Keith M. Prufer

The Uxbenká Archaeological Project 2006 Field Season

With contributions by Dr. Andrew Kindon, Dr. Holley Moyes, Dr. Douglas Kennett, Dr. Kevin Cannariato, Shoshaunna Parks, Bethany Myers, Charles Mustain, and Nancy Komulainen

Research Year: 2006
Culture: Maya
Chronology: Late Preclassic to Early Classic
Location: Toledo District, Belize
Site: Uxbenká

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Introduction

The following is a report on FAMSI funded research conducted in 2006 by the Uxbenká Archaeological Project (UAP). Fieldwork was performed between May 20th and July 3rd 2006 under permits issued by the Institute of Archaeology (IA) and the Institute of Social and Cultural Research (ISCR), National Institute of Culture and History (NICH), Government of Belize.

Archaeological studies were directed by Dr. Keith M. Prufer, along with co-PI Dr. Andrew Kindon. Other research programs undertaken by the UAP in 2006 include a pilot for a cave survey program led by Dr. Holley Moyes; sampling of speleothems for development of a rainfall proxy organized by Dr. Kevin Cannariato, Dr. Douglas Kennett, Dr. Keith Prufer, and Brendan Culleton; and applied and anthropological research within the Mopan Maya speaking community of Santa Cruz conducted by Ms. Shoshaunna Parks along with and under the direction of co-PI Dr. Rebecca Zarger and Prufer. Additional project participants in 2006 included Charles Mustain, Bethany Myers, Dr. Mark Aldenderfer, and Nancy Komulainen as well as numerous residents of the village of Santa Cruz.

This UAP is investigating Uxbenká, a small but significant site located in the Toledo Uplands of southern Belize. There, hieroglyphic texts from the 4th century suggest a political relationship with the large urban center of Tikal though they do not specify the nature of this relationship. The UAP is utilizing data from intensive archaeological survey and excavations to investigate Uxbenká's settlement history and regional and long-distance economic and political ties over time.

Uxbenká is the oldest known political center in the area referred to today as "Southern Belize." This region is geographically circumscribed by the Maya Mountains to the west; the inhospitable coastal pine flats to the north; the Caribbean Sea the east; and the swampy Sarstoon and Temash river drainages to the south. Today, as in the past, these geographic features serve to limit the movement of people and goods to a few corridors. The perceived isolation of the region has been an important characteristic of previous discussions of the social and political makeup of southern Belize. Researchers have suggested that post AD 500 southern Belize formed a kind of homogenous cultural "regional tradition" (Leventhal 1990, 1992) or "Maya Realm" (Hammond 1975). Our current research suggests that settlements histories in southern Belize were far more complex that previously thought, and that the early communities may have been influenced by disparate regions (Prufer 2005).

In general, Southern Belize (Figure 1) is an enigmatic and poorly studied region, despite over 100 years of archaeological research, and the earliest sites remain the least well known. Ceramic and radiocarbon data indicate Uxbenká was likely first settled sometime between AD 100 and 250. Uxbenká's ascendance as a political capital appears to have been followed by the development of a number of other regional centers sometime after AD 500, including Pusilhá, Lubaantun, Mukelbal Tzul, and Nimli Punit. The only other community that is known to have been settled prior to AD 500 is Ek Xux, located in the remote Bladen Valley of the Maya Mountains (Prufer 2002), though we need to stress that the early settlement history of southern Belize needs considerably more work.

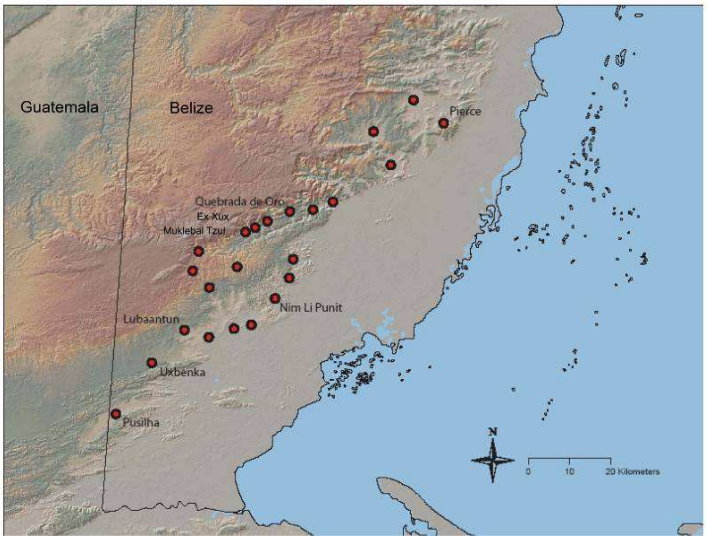

Figure 1. Map showing locations of significant sites in southern Belize (Map by J. Bartruff and K. Prufer).

Uxbenká is located in what is today an exceptionally rich agricultural region with easy access to coastal and inland trade routes. The ancient community likely exploited the fertile agricultural soils for economic gain, and in particular Uxbenká may have a major center in a region that produced cacao. The soils immediately surrounding Uxbenká are part of what has been characterized as the Toledo Uplands Soils, which are considered excellent for cacao production (Wright *et al.* 1959). They are derived in part from decaying sand- and mud-stones, and today are among the most fertile in Belize. We have observed that local soils around Uxbenká sustain a number of crops farmed by slash-and-burn and mulching methods with very short fallow times and little soil degradation. Cacao, which prefers nitrogen rich soils is currently a preferred cash crop in the region.

The ancient community was situated peripheral to and between several larger polities, including Tikal, Copán, and Caracol. Research from nearby southeastern Petén, Guatemala suggests pre-AD 500 geopolitical landscapes of competing rural elites (Laporte and Morales 1994). At the time when Uxbenká was settled southern Belize appears to have been a culturally marginal region, though it was located not far from established trade routes between the larger polities Tikal and Copán (Sharer 2003). As a whole, Southern Belize remained sparsely settled until after AD 500, when the region rapidly grew to include six monument bearing sites and over 100 smaller communities. Uxbenká is located in the Rio Blanco Valley, an east-west passage through low rolling hills that connects the coastal plain to the southeastern Petén. This passage is significant in that it forms the only easily assessable route between the sea and the Petén south of the Belize Valley and north of the Rio Dulce.

