/THE WASHINGTON POST) A new specialized museum has recently opened in Valladolid, Mexico. El Museo de Ropa Étnica de México A.C., or MUREM, revolves around indigenous and traditional clothing in Mexico. The museum currently comprises over 90 complete outfits from 25 ethnic groups from all over Mexico.

For more information, visit <https://www.murem.org/>
A Terminal Classic Period Molded-carved Ceramic Production Mold from Actun Xtuyul, Pacbitun, Belize

Jon Spenard and Christophe Helmke

Actun Xtuyul (‘Termite Cave’) is one of several limestone karst landmarks in the Nohoch Tunich Bedrock Outcrop Complex, approximately 25 hectares of exposed limestone bedrock outcrop capping a hill on the southeastern outskirts of the pre-Hispanic Maya city of Pacbitun (Fig. 1). The area is a geologic mosaic of boulders, chasms, cracks, rockshelters, small caves, a collapsed natural bridge, and other types of diminutive karst features, which the pre-Hispanic Maya used ritually and extensively modified in the Classic period (AD 250–900). Situated above the ceiling of another much larger rockshelter named Actun Nohoch Tunich, Actun Xtuyul makes up only a small portion of the karstic landscape, measuring 13 m long, 3 m deep, and 2 m high (Fig. 2). A series of aligned, single course, uncut limestone rock clusters just outside its dripline delineate what must have been a special function area, presumably a ritual performance space (Fig. 3). Structurally, Actun Xtuyul is the product of natural sheet erosion undercutting the exposed bedrock face above Actun Nohoch Tunich, and several smaller-scale active instances of it were observed during our investigations. Nevertheless, the presence of undisturbed Maya artifacts on the rockshelter floor indicates these weathering processes are intermittent and have had little impact on the archaeological deposits and their formation. With its location just above Actun Nohoch Tunich, Actun Xtuyul is only accessible by foot via one of three narrow, natural access routes (see Figs. 2 and 3). Overall, such restricted access indicates the artifacts found in the latter rockshelter were deposited intentionally and that activities conducted at the site were the reserve of the few.

The ceramic production mold that is the focus of this paper was found pressed against the center-rear wall on the floor of Actun Xtuyul. A complete systematic surface collection was made in there, and two adjacent 1×1 m excavations units placed where the mold was encountered to search for additional pieces of the object, although none were recovered (Spenard 2012: 164–167). Even so, ceramic sherds stylistically dating to the Classic period, carbonized botanical remains, slate manuports, a single chert flake, and a large milky quartz pebble were recovered from the excavations (Spenard 2014: 253–255). Although these artifacts were few in number, the paleoethnobotanical assemblage recovered is more diverse than any of the karst features yet investigated in the region (Parker 2013: 12–14). These plant remains include charcoal from immature specimens of *Allophylus* sp., *Pinus* sp. (pine), *Bertiera guianensis*, *Alvaradoa amorphoides*, *Ficus* sp., and two dicots, unidentified as to species, as well as mature chunks of pine and an indeterminate species, and four burned seeds, one of which was identified as *Oxalis* sp. (wood sorrel) (Parker 2014: Table 6.2).
Description of the Actun Xtuyul Ceramic Production Mold

In its current form, the mold measures 8.25 cm long by 4.48 cm wide by 1.14 cm thick and weighs 37.5g. It is sand and calcite tempered, and some small magnetic nodules are visible on its surface. Originally part of a larger production mold, the piece had been reshaped, drilled twice, and broken prior to being cached in the rockshelter (Fig. 4). A large charred patch, several drops of an unidentified burned residue on the impression surface, and the context of its recovery attest to the object’s final ritual use. The impression surface is slightly concave rather than flat indicating the vessels it produced would have been formed within the mold, rather than applying the decorative panels to wholly formed vessels, an order of operation previously proposed for other molded-carved type vessels (Werness 2003:3). This confirms

Figure 2. Actun Nohoch Tunich with arrow pointing to Actun Xtuyul, facing northeast. Southern access to Actun Xtuyul begins just beyond right of image, and the northern access begins to left of three individuals below the arrow (photograph by Jon Spenard).

Figure 3. Plan drawing of Actun Xtuyul and surrounding components of the Nohoch Tunich Bedrock Outcrop. The “X” marks where the ceramic mold was recovered (map by Michael Mirro, with modifications by the authors).
the observations made by Ting and Helmke (2013: 45) that molded-carved vases were made directly within the molds, as two halves, and then adhered together along seams, thereby forming the characteristic vertical plain bands of this decorative mode.

The iconographic program of the mold displays part of seated human figure leaning forwards, with part of a leg, arm, and upper torso of the individual (Fig. 5). Seated on a twisted cord, elbow resting on bent knee, the individual’s loincloth is visible along the leg, and wears a three-piece anklet, a six-piece bracelet, and part of the necklace is visible above. A pair of grooved feathers runs the length of the lower arm, and others sway below, touching the individual’s ankle. Much like those adjacent to the arm, some of these feathers originating from a missing part of the scene are differentiated with fine incised lines. The drill holes are adjacent to one another, one affecting part of the scene are differentiated with fine incised lines. The drill holes are adjacent to one another, one affecting part of the cord, and the other along the decorative knot at the bottom of the loincloth. The objects below the horizontal cord are difficult to identify, although a human hand can be discerned, which appears to grasp another length of rope extending down from the horizontal cord dividing the scene. The continuation of the cord and other objects below the kneeling character reveal this to be an upper register of a larger scene.

Iconographic Comparisons

Comparing the iconographic program of the Actun Xuyul mold to other published examples of all three Molded-carved types (Pabellon, Sahcabe, and Ahk’utu’), as well as the online photographic database compiled by Maline Werness, reveals the rarity of the scene preserved (Adams 1971; Coe 1982; Graham 1987; Graham et al. 1980; Helmke 2000; Helmke and Reents-Budet 2008; Sabloff 1972; Smith 1955; Werness 2003, 2007). The presence of twisted cords acting as a framing device separating two superimposed registers on the mold’s iconography distinguishes it from all known molded-carved scenes except for a partial vase from Lamanai, Belize (Graham 1987: Fig. 3d) and unpublished sherds in the Altun Ha collection (Helmke 1999). The Lamanai vessel depicts a ritual bloodletting event involving humans and supernatural beings. Unfortunately, none of the iconographic components on the Lamanai vase precisely match those of the Actun Xuyul mold, although there are two places where overlap may be found. Even if the Lamanai vase and Actun Xuyul mold do not share the same scene, the content of both iconographic programs are similar enough to suggest a close relationship between them, possibly being variants of the same type. Graham (1987: 79) notes that the form of the Lamanai vessel is common to central Belize; however, due to distinctive features of the form and the iconography, Helmke and Reents-Budet (2008: Fig. 6) identify it as belonging to the Sahcaba Molded-carved type. The absence of this iconographic program in the well-defined and homogeneous iconography of the Ahk’utu’ Molded-carved type–what is in essence highly standardized iconography–evidently speaks against its identification as to that type. As the iconography is not known and the Lamanai vase form is distinctive from Pa-
bellon Molded-carved, it is best to identify the Actun Xtuyul piece as the mold for Sahcabe Molded-carved ceramics. For these reasons, we surmise that the molded-carved vessels produced with the Actun Xtuyul mold should be identified as Sahcaba Molded-carved, although in the absence of paste identifiers this identification is necessarily hypothetical.

