**[Supplementary material]**

# Defining the Preclassic ceramic economy at Cahal Pech, Belize using geochemical compositional analyses

Claire E. Ebert[1], Daniel E. Pierce[2] & Jaime J. Awe[1]

[1] *Department of Anthropology, Northern Arizona University, 5 East McConnell Drive, Flagstaff, AZ 86011-5200, USA*

[2] *Archaeometry Laboratory, University of Missouri Research Reactor, 1513 Research Park Drive, Columbia, MO 65211, USA*

[*] *Author for correspondence (Email: claire.ebert@nau.edu)*

Our study examined Preclassic-period ceramic assemblages from the following radiocarbon-dated contexts at Cahal Pech, Belize. All radiocarbon dates discussed are reported at the 2σ calibrated date range.

## Plaza B

Plaza B is the largest open courtyard in the Cahal Pech monumental site core, measuring approximately 50m north–south × 60m east–west. Large scale horizontal exposures and test excavations have identified contexts representing the earliest village settlement in this location of the site (Awe 1992; Peniche May 2016; Ebert *et al.* 2017; Ebert 2018), associated with the Cunil ceramic complex (1200–1000/900 cal BC), earliest ceramics in the Belize River Valley during Early Preclassic (Figure S1; Sullivan & Awe 2013; Sullivan *et al.* 2018). Contexts located below floor 17 (construction phases Plaza B/first through Plaza B/fourth) have been directly dated to the Cunil complex (for radiocarbon dates, see Table S1). A second phase of construction occurred in Plaza B during the beginning of the Middle Preclassic (construction phases Plaza B/eighth—Plaza B/ninth). Construction phase Plaza B/ninth (floor 13) represents the first in a series of low rectangular platforms that may have served as higher-status residences. The next construction event, Plaza B/tenth (floor 12), enlarged the first rectangular platform, and a retaining wall composed of at least five courses of regularly cut limestone blocks was placed on the building. Plaza B/eleventh consisted of the construction of a specialised keyhole-shaped round structure. The last Middle Preclassic construction episode within Plaza B (Plaza B/twelfth,

floor 11) was an extensive cobble platform (~98m$^2$) covering the keyhole-shaped structure that was placed between 765 and535 cal BC.

A single radiocarbon date below floor 8 in Plaza B provides evidence for construction activity through at least the middle of the Late Preclassic Period between 105 cal BC and cal AD 15 (UCIAMS-169813). Relatively little Late Preclassic and Early Classic Period materials were recovered from the Plaza B excavations (Peniche May 2016), however, and archaeological data also indicate a hiatus in activity at Structure B4 until the Late Classic Period (Awe 1992; Healy *et al.* 2004).

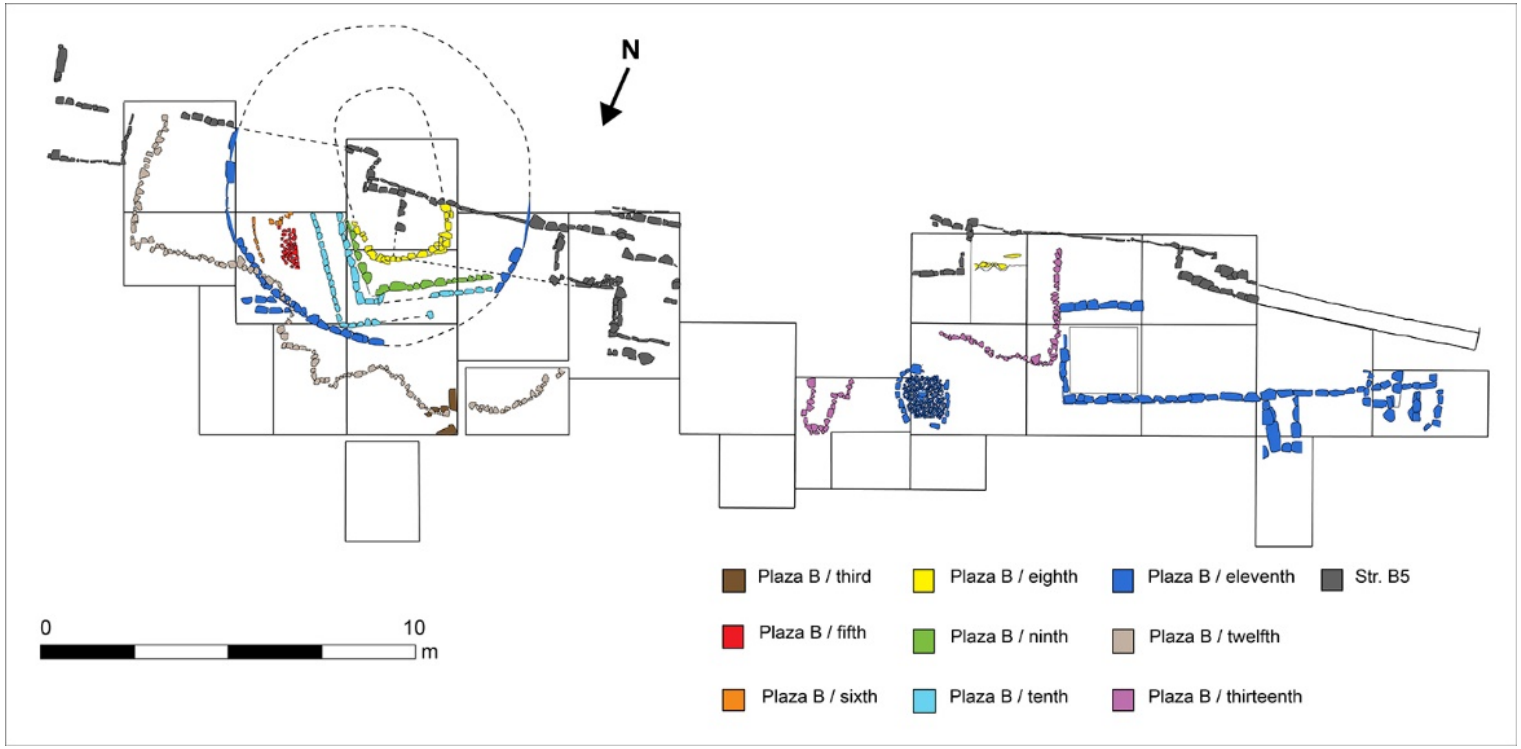


*Figure S1. Plan of Plaza B, showing construction phases discussed in the main text (after Peniche May 2016: fig. 4.3; drawing and digitisation by N. Peniche May, J. Can & M. Méndez).*