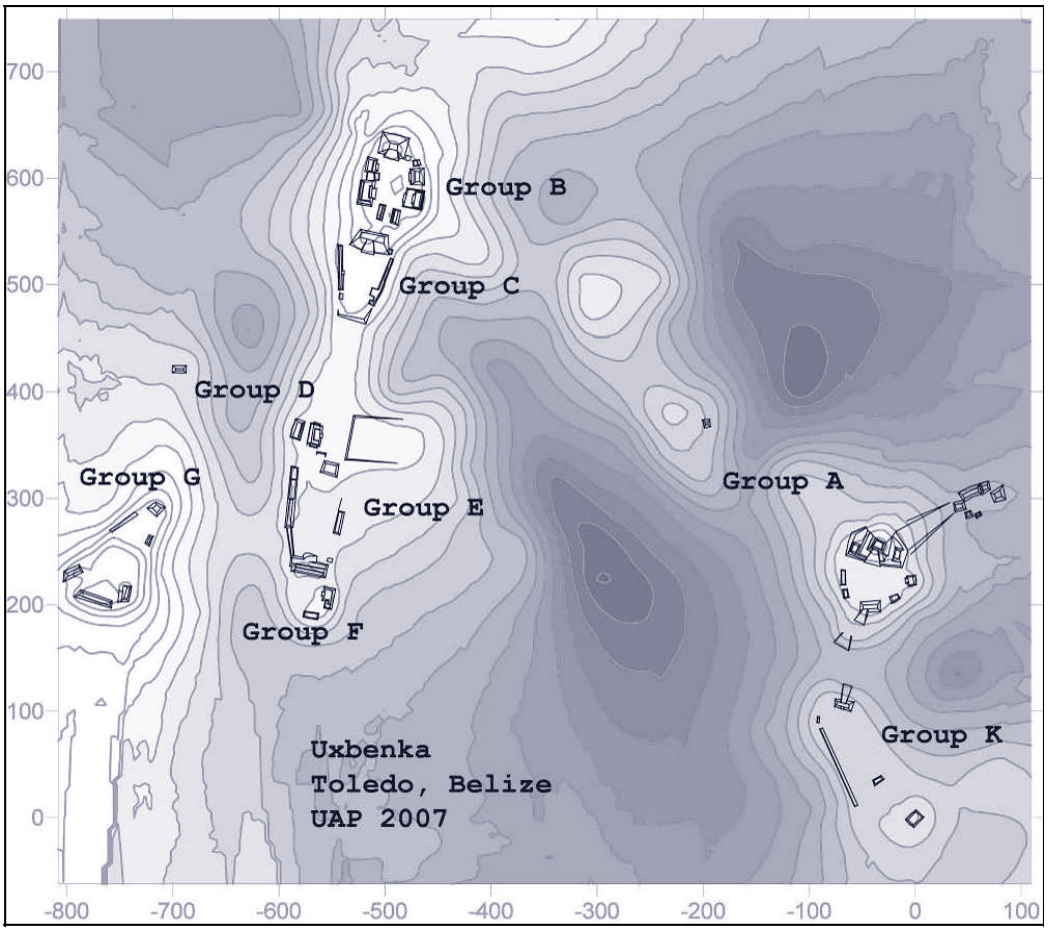

Figure 2. Mapped areas of the Uxbenká site core (map by K. Prufer, A. Kindon and C. Mustain).

Our 2006 investigations at Uxbenká addressed two sets of related research questions: **(1)** When was Uxbenká initially settled; and **(2)** what areas of the site were settled prior to AD 500? Uxbenká has at least a 700 year occupation history, making it long lived even by standards of the central Petén. The broader goals of the UAP are to better understand how Uxbenká was integrated into regional social and political systems through time. We have also initiated studies that will allow us to better understand the role of climate change in regional cultural developments as well as a broad-scale investigation of landscape use and modification. Further, UAP is also committed to creating a balanced and productive working relationship with the indigenous Maya community of Santa Cruz, upon the farmlands of which the ruins of Uxbenká are found.

Archaeological Excavations at Uxbenká

Building on our FAMSI funded 2005 field season, the goals of the 2006 UAP were to better understand the diachronic development of Uxbenká through a program of test pit excavations in various precincts of the site, to conduct a limited cave survey of the karst

hills surrounding Uxbenká, to sample speleothem fragments from one cave to aid in developing rainfall proxies for the last 4000 years, and to continue our efforts to build a cooperative and collaborative relationship with the Mopan Maya community Santa Cruz, on whose reservation lands Uxbenká is situated.

Our 2006 excavations focused on chronology building and the identification of the early components at the site. These excavations followed standard archaeological conventions. All units were backfilled following excavation and documentation. Excavations consisted of a series of 1x2, 2x2, 2x3 and 2x4 m test pits placed off structures and in plazas in order to record stratigraphy and collect data related to construction of the open plaza areas. Some units were expanded incrementally when they exposed intact contexts with chronological integrity.

Test pits were excavated in 3 of the 8 mapped plazas groups (Groups A, D, and L) including one residential plaza. These groups can be located in Figure 2 and detailed locations of individual sub-operations are shown in Figure 3 and Figure 4.

During our excavations we documented surface contexts that date to the third century AD. AMS radiocarbon dates (Table 1) from three excavation units support these dates as well as do ceramics from cave assemblages. We are now confident in suggesting that ceramics recovered from stratigraphic excavations in Group A, sub-operations 4, 6, and 7 indicate that the settling of Uxbenká predates any other known sites in southern Belize by at least two centuries.

Table 1. AMS Radiocarbon dates from Uxbenká and Kayuko Cave research 2006.

Site	Description	Lab # [1]	$\delta^{14}C$	±	^{14}C age (BP)	±	95.4 (2 σ)	% [2]
Uxbenká	OpA Sub7 Level4	33400	-199.7	1.9	1790	20	AD 137- 259	0.827
							AD 284- 289	0.009
							AD 291- 323	0.163
Uxbenká	OpA Sub 6 Level3	33401	-183.9	2.0	1635	20	AD 348-368	0.040
							AD 379-442	0.815
							AD 452-461	0.010
							AD 485-531	0.136
Uxbenká	OpA Sub4 Level4	33404	-198.5	1.8	1775	20	AD 143-151	0.009
							AD 169-193	0.037
							AD 210-337	0.954
Uxbenká	OpA Sub4 Level5	33403	-193.0	2.0	1720	25	AD 251-391	1.000
Kayuko	Wooden Canoe	33402	-205.3	1.7	1845	20	AD 90-101	0.024
							AD 124-235	0.976

[1] UCIAMS Kerk Carbon Cycle AMS Facility UC Irvine

[2] Relative area under probability distribution

In 2006 we also undertook a small-scale cave survey at two locations near Uxbenká. The purpose of this study was to determine the feasibility of conducting a longer term study of prehistoric use of caves in the area in and around Uxbenká. Part of this initial project

involved sampling natural cave formations for dating, compositional analyses, and oxygen isotope studies related to paleoclimatic reconstruction. The results of this preliminary field study have been the basis for several grant applications to expand our archaeological research at Uxbenká to include a cave/landscape component in 2007 and beyond.

During this short pilot study caves were examined in two areas. The first is the karst hills to the south of Uxbenká and the modern community Santa Cruz, locally referred to as "rock patch". In this area we conducted a purposive pedestrian survey. The second location was a small (< 1 m diameter) cave opening noted but not mapped by the UAP in 2005. This cave opening is located approximately 1 km north of the site core at the base of a low hill atop which are located several small residential structures.

2006 was also a year where substantial progress was made in creating a collaborative, sustainable, and mutually beneficial set of relationships between the UAP archaeologists and the community of Santa Cruz. An educational program targeting primary school children in Santa Cruz was initiated by graduate student Shoshaunna Parks. Students were given classroom and hand-on instruction in archaeology and cultural heritage. Under the direction of Ms. Parks a second year of interviews with community members was completed, assessing their goals, beliefs, and perspectives on the archaeological research at Uxbenká and potential impacts on the community. The UAP also succeeded in initiating a village-wide community based organization (CBO) that will serve as the voice of Santa Cruz in future development at Uxbenká and other potential tourist sites.