The Actun Xtuyul mold is a unique item in the artifact assemblage of the Pacbitun ceremonial karstcape; moreover, it is one of only four known production molds for any of the three molded-carved types recovered anywhere in the Maya area. The others were recovered from Altar de Sacrificios (n=2) and Seibal (n=1), all of which were used to make Pabellon Molded-carved types (Adams 1971: 51; Willey et al. 1975:49). Nevertheless, the Actun Xtuyul mold contains the most complete scene yet recovered, as described above. The Altar de Sacrificios pieces retain the upper borders and uppermost portion of the scenes, while the Seibal piece is from an indistinct position in the middle of the iconographic program (Adams 1971: Fig. 67 h,i; Willey 1978: Fig. 55). This overall lack of known production molds has restricted scholars studying the vessels to speculating about their manner of production based on the condition of the decorations, the interior walls of the pots themselves, or variances in minor details in the scenes (Adams 1971: 49; Graham 1987: 79; Graham et al. 1980: 164; Sabloff 1972: 195; Smith 1955: 43; Werness 2003: 3–4). Their conclusions tend to suggest that the elaborate decorations on the vessels were made by some combination of carving, gouging, incising, modeling, molding, or tracing. More recently, Helmke and Reents-Budet (2008: 40–41) have observed that the size and clarity of Ahk’utu’ vessels lessen over time, suggesting to them that the scenes on later pots were produced from casts made from earlier ones, although whether their observation is applicable to the other molded-carved types remains unknown at present. Being a larger, and more diagnostic piece of an original mold, the Actun Xtuyul specimen shows a high level of detail (e.g. shafts of feathers as well as fingernails and creases delineating the palm of the hand), suggesting post molding modifications such as gouging, and incising, would have been minimal on vessels produced by original molds rather than molds cast secondarily from vessels.

In pondering how Molded-carved type vessels were produced, archaeologists have been left to speculate about where these ceramics were being produced because so few molds are known (Ting and Helmke 2013). In light of this, the Actun Xtuyul mold was included as part of a preliminary Instrumental Neutron Activation Analysis study of ceramics from Pacbitun, the full results of which are the focus of a forthcoming paper. Briefly, Ronald Bishop of the Smithsonian Institution sampled the mold, determining its chemical “fingerprint,” which was then compared to the Smithsonian database of Maya ceramics to determine where it was made (Spendar 2014: 332–242). While the current database prohibits precise identification of the site where the mold was produced, including Pacbitun, its chemical signature indicates it was made in the Belize Valley (Ronald Bishop, personal communication 2014).
Much information about the ritual landscape of Pacbitun and socio-political changes in that region can be gleaned from the production mold. Considering the entire Actun Xtuyul artifact assemblage, the mold fragment likely had a secondary use as a tool for divination or shamanic ritual following its initial primary function: making molded-carved type pottery. Firstly, the quartz pebble stands out as a significant artifact. It is round in shape, but with several uneven rough surfaces. The object weighs 77 g and measures 5 cm at its widest, making it roughly the size of a golf ball. Quartz objects appear in caves and rockshelter artifact assemblages with some regularity, although usually in small quantities (Halperin 2002: 103; Helmke 2009: 298, 290, 293, 390; Ishihara-Brito 2007: 223; Spenard 2006: 124; Woodfill 2010: 28–74). Comparisons to ethnographic accounts suggest the pre-Hispanic Maya may have used such objects for shamanistic curing and divination (Brady and Prufer 1999; Brown 2000; Hanks 1990: 246–248; Love 2004: 15–20; Tedlock 1982: 59; Wisdom 1940: 345). Contemporary Maya priests and day-keepers prefer a special type of stone or mineral called a sastun, meaning ‘transparent, bright or clear stone’ (Barrera Vásquez 1980: 971), but the word is used colloquially to refer to a special class of round-shaped quartz divining crystals, similar to the pebble recovered from Actun Xtuyul (Brady and Prufer 1999; Brown 2000; Hanks 1990: 246; Hofling and Tesucún 1997; Love 2004: 12). Furthermore, Tedlock (1982: 59) notes the basic tools of day-keepers in highland Guatemala are crystals and divining seeds. Considering that no other pieces of the ceramic mold were recovered during systematic investigations of the rockshelter, the recovery of seeds and the quartz pebble, the heavy modification of the mold, and its caching in a rockshelter of difficult access, we propose the piece may have eventually served as a tool for divination or shamanic ritual.

In this paper, we have reported on the recovery of a Terminal Classic ceramic production mold, and the social implications of its presence in the environs of Pacbitun. Prior to its ceremonial use, the mold had evidently been used to produce molded-carved pottery, likely of the Sahcaba Molded-carved type. Using Instrumental Neutron Activation Analysis, the sherd was sourced to the greater Belize Valley, which is well in keeping with the distribution of that ceramic type. Nevertheless, its recovery in a rockshelter near Pacbitun strongly suggests that the mold was used at a local production locus. Accounting for the archaeological contexts and the near mass-production of molded-carved vessels, suggest they were used for gift exchanges by secondary elites who were taking advantage of the collapsing political system in the Terminal Classic period to bolster their own political power (Helmke 2001). Thus, the presence of this mold at Pacbitun highlights a weakened institution of kingship and emerging political factionalism there at the end of the Late Classic period.

The rarity of the iconographic scene helps to define the as yet little known Sahcaba Molded-carved type, which along with Pabellon and Ahk’utu’tu’ form one of the most important horizon markers for the Terminal Classic period. Rather than evidence of foreign incursions and influence, increasing evidence now demonstrates instead that these ceramic types were produced locally, although within different regional spheres. Importantly, the partial overlap of these spheres testify to the interconnectedness of the different regions in the Terminal Classic. The discovery of the mold at a site in the vicinity of Pacbitun and the secondary context in which it was deposited speak eloquently of the revolutionary nature that defines the Terminal Classic at these sites and the broader region as a whole.

