



# Isotopic analysis of newly discovered fragments of an Ulúa Valley marble vase at the ancient Maya site of Pacbitun, Belize

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## ABSTRACT

The discovery of carved marble fragments with a Late Classic-to-Terminal Classic period (550–900 CE) elite burial in the center of a courtyard at the ancient Maya site of Pacbitun, Belize adds to the corpus of Ulúa Valley marble vases fragments found in the Maya lowlands. Confirmation of the vase's origins by both style and stable carbon and oxygen isotope analysis shows that the likely source of production is the archaeological site of Travesia in northwest Honduras. In addition to the implications for trade and political connections between the archaeological sites in Belize and Honduras, the direct association of the vase fragments to a potentially desecrated burial highlights some interesting questions about local politics at Pacbitun, Belize.

## 1. Introduction

### 1.1. Project introduction

The recent discovery of carved marble fragments with a Late Classic-to-Terminal Classic period (550–900 CE) elite burial at the ancient Maya site of Pacbitun, Belize and its identification as part of an Ulúa Valley marble vase increases our understanding of the few examples found in the Maya lowlands. Stable carbon and oxygen isotope analysis shows that the likely source of production is the archaeological site of Travesia, in northwest Honduras. In addition to the implications for trade and political connections between the archaeological sites in Belize, Guatemala, and Honduras, the direct association of the vase fragments to a potentially desecrated burial highlights some interesting questions about local politics at Pacbitun, Belize.

### 1.2. Description of Pacbitun, Belize

Pacbitun is an ancient Maya site located along the southern rim of the Belize Valley, with a peak population of between 5000 and 10,000. The ceremonial and administrative center of the site is situated on a plateau of limestone rock directly adjacent to the Maya Mountains. Located about three kilometers east of the Maya village of San Antonio in the Cayo District, Belize (Figs. 1 and 2), this area straddles two ecozones with resulting access to a wide variety of resources, including

granite, slate, pine, natural springs, and fertile agricultural land (Healy, 1990: 248).

The architecture of this epicenter zone consists of 41 masonry structures and three main plazas (A to C) which are located on an artificially leveled hill (Healy et al., 2007). Generally, the site is oriented east-west, with an additional two Plazas (D and E) that are adjacent to the north side (Healy, 1990:250) (Fig. 3). An additional architectural group (named the Eastern Court) and a large reservoir are located to the northeast of Plaza A (Cheong, 2013).

The earliest sedentary agricultural communities in the Belize Valley began at the end of the Early Preclassic period (1100–900 BCE) at the sites of Blackman Eddy and Cahal Pech (Awe, 1992; Cheetham, 1998; Garber et al., 2004a, b; Healy et al., 2004; Powis et al., 2017; Sullivan et al., 2009; Sullivan et al., 2018). Excavations in Plazas A and B of Pacbitun suggests that site occupation began slightly later with initial construction occurring during the succeeding early Middle Preclassic period (900–600 BCE). At this time, a small agricultural community developed with at least three apsidal-shaped houses built just above bedrock. Some of the early residents were involved in marine shell bead production. Between 600 and 300 BCE, the size of the community in Plaza B expands five-fold, with rectangular-shaped platforms replacing apsidal ones, and the shell bead industry intensifying (Hohmann, 2002; Powis et al., 2009). It is during this period from 600 to 300 BCE, known as the late Middle Preclassic, that two large ceremonial platforms are erected at the site. In Plaza A, a large 32 m long platform is built,

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Fig. 1. Regional map of sites and marble sources mentioned in text. Star is Pacbitun, circles are sites, and pentagons are marble sources.

designated as Q, on the highest point of the site (Powis et al., n.d.; Micheletti and Powis, 2018) and a large round platform is constructed just above bedrock in the center of Courtyard 2 (Cherico and Skaggs, 2018). By 400–300 BCE, all of these buildings were abandoned and covered with the first lime-plastered plaza floor surfaces (Micheletti and Powis, 2018). In Plaza A, the first (earliest) plaza floor served as the base upon which the E Group was constructed (Micheletti, 2016). Through the Late-to-Terminal Preclassic period (300 BCE–300 CE), all the major structures at the site were built and the site population grew substantially (Healy, 1990). Pacbitun continued to grow to its largest size, just before abandonment around 900 CE, with major renovations occurring at most structures in all plazas (Healy, 1990).