**Table S1. Radiocarbon dates for the Cahal Pech site core and peripheral settlement. All dates are reported as conventional $^{14}C$ ages corrected for fractionation, with measured $\delta^{13}C$ following Stuiver and Polach (1977). Date calibrations were produced in OxCal v.4.3 (Bronk Ramsey 2009) using the IntCal13 Northern Hemisphere atmospheric curve (Reimer *et al.* 2013).**

| Context | Lab # | Provenience | Material dated | Conventional radiocarbon age (BP) | 2σ cal range (BC/AD) | Ceramic phase | References |
|---|---|---|---|---|---|---|---|
| *Structure B4* | | | | | | | |
| | UCIAMS-115021 | EU10, lvl 4, above fl. 4 | Charcoal | 2225±15 | 375–205 BC | EF/LF Xakal | Ebert *et al.* 2017 |
| | Beta-40863[a] | EU5, fl. 7 | Charcoal | 2470±90 | 795–400 BC | LF Kanluk | Awe 1992 |
| | UCIAMS-115022 | EU10, lvl 6, surface fl. 6A | Charcoal | 2705±15 | 900–815 BC | EF Xakal | Ebert *et al.* 2017 |
| | UCIAMS-115023 | EU10, lvl 7, surface fl. 7 | Charcoal | 2585±15 | 805–775 BC | EF Kanluk | Ebert *et al.* 2017 |
| | UCIAMS-115024 | EU10, lvl 8, surface fl. 8 | Charcoal | 2735±20 | 920–825 BC | EF Kanluk | Ebert *et al.* 2017 |
| | UCIAMS-111159 | EU10, lvl 8, in fl. 8 | Charcoal | 2505±15 | 775–545 BC | EF Kanluk | Ebert *et al.* 2017 |
| | Beta-77206[a,b] | EU5, fl. 8 | Charcoal | 1950±200 | 405 BC–AD 540 | EF Kanluk | Healy & Awe 1995 |
| | Beta-40864 [a] | EU5, fl. 9 | Charcoal | 2720±60 | 1000–795 BC | EF Kanluk | Awe 1992 |

| Context | Lab # | Provenience | Material dated | Conventional radiocarbon age (BP) | 2σ cal range (BC/AD) | Ceramic phase | References |
|---|---|---|---|---|---|---|---|
| | UCIAMS-111160 | EU10, lvl 10, fl. 10 | Charcoal | 2220±15 | 365–205 BC | Cunil | Ebert *et al.* 2017 |
| | Beta-40865 [a] | EU5, fl. 10C | Charcoal | 2740±70 | 1055–795 BC | Cunil | Awe 1992 |
| | Beta-77205 | EU5, fl. 10A | Charcoal | 2800±50 | 1110–830 BC | Cunil | Healy & Awe 1995 |
| | Beta-77204 [a] | EU5, fl. 11 | Charcoal | 2710±120 | 1215–540 BC | Cunil | Healy & Awe 1995 |
| | Beta-56765 [a] | EU5, fl. 11 | Charcoal | 2730±140 | 1285–510 BC | Cunil | Awe 1992 |
| | UCIAMS-111158 | EU8, lvl 12/13, fl. 13 | Charcoal | 2830±15 | 1030–920 BC | Cunil | Ebert *et al.* 2017 |
| | UCIAMS-111162 | EU10, lvl 21, fl. 13 | Charcoal | 2845±20 | 1075–920 BC | Cunil | Ebert *et al.* 2017 |
| | UCIAMS-111161 | EU10, lvl 14, southern posthole | Charcoal | 2435±20 | 745–405 BC | Cunil | Ebert *et al.* 2017 |
| | Beta-253772 | EU 8, lvl 13, fl. 13 | Charcoal | 2840±40 | 1125–900 BC | Cunil | Sullivan & Awe 2013 |
| | Beta-77207 | EU5, below fl. 13, on bedrock | Charcoal | 2930±50 | 1280–980 BC | Cunil | Healy & Awe 1995 |

| Context | Lab # | Provenience | Material dated | Conventional radiocarbon age (BP) | 2σ cal range (BC/AD) | Ceramic phase | References |
|---|---|---|---|---|---|---|---|
| | Beta-253771 | EU9, lvl 14, below fl. 13 | Charcoal | 2970±40 | 1375–1050 BC | Cunil | Sullivan & Awe 2013 |
| *Plaza B* | | | | | | | |
| | UCIAMS-169810 | Lot PL-B-224, below fl. 4 | Charcoal | 180±15 | AD 1665–1950 | Xakal/Mount Hope | Ebert *et al.* 2017 |
| | UCIAMS-169811 | Lot PL-B-263, below fl. 5 | Charcoal | 205±20 | AD 1650–1950 | EF/LF Xakal | Ebert *et al.* 2017 |
| | UCIAMS-169812 | Lot PL-B-228, below fl. 6 | Charcoal | 155±15 | AD 1665–1945 | EF/LF Xakal | Ebert *et al.* 2017 |
| | UCIAMS-169813 | Lot PL-B-24, below fl. 8 | Charcoal | 2035±15 | 95 BC–AD 20 | EF/LF Xakal | Ebert *et al.* 2017 |
| | UCIAMS-172404 | Plaza B/12$^{th}$, lot PL-B-146, below fl. 10 | Faunal Bone | 2500±20 | 775–540 BC | LF Kanluk | Ebert *et al.* 2017 |
| | UCIAMS-172405 | Plaza B/10$^{th}$, lot PL-B-193, between feat. 21 & 26 | Faunal Bone | 2530±20 | 795–550 BC | LF Kanluk | Ebert *et al.* 2017 |
| | UCIAMS-174957 | Plaza B/9$^{th}$, lot PL-B-180, below fl. 13 | Faunal Bone | 2545±20 | 800–560 BC | LF Kanluk | Ebert *et al.* 2017 |
| | UCIAMS-169814 | Plaza B/8$^{th}$, lot PL-B-176, feat. 19 | Charcoal | 2525±15 | 790–550 BC | EF Kanluk | Ebert *et al.* 2017 |