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Puuc centers have long been regarded as the Terminal Classic “florescence” of Maya Lowland civilization. Research over the past two decades, however, renders this view untenable given the numerous Preclassic (B.C. ~800–A.D. 300) archaeological sites identified across the hill region now demonstrating a much longer, local developmental sequence. Among the most significant Preclassic centers is Xcoch strategically located at the heart of the central Santa Elena Valley, exhibiting massive monumental architecture distributed across an extensive settlement landscape. These data indicate an early stratified society and central place in a formative settlement hierarchy long before the apogee of large urban centers like Uxmal in the Late-Terminal Classic.

This paper reviews archaeological data at Xcoch and surrounding sites with the goal of documenting Preclassic settlement across the Santa Elena Valley, a district of rolling terrain south and west of the Puuc ridge and north of the Bolonchen hill district (Fig. 1). We focus on three kinds of temporally and spatially associated archaeological data. First, we use the presence and pattern of megalithic style architecture, consisting of large pillow-shaped boulders set in dry masonry with abundant chinking stones, found on high platforms and pyramid structures. Second, hydraulic features that show attributes of Preclassic water collection, storage, and dispersal such as *aguadas* (human-made or human-altered reservoirs) and depression features (smaller open-air tanks), before *chultuns* (underground cisterns) became the preferred means for household and community water storage. Finally, Preclassic ceramics are utilized to help identify early occupations and place them in relative temporal context. These data provide

Figure 1. Topographic satellite image and map of regional settlement hierarchy for the central Santa Elena Valley, Puuc Ridge, and part of the Bolonchen Hill district showing Xcoch and surrounding Preclassic outliers in a nested hexagonal pattern as well as other sites and modern towns mentioned in the text. The base map is a SRTM-derived hillshade, outline of the National Center for Airborne Lidar Mapping lidar (NCALM) in the Kiucic area (Bolonchen district) of the Puuc region, Campeche, Mexico flown in May 2017 (William Ringle PI). G-LiHT transect for the Santa Elena-Tzubil area composed of tiles Yuc_Norte_NFI_10s443 to 10s446, plus other G-LiHT transects including near Kiucic and Yuc_Norte_GLAS_11s. Inset map of the Northwest Yucatan peninsula shows locations of Xcoch, the Puuc region detail map, and G-LiHT transects.
measures not only for Preclassic site identification, but also as a basis for proposing a preliminary reconstruction of a settlement hierarchy centered on Xcoch. We note that some of these sites likely represent the first farming populations in the Santa Elena Valley. Though provisional, this work breaks new ground regarding the evolution of social complexity in the Northern Maya Lowlands.

Research at Xcoch

Excavation at monumental and residential architecture and investigation at a deep, water-bearing cave situated below the site center revealed significant occupation from the Middle Preclassic to the Late Preclassic in addition to the Classic Periods. A hiatus at the end of the Preclassic likely related to drought may have played a critical role in a pause in social development similar to the Southern Maya Lowlands (e.g., Hodell et al. 2001; Haug et al. 2003; Webster et al. 2007; Moyes et al. 2009; Dunning et al. 2013; Dunning et al. 2014a; Medina-Elizalde 2015). The Xcoch cave and its permanent water source was clearly ritually important while large-scale hydraulic features (aguadas) were also key to understanding the Preclassic settlement landscape.

The initial work at Xcoch revealed a large site in the Preclassic (Smyth and Ortegón 2008) (Fig. 2). A massive Central Acropolis composed of the Great Pyramid, Grand Platform, and Xcoch Plaza (Figs. 3 and 4) constructed in the megalithic style is typical

Figure 2. Grid map of Xcoch with metric coordinates on borders showing highlighted settlement groups of megalithic architecture and water features including aguadas and smaller reservoirs dated to the Preclassic period.
of Preclassic occupation across northern Yucatan (Taube 1995; Mathews 2003, Mathews and Maldonado 2006). Deep excavations at Xcoch also recovered medium-cut facing stones from building foundations and walls suggesting a variant of the megalithic style associated with Middle Preclassic ceramics and radiocarbon dates (Smyth et al 2014; Smyth n.d.). Similar megalithic stonework is reported for Xocnaceh and its enormous Preclassic platform 20 km east of Xcoch (Stanton and Gallareta 2002; Gallareta and Ringle 2004; Bey 2006; Gallareta 2018). Moreover, depression features altered to hold water at Xcoch, three open-air tanks and three aguadas, are dated to Preclassic times (Dunning et al. 2014a; Smyth et al. 2014).

Middle and Late Preclassic ceramics (Mamom and Tiho-suco Complexes) were recovered from early stratigraphic architectural contexts across Xcoch. Hemispherical water vessels with cylindrical monopod supports and long narrow necks from the Xcoch cave were identified as Yotholin Patterned-Burnished (Fig. 5) (Brainerd 1958; Smyth and Ortegón 2008). A Yotholin support from a deep stratigraphic unit outside the cave is associated with medium-cut stones (Smyth et al. 2014). At Xocnaceh, Yotholin dishes, bowls and beakers came from stratigraphic columns predating and transitioning into Ek phase ceramic wares (Kohut et al. 2018). Early Middle Formative (circa 1000 B.C.) Yotholin, therefore, may predate Early Nabanche ceramics from Komchen representing the earliest pottery in the Yucatan and a pre-Mamom “fossil index” (Brainerd 1958; Folan 1968; Boucher and Polomo 2005; Andrews et. al 2018; Kohut et al. 2018; cf., Andrews 1990; Robles and Ceballos 2018).

Preclassic Xcoch includes early surface structures, Middle Preclassic substructures, and abundant formative ceramic diagnostics across 1.5 km², or half the estimated Late Preclassic site size (Smyth n.d.). Xcoch seemingly headed a regional hierarchy of outliers attracting populations with the only cave in the Santa Elena Valley known to penetrate the permanent water table. Xcoch centers six major outliers situated a day’s walk surrounded in turn by smaller outliers...
and village hamlets forming a nested hexagonal pattern (Fig. 1), with many attendant socio-political and economic correlates. This settlement network tied to Xcoch has been provisionally identified by remote sensing including satellite imaging, G-LiHT Lidar (Light Detection and Ranging), and ground survey.

**Preclassic Diagnostics**

Megalithic architecture, Preclassic pottery, and water reservoirs are correlated at Xcoch and confirmed by substructures and sealed stucco floors dated by C-14 (Tables 1 and 2)(Smyth et al. 2011; Smyth et al. 2014). Megalithic stonework, therefore, should be a key diagnostic of Preclassic occupation at other Puuc sites (Mathews and Maldonado 2006). Excavations have identified episodes of Preclassic reservoir construction such as the enormous Xpotoit Aguada at Yaxhom and Gondola Aguada at Xcoch (Dunning et al. 2014b; Ringle et al. 2011).