### 1.3. Courtyard excavations and the discovery of Ulúa Valley marble vase fragments

On the southern edge of Plaza B are three enclosed courtyards,

flanked on all sides by 13 structures visible today and emplaced during the Late Classic period (550–700 CE) as seen in Fig. 4. The courtyards and structures are described as Pacbitun's "palace" area due to the restricted nature of the buildings, the change in elevation from Courtyard 1 to 3, and the presence of only range structures around each courtyard area.

Previous excavations into the northern structure of Courtyard 2 (Structure 23) by Cassandra Bill and Paul Healy in 1986 (Bill, 1987; Healy, 1990; Healy et al., 1995; Healy et al., 2007) confirmed some of these themes. Continuing exploration of all three courtyards since 2016 has revealed both earlier and later occupation than was expected. Excavations in the center of Courtyard 2 found evidence of a large Middle Preclassic period round structure, measuring approximately 11–12 m in diameter, below three plaster floors (I to III from shallowest to deepest). The round platform was situated just above bedrock and occupied an open area that was about half of the current courtyard area (Cherico and Skaggs, 2018). A radiocarbon date from a fill layer in Bill's (1987) excavations from above Floor III returned a calibrated date of 40 BCE–220 CE (Bill, 1987:123–128), though the sigma level is not stated. This suggests that the circular platform was completely covered by the Terminal Preclassic, Ku Phase (100 BCE–300 CE) plaza floor. The surrounding range structures were built on top of Floor II, with the northern and western buildings directly above the edges of the round structure.

Excavations into the eastern most structure of Courtyard 1 (Structure 25) in 2016 (Skaggs et al., 2017), and its interior plaza in 2018 (Pierce and Skaggs, n.d.), showed that this courtyard was constructed in the Late Classic period. A carbonized residue in a ceramic dish base found in a lower fill layer yielded a date of  $1460 \pm 30$  BP, which corresponds to a 2-sigma date of 550–650 cal AD (Beta-476705). Charcoal found in a layer just above bedrock in front of Structure 25 yielded a date of  $1370 \pm 30$  BP, which corresponded to a 2-sigma date of 640–675 cal AD (Beta-443542). Excavations revealed both administrative and residential aspects to this courtyard.

Like in Courtyard 1, it seems that Courtyard 3 was constructed in the Late Classic period. Excavations in 2017 into the center, revealed two plaster floors (Floor I and II) above bedrock. Radiocarbon dates taken of charcoal samples from two ceramic caches cut into Floor II yielded a date of  $1460 \pm 30$  BP, which corresponds to a 2-sigma date of 550–650 cal AD (Beta-476703), and  $1470 \pm 30$  BP, which corresponds to a 2-sigma date of 545–645 cal AD (Beta-476704), respectively (Skaggs and Cherico, 2018). Excavations into the buildings on the northern end of Courtyard 3 (Structures 22 and 33) provide additional evidence of Late Classic dates of construction (Pierce and Skaggs, 2018).

In the center of Courtyard 3, on axial alignments with the northern and eastern structures, five caches and two haphazard capstone cist burials (Welsh, 1988), CT3-1 and CT3-3, were found. Excavations expanding further to the west uncovered two 1.3 m slate slabs slanting to the west, and a one-meter diameter column of burnt limestone. Just to the west of these slate slabs were two graves, designated upper and lower, were stacked on top of each other in one burial (Burial CT3-2). The burial unit, both upper and lower graves, was in a highly disturbed context (Fig. 5). The upper grave was directly below the one-meter wide column of limestone. It was an extended skeleton with head to the south, sitting on top of small horizontal slabs of slate (Fig. 6). Below the slabs was the lower grave, which was another extended skeleton with head to the south. Around the burial unit (Burial CT3-2), starting at only 0.7 m deep and just above the level of Floor I, carved white marble fragments were found. These fragments became larger and more numerous as the excavation proceeded into the limestone column. No evidence of Floor I or II was found in the limestone column and the normally white marl around the burial unit (Burial CT3-2) was red and pink as if exposed to heat. It is unclear if the upper grave was the source of the marble vase fragments, but some fragments were found in contact with the skull and some fragments were under the femur of the