| Context | Lab # | Provenience | Material dated | Conventional radiocarbon age (BP) | 2σ cal range (BC/AD) | Ceramic phase | References |
|---|---|---|---|---|---|---|---|
| | UCIAMS-169815 | Plaza B/5th, lot PL-B-167, below fl. 16 | Charcoal | 2760±20 | 975–835 BC | EF Kanluk | Ebert *et al.* 2017 |
| | UCIAMS-172403 | Plaza B/4th, lot PL-B-168, below fl. 17 | Faunal Bone | 2835±20 | 1050–925 BC | Cunil | Ebert *et al.* 2017 |
| | UCIAMS-169816 | Plaza B/4th, lot PL-B-169, below fl. 17 | Charcoal | 2820±15 | 1015–920 BC | Cunil | Ebert *et al.* 2017 |
| | UCIAMS-169817 | Plaza B/3rd, lot PL-B-184, fill/Sascab | Charcoal | 2800±20 | 1010–900 BC | Cunil | Ebert *et al.* 2017 |
| | Beta-253773 | Op. 1v, lvl 15 | Charcoal | 2940±40 | 1265–1015 BC | Cunil | Sullivan & Awe 2013 |
| *Peripheral Settlement* | | | | | | | |
| | UCIAMS-123532 | Tzutziiy Kin Group Str. 2, terminal construction, fill | Charcoal | 1255±15 | AD 685–775 | Spanish Lookout | Ebert *et al.* 2016 |
| | UCIAMS-121554 | Tzutziiy Kin Group Str. 2, fl. 3 | Charcoal | 1365±15 | AD 645–675 | Tiger Run | Ebert *et al.* 2016 |
| | UCIAMS-121553 | Tzutziiy Kin Group Str. 2, feat. 1, fill | Charcoal | 1555±15 | AD 425–550 | Hermitage | Ebert *et al.* 2016 |
| | UCIAMS-164869 | Tzutziiy Kin Group Str. 2, below fl. 6 | Charcoal | 1880±15 | AD 70–210 | LF Xakal | Ebert *et al.* 2017 |

| Context | Lab # | Provenience | Material dated | Conventional radiocarbon age (BP) | 2σ cal range (BC/AD) | Ceramic phase | References |
|---|---|---|---|---|---|---|---|
| | UCIAMS-164870 | Tzutziiy Kin Group Str. 2, below fl. 7, paleosol | Charcoal | 1865±15 | AD 80–215 | LF Xakal | Ebert *et al.* 2017 |
| | UCIAMS-164871 | Tzutziiy Kin Group Str. 2, below fl. 7, paleosol | Charcoal | 1890±15 | AD 65–205 | LF Xakal | Ebert *et al.* 2017 |
| | UCIAMS-164872 | Tzutziiy Kin Group Str. 3, below fl. 2 | Charcoal | 1920±15 | AD 50–130 | LF Xakal | Ebert *et al.* 2017 |
| | UCIAMS-121552 | Tzutziiy Kin Group Str. 3, below fl. 7, paleosol | Charcoal | 2150±20 | 355–110 BC | EF Xakal | Ebert *et al.* 2016 |
| | UCIAMS-169818 | Zopilote Group Str. 1, tomb 1 burial, inside vessel 10 | Charcoal | 1320±15 | AD 655–765 | Hermitage/ Tiger Run | Ebert *et al.* 2017 |
| | UCIAMS-164876 | Zopilote Group Str. 1, below fl. 8 | Charcoal | 1765±15 | AD 230–335 | LF Xakal | Ebert *et al.* 2017 |
| | UCIAMS-164877 | Zopilote Group Str. 1, below fl. 8 | Charcoal | 1780±15 | AD 170–330 | LF Xakal | Ebert *et al.* 2017 |
| | UCIAMS-164874 | Zopilote Group Str. 1, below fl. 7 | Charcoal | 2070±15 | 165–40 BC | EF Xakal | Ebert *et al.* 2017 |
| | UCIAMS-164875 | Zopilote Group Str. 1, below fl. 8 | Charcoal | 2070±15 | 165–40 BC | EF Xakal | Ebert *et al.* 2017 |

| Context | Lab # | Provenience | Material dated | Conventional radiocarbon age (BP) | 2σ cal range (BC/AD) | Ceramic phase | References |
|---|---|---|---|---|---|---|---|
| | UCIAMS-164878 | Zopilote Group Str. 1, fl. 5 | Charcoal | 2085±20 | 170–45 BC | EF Xakal | Ebert et al. 2017 |
| | UCIAMS-164873 | Zopilote Group Str. 1, fl. 1A | Charcoal | 2175±15 | 355–175 BC | EF Xakal | Ebert *et al.* 2017 |

[a] Denotes radiometric measurement.

[b] Denotes date found unacceptable for context by original investigators.