The Central Acropolis at Xcoch (Figs. 2 and 3) conforms to the Middle Formative Chiapas urban pattern: high platforms and largest pyramid to the north, E-group complexes often to the south, west platforms, and eastern elite residential precincts (Clark and Hansen 2001:3–12). On the north is the Great Pyramid-Grand Platform and south the Xcoch Plaza, where the Cave Pyramid adjoins a long platform with three foundations facing an East Pyramid suggestive of the E-group variant found at Dzibilchaltun. Pyramids and platforms defined the Eastern Elite District and high platforms also occur to the west. The Xcoch cave and its labyrinthine subterranean passages lie between two urban aguadas and numerous depression features, all associated with megalithic architecture. Preclassic ceramics diagnostics were recovered throughout.

For regional survey, megalithic architecture, Preclassic surface pottery, and water reservoirs found together, even with later settlement present, should indicate Preclassic occupation (Dunning 2014b; Smyth et al. 2014; Smyth et al. 2017a). Applying this pattern recognition approach, Xcoch outliers were investigated for these diagnostics employing satellite imagery, G-LiHT lidar, and informant-guided ground survey.

**G-LiHT for the Xcoch Area**

Lidar, with its ability to look beneath the tree canopy and surface vegetation, is revolutionizing archaeological survey (Reese-Taylor et al. 2016; Šprajc 2017; Canuto et al. 2018). The Xcoch area has benefited from a small strip of lidar from the NASA G-LiHT project (Figs. 1 and 6). The NASA project used satellites to evaluate forest structure (and carbon sequestration) on the Yucatan Peninsula (Cook et al. 2013), also using an instrument package including lidar, hypserspectral and...
Figure 7. Map of central Uxmal showing the North Group and nearby aguadas at the top (after Graham 1992).
thermal imagers. Golden et al. (2016) initially recognized the value for archaeological survey of the lidar-derived ground point component of the G-LiHT data. While G-LiHT on-the-ground lidar point density is just six points per m² (Cook et al. 2013), less than the typical fifteen or so points per m² used for detailed studies in the Maya area (Fernandez-Diaz et al. 2014), these data have proven a valuable survey tool to examine ancient Maya marketplaces (Ruhl et al. 2018) and water management features (Dunning et al. 2019). Pedestrian survey around Xcoch “ground truthed” megalithic architecture and water-related features revealed by G-LiHT lidar. Surface ceramics were then examined for Preclassic diagnostics. After a review of previous settlement research in the Puuc, we discuss the results of the reconnaissance survey to date and our current understanding of a Preclassic settlement hierarchy of the Santa Elena Valley.

Previous Settlement Survey in the Puuc

Archaeological settlement survey began with the travels of John Lloyd Stephens and Frederick Catherwood in 1841 and 1842 (Stephens 1963). After a brief visit to Uxmal in 1840, these early explorers returned to visit dozens of Puuc sites, often the first outsiders to do so. While other outsiders later visited the Puuc, these visits were generally limited to one or two sites—with one notable exception. Teobert Maler undertook repeated and extensive visits from 1886 and 1894 (Maler 1895a, 1895b, 1902, and 1997) documenting some 100 sites, many were not rediscovered until 100 years later. These early investigations were not settlement surveys per se, rather expeditions of discovery documenting standing architecture. A tradition of documenting standing structures continued into the 20th century by Mexican, American, and European scholars, their work chiefly focused on one or more sites. Harry Pollock of Washington’s Carnegie Institution reached many much Puuc sites across Yucatan and Campeche (Pollock 1980). While Pollock’s work again focused on architecture, he tried to roughly assess site size and layout and information about environmental settings.

The first attempt to document the totality of sites in the region was the Atlas Arqueológica de Yucatán (Kurjack et al. 1979; Garza T. and Kurjack 1980). This project employed photogrammetric analysis of stereopairs of aerial photographs and ground visits. Whereas higher resolution photographs and generally low vegetation allowed for detailed settlement analysis over northwest Yucatan, higher forest cover and lower resolution photos in the Puuc necessitated ground visits. Local guides, such as Mario Magaña and Pedro Góngoro Dzul, roving guardians hired by the Centro Regional de Yucatán-INAH, greatly facilitated this site survey.

Local informants also guided architect George Andrews’ extensive survey of Puuc architecture from 1984 to 1991. Taking inspiration from the Atlas Arqueológico, Andrews estimated site size, volume of monumental architecture, and special attributes such as stelae to assign ranks to each site (Andrews 1995).

A similar approach to site ranking was used by Nicholas Dunning in a more systematic survey of 725 km² of the Puuc employing both local guides and systematic road-trail survey (Dunning 1989, 1992; Dunning and Kowalski 1994). Dunning determined that Late-Terminal Classic (A.D. 600–950) sites with “major” attributes such as large temple pyramids, palaces, ball courts, stelae or inscriptions were spaced at 6.5 to 9.5 km intervals, with variation conditioned by topographic factors. Additionally, sites exhibiting early occupation (megalithic or Proto-Puuc architecture) typically were linked to

Figure 8. North range of the Nunnery Quadrangle and Uxmal’s North Group in the background after partial clearing in the mid-1990s.
water sources (caves or aguadas). Some Puuc aguadas appear to have originated as natural karst sinks modified to serve as reservoirs, whereas others were entirely artificial. Another significant finding was that many intersite “hamlets” lacked chultuns and were probably only occupied in the rainy season as part of land- or labor-control strategies (Dunning 2004).

Recent decades have seen numerous site-focused settlement studies. Alfredo Barrera Rubio undertook opportunistic surveys of cleared milpas around Uxmal to ascertain site limits (Barrera Rubio 1978). The first attempt to map an entire Puuc site occurred at Sayil (Sabloff et al. 1985; Tourtellot et al. 1989; Sabloff and Tourtellot 1991). These data were used to estimate ancient population size (Tourtellot et al. 1990) but were later challenged (Becquelin and Michele 1992; Andrews 2004). Subsequent research at Sayil also included surface collections at residential clusters (Killion et al., 1989). Michael Smyth and Christopher Dore directed site-scale surface collections and soil testing to reconstruct community organization revealing site-wide patterns of activities and ancient land use (Smyth and Dore 1992; Smyth et al. 1995). Survey methods were extended to the adjacent site of Chac II documenting substantial Early and Middle Classic occupations (Smyth et al. 1998). Investigations of the large site of Oaxintok on the northwest Puuc periphery also revealed a large Early Classic component and pulsating pattern of Classic Period settlement expansion and contraction (Rivera Dorado 1995).