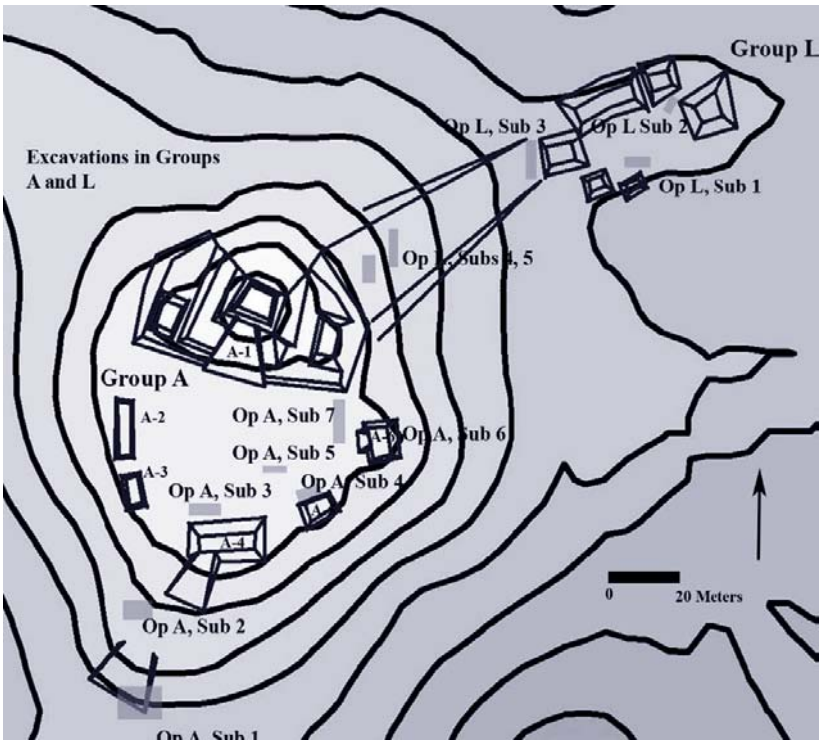

Figure 3. Locations of excavations within Group A (Stelae Plaza Group) and Group L, a large residential group located adjacent to the Stelae Plaza (map by K. Prufer and A. Kindon).

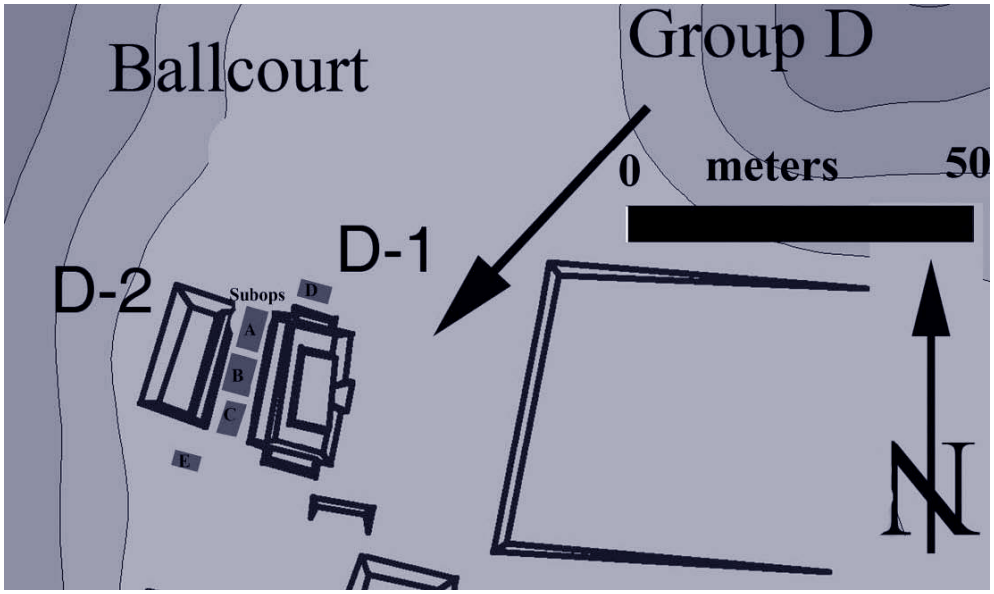

Figure 4. Locations of excavations within the Group D ballcourt group (Map by K. Prufer and A. Kindon).

Excavations in the Group A Stelae Plaza

Sub-Operations A1 through A7 focused on contexts in the Group A Stelae Plaza in order to build a chronology of occupation and use of site core. All excavations were "off structure" meaning that no architecture was penetrated or damaged in the course of the excavations. With three exceptions test pits were placed into plaza floors away from or adjacent to buildings. The exceptions were the cleaning of a looters pit, and two excavations were conducted off the main summit of the Stelae Plaza hilltop.

Sub-op A-1 was an excavation of contexts associated with an altar fragment, which is located at the base of the stone faced ridge that contains Group A. The altar was partially buried in rubble that had tumbled down from the stone-faced hillside above. It is at the base of what appears to be a low (ca. 50 cm.) stone wall. The objective of the excavation was to determine if the altar was *in situ* and if it was carved. Once the altar was exposed it was apparent that it was fragmentary and sitting on soil at the base of a wall (Figure 5). It was removed exposing a layer of rubble and gravely, gray silt loam. Excavations into this soil indicated that the altar fragment was at the base of the wall not incorporated into it. The altar had been shaped, but the upper surface that may have been carved is missing and it appears that the altar had been laterally cleaved and our fragment was a semicircular piece of the uncarved base.

Figure 5. Excavated partial altar stone in Op A, Sub-Op 1.

Sub-Operations A-2 and A-2b were associated with Stelae 18, which is located on a lower terrace of Group A along the stairway below the main stelae plaza. These excavations revealed the hole that the stela was set in. No dedicatory cache was encountered; in fact no artifacts were recovered from these units, though a very small carbon sample was collected from below the base of the stela, possibly associated with a burning event that occurred when it was erected at the site.

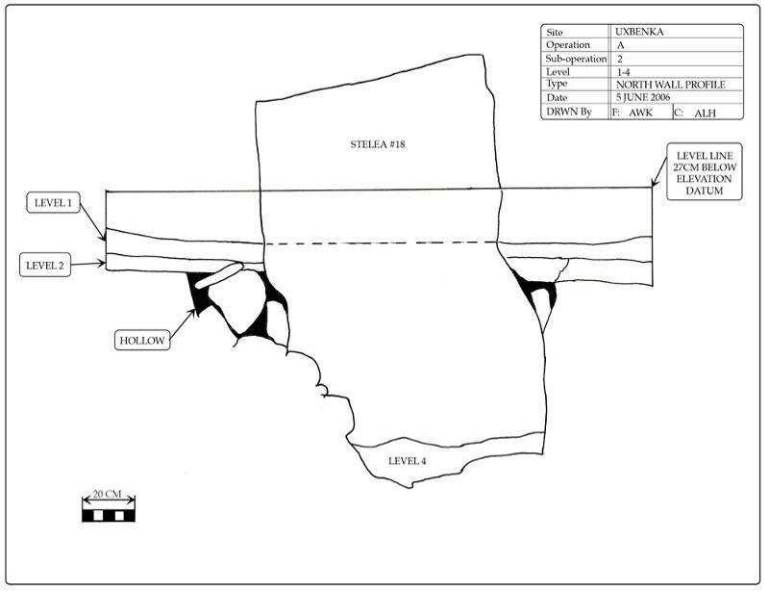

Figure 6. North profile of Operation A, Sub-Operation 2.