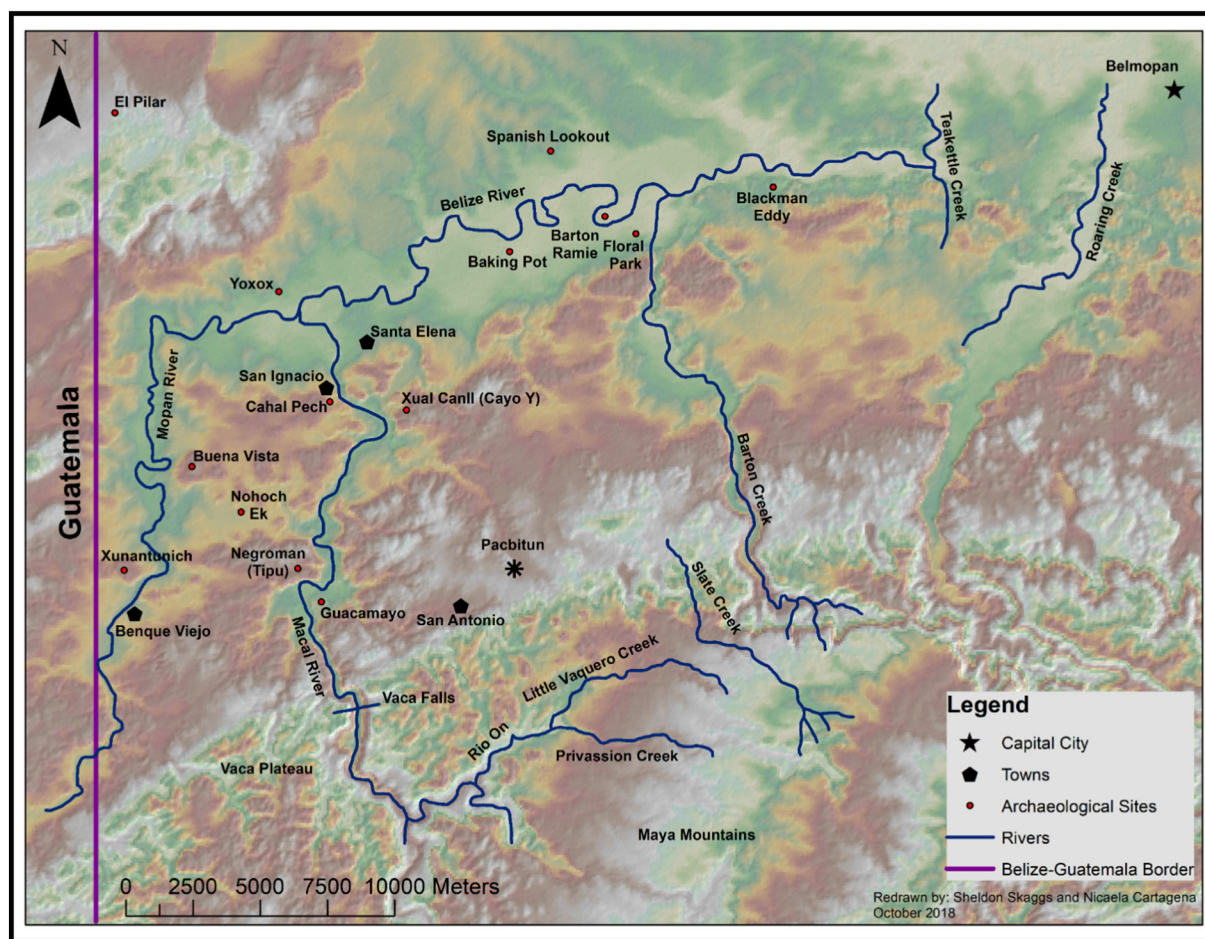


Fig. 2. Map of Pacbitun in relation to other important sites in the region.

upper grave skeleton. The lower grave had no grave goods, and no evidence of intrusion. No marble vase fragments were found below the slate slabs of Burial CT3-2. In addition to the carved marble vase fragments, the upper grave skeleton was found associated with other elite grave goods, including two carved conch shell atlatl finger loops, two jade beads, an obsidian eccentric in the shape of a centipede, three marine shell bead tinklers, a limestone spindle whorl, and a carved human long bone tube (Fig. 7) (Skaggs and Powis, 2018).

A number of factors suggest that the upper grave was revisited in antiquity, and likely desecrated. The marble fragments were scattered below the topsoil level, but above Floor I. The soil around the limestone column was mounded up onto the plaster floor, showing the floor was not repaired after intrusion. The skull of the upper grave individual in Burial CT3-2 was out of position, being at torso level in an otherwise extended position. Additionally, the positioning of the upper grave skeleton lying on its right side up against the wall of the shaft is not the typical prone or supine placement normally found at Pacbitun. The column of limestone was haphazard, and many of the stones were burned. Numerous charcoal fragments were intermixed with the stones, and the surrounding marl appeared baked, suggesting the stones were just tossed back in and then the entire area was burned.