**Structure B4**

Structure B4 is a 5.5m-high temple located at the south-eastern corner of Plaza B. This building has produced the longest radiocarbon-dated construction sequence at Cahal Pech. A series of excavations conducted from 1988–2012 documented at least 13 discrete construction episodes (Figure S2; Awe 1992; Ebert *et al.* 2017; Healy & Awe 1995; Healy *et al.* 2004; Ishihara-Brito & Awe 2013). The uppermost strata of the building are composed of Late and Terminal Classic materials (cal AD 300–900), including some intrusive burials, with context located below floor 3 (Structure B4/tenth) associated with Early through Late Preclassic occupation.

The earliest material at Structure B4 dates between 1205–990 cal BC (Beta-77207). A radiocarbon sample was recovered beneath floor 13 on the surface of bedrock, which was likely leveled prior to initial Cunil occupation at Cahal Pech. Domestic buildings located below floor 10 (construction phases B4/first through B4/fourth) also date to the Cunil phase (Ebert *et al.* 2017). Beginning after approximately 960 cal BC, during the Middle Preclassic (early facet Kanluk ceramic complex) Structure B4 underwent several modifications (B4\fifth through B4\seventh), terminating with the construction of a specialised round structure measuring approximately 1.5m in height and dating between 895–820 cal BC (Beta-40863; Healy & Awe 1995).

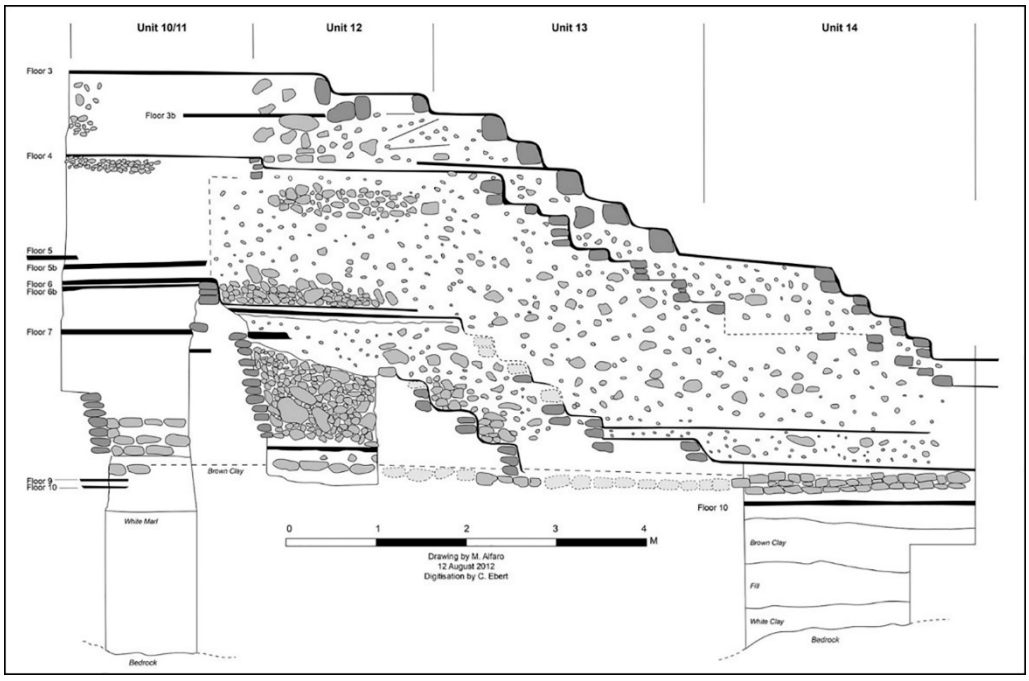


*Figure S2. Profile of Cahal Pech Structure B4 (after Ebert* et al. *2017: fig. 6).*

Construction phases B4/eighth through B4/tenth occurred at the end of the Middle Preclassic and into the Late Preclassic, with remodeling of monumental buildings occurring at punctuated intervals between 600 and 200 cal BC (late facet Kanluk to early facet Xakal ceramic complexes). The building corresponding with Structure B4/eighth (floors 7A and 7B), which consisted of a 3m-tall circular platform made of cut limestone blocks. During the construction of structure B4/ninth, a plastered surface corresponding to floor 6 replaced floor 7. The subsequent placement of floor 5 (Structure B4/tenth) raised the building approximately 1.2m above the surface of Structure B4/eighth, and the plaza floor of the building itself was also raised 0.5m (Ishihara-Brito & Awe 2013: 127).

**Tzuztiiy K'in Group**

The Tzutziiy K'in Group (roughly translating to 'sunset' in Yucatec Mayan) is a large domestic group located atop a small hill approximately 1.8km directly west of the Cahal Pech site core. The group was first documented through survey and excavations in 2012, with continued research in 2015 (Ebert & Dennehy 2015; Ebert & Fox 2016; Ebert *et al.* 2016). A total of seven structures surround the group's main plaza, many of which have been heavily looted in modern times (Figure S3).