The results of the excavation indicate that Stela 18 was set in a ca. 1 m deep hole dug into the decaying siltstone bedrock (Figure 6). A lack of soil in lowest levels and the absence of a dedicatory cache suggested that it might have been excavated in the late 1980s by Richard Leventhal's Southern Belize Archaeological Project. However, Thomas Jamison, who was a member of that team, reported that Stela 18 had not been excavated (personal communication, June 2006). This assertion is bolstered by the internal stratigraphy documented during the excavations. It was undisturbed and it appears that the hole was excavated and partially filled with soil to raise the stela to a desired level. The charcoal in this lowest layer (Level 4) of soil suggest a burning ceremony may have taken place prior to, or at, the time the stela was raised. After the stela was placed in the hole it was chinked with numerous large cobbles to hold it in place. It also appears that the south part of the feature, which is presumably on the front side of the stela, was capped with flat, shaped stones that could possibly have served as solid surface in front of the stela.

Sub-operation A-3 was 3x2 m excavation located at the southwestern end of the plaza in front of Structure A-4. Approximately 2 meters directly north of the unit is a looted masonry tomb that had been excavated into the bedrock below the plaza floor. Excavations exposed a thick, layered plaster floor approximately 30 cm below the ground surface spanning the entire unit. The floor was very irregular, varying by as much as 35 cm, indicating significant erosion and buckling over time. The floor had evidence of some localized light burning, however, given the shallow depth this may be the result of historic milpa burning.

In the matrix above the plaster floor were found 3 shell beads, 2 mirror fragments, 1 green mosaic tile, 1 ceramic censer fragment, and a small broken piece of white jadeite. These may have been associated with activities or fill from a large looted plaza tomb north of the unit. Also found in the matrix were several kilograms of chert debitage and three obsidian blade fragments. The debitage suggests the floor was used at one point for tool production, though it is unclear if this was after abandonment of the site. A 1x2 m unit (1/3 of the original sub-operation) was excavated in the center of the floor. Approximately 15 cm below the floor bedrock was encountered. No diagnostic artifacts were found below the floor.

Sub-operation A-4 was a 2x3 m test unit excavated in front of Structure A-5 in order to obtain chronological information regarding the development of the southeastern portion of the Group A plaza. This unit abutted to the stone foundation of Str. A-5 but did not penetrate into the building. Excavations in the initial levels found significant collapse debris from the structure but no discernable features and few artifacts. Soils were uniform. At 65 cm below datum the unit was narrowed and a second, smaller 1x2 m unit (oriented NS) was opened in the base of the 2x3 m unit (Figure 7).

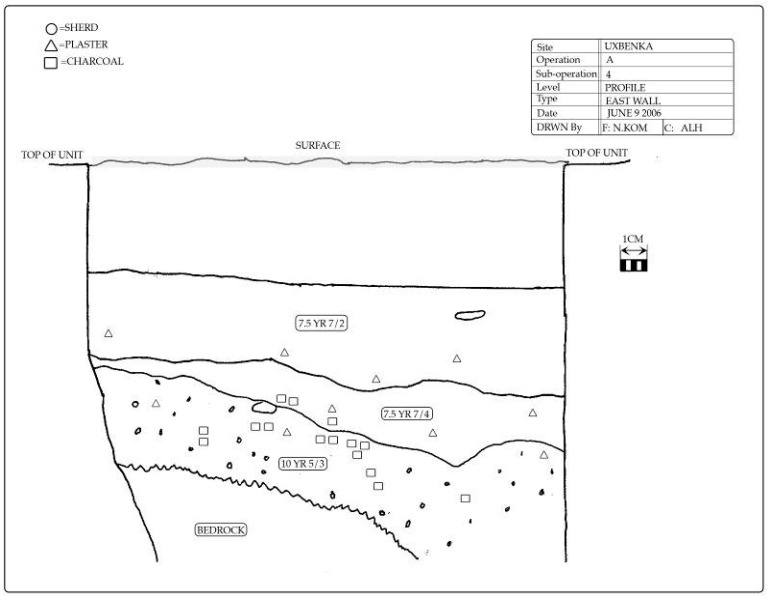

Figure 7. East wall profile of unit Op A sub 4.

At the interface of the 2x3 and 1x2 m units a distinct soil color and texture change was encountered. Numerous pieces of degraded plaster found at the interface suggest that there was a floor at this level. Artifacts were few, but include at least 2 diagnostic orange-slip basal flanged sherds. Below these were found numerous sherds including several Sierra Red bowl fragments that pre-date the 5th century AD. Excavations continued until bedrock was encountered at 165 cm. Samples of carbon from levels 3 and 5, the deepest levels containing cultural materials, provided AMS dates between AD 143 and 391 (Table 1), indicating initial modification of the bedrock plaza floor was modified and the earliest construction of the plaza was conducted prior to the 5th century.

Sub-operation 5 was a 1x3 m test unit sited parallel to and 5 m to the north of Str A-5. The objectives of the excavation were to determine if the plaster floor located in front of Str. A-4 was duplicated for Str. A-5. However, no plaster floor was encountered and bedrock was less than 50 cm below the present ground surface. It was concluded that in this area of the plaza a crude single layer floor of paving stones had been placed above the heavily leveled and channeled mudstone bedrock. It is also possible that a very thin, now degraded, plaster floor may have been situated directly below that cobble floor.

Figure 8. Op A Sub 5 Showing modified bedrock surface below the plaza floor.

Sub-Operation 6 was a salvage and profile cleaning exercise in a looters pit in Str. A-5, where a monument fragment was recovered in 2005 (see FAMSI report 2005). The salvage was conducted at the request of the Belize Institute of Archaeology in order to (a) search for additional monument fragments and (b) better understand the construction history of the building. The looters trench was cleaned of debris and all larger stones filling the pit were examined as possible monument fragments. None were apparent.

The looted hole in structure A-5 has essentially destroyed the building. The looters had excavated from the top of the building downward to a depth or roughly 1.5-2 m. There is no evidence that the structure contained any interior features such as tombs or crypts, but the severe damage to the building means we cannot be certain. The depredations appear to be at least 10-20 years old. Several dozen sherds (a small number for the context) were recovered including 3 Early Classic pieces. These could not be provenienced.

Figure 9. Profile of the looters trench in Str. A-5 (Op A, Sub 6).

The looters pit was profiled on the south wall of the disturbance (Figure 9). The wall was troweled clean and a baseline established. Excavations revealed an interesting construction history for this smaller building that is worth describing. Level 1 in the profile consisted of the stone construction of the small platform. The numerous cut-stone blocks were set into a matrix of silt-loam. Because of the damage to the building the blocks were uneven spaced in the profile. In the profile this level was approximately 120 cm thick, but this depth is deceptive. The actual height of the building is closer to 170 cm.

Level 2 is the remains of a plaster floor. Matrix soils consisted of gritty soils from decaying plaster. Below this, Level 3 was a cultural layer with several deposits of carbon and several intact non-diagnostic sherds. The soils were clay-silt-loams, crumbly and similar to the construction fill above. Below this there were 2 more levels with smaller deposits of plaster and occasional carbon deposits above bedrock. A single AMS radiocarbon date from Level 3 provided a date between AD 348 and 571 (81.5% probability between AD 379-442, Table 1). The profiling of this looter's pit suggests that there was an earlier structure constructed of non-stone materials (soils and plaster) underlying a later stone construction, the latter of which is presumed to date to the final use of the plaza.