#### 1.4. The Pacbitun partial vessel – Ulúa Valley carved marble vase fragments

The majority of the carved marble fragments were mended into a single vessel, which is about 50% complete. The vessel was in a fragmentary state within the grave and spread both vertically and horizontally from the Burial CT-2 to a distance of two meters away. The entire front section and the upper rim have been reconstructed (Fig. 8)

making it possible that the entire vase was initially included in the burial. The overall color of the vase is white, but there are a few thin red streamers that are either paint or veins in the original marble.

The entire rim was mendable, with a measured diameter of 15.2 cm. The height is 24.5 cm, though the height is measured without a ring base, which may have been present but not recovered since excavations didn't extend around the burial a full 2 m in every direction. With only half of the base present, the diameter is estimated to be a bit wider than the rim at 18 cm. Overall thickness of the walls is 0.8 cm, while the curve of the interior base was 1.2 cm at its thickest. Unfortunately, the two lug handles are also missing, but the handle bases on both sides have five toed foot cravings (Fig. 9), suggesting a prone feline or composite form for the handles. The base of the handles is about 10 cm long, but the length above this attachment is unknown since the actual handles were not recovered.

In terms of the iconography, the center of the front of the vase has a forward-facing animal face with a lipped oval mouth, an hour glass nose, round blank eyes, and two swirls facing each other that might be horns. The swirls touch the upper border, which has *voussure* (half-moon motifs) overlapping each other to the left. Below the face is a block of two columns of four rows of swirls. The rows alternate between swirling down right below the face to swirling up in the next row down and repeating the pattern in the last two rows. On either side of the face is a profile animal face with only one eye and a stylized set of teeth at the edges of a swirl. The column with the profile eye has four rows of swirls while the ones with the teeth and the last column with only swirls both have five. The base border has *voussure* all overlapping to the right on the base and the left on the rim.



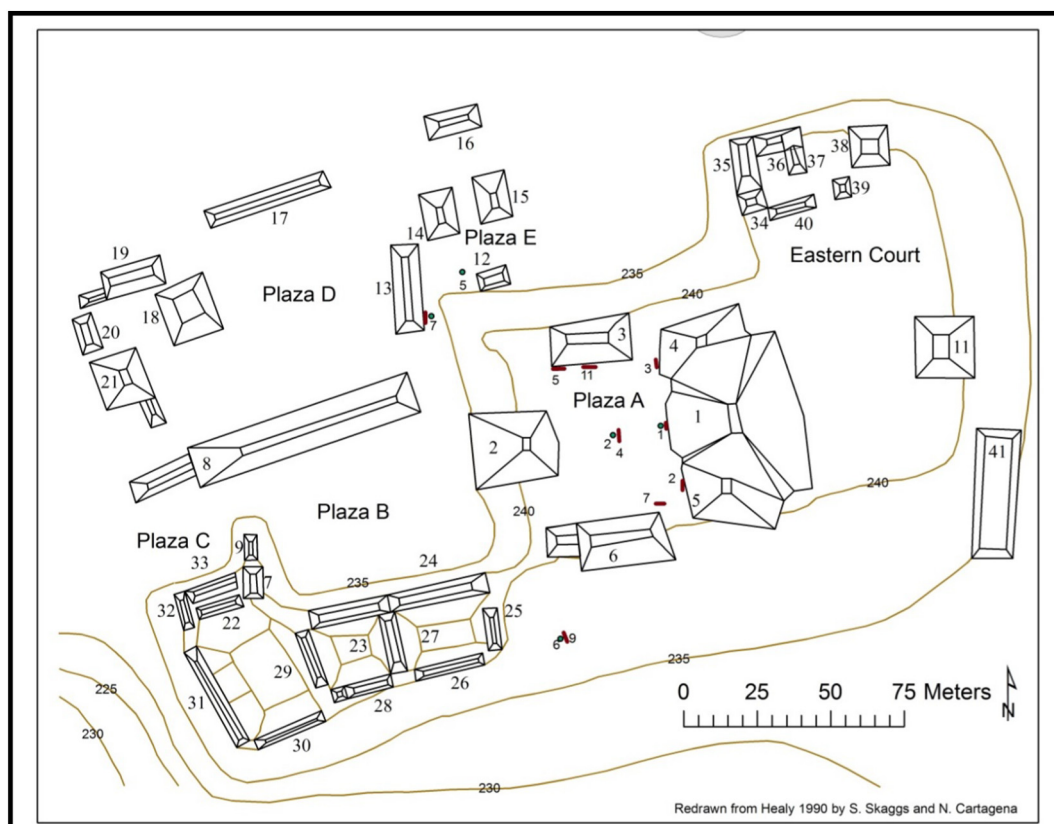


Fig. 3. Site core map of Pacbitun with masonry Structures 1–41 and Plazas A to E, plus the Eastern Court.