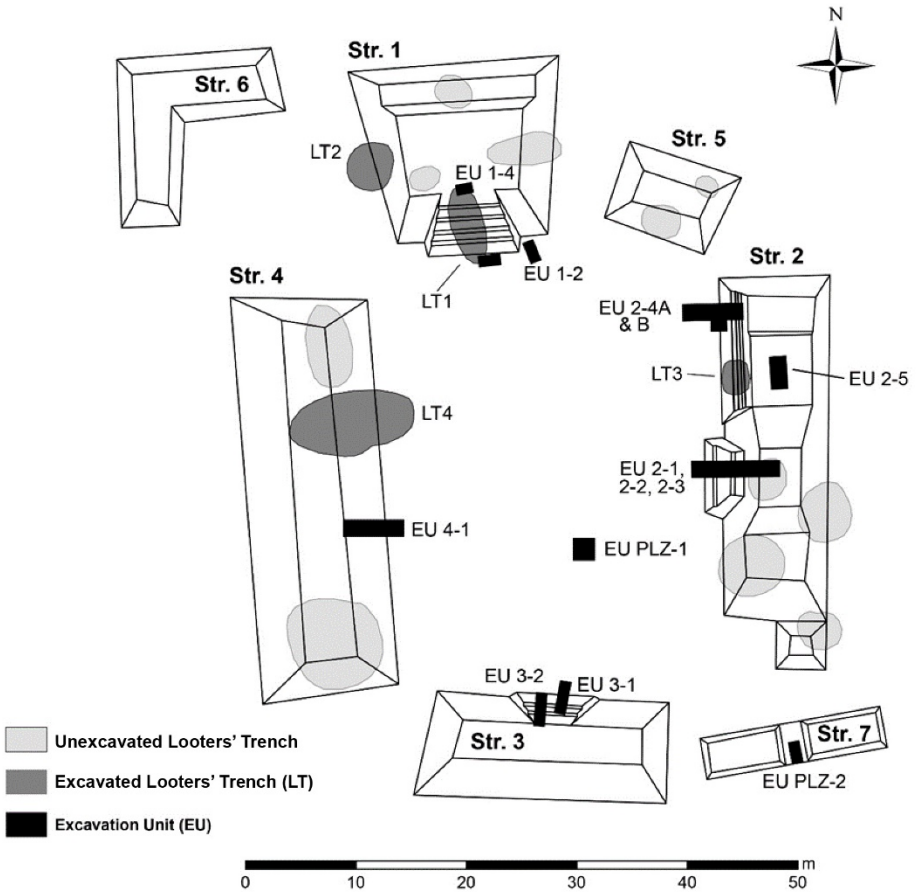


*Figure S3. Map of Tzutziiy Ki'n showing locations of test excavations and excavated looters' trenches (after Ebert & Fox 2016: fig. 3).*

Ceramic samples analysed in this study were derived from excavations at Structure 2 and Structure 3 conducted from 2012 through 2015 (Ebert 2017). The earliest radiocarbon date (UCIAMS-121552) from Tzutziiy K'in comes from the paleosol level beneath Structure 3 (Unit 3-1), and dates the initial settlement of the group by at least 350–110 cal BC, during the beginning of Late Preclassic (Figure S4; Ebert *et al.* 2016). The paleosol matrix deposit contained high concentrations of late Middle and Late Preclassic ceramics primarily dating to the Kanluk (Savanna Orange types) ceramic and Xakal (Sierra Red, Polvero Black types) ceramic phases, likely indication of domestic occupation as early at the end of the Middle Preclassic. Middle to Late Preclassic ceramics from the Kanluk and Xakal phases were found in strata below floor 3 in both units at Structure 3 sampled in this study. A charcoal sample from below

floor 2 produced at date of cal AD 50–130, during the late facet of the Xakal ceramic complex, suggesting continued domestic construction at this location through the end of the Preclassic.

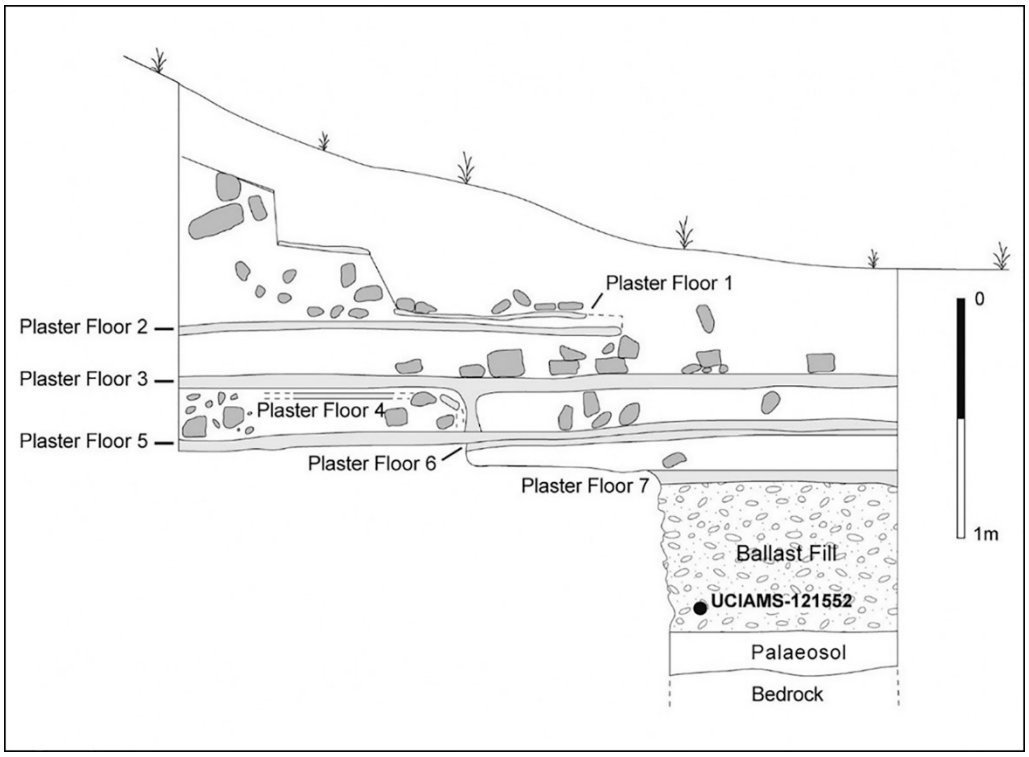


*Figure S4: Profiles of Tzutziiy K'in Structure 3, showing the location of the earliest radiocarbon sample for the group (after Ebert* et al. *2016: fig. 5).*