Sub-operations A7a through A7e began as a 1x3 m unit on the eastern end of the Stelae Plaza and was expanded to include 5 additional sub-unit extensions (7a - 7e), forming a 17 m long trench across the plaza floor in front of Structure A-6. The initial objectives were to (1) explore the area in front of Structure A-6; and (2) define a chronology for the eastern end of the plaza.

In this unit rows of cut blocks running parallel structure A-6 were encountered spanning the entire length of the building and extending beyond the structure corners (Figure 10). In places along the length of the wall there were small sections of intact plaster, suggesting that this feature may have once been covered by plaster or may have underlain a now degraded plaster floor. Artifacts from across the trench were generally sparse and unassuming. Important finding included a number of small greenstone bead fragments and two rim-to-flange sherds from diagnostic orange slip basal flange bowls.

Figure 10. Op A, sub 7d showing the stone wall resting on bedrock below plaza floor.

In all, the wall was followed for 17 m before a corner was uncovered (Figure 11). At one time the step may have been an access point to a lowered plaza. The only diagnostic sherds were the two Early Classic sherds found in Sub 7b, at or just above the level of the step. Although it would take further investigation to verify, the data suggest that the area in front of the step was filled in at the end of the Early Classic Period.

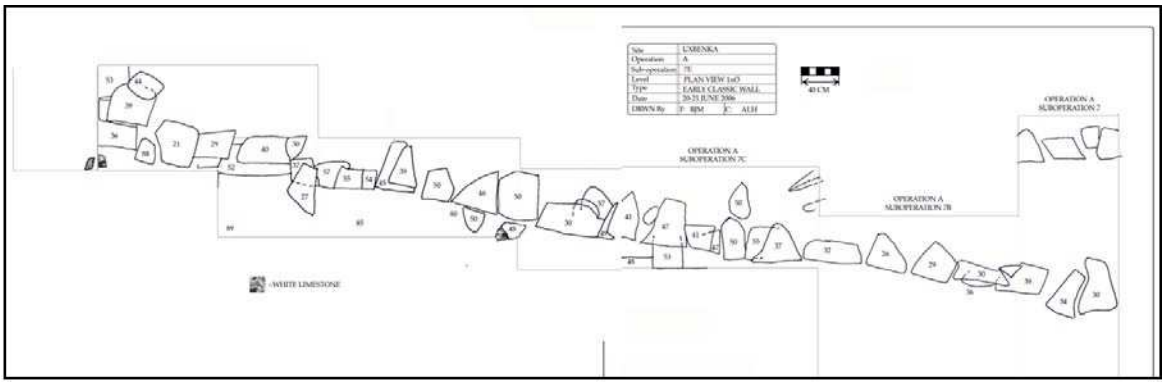

Figure 11. Plan view of stone wall in Op A, Subs 7 through 7e.

No clear evidence of a plaster floor was found in any of the Sub 7 excavations. This is suggestive of a multi-level plaza that may have separate construction and use chronologies. A single AMS radiocarbon date from the base of the wall, but associated with the construction provides an evidence for construction between AD 137 and 323 (2 sigma, Table 1).

In summary, our 2006 excavation strongly indicate that the group A Stelae Plaza was occupied and underwent modification of its bedrock hilltop by the fourth century. Given that there is no evidence yet of earlier settlements, the Group A plaza may have been the location of the original community.

Excavations in the Group D Ballcourt

Excavations in Group D were associated with a ballcourt located on the western edge of a 500 m long ridge housing five architectural groups (Figure 2 and Figure 4). Sub-operations D-1 and D-2 were placed along the central axis of the ballcourt alleyway. Two smaller excavations (Sub-operation D-3 and D-4) were located to the north of the eastern ballcourt structure, but were abandoned while excavating the level 1 overburden due to heavy rainfall. The primary objectives for these Sub-Operations were to determine the date of the construction of the ballcourt along with the duration of its use. All excavations were abandoned after 5 days of heavy rainfall at the onset of the rainy season in late June. Here we discuss suboperations D-1 and D-2.

Sub-operation D-1 was a 3 m by 2 m excavation unit located on the north end of the centerline of the ballcourt alleyway. The unit was oriented so as to encompass the northern terminal end of the alleyway, equidistant from the basal edges of the structures forming the ballcourt. Level 2 consisted of a 5 cm thick layer of lighter, more yellow-silt-loam above a cobble floor that appears to have extended across the width of the alleyway, ending approximately 30 cm from the base of the structure that forms the eastern edge of the ballcourt (Figure 12). This floor appears to have been plastered in antiquity, as several of the cobbles retain traces of plaster on their surfaces. The floor appears largely intact and quite level.

Figure 12. Plan view of the base of Level 2 in Sub-Operation D-1 showing cobble and plaster floor in the ballcourt alley.

Sub-operation D-2 was a 3 m by 2 m excavation unit located at the midpoint of the centerline of the ballcourt alleyway. The unit was oriented so as to encompass the center of the alleyway, equidistant from both the north and south ends of the alleyway and equidistant from the basal edges of the structures forming the ballcourt. During the excavation of Level 2 a large fragment of a jade celt or hammerstone was located in the southwest corner of the unit. The cobble and plaster floor identified in Sub-operation D-1 extends into the northern third of Sub-operation D-2, but appears to end approximately one

meter south of the unit's north wall where it is replaced with a combination of small limestone and sandstone cobbles interspersed with pieces of plaster. The intact portion of the floor retains several large patches of plaster, further supporting the idea that the ballcourt alleyway was paved and plastered in antiquity.

Figure 13. Op D, Sub 2 and 2b ballcourt marker being turned to check for carvings on reverse side. We estimate that the marker weighs in excess of 175kg.

The most impressive find in Operation D was a large ballcourt marker located almost directly in the center of the alleyway. This marker was uncovered at the base of Level 2. Upon completion of this excavation the entire ballcourt marker was exposed revealing a large oval-shaped stone measuring approximately 1.4 meters in length by 1 meter in width by 0.25 meters in thickness (Figure 13). The upper surface of the stone is a bas-relief carving of a smaller, more regular circle measuring approximately 0.7 meters in diameter and raised above the surface of the stone approximately 5 centimeters. This raised circle does not appear to have been further carved or decorated in any way. The form suggests that in antiquity the occupants of the site buried the marker under the surface of the alleyway, leaving only the raised carved circle exposed. The resulting appearance of the ballcourt marker would have been very similar to the uncarved marker at Nim Li Punit. An effort was made to excavate below the marker in order to determine if any dedicatory caches or other ritual contexts were present. Unfortunately, due to heavy rainfall the water table had risen to the point that the excavation unit continually filled with water, making excavation impossible. The decision was made to abort the excavation at this point, with the possibility of returning to excavate here further in the future.

Excavations in Group L Residential Compound

Operation L consists of a small plaza surrounded by six structures located below and adjacent to Group A (the Stelae Plaza). This plaza group appears to have been linked to the Stelae Plaza by means of a steep ramp formed from a natural down-sloping ridgeline leading from Structure A-1, the principle temple building in the Stelae Plaza to the western edge of Group L. It is possible that this ramp was one of the primary entrance features to the Stelae Plaza, and to the site core in general. However, it is equally possible that Group L was a restricted residential and/or ritual plaza associated with the Stelae Plaza (Figure 14).