## 2. Methods and results

The use of scientific methods of analysis to distinguish between white marble sources was first established by Norman Herz (1987), using stable carbon and oxygen isotope analysis. Unlike obsidian where a single analytical method is sufficient to distinguish sources (e.g. Glascock, 2002; Tykot, 2003, 2004), the differences between marble source groups are not as distinct and care must be taken in using a multi-method approach to assign marble artifacts to specific sources (e.g. Attanasio et al., 2000; Tykot et al., 2018). As with any sourcing study, a database of potential geological sources must be established, and this has already been done for white marble in Mesoamerica. The only white marble sources are specifically located in the Ulúa Valley in northwestern Honduras, about 250 km by land from Pacbitun. A detailed survey of these marble sources was conducted by Christina Luke, and extensive isotopic and petrographic analyses were performed on the samples collected (Luke and Tykot, 2002; Luke et al., 2006). Three source groups have been identified: Santa Rita, Baracoa, and El Cutuco with the archaeological site of Travesia the probable crafting center (Luke and Tykot, 2002).

In this study, a small clean powdered sample was taken from the Pacbitun vessel, and carbon and oxygen stable isotope analysis was conducted in the Paleolab at the University of South Florida using a ThermoFisher MAT253 isotope ratio mass spectrometer coupled to a GasBench-II and continuous-flow interface. To produce  $\text{CO}_2$  gas, the sample was reacted with 600  $\mu\text{l}$  of 104%  $\text{H}_3\text{PO}_4$  at 25 °C for 24 h. The reported values have precisions of  $\pm 0.1\text{‰}$  and were calibrated relative to VPDB:  $\delta^{13}\text{C} = 2.8\text{‰}$ ,  $\delta^{18}\text{O} = -9.0\text{‰}$ .

These isotope values clearly put the object in the Santa Rita marble source group (see Luke et al., 2006; Luke and Tykot, 2007), the source used for many of the Ulúa vases that have been tested (Fig. 10).

As exotic sculptured items, the total number of marble vases found is quite modest (Luke, 2008). Just five other fragments of marble vases

had previously been found in Belize and only three analyzed. The fragment from Chac Balam was determined to be from the Santa Rita source (Luke and Tykot, 2007). The other two of those analyzed, from Altun Ha and dating to the late Late Classic, isotopically match with the Baracoa marble source group, which apparently was rarely used as only a small number of the total marble samples tested are assigned to that group (see Luke et al., 2006; Luke and Tykot, 2007).

## 3. Discussion

The partially reconstructed vessel from Pacbitun is important for a number of reasons; first, these vases are incredibly rare to find archaeologically in the Maya lowlands; second, this vase follows the pattern of Late Classic-to-Terminal Classic finds of Ulúa Valley vases in the Maya lowlands; third, the Pacbitun vase directly connects the site of Pacbitun with sites that have connections to northwest Honduras such as Altun Ha and Uaxactun; fourth, these connections seem to continue into the Terminal Classic with the gift giving of ceramic Ahk'utu' moulded-carved vases (Ting et al., 2015); fifth, the find directly connects vase fragments to a burial context, and based on the evidence of desecration, it may provide information about local politics.

Ulúa Valley style carved marble vase finds in the Maya Lowlands are rare, with only four other sites in Belize (Altun Ha, Chac Balam on Ambergris Caye, Moho Cay which is also called Laughing Bird Caye, and San Jose), and the site of Uaxactun in Guatemala, having fragments of them (Luke, 2010; Luke and Hammond, 2016). Outside of Belize and Guatemala, sites in northwestern Honduras have a higher frequency of occurrence. A southern distribution of vases reaches down to sites around Guanacaste in Pacific Nicaragua and northern Costa Rica (Luke, 2010). Approximately 131 whole vessels and 51 fragmented vases are in museums or private collections (Luke and Tykot, 2007).