A total of five construction phases were recorded at Structure 2 (Figure S5). The first phase of construction at the building (phase TK-2 first) consisted of a soil layer placed on top of a paleosol layer, dating to the end of the Middle and beginning of the Late Preclassic period. The second phase (TK-2 second) of construction consisted of a masonry stone platform. This building runs at an angle across the unit, and is not part of the Classic period construction of Structure 2. Rather, it may represent an earlier Preclassic period component of the site. Floor 7, a thin plaster floor, abuts the interior portion of the masonry platform, and perhaps was located at the interior of this structure. The fill below floor 7 contained a few diagnostic sherds dating to the Kanluk and early facet Xakal ceramic complex. Three charcoal samples from this strata produced a date range of 65–215 cal BC. The third phase of construction (TK-2 third) consisted of a series of five plaster floors (floors 2–6). These floors were only exposed in the eastern

portion of the unit. Three of these floors were also recorded in the nearby units 2-1, 2-2, and 2-3. A radiocarbon sample collected directly from the surface of plaster floor 2 produced a date range of cal AD 650–670 (UCIAMS-121554), placing all subsequent construction activities at the structure within the Late Classic (Ebert *et al.* 2016).

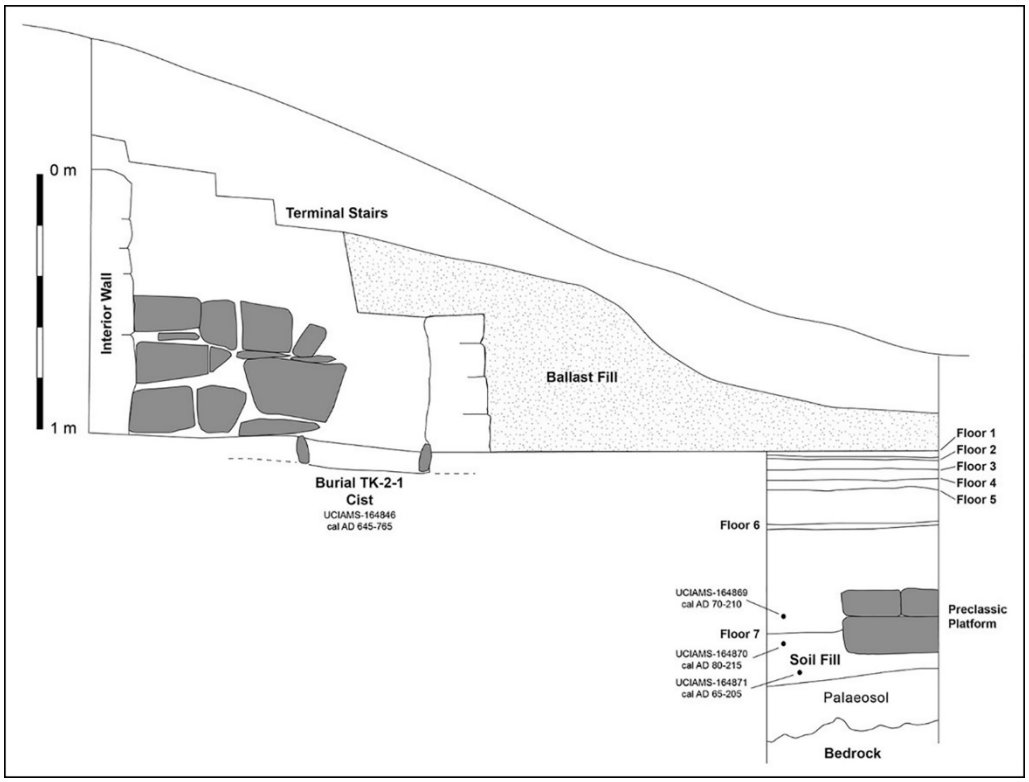


*Figure S5. Tzutziiy K'in Structure 2 profile (Ebert & Fox 2016: fig. 4).*

**Zopilote Group**

The Zopilote Group is a large terminus group located approximately 0.75km south of the Cahal Pech monumental core at the end of the Martinez Sacbe (Figure S6). Excavations in 2015 uncovered a total of 11 construction phases (Figure S7), and targeted these contexts for direct dating and ceramic sampling. The earliest construction episodes (ZPL-1 first through ZPL-1 third) were associated with ceramics from the Cunil (1200–900 BC), Kanluk (900–350 BC), and Xakal (350 BC–AD 350) ceramic phases (Ebert & Fox 2016). Floor 1a represents the earliest construction activity at the group, and does not appear to be associated with temple platforms composing later construction episodes. The palaeosol layer contained high frequencies of freshwater shells, chert cores and flakes, and fragments of utilitarian ceramic vessels. This strata

probably represents the initial residential occupation at the site. The occupation of this surface is dated by the presence of Cunil and transitional Cunil/Kanluk ceramic materials (Sullivan & Awe 2013; Sullivan *et al.* 2018). This includes rim sherds of Uck Red and Coyol Cream vessels and a strap handle from a Sikaya Unslipped/Jocote vessel. Additionally, the assemblage contained one sherd with similar shape and surface treatment to Savana Orange (Savana variety, Kanluk phase) with ash temper typical of Cunil ceramics (Sullivan & Awe 2013), suggesting that perhaps the level represents a transitional Cunil/Early Facet Kanluk complex (*c.* 1000–650 cal BC).