Figure 14. Group L viewed from the Stelae Plaza.

Sub-Operations L-1 through L-5 were all off-structure test excavations exploring the internal chronology of Group L and to determine whether this group was domestic or ritual space, or both. In particular, considering the fact that excavations in the Stelae Plaza have suggested that the eastern portion of the group may have been the earliest occupation at the site (see Operation A discussion above), it was of interest to test the temporal assignation of Group L and determine whether its construction preceded the construction of the Stelae Plaza or whether they were contemporaneous.

Sub-operation L-1 was a 3 m by 2 m excavation unit located in the plaza floor of Group L, parallel to the northern basal edge of Structure L-6. This structure is the smallest of the

constructions in the group, and is the only building on the southern edge of the plaza. The size of the structure, along with its placement in the group, suggests that it was most likely not a domestic structure. The general layout of Group L shows a clear orientation to the south, with the other five structures in the group forming a U-shaped plaza with the opening facing in this direction. Like several other plazas this orientation opens directly towards the large V-shaped cleft in the limestone ridge that runs roughly east-west directly south of the site along the Rio Blanco drainage, approximately 3 km from the site core. The location of Structure L-6 on the southern edge of the plaza where it would have been framed against this topographic feature (Figure 15), along with its diminutive size, suggests that the structure may have served as a shrine or large altar. Unfortunately the structure has been heavily looted in recent history, most likely destroying much of the cultural information regarding its function and use. At least two crude stone features were excavated and a possible cache of a single smashed vessel was recovered along with a large figurine fragment. The majority of these ceramics appear to be Late Classic in origin. Heavy rainfall significantly slowed down excavation of this unit, as water constantly seeped in from the surrounding soil.

Figure 15. View from Group L toward the cleft in the karst "rock patch."

Sub-operation L-2 was a 3 m by 2 m excavation unit located along the western basal edge of Structure L-4, on the opposite side of the structure from the plaza and at the point at which the ramp feature leading up to the Stelae Plaza connects with Group L. The unit was placed here with the primary objective of determining the nature and extent of the ramp construction. In this unit the natural bedrock layer had been modified in antiquity to

form a linear depression or trench running from the southeast corner of the unit in a northwest direction across the unit, leaving the unit about midway along the eastern wall. This trench was likely a drainage feature designed to channel water away from Structure L-4 and the interior of the plaza group. One of the more interesting findings from Sub-operation 2 is that the ramp feature does not appear to have consisted of any actual masonry construction features. Instead, it appears that the ramp was formed largely by modifying the natural bedrock topography of the hillside on which the Stelae Plaza was built, resulting in a raised ramp or causeway feature leading from Group L to Group A consisting simply of the natural bedrock.

Sub-operation L-3 was a 1 m by 3 m excavation unit located in the plaza floor parallel to the southern basal edge of Structure L2 and perpendicular to the west basal edge of Structure L1. The objectives of this unit were to determine the timing and length of occupation of Group L and to provide a comparative sample for Sub-operation L-1. Upon excavation of the unit no cultural features were found, although a significant amount of both ceramic and lithic artifacts were recovered, suggested a relatively extended period of occupation. The only significant artifact found was a figurine fragment displaying stylistic similarities with figurines found at other Late Classic sites in the area, particularly Nim Li Punit and Lubaantun. The vast majority of artifacts recovered from Operation L appear to date to the Late Classic, suggesting that this group was occupied at the same time as the height of activity in the Stelae Plaza.

The 2006 Cave Survey

Archaeological reconnaissance conducted during the 2006 field season resulted in the identification of 5 new caves and revisiting of 1 cave previously noted by the UAP. The purpose of this study was to determine the feasibility of conducting a longer term study of prehistoric use of caves in the area in and around Uxbenká under the direction of Dr. Holley Moyes.

During this short pilot study Moyes led a team that examined caves in two areas. The first is the karst hills to the south of Uxbenká and the modern community of Santa Cruz, locally referred to as “rock patch” (Figure 16). In this area a pedestrian survey examined selected areas adjacent to and above the Rio Blanco. Much of this preliminary survey was guided by information provided by local informants from Santa Cruz. The second location is a small (< 1 m diameter) cave opening noted but not mapped by the UAP in 2005.

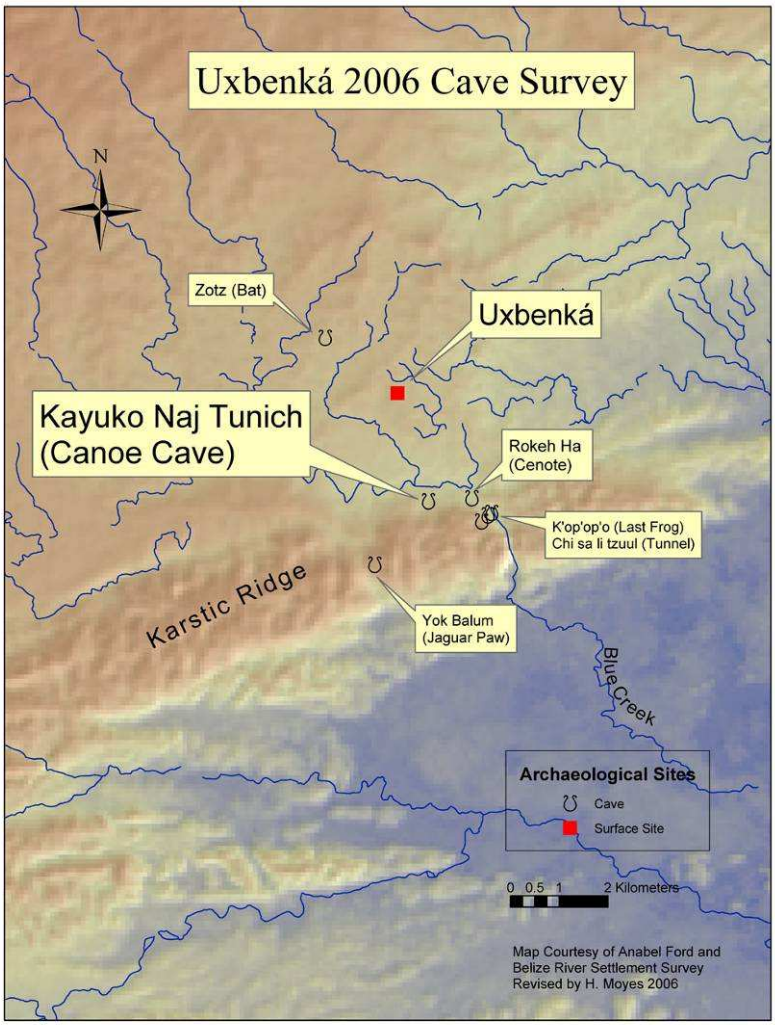

Figure 16. Cave sites in the 2006 Uxbenká Cave Project survey area (map by H. Moyes).