Ulúa Valley marble vases were produced from 650 to 850 CE, but there are stylistic elements which appear to represent an early and a

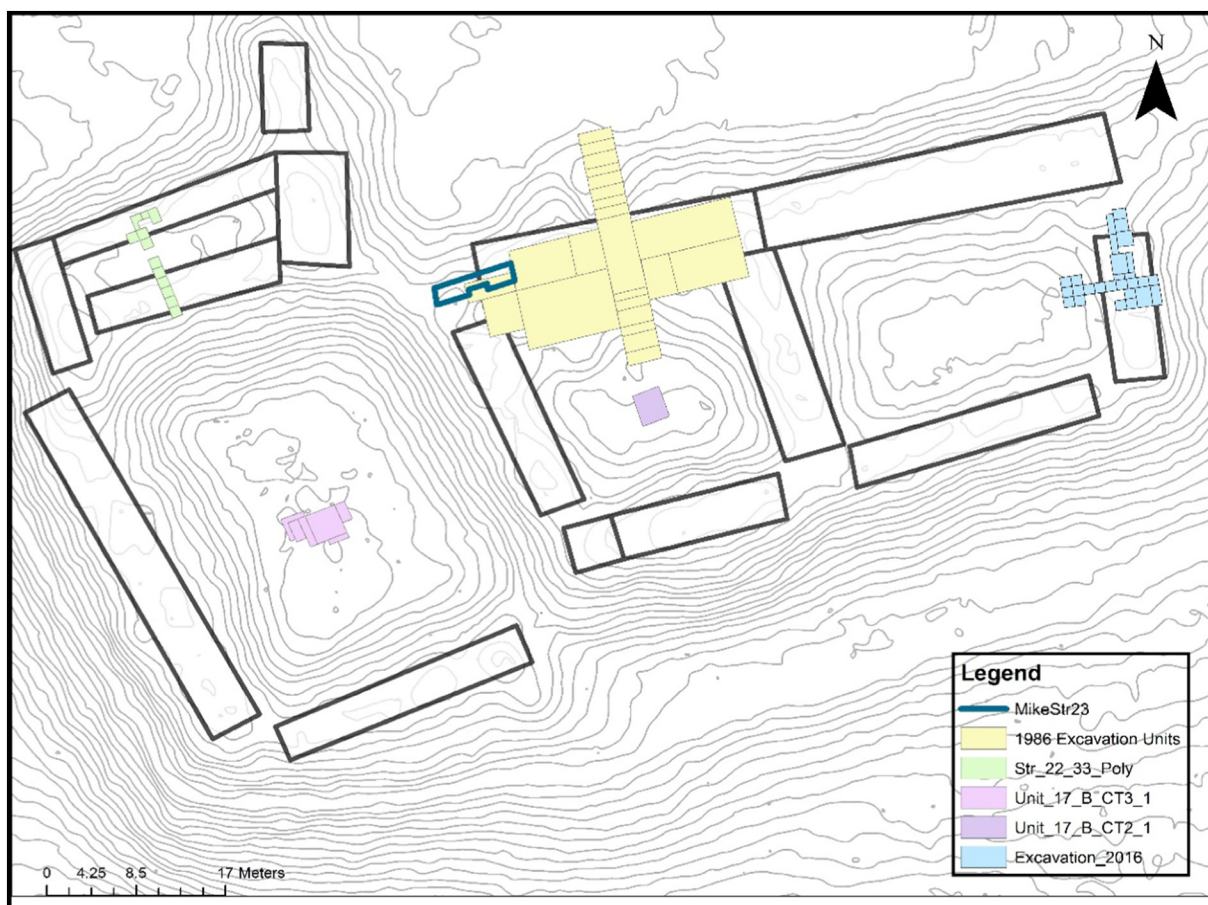


Fig. 4. Map of the three courtyards with Courtyard 1 on the east, Courtyard 2 in the center, and Courtyard 3 on the west. Colored rectangles show excavation locations.



Fig. 5. Looking west beyond the slate slabs at the top of the disturbed area around Burial CT3-2 and the burnt rock pile. Photo by Sheldon Skaggs.





Fig. 6. Looking north at the slate slabs under the top skeleton in Burial CT3-2. Photo by Sheldon Skaggs.



Fig. 7. Burial CT3-2 upper skeleton grave goods, including numerous vase fragments, two jade beads, obsidian centipede shaped eccentric, two marine shell atlatl finger loops, three marine shell tinklers, a limestone spindle whorl, and a limestone disk. Photo courtesy of Jeff Powis.

later phase (Luke, 2003). Early phase vases (650–750 CE) tend to be much shorter and wider than later vases, and in fact are labeled as drums or cups. The handles are birds or bats, and the motifs on the front tend to only have forward-facing animal faces. The borders of early examples have scale borders around the top and/or bottom of the vessel instead of *vousure* (half-moon shapes) or mat designs (Luke, 2003).