Other site-focused surveys included Xculoc, Xpostanil, and Chunchuhub. Pierre Becquelin and Dominque Michelelet found the architectural composition of each site markedly different, suggesting varied function or organization (Dominique et al. 2000). Christian Isendahl (2002, 2011) mapped the site of Xuch in detail and linked various occupation zones with probable zones of relative agricultural productivity. Complete mapping of Xkipche was also attempted, including surveys extending to the site hinterlands as well as investigations at neighboring Hunto Chac (Prem 2003; Prem and Dunning 2004).

William Ringle, George Bey, and Tomás Gallareta Negrán have conducted settlement research in the Puuc region since 2000. Initially focused on the site of Kiuc, they later undertook intersite survey linking Kiuc with Huntchmul and Labná (Ringle et al. 2001). Later, a survey was initiated at Yaxhom and nearby sites (Ringle 2011; Galvin et al. 2018). More recently, a 200 km² swath of terrain including Yaxhom, Labna, Huntchmul, Kiuc and other sites in the eastern Puuc was imaged with airborne lidar for regional-scale analysis (Ringle et al. 2018; Seligson et al. 2019).

Many Puuc archaeological sites have been documented by dedicated amateur archaeologists, most notably Karl Herbert Mayer and Stephan Merk. Most of their findings have appeared in Mexican, though Merk has also reported on regionally focused site surveys in two successive books (Merk 2011, 2016).

The heavy overlay of Late-Terminal Classic occupation in the Puuc region, often including eye-catching standing buildings and the rarity of deep penetrating excavations, it is not surprising that earlier occupations have been over-looked. However, an expanding body of data now begin to estimate the extent and nature of Preclassic settlement.

**Preclassic Regional Hierarchy**

The presence of Xcoch, a Preclassic rank 1 site in the Santa Elena Valley, raises questions regarding the existence of contemporary settlements across the Puuc region. A growing list of Preclassic sites now include Paso de Macho and Huntchmul (Gallareta and Ringle 2004), Kiuc (Bey 2006; Andrews and Bey 2011), Xcenacel (Gallareta and May 2007), Yaxhom (Dunning 1992; Ringle 2011), among others (Fig. 1). Within Xoch’s hinterland (~a 10 km radius), outliers of different sizes, monumental construction, and residential features are identifiable by megalithic architecture, Preclassic ceramics, and associated water features. Given a lack of surface water in the region yet presence of high-quality agricultural soils, the high labor investments required for hydraulic features, cleared farm fields, and monumental construction perhaps combined to discourage site abandonment and teth-er populations to improved landscapes. The fact that most known Preclassic sites were (re)occupied in the Classic period supports this observation.

Discussed below are Preclassic sites organized by rank-order based on walking distance to Xcoch and stratified by estimated site size and relative scale of monumental architecture. Smaller sites adjacent to rank 2 centers are characterized as nested outliers especially those small sites with modest monumental architecture (Rank 3) and only residential settlement or early farming communities (Rank 4).

**Uxmal North Group (Rank 2)**

Uxmal was a regional capital in the late 9th century A.D. (Kowalski and Dunning 1999) but only a modest settlement in the Preclassic (~0.5 km²). Mexican field projects identified Late Preclassic ceramics (Barrera Rubio 1978, 1981) with high densities near the megalithic North Group some 9 km west of Xcoch. These data suggest that the North Group was the center of early occupation, but outside Uxmal’s Terminal Classic (A.D. 800-950) monumental core where no Preclassic substructures have been reported (Fig. 7).

Megalithic architecture at the North Group consists of a multilevel acropolis platform supporting a pyramidal superstructure at the north end with adjacent east and west mounds (Fig. 8). Nearby are four major aguadas (300 to 600 m west), including the largest reservoir Ch’en Chan Akal, which implies use in the Preclassic and a principle reason for settlement here. However, none of these aguadas have been dated radiometrically and there has been no research target-ing a Preclassic component at the site. The current evidence suggests that Uxmal was a minor site within the settlement orbit of Xcoch.

**Nohpat (Rank 2)**

Some 7 km southwest of Xcoch, Nohpat is one of the largest unexcavated sites in the Puuc and is connected to Uxmal by an intersite causeway leading to the Central Acropolis (Group I; Carrasco 1991; Dunning 1992). In the Preclassic Nohpat was probably larger than Uxmal approaching 1 km². Two aguadas are known, the largest lies east of Group I and its massive platform and tall North Pyramid (Structure 1) constructed of megalithic stonework (Fig. 9). In 2018, Preclassic ceramic diagnostics were identified on-platform near the main pyramid (Fig. 10). High platforms in Groups II and
III contain numerous large structures (Dunning 1992:169), though megalithic substructures have not been identified. The spatial orientation of Groups I-III resembles the Middle Formative Chiapas pattern found at Xcoch, namely a north-south-east urban plan (Smyth et al. 2014, Smyth n.d.).

The Chetulix cave near Nohpat contains a narrow opening to a potential subterranean water source apparently sealed in Preclassic times. Explorations in 2012 could not access the cave but numerous water jar sherds of Middle Preclassic Chacnecote cached at the entrance indicate an offering commemorating an intentional act of closing (Smyth et al. 2012). These data imply that Nohpat was a major site closely tied to Xcoch near the beginning of complex society in the region.

Kuxnecau (Rank 2)

Four km southeast of Santa Elena is Kuxnecau (Kuxnecan in Dunning 1992). The site includes a large platform and adjacent quadrangle with a tall southern pyramid of Late-Terminal Classic construction but also underlying megalithic structures. Some 400 m south is a massive 8 m high megalithic platform and 20+m tall pyramid surrounded by megalithic buildings near a potential reservoir. Ceramic diagnostics confirm a Preclassic acropolis and site area estimated at 0.5 km².

Eekbalam (Rank 3)

Eekbalam (jaguar star) lies 2.5 m west of Kuxnecau near the Eco-Hotel La Nueva Alta (Fig. 1). Part of Ejido Revolución 1910 and Site 224 (Dunning 1992:236; 265-266), Proto-Puuc and Early Puuc buildings stand upon a terrace platform with megalithic stonework. To the east are megalithic platforms where Preclassic ceramics were identified in 2018. These platforms surround a low-lying zone of *zacate* grass and large reservoir known as Aguada Xcaamal, a plugged sink that still holds water during the rainy season (Dunning 1992:236). Whether there are other larger Preclassic structures in the vicinity is unclear, but the current data suggest that Eekbalam covers less than 0.5 km², a possible outlier of Kuxnecau.
Cab (Rank 2)
Cab (or Tzehta’bay), 12 km southeast of Xcoch, contains numerous megalithic structures including a large megalithic platform and 12 m tall pyramid at the north end (Fig. 11) where a tecomate rim of Yotholin Patterned-Burnished suggests a pre-Mamom occupation (Fig. 12). On the east side of the platform are megalithic foundations and a platform with a megalithic staircase; an aguada lies to the east near the road to Rancho Santa Rosalia. These data suggest a modest settlement of 0.5 km² whose Preclassic relationship with Xcoch remains unclear. Cab is nearer and arguably an outlier of Xocnaceh on eastern foot of the Puuc ridge where little surrounding residential settlement has been reported (Gallareta 2018).