Kayuko Naj Tunich (Canoe Cave) was the most heavily utilized cave encountered. The cave's entrance is located on a sheer karst face 352 km above sea level. It is due south of the Uxbenká site core on the north side of the karst ridge 2.3 km from the Stelae Plaza. Its entrance can be seen from the site and the Stelae Plaza is visible from the mouth of the cave (Figure 17). Initial reconnaissance of the site occurred in June. Locals reported that there was a canoe inside the cave. The site is difficult to access and currently can only be reached via a 60 m climb by rope. Upon entry we confirmed the presence of the canoe-like object, a 1.5 m long and 24 cm wide object carved from hardwood (Figure 18). We also found that the cave contained a small masonry structure, similar to those reported at Naj Tunich cave in Guatemala. To our disappointment we also found the cave had been badly looted. According to our local informants, the looting occurred within the last five years. Those who had previously visited the site reported that the canoe-like object once sat on top of the structure. They also stated that it had contained a brown mud-like substance. An AMS radiocarbon date of the wooden artifact produced a 2 sigma date between AD 90

and AD 235. Even accounting for a reasonable old wood effect this would make the cave one of the oldest known sites in southern Belize.

Figure 17. View from Kayuko Naj Tunich to Uxbenká, which is spread out across the rolling hills of the Rio Blanco Valley, some 150 m below the cave.

Figure 18. The wooden canoe-like object found in Kayuko Naj Tunich.

Looting of the site involved smashing of the masonry construction and breaking the canoe. Despite this vandalism, the canoe-like object remains partially intact. In 2006 we opted to leave it in its current position because the cave provided a dry and stable environment and because the site is very difficult to access. In 2007 with the assistance of FAMSI excavations were undertaken at Kayuko Naj Tunich and a related architectural complex associated with the cave. These efforts are presented in a separate FAMSI report by Holley Moyes.

Yok' Balum (Jaguar Paw) consists of a both a rockshelter and deep cave. The rockshelter exhibits Maya usage but the cave does not. The shelter is located north of the entrance to the deep cave. It has a large southwest facing entrance that measures approximately 20 m across and is approximately 14 m deep from the drip line. There are at least two rock

alignments in the shelter, one of which borders part the east wall blocking a niche. Jute shell was found on the surface adjacent to the alignment.

A large stalactite that resembles a foot hangs from the ceiling near the front of the shelter, hence the name “Jaguar Paw” or in Mopan Maya Yok’ Balum. There is a large stalagmitic formation beneath the feature which measures 5 m x 2 m. A few potsherds and jute are located on the ground on the southeast side of the stalagmite. Jar sherds were also found stashed on a shelf in the ceiling probably having been placed there recently.

The cave system is deep and although we traveled for approximately an hour, we never found the end. There is also another entrance on the north side of the mountain which contains pottery. Several speleothem samples were collected from the cave for compositional analysis, and these are also discussed in this report.

Rok’ Eb Ha (Cenote Water) is a large southwest-facing cave located on the Rio Blanco River. It is located in the cleft in the mountains to the south of Uxbenká. The river runs beneath the cave 40-60 meters below an interior cliff (Figure 19). It re-emerges at Hokeb Ha Cave at the beginning of Blue Creek. To the east of the entrance is a huge cenote-like pool. In 1995 Prufer explored the entire passage, which took 19 hours. The passage was initially mapped by Dr. Thomas Miller (University of Puerto Rico) in the 1970s.

Figure 19. The dramatic entrance to Rok’eb Ha an enormous cave that drains the Rio Blanco Valley into an underground system.

The site has a huge dramatic entrance with stalactites resembling teeth hanging from the cave mouth. The cave is entered via a large area of breakdown. Some sherds and jute are present among the boulders, but the cave has been heavily looted. An inspection of the sidewalls of the looters pits suggests that there is no cultural material in the subsurface deposit in this area due to the lack of charcoal.

This cave is prone to flash flooding as evidenced by the logs lodged in the ceiling. Sticks, leaves, and twigs are located throughout the system. A small dark zone that extends approximately 100 meters is present on the east side of the site. An alcove entered via a crawl space on the northeast wall of the cave contains pottery. A number of sherds were probably recently placed on a shelf. The floor of the area consists of a yellow silty loam matrix. No charcoal was noted in the area and an informal subsurface trowel test suggested that there is no subsurface deposit. The presence of sticks and leaves in the back of the alcove suggest that the deposits were washed in. Due to the hydrology, heavy looting, and lack of evidence for good stratigraphy, the cave is not a good candidate for excavation.

Chi sa li tzuul (Through the Mountain) is a tunnel cave **located** on the hill that forms the cleft between the two hills. Most of the tunnel can be traversed standing though some areas had a low ceiling height that required short crawls. The tunnel is well decorated but contains no obvious cultural material.

K'op'op'o (Last Frog Cave) is located on the westernmost cliff face to the west side of the V-shaped cleft. The face can be viewed from Uxbenká. We reached the base of the cliff and made an almost vertical climb to a ledge. Locals had conveniently placed a rope in the uppermost part of the climb to facilitate access.

The shelf measured approximately 5 m x 3 m and faced due north. An area of breakdown, approximately 2 m high, located on the west side of the shelf, leads to an entrance crawl. Upon entry the interior dropped approximately 2 m into a passage that measured approximately 6 m in length, with a maximum width of 2 m and ceiling height of 3-4 m. The passage ran roughly north/south. The terminus was the only dark zone area. At the terminus of the passage was a small stack of pottery placed on top of a shelf on the north side of the passage. The sherd stack consisted of about 20 sherds of what appeared to be primarily jar sherds.

Zotz Cave (Bat) was so named because of the presence of large numbers of bats throughout the system and the site is covered in fresh guano. The cave is located approximately 1 km from the Uxbenká site core and the hill in which it sits can be seen from the site. The cave runs beneath a plazuela group that sits on top of the hill.

The cave opening is small, 2-3 m across, and descends approximately 3 m into a chamber that opens up onto the cave passage. The headroom in the passage ranges from approximately 3 m to 50 cm crawl spaces. It took about 1 hour to traverse the passage and we estimate that is about 200 m in length. The width of the passage is no more than 2-3 m and both side walls are lined with mudstone. The cave has been flooded repeatedly in antiquity. We suspect that when the sump in the rear of the cave floods, it may produce enough water to fill the entrance chamber. Therefore, the entrance may form a pool under these circumstances. There are a number of sherds in the mud matrix of the floor with a

higher density in the entrance area and fewer toward the back. An informal surface collection included Late Preclassic, Early Classic, and Late Classic examples.

Paleoclimate Research: Preliminary Collections of Speleothem Fragments from Yok Balum

In 2006 we undertook a program to use stalagmites from caves in the Rio Blanco Valley to assist in generating a precisely dated decadally to annually resolved precipitation record for southern Belize for the last 4000 years based on the oxygen isotope values of speleothems (stalagmites) that grew during this interval. This study is a pilot for a larger study of environmental change, landscape transformation, and cultural adaptation in southern Belize. The following description is modified from Cannariato (*et al*. 2006).