The Pacbitun vase fragments share many characteristics of other fragmented vessels found outside of Honduras, in that it has late motif

elements and is cylindrical (taller than it is wide) in shape. It is similar to other examples found in Belize and Guatemala, having front-facing and profile zoomorphic heads between upper and lower bands of *vousure* shapes, and feline or composite handles. These are all motif elements of the latter half of the production range from 750 to 850 CE (Luke, 2003).

All of the Ulúa Valley fragmented marble vases discovered in Belize and Guatemala have been in very late Late Classic-to-Terminal Classic



Fig. 8. Front of the Pacbitun vessel. Image captured from 3D model created in Zephyr 3DFlow and displayed with SketchFab.

contexts except for the Moyo Caye find, which was found in a beach deposit, and was of an earlier style of vase (Luke and Hammond, 2016). The context of the Pacbitun partial vessel adds further evidence of this Late Classic-to-Terminal Classic elite trade across 250 km (Luke et al., 2002). The Pacbitun vessel fragments also help define the political and trade relationships between the two Central American regions. Critical to this discovery was the confirmation, by analysis of stable carbon and oxygen isotopes, of the origin of the marble from Pacbitun to the most common marble source for Ulúa Valley vases, namely the Santa Rita area of the Ulúa Valley. Interestingly, while the marble source for the fragmented vessel from Altun Ha is different, and from the rarely used Baracoa marble source, the style and time period are the same, which suggests sites in Belize received vases from both primary and secondary sources.

The material culture and polychrome ceramics found at the sites of

Uaxactun, Altun Ha, and San Jose show strong connections between the sites and also between Altun Ha and western Honduras (Luke, 2010). The lack of Ulúa Valley style polychrome ceramics at Pacbitun suggests that perhaps Pacbitun received its vase through indirect exchange with these other Maya lowland sites rather than directly with western Honduras. This still implies that Pacbitun was an important part of the political network, since these artifacts are thought to be exchanged between rulers.

In the Terminal Classic, there was a connection between sites that traded and produced Ahk'utu' moulded-carved vases (Ting et al., 2015), sometimes referred to as the Belize Pabellon ceramics. These occurred in the eastern lowlands on the north coast of Belize. Pabellon moulded-carved vases have been found more widely distributed, but most interestingly, two of these vases were found in plaza burials at Copan, suggesting this trade extended into Honduras (Manahan and Canuto,





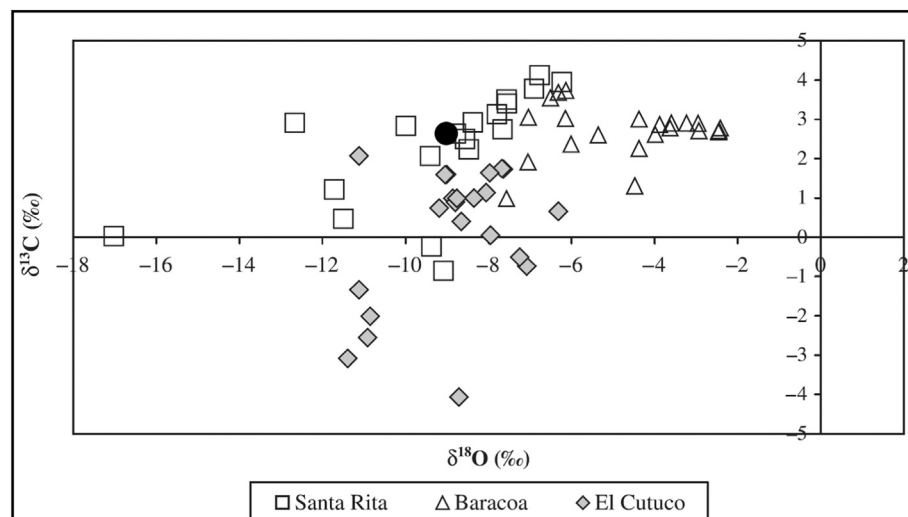
**Fig. 9.** Detail of the feet which would connect to one of the handles of the vase. Image captured from 3D model created in Zephyr 3DFlow and displayed with SketchFab.

2009). Maya lowland trade in Ulúa Valley vases likely started earlier than production and trade of Pabellon modeled-carved vases, and until the discovery of the Pacbitun vessel fragments, only at the northern sites of the Akh'utu' trading sphere. With the Pacbitun fragments discovery, Ulúa Valley marble vase trade now coincides with more of the Akh'utu' trading sphere, but curiously doesn't include Belize River sites between the northern and southern edges of the distribution.