Tzubil (Rank 2)
Nine km east of Xcoch is a group of high mounds abutting the Puuc ridge near Ticul locally known as Tzubil, a name taken from a bas relief on a stone block depicting a protruding member penetrating a border. This early site is where the Centro Regional de Yucatán (INAH) performed excavations within a depression-sascabera (marl quarry) at a northern pyramid platform producing significant quantities of Middle and Late Preclassic diagnostics in stratigraphic context (Boucher 1990; Boucher and Palomo 2005; Dunning 1992). Reconnaissance in 2018 revealed a megalithic platform with abundant Preclassic surface ceramics, and a tank-like reservoir akin to the Preclassic water features excavated at Xcoch (Fig. 13; Smyth et al. 2017). Preliminary data suggest that Tzubil was a major site covering 1 km² surrounded by outliers of early farming communities.

Tzubil Outliers (Rank 4)
A transect of G-LiHT lidar imagery 1.5 km southwest of Tzubil revealed hamlets of multiple small mounds (Fig. 6). In 2019, ground truthing near Ticul’s high-tension towers locating residential groups with L-shaped platforms, megalithic buildings, pilas (stone basins, or metates) single-room foundations but no monumental architecture. Two possible stelae and Preclassic ceramic diagnostics were identified but no chultuns were found. Off-platform depressions suggest early water features including a potential aguada.

Savanna Group (Rank 4)
G-LiHT lidar also revealed several mounded features in a savanna zone 2.5 km northeast of Tzubil. Covered with thick zacate grass, locating settlement features by pedestrian survey is nearly impossible (Fig. 14). Fortunately, bare earth imagery led ground survey to a group of raised platforms with boulder foundations associated with early Middle Preclassic surface ceramics (Chancenote striated and possible Kin origin).
suggesting a pre-Mamom occupation. In addition, a circular depression and potential aguada with surrounding berms and platforms are flanked by two parallel linear features suggesting a possible ballcourt. Hillside platforms near pool-sized sartenejas (limestone holes) are located south of the Puuc ridge near Highway 184. These small-scale settlement features may represent one of the first pioneering farming communities for the region.

Holbonbek (Rank 2)

Seven km northeast of Xcoch is the little-known site of Holbonbek, or site 31 (Fig. 1; Garza T. and Kurjack 1980; Dunning 1992:201). Noted for a large pyramid and acropolis with abundant megalithic stonework, this site was visited by Michael Smyth in 2002 and 2018 (Fig. 15). A 20+ m pyramid on the north end of a massive building platform shows megalithic stairs fronting high platforms (10+ m). Other prominent mounds are obscured by heavy zacate grass, but on the western approach to the acropolis is a 30 m long platform up to 12 m tall with exposed megalithic stonework (Fig. 16). The platform’s east orientation facing the acropolis and rising sun and Preclassic surface pottery suggest an early E Group complex. A possible reservoir or clay-lined sink is south and a large aguada to the east was reported by Dunning (1992). Holbonbek, apparently did not exceed 0.5 km² but its prominent central architecture, potential outliers (below), and clear view of the Xcoch Great Pyramid indicate an important place in the Preclassic settlement hierarchy.
T’óoch Ich (Rank 3)
T’óoch Ich is Preclassic outlier 2.5 km northwest of Holbonbek probably less than 0.5 km² (Fig. 1). A megalithic acropolis platform and modest pyramid overlook a large aguada in a small valley along the Puuc Ridge. Several L-shaped platforms with boulder retaining walls, megalithic staircases, and Preclassic surface ceramics indicate an early outlier settlement.

Rancho Meex (Rank 2)
Rancho Meex (Rancho Mex in Dunning 1993) is a Preclassic site 9 km north of Xcoch along Highway 261 which may have covered at least 1 km² (Figs. 1 and 17). Briefly visited by Hanns Prem and Nicholas Dunning in 1993 and Michael Smyth in 2018 and 2019, the site consists of a series of contiguous courtyards typical of large sites in the Santa Elena Valley. Fracturing in local bedrock favors both shallow caves and aguada development such as in a low-lying area east of the site center. In the Preclassic the central megalithic core is dominated by an Acropolis with a massive east platform and north pyramid. The un-vaulted summit building shows thick boulder walls with chinking stones like the one atop a megalithic pyramid at Yaxhom (Str. K8220E1080, Nucuchtunich group) provisionally dated to the Early Classic (Ringle 2011: 11). Rancho Meex’s Acropolis and Pyramid have yielded Preclassic surface ceramics. A triadic-like south group centered by a smaller megalithic pyramid and large platform to the west suggest a possible E-group complex.

Gruta Tucil (Rank 3)
Approximately 1.3 km north of Rancho Meex atop the Cordon Puuc near the Parque Ecológico El Mirador is a large acropolis-like megalithic platform supporting a ruined Puuc-style palace. A short distance (140 m) southwest is the Gruta Tucil exhibiting speleological evidence of stalactites, flowstone, and roof fall breakdown for a cave that allegedly reaches underground water (Fig. 18). Tucil is one of two other caves (Actun Xpek, and Actun Ziithá) explored by James Reddell (1977). Importantly, well-preserved Preclassic ceramics indicate that the cave was actively utilized in early times (Fig. 19). Indeed, a long megalithic platform above the cave and numerous megalithic foundations are associated with a possible hilltop reservoir. Clearly a northern outlier of Rancho Meex, the Gruta Tucil occupies one of the highest
points in Northern Yucatan and enjoys a commanding view of the Xcoch Pyramid.

**Toniná? (Rank 3?)**

An unreported site 2.5 km east of Rancho Meex was visited in 2018. Apparently called Toniná by local Maya farmers, the site lies among hills entered by a low-lying zone of zacate grass, with an aguada that reportedly still holds water. Uphill, a sinkhole contains large trees and luxuriant vegetation typical of rejolladas (dry sinkholes) of northern Yucatan. An overhang on the lower east side with massive stalactites may lead to an underground cave with subterranean water. A Preclassic rim sherd of Joventud or Sierra red was seen on-the-floor near the south wall. To the north on a leveled hilltop are two megalithic foundations with no chultuns, pilas, or other domestic features suggestive of a non-residential function. Though not visited, satellite imagery reveals a large acropolis to the north in a remote and inaccessible part of the forest. These settlement data indicate a potentially significant Preclassic outlier of Rancho Meex.