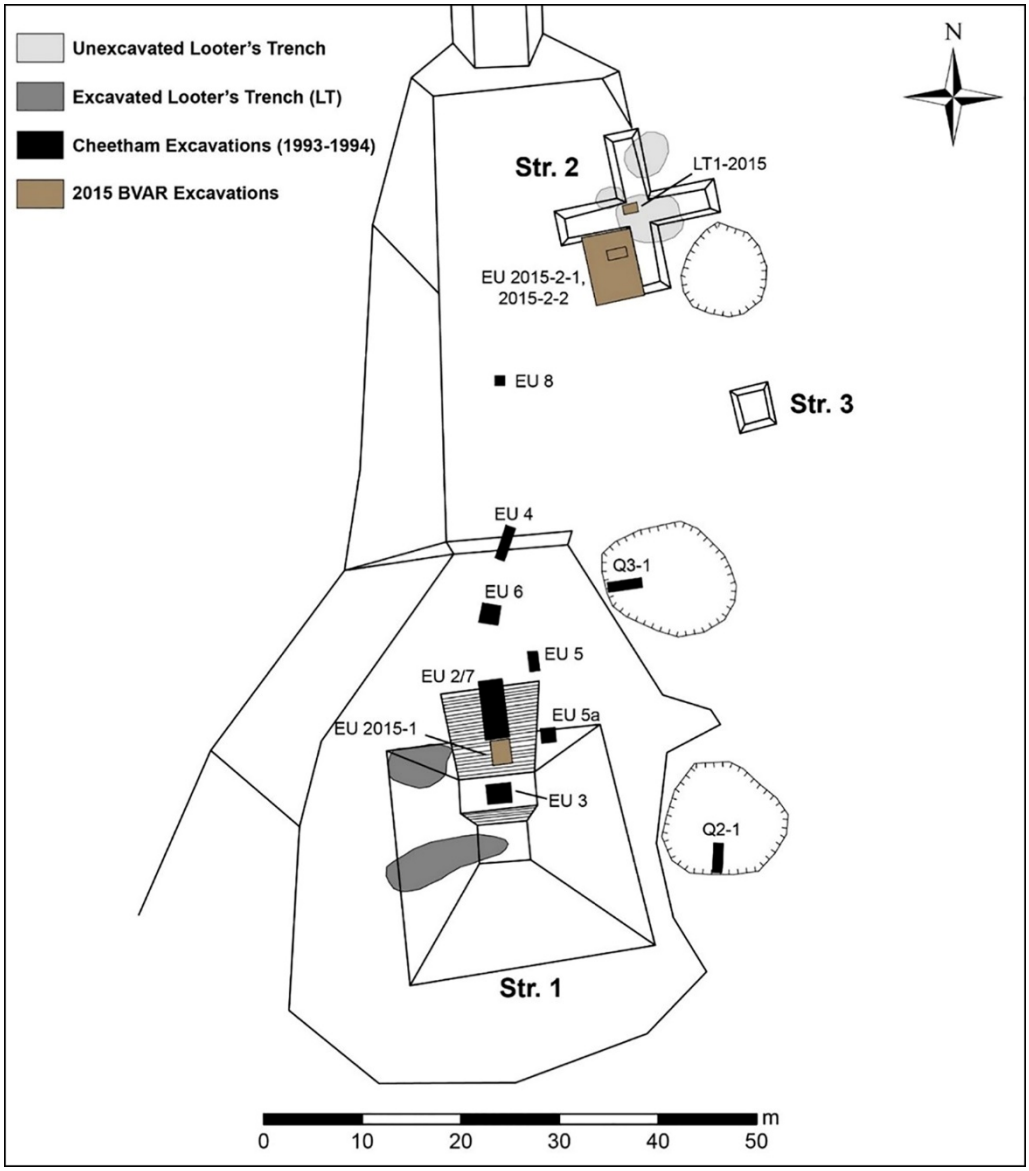


*Figure S6. Map of the Zopilote Group showing BVAR excavations from 1993–1994 and 2015 (Ebert & Fox 2016: fig. 10).*