Like the Pacbitun vase fragments, a recent find of an early style whole vessel with a burial in the Palmarejo Valley, Honduras, is one of the few with good archaeological data associated with the discovery. That discovery helped determine the ceremonial/ritual function of these vessels (Wells et al., 2014). Furthermore, the Palmarejo find was determined to post-date the initial burial, and might suggest a role for the vessels to establish linkages to ancestral worship (Wells et al., 2014). The addition of large fragments of a single cylindrical vessel found in Burial CT3-2 at Pacbitun, Belize is important for similar reasons. This is the only Maya lowland site with Ulúa Valley vase fragments directly associated with a burial rather than just in elite residential areas. Burial contexts are more common at sites outside the

Maya lowlands. Additionally, this is similar to the tradition in the Maya lowlands of caching white stone vases in elite graves (Luke, 2010). With no previous evidence at Pacbitun of participation in white stone vase caching, the reasons for the fragments being spread across a courtyard burial either initially or post burial could mean the individual buried had contacts not normally available to other Pacbitun elites (Luke et al., 2002).

The grave goods associated with the upper grave in Burial CT3-2, in addition to the marble vase fragments, are a mixture of artifact classes, some of which may be associated to gender specific activities. At sites like Caracol, the interment of a stone spindle whorl is generally linked to an elite female burial, though a small number of male burials at other sites have also had spindle whorls (Chase et al., 2008). Atlatls, on the other hand, are linked to both hunting and warfare and are generally associated with males. There is some scholarship on potential female leaders or warriors in the Maya world (Aoyama and Graham, 2015; Hewitt, 1999). It is possible that a male and female were buried at the same time, and that all the grave furniture for both was placed with the upper individual. The skeletal remains were not preserved well enough



**Fig. 10.** Stable carbon and oxygen isotopes for three geological marble groups, plus the Pacbitun vessel sample in black circle. After Luke et al. (2006).



to easily identify the sex of either buried individual.

Burial CT3-2, a plaza burial in the elite courtyard, is unique among those found at Pacbitun. The vase fragments suggest not just elite, but ultra-elite use of Courtyard 3. Along with the caches and other burials, this could mean that Courtyard 3 is the residence of the royal family at Pacbitun. The burial is unique not only due to the marble vase fragments and the two carved shell atlatl finger loops, but also due to the degree of disturbance and burning. A speculative explanation is that the elite person associated with the burial developed from a power base that differed from others at the site. Perhaps the eventual fall from power of this faction towards the end of occupation at Pacbitun resulted in the desecration of the burial and placement of the marble vase fragments as part of the desecration. This could have been the result of new political connections to sites with more direct links to the Ulúa Valley, like Uaxactun, San Jose, or Altun Ha (Luke, 2010), that broke down later in time.

A similar desecrated burial much further north during the Terminal Classic at the site of Yaxuna (20 km south of Chichen Itza) also had burning, unrepaired floors, disturbance of the skeleton, and a scattering of exotic ceramics derived from Chichen Itza (Ambrosino, 2003). The burial was of a female, but with more jade and other grave goods than any other burial on site, and also in a building with symbols of warriors and leadership icons at the front. The structure in which the lavishly equipped burial was laid had masses of ceramics and white marl layers, suggestive of a termination ritual (Ambrosino, 2003). Ambrosino (2003) suggests this burial was of a previous female leader, and that the ceramics from Chichen Itza are the result of later warfare, where the conquerors contaminated the leader's burial with their own power as part of the termination of the structure. It is possible that we are witnessing the same type of desecration at Pacbitun, but more research is needed to determine how the site fits into the broader political sphere of the Late-to-Terminal Classic period.

#### 4. Conclusions

Discovery of fragments of a single Ulúa Valley marble vase with a Late Classic-to-Terminal Classic period (750–850 CE) style in an elite burial in the center of a courtyard at the ancient Maya site of Pacbitun, Belize adds to the corpus of vase fragments across the Maya lowlands. The Pacbitun vase is significant because it is the first direct connection of Ulúa Valley vase fragments with an elite burial, and is also one of only three sites in Belize to be confirmed by both style and stable carbon and oxygen isotope analysis to production at the archaeological site of Travesia, in northwest Honduras. This adds important evidence to both the exchange and the political use of these iconic vessels in the Maya region. The potential desecration of the burial and association with the Pacbitun partial vessel highlights the potential for either warfare or political change as the trade network broke down at the site in the 9th century.

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