**Ramonales (Rank 3)**

Another Preclassic site and potential outlier of Rancho Meex was discovered on a new cattle ranch 10.8 km northwest of Xcoch. Ramonales appears to represent a single-period occupation. Highlighted by a 5+ m high acropolis where surface ceramics are abundant, a 0.5 ha platform supports east and west megalithic pyramids (Figs. 20, 21). Raised foundations for perishable structures are found on and off-platform and a deep depression or water reservoir connects to drainage canals adjoining a west stairway. On the eastern approach is a megalithic group adjacent to a walled sascabera apparently converted into a water reservoir like those documented at Xcoch. Reconnaissance found no evidence for Classic period settlement features: no vaulted buildings, no chultuns, and surface ceramics were too eroded for identification. Megalithic architecture is distributed over less than 0.5 km².

Figure 20. Sketch map of Ramonales showing the Megalithic Acropolis, depression features, and east megalithic groups.

Figure 21. West Pyramid at the Preclassic Megalithic Acropolis at Ramonales.

Figure 21. West Pyramid at the Preclassic Megalithic Acropolis at Ramonales.
Dos Aguadas (Rank 3)

Midway between Xcoch and Uxmal are two aguadas (Figs. 22, 23) with heavy alkache (waterlogged clays) that retain water during the rainy season. The larger east aguada (2,000 m²) shows clear berms indicating an engineered hydraulic feature. A leveled hilltop to the south supports a massive two-level basal platform faced with huge boulder retaining walls. The lower northern extension supports an Early Puuc vaulted building where cemented into the concrete hearting of the northwest corner was a large Middle Preclassic Chan cenote body sherd. The upper terrace includes a partial quadrangle and raised platform for megalithic structures. Immediately north of the aguadas is another group locally known as Ché with several standing buildings and a megalithic pyramid and quadrangle visited by Stephan Merk in 2003 (personal communication, 2019) who also reported (Merk 2019) an Uxmal outlier (Ich Equis) 3 km west whose northern group features a platform with roughly cut large stones which may be in the megalithic style.

Two Aguadas (Rank 4)

In the eastern Xcoch hinterland are two aguadas whose estimated storage capacity far exceeded local domestic water requirements (Fig. 1). Research at the South Aguada at Xcoch shows that such reservoirs began in the Preclassic (Dunning et al. 2014b). One of these rural aguadas is locally known as Si’ina’an Ik’k (scorpion wind), a large well-preserved reservoir with high berms, canals, and a western sluiceway connected to a network of linear earthen features between the Savanna Group and urban Xcoch. With no associated monumental architecture and little residential settlement, this ancient hydraulic feature must have been engineered for the storage and redistribution of rainwater for irrigation. These and other hydraulic features surrounding Xcoch begin to show how the greater watershed was modified to harvest rainfall for irrigating outlying farm fields perhaps at the beginning of Maya settlement in the region.

Discussion

Three kinds of temporally and spatially associated archaeological data provide surrogate measures of Preclassic occupation. Synthesizing these data in the Santa Elena Valley reveals a diversity of early satellite sites surrounding Xcoch. Site ranking estimated by megalithic architecture and settlement size provides a means to infer political importance and relative position in a hierarchical settlement system. The volume of monumental architecture at Xcoch is an order magnitude greater and the site three times larger than of any other site presumably because its leaders were able to attract more laborers and residents than other rival communities. Furthermore, the number and diversity of early hydraulic features like aguadas are greater at Xcoch than any other site except Uxmal (where aguada ages are unknown) suggesting that the greater hinterland watershed was engineered at an early date to harvest rainwater for irrigation farming. The Xcoch cave as a pilgrimage destination attracting outsiders to its sacrosanct subterranean water was surely a significant factor in the emergence of Xcoch as a primate center (see Dunning et al. 2014b; Weaver et al. 2015).
A settlement hierarchy including six Preclassic rank 2 centers are a day’s walk from Xcoch. These sites contain monumental architecture and settlement areas in excess of 0.5 km². At least three-tiers of this system appear organized in a nested hexagonal pattern composed of various rank 3 settlements and rank 4 hamlets surrounding more substantial rank 2 centers. While the rules or principles influencing settlement behavior of this hexagonal model (Marcus 1973; Flannery 1976: 162-173) are beyond the current data, Xcoch and its satellites appear to incorporate a ring of aguadas designed for hinterland irrigation and intensive agriculture. Together with monumental architecture, agricultural intensification implies new strategies for organizing labor and increasing production.

The closest Preclassic rival to Xcoch was likely Yaxhom, a site at the eastern apex of the Santa Elena Valley featuring a megalithic acropolis, an E-group, an enormous reservoir, and network of satellites linked by causeways to the central group (Fig. 1) (Dunning 1992; Ringle 2011). Just north of the Puuc Ridge, Xocnacch’s massive Middle Preclassic acropolis but relatively small resident population may have served a special purpose strategically positioned on the boundary of the Coastal Plain between the settlement hierarchies headed by Xcoch and Yaxhom. These central places, their outliers, and potential interactions with a political sphere suggests a complex inter-regional network at the dawn of the Maya in Northern Yucatan.

Reconnaissance of the Santa Elena Valley aided by G-LiHT lidar has discovered settlements on the outskirts of Xcoch that may represent early farming communities. Whether pioneering agriculturalists were pre-Mamom is a critical question that warrants further research. However, these data demonstrate that beneath the savanna grasslands and forest canopy are settlements in virtually all areas where agricultural production and water storage were possible.

Xcoch is of special importance for its water-bearing cave and central position in a Preclassic settlement hierarchy. Research over the past 20 years shows that the Puuc Hills was as early and culturally complex as any other Maya region. New data from the Northern Maya Lowlands is inspiring a major transformation in thinking regarding the role of the north in the evolution of Maya society (Andrews and Robles 2004; Anderson 2011; Brown and Bey 2018). Surrogate measures of early occupation are helping locate early sites to reconstruct a model of settlement hierarchy. The next phase requires larger-scale regional data and a program of excavation. When the first farming peoples settled around Xcoch, with whom they interacted, and the nature of settlement organization including environmental factors are compelling issues that relate to social complexity in the development and decline of Preclassic Maya civilization.

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Table 1. Data from three megalithic architectural groups at Xcoch with related Preclassic surface pottery and hydraulic features denoting early occupation dated by architectural stratigraphy, excavation context (Op.), and radiocarbon assays.