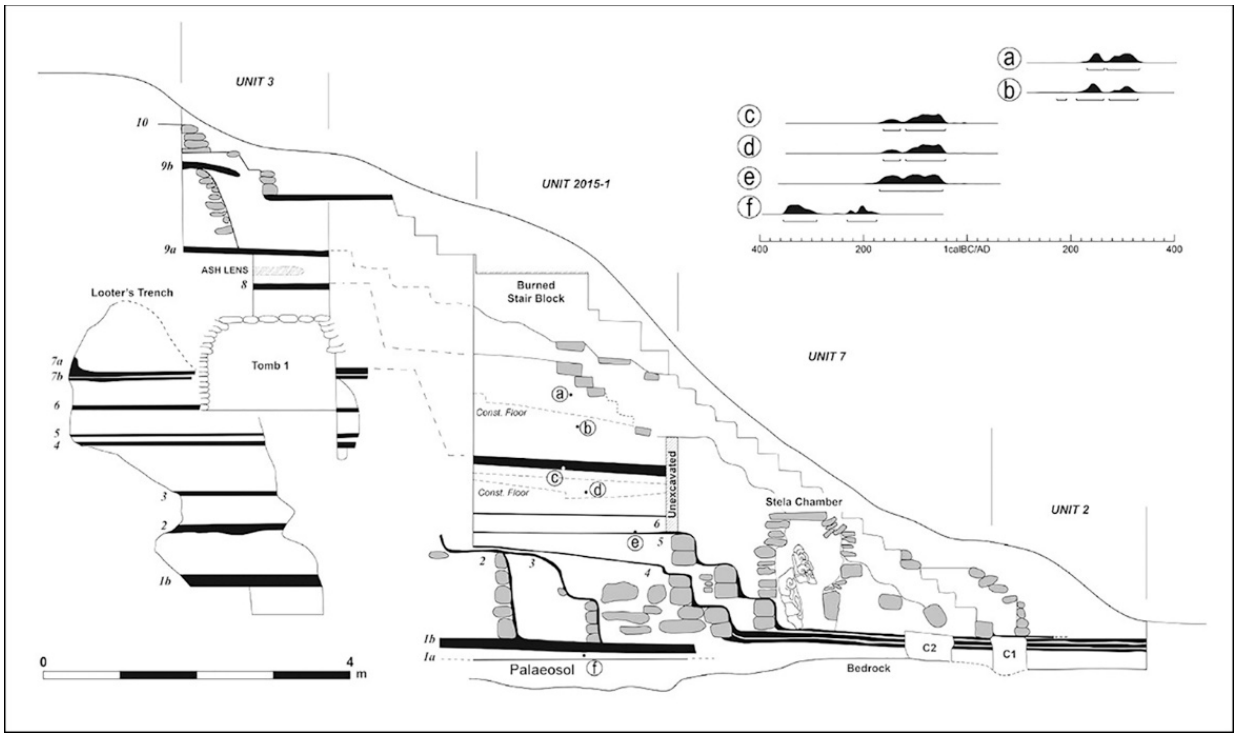


*Figure S7. Profile of Zopilote Structure 1 construction phases. Radiocarbon samples collected from unit 2015-1 are lettered a–f and correspond to calibrated date ranges (after Ebert & Fox 2016: fig. 11).*

The construction of several low masonry platforms at the Zopilote Group (ZPL-1 first through ZPL-1 sixth), which probably functioned as public temple buildings 170–40 cal BC. A charcoal sample from below floor 1b (ZPL-1 first) yielded a date 2σ range of 355–175 cal BC (UCIAMS-164873), suggesting that construction of platforms at Structure 1 began during the beginning of the Late Preclassic. The next burst of construction activity took during end of the Late Preclassic. A series of three AMS radiocarbon dates associated with the construction of ZPL-1 fifth through ZPL-1 seventh dated between 170 and 40 cal BC (UCIAMS-164878, UCIAMS-164875, UCIAMS-164874), suggesting that the construction of these temple platforms during the end of the Late Preclassic was fairly rapid (Ebert *et al.* 2017). Two charcoal samples from within the fill of ZPL-1 eighth date to cal AD 170–330 (UCIAMS-164877) and cal AD 230–335 (UCIAMS-164876), indicating and that this building was constructed during the beginning of the Early Classic (Ebert 2017).

**References**

AWE, J.J. 1992. Dawn in the land between the rivers: formative occupation at Cahal Pech, Belize, and its implications for Preclassic development in the central Maya lowlands Institute of Archaeology. Unpublished PhD dissertation, University of London.

BRONK RAMSEY, C. 2009. Bayesian analysis of radiocarbon dates. *Radiocarbon* 51: 337–60. https://doi.org/10.1017/S0033822200033865

EBERT, C.E. 2017. Preclassic Maya social complexity and origins of inequality at Cahal Pech, Belize. Unpublished PhD dissertation, The Pennsylvania State University.

– 2018. Preclassic plaza investigations at Cahal Pech, Belize: results of the 2017 excavations in Plaza B, in C.E. Ebert, J.A. Hoggarth & J.J. Awe (ed) *The Belize Valley Archaeological Reconnaissance Project: a report of the 2017 field season*: 1–47. Waco (TX): Institute of Archaeology.

EBERT, C.E. & T. DENNEHY. 2015. Preliminary investigations at Tzutziiy K', in J.A. Hoggarth, R. Ishihara-Brito & J.J. Awe (ed.) *The Belize Valley Archaeological Reconnaissance Project: a report of the 2012 field season*: 185–209. Belmopan: Belize Institute of Archaeology, National Institute of Culture and History.

EBERT, C.E. & S. FOX. 2016. The 2015 settlement excavations at Cahal Pech, Belize: continued research at Tzutziiy K'in, the Zopilote Group, and the Martinez Group, in J.A. Hoggarth & J.J. Awe (ed.) *The Belize Valley Archaeological Reconnaissance Project: a report of the 2015 field season*: 80–112. Waco (TX): Institute of Archaeology, Baylor University.

EBERT, C.E., B.J. CULLETON, J.J AWE & D.J. KENNETT. 2016. AMS $^{14}$C dating of Preclassic to Classic Period household construction in the ancient Maya community of Cahal Pech, Belize. *Radiocarbon* 58: 69–87. https://doi.org/10.1017/RDC.2015.7

EBERT, C.E., N. PENICHE MAY, B.J. CULLETON, J.J. AWE & D.J. KENNETT. 2017. Regional response to drought during the formation and decline of Preclassic Maya Societies. *Quaternary Science Reviews* 173: 211–35. https://doi.org/10.1016/j.quascirev.2017.08.020

HEALY, P.F. & J.J. AWE. 1995. Radiocarbon dates from Cahal Pech, Belize: results from the 1994 field season, in P.F. Healy & J.J. Awe (ed.) *Belize Valley Preclassic Maya Project: report on the 1994 field season*: 198–215. Peterborough (ON): Department of Anthropology, Trent University.

HEALY, P.F., B. HOHMANN & T.G. POWIS. 2004. The ancient Maya center of Pacbitun, in J.F. Garber (ed.) *The ancient Maya of the Belize Valley: half a century of archaeological research*: 207–27. Gainesville: University of Florida Press.

ISHIHARA-BRITO, R. & J.J. AWE. 2013. Excavations on Cahal Pech Structure B4, in J.A. Hoggarth, R. Ishihara-Brito R. & J.J. Awe (ed.) *The Belize Valley Archaeological Reconnaissance Project: a report of the 2012 field season*: 118–27. Belmopan: Institute of Archaeology.

PENICHE MAY, N. 2016. Building power: political dynamics in Cahal Pech, Belize during the Middle Preclassic. Unpublished PhD dissertation, University of California, San Diego.

REIMER, P.J., et al. 2013. Intcal13 and Marine13 radiocarbon age calibration curves 0–50 000 years Cal BP. *Radiocarbon* 55: 1869–87. https://doi.org/10.2458/azu_js_rc.55.16947

STUIVER, M. & H.A. POLACH. 1977. Discussion: reporting of $^{14}C$ data. *Radiocarbon* 19: 355–363. https://doi.org/10.1017/S0033822200003672