<table>
<thead>
<tr>
<th>Megalithic Context</th>
<th>Preclassic Pottery</th>
<th>Hydraulic Features</th>
<th>Stratigraphy</th>
<th>Pozo – Context - C-14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Acropolis: Grand Platform, Xcoch Plaza, Cave Staircase, West Causeway, South Terrace</td>
<td>Widespread Surface; Abundant Subsurface</td>
<td>Gondola Aguada; Open-Air Tanks</td>
<td>Stucco Floors; Substructures</td>
<td>Op. 4 - Lev. 6 Piso V - Yes - Lev. 7 Piso VI - “</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Op. 5 - Lev. 11 Piso X - “</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Op. 7 - Lev. 3 Piso II - “</td>
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<tr>
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<td></td>
<td>Op. 8 - Lev. 9 Piso VIII - “</td>
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<td></td>
<td></td>
<td>Pozo 1 - 85 cm b.s. - “</td>
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<td></td>
<td></td>
<td></td>
<td>Op. 36 - Lev. 4 Piso III - “</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pozo 1 - Lev. 5 230 cm - “</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Aguada Gondola 310 cm - “</td>
</tr>
<tr>
<td>North and East Pyramids: Chikin Mul Platform; Candelaro Group</td>
<td>Surface; Abundant Subsurface</td>
<td>East Aguada; Open-Air Tanks</td>
<td>Stucco Floors; Substructures</td>
<td>Op. 26 Lev. 3 - Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Op. 35 Lev. 8 Piso V - “</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td>Op. 50 Levs. 2-3 - No</td>
</tr>
<tr>
<td>Chac Na Group; Triadic Group; South Aguada Group</td>
<td>Surface; Abundant Subsurface</td>
<td>South Aguada; Open-Air Tanks</td>
<td>Stucco Floors; Substructures</td>
<td>Op. 20 - Lev. 3 Piso II - No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Op. 43 - Lev. 3 Piso II - “</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Op. 61-Levs.2-6 Pisos I-V - “</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pozo 1-S Aguada 200 cm-Yes</td>
</tr>
</tbody>
</table>
Table 2. Preclassic and Early Classic radiocarbon dates from Xcoch, Yucatán calculated using the Accelerator Mass Spectrometer (AMS) technique from the National Ocean Accelerator Mass Spectrometry Facility (NOSAMS) and the Calib Radiocarbon Calibration Program.

<table>
<thead>
<tr>
<th>Field Specimen</th>
<th>Lab# NOSAMS</th>
<th>Conventional C-14</th>
<th>Uncalibrated Calendar Date</th>
<th>Calibrated C-14 Date (2 sigma)</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>20013</td>
<td>78754</td>
<td>1460 +/- 25</td>
<td>A.D. 490</td>
<td>A.D. 560–646</td>
<td>S Aguada, Pozo 1 (200 cm)</td>
</tr>
<tr>
<td>20045</td>
<td>78756</td>
<td>2520 +/- 30</td>
<td>570 B.C.</td>
<td>792–716, 695–539 B.C.</td>
<td>Grand Platform, Op. 4, Lev. 6 - Piso V</td>
</tr>
<tr>
<td>20046</td>
<td>78757</td>
<td>2550 +/- 30</td>
<td>600 B.C.</td>
<td>800–743, 689–663, 647–549 B.C.</td>
<td>Grand Platform, Op. 4, Lev. 7 - Piso VI</td>
</tr>
<tr>
<td>20126</td>
<td>84304</td>
<td>2040 +/- 25</td>
<td>90 B.C.</td>
<td>159–135 B.C., 114 B.C.–A.D. 24</td>
<td>Aguada Gondola, Pozo 1 (310cm)</td>
</tr>
<tr>
<td>20198</td>
<td>84310</td>
<td>2590 +/- 30</td>
<td>640 B.C.</td>
<td>809–763, 680–673 B.C.</td>
<td>West Sache, Op. 36, Lev. 4, Piso III (below)</td>
</tr>
<tr>
<td>20251</td>
<td>104688</td>
<td>2250 +/- 30</td>
<td>300 B.C.</td>
<td>392–348, 317–207 B.C.</td>
<td>S Terrace Pozo 1, 85 cm b.s.</td>
</tr>
</tbody>
</table>

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cations, Inc.
Abstract: The Maya center of Xcoch contains some of the earliest and largest monumental constructions in the Puuc Hills. First noted by John Lloyd Stephens in 1841 as a large city with a deep, water-bearing cave and gigantic pyramid, Xcoch is now among a growing list of Puuc sites dated to the Preclassic period. A multidisciplinary research program revealed Maya community patterns, megalithic architecture, and material culture for a Preclassic complex society. Massive platforms, numerous pyramids, habitation structures, and an internal causeway connecting the Gondola Aguada to the Xcoch grotto are among many Preclassic features distributed across 3 km². This paper reviews the Preclassic at Xcoch and its role as a regional center for a hierarchy of outlier sites in the central Santa Elena Valley. Megalithic architecture, formative ceramics, and early water features are employed as diagnostics in a regional reconnaissance aided by remote sensing, including G-LiHT lidar, and pedestrian survey. These data show evidence for a multi-tiered hierarchy of Preclassic hinterland sites within Xcoch’s immediate settlement system long before the appearance of the world heritage site of Uxmal.

Resumen: El centro maya de Xcoch contiene algunas de las construcciones monumentales más antiguas y granes de las colinas Puuc. Primero notado por John Stephens en 1841 como una gran ciudad con una profunda cueva de agua y una pirámide gigantesca, Xcoch es ahora entre una lista creciente de los sitios Puuc fechados en el período preclásico. Un programa de investigación multidisciplinaria reveló patrones comunitarios mayas, arquitectura megalítica, y material cultural para una sociedad preclásica compleja. Las enormes plataformas de construcción, las numerosas pirámides y plazas, las estructuras habitacionales de piedras grandes, y una calzada interna que conecta la gran Aguada Gondola con la gruta del Xcoch se encuentran entre muchas características de asentamiento preclásico distribuidas a través de 3 km². Este artículo revisa los patrones materiales preclásicos en Xcoch y su papel como un sitio regional para el valle central de Santa Elena. Arquitectura megalítica, cerámicas formativas, y elementos tempranos de agua en Xcoch se emplean como diagnósticos en un reconocimiento regional dentro del valle de Santa Elena por detección remota, incluyendo G-LiHT lidar, y un recorrido peatonal. Estos datos demuestran evidencia de numerosos sitios preclásicos interiores para una jerarquía multivínculo dentro de la órbita de asentamiento inmediata de Xcoch de cual algunos podrían representar los primeros agricultores de la región. Estos resultados preliminares sugieren que Xcoch era una sociedad estratificada en el corazón de un sistema de asentamiento regional siglos antes del apogeo del sitio patrimonial de la humanidad de Uxmal.
Altum me fac deus: quot nia intra uerūt a qua vel que ad animam meam.

Inficlus sum in limpio fundi: * 2 non est habita

Ven in altitudi 3 tia. nem maris: 2 temp ē

Has demer sit me. Laboravi claman, rau

cae factae sunt fauces: me: * defecerunt oeu

limei,