In the tropics, where strong vertical convection is the primary source of precipitation, the oxygen isotope ($\delta_{18}O$) values of rainwater are inversely correlated with the amount of rainfall (Rozanski *et al*., 1993). This "amount effect" signal is carried from rainwater to groundwater to cave dripwater where it is then preserved in the $\delta_{18}O$ of speleothem calcite (McDermott, 2004). Thus, by sectioning a stalagmite, progressively milling the calcite along growth horizons following the axis of growth, and determining the $\delta_{18}O$ values of these samples, a high-resolution record of past rainfall variations can be generated (Fleitmann *et al*., 2003; Neff *et al*., 2001; Wang, 2001). Stalagmite-based precipitation records offer the potential of an annual-layer-counted chronology, when laminations are preserved, and a very precise radiometric chronology (±20 yr) when detrital thorium content is low. Cave-environment and kinetic effects on speleothem $\delta_{18}O$ values are minimized by selecting stalagmites from deep within the cave where temperature is stable and relative humidity high. Although changes in the drip rate can affect the stalagmite $\delta_{18}O$ values, this would drive them in the same direction as the amount effect such that wetter conditions result in more negative $\delta_{18}O$ values (Burns *et al.*, 2002; Fleitmann *et al.*, 2003). Equilibrium calcite deposition can be determined for the modern cave environment by analyzing active dripwater and calcite formation (Mickler *et al.*, 2004).

In June 2006, we collected 10 stalagmites from Lok Balum, a cave nearby Uxbenká (Figure 20). They range in length from ~20 cm to almost 2 m. At the time of collection, environmental data loggers were installed in the cave. They will monitor temperature and humidity every half-hour while deployed over the course of a year to determine the stability of environmental conditions within the cave. We also set up apparatuses below several active drips to collect modern calcite deposition (Figure 21). As of this writing a monthly rainwater and cave dripwater collection program has been underway for 16 months. This modern environmental information will be used to help calibrate the stalagmite paleoprecipitation proxy.

Figure 20. Stalagmites collected from Yok Balum cave for dating and isotopic analysis.

Figure 21. Drip water collection apparatus being installed at the base of one of the sampled stalagmites.

The uranium series dating method, based on the decay of ^{234}U to ^{230}Th, is an ideal chronometer for dating speleothem. Given the excellent preservation of speleothems and the appropriately long half life of ^{230}Th of 75,690 years (Cheng 2000), speleothems provide one of the best absolutely datable climate proxies. With the introduction of multicollector inductively coupled magnetic analyzer mass spectrometers (MC-ICPMS) with multiple ion counters, we are now able to produce extremely precise age estimates (Asmerom *et al*. 2006). The MC-ICPMS mass spectrometers provide much higher ionization efficiency of Th, compared to thermal ionization mass spectrometers, by up to a factor of 100. Recently we installed and accepted a new Thermo Neptune MCICPMS, which is producing very precise age data using a method that we developed that utilizes a combination of Faraday cups with 1010, 1011 and 1012 Ω resistors, an electron multiplier and a channeltron (Asmerom *et al*., 2006). Preliminary dates from the tips and bases of collected stalagmites indicate that most of them were growing during some portion of the last 4 kyr and will thus be useful for our proposed project to reconstruct a high-resolution record of precipitation variations in southern Belize for the last 4 ka (Table 8.1). Immediate future work includes assessing the quality of the samples we have collected for the paleoclimate reconstruction. This includes mapping growth hiatuses, refining the dating and determining the mineralogy (calcite or aragonite).

Long-term goals of the paleoclimate component of the project include collection of a second suite of stalagmites from another nearby cave so that a second replicate climate record can be generated. Data loggers and apparatuses to collect modern calcite deposition will be installed in this cave as well and a monthly rainwater and cave dripwater collection program begun. Weather stations will be installed near both cave locations so that modern climate data can be collected throughout the project duration and used to calibrate the climate proxies. Once the newly collected stalagmites have been dated, the best specimens will be selected from which to generate stalagmite paleoclimate records from the two locations. A primary cave location will be determined from which the most detailed paleoclimate record will be generated (annual resolution from 0-2 ka and decadal resolution from 2-4 ka). A decadal resolution record (0-4 ka) will be generated from the other cave location for comparison. Several “windows” at annual resolution will be generated in the secondary record for detailed comparison of specific climate events found in the primary record that are possibly related to Mayan cultural changes.

Further FAMSI funded research in 2007 was conducted by Cannariato, Kennett, Culleton and Prufer with the goal of refining the sequence and conducting isotopic studies of these and other speleothems. The results are to be presented in a forthcoming FAMSI report.

Table 2. Preliminary dates for stalagmites collected from Yok Balum Cave, southern Belize.

Stalagmite	Length (cm)	Tip Date (yr B.P.)	Base Date (yr B.P.)	Growth Rate* (mm/yr)
YOK-A	19			
YOK-B	18			
YOK-C**	52	4,493 ±37	13,104 ±64	0.06
YOK-D	72			
YOK-E	46	1,430 ±108	33,619 ±605	0.01
YOK-F	117	2,217 ±350	31,519 ±375	0.04
YOK-G	106	80 ±3	2,719 ±33	0.40
YOK-H	18			
YOK-I	62	64 ±2	13,433 ±69	0.05
YOK-J***	183			

* assuming no hiatuses
** broken when found
*** not active

Community Outreach in Santa Cruz, Toledo District, Belize

As an archaeological project working on lands controlled by a local indigenous community the UAP has implemented plans and programs to (a) assure a collaborative, respectful, and mutually beneficial relationship between the scientific researchers and the local villagers and (b) insure that the local community benefits from the long-term research being conducted in their midst, and that these benefits are tangible and lasting (i.e. beyond the duration of the project). From the outset of the UAP in 2005 we were acutely aware that our excavations would lead to increased public awareness of the archaeological site and an increase in visitors to the area. We were also aware that there were potential benefits and costs for the community as a result of elevating the profile of Uxbenká. In collaboration with the Belize IA and ISCR the UAP has worked towards balancing the community's needs with the scientific goals of the research and those of local and national governmental organizations.

Identifying stakeholders capable of building the capacity necessary to generate direct benefits from the increased visits to the site has proved challenging for the project. Santa Cruz is a village of approximately 400 individuals, roughly half of whom are children. The principal household language is Mopan Maya, and the vast majority of subsistence comes from slash-and-burn or slash-and-mulch farming. The village lacks electricity (but not potable water) and in 2006 there were no private vehicles owned by villagers. A survey conducted by Shoshaunna Parks in 2006 indicated that household income in the village is well below $1000 per year. While the village has a primary school which all children under the age of 14 are required to attend, further educational opportunities are drastically limited by lack of necessary funds for high schools books and fees and family labor needs. As a relatively traditional and conservative Maya village, residents of Santa Cruz are concerned

with both economic opportunities and maintaining their community's cultural and linguistic values. The community also regards the ruins of Uxbenká as a part of their communal land holdings, though they understand the IA's legal position as the steward of all archaeological sites in Belize. There are two issues that community members fear the most, in relation to the archaeological site. First is that the inevitable tourism development around the ruin, the nearby spectacular caves, and rainforest will leave them behind economically. Second, is that growth and development will lessen their autonomy in relation to traditional farming and hunting lands that the community has controlled for many generations.

From an archaeologists perspective these challenges are further exacerbated by necessarily short field season with research goals and a lack of potential funding for community-based programs. In the beginning, as was noted by Parks (2006):

> While the archaeologists established good working relationships with village leaders and community members from their initial presence at Uxbenká in 2005, their interaction with the local people was relegated to a sphere in and around the ruins. Rarely do archaeological researchers have the luxury of entering the village to engage with men outside the "work-place" or with the women and children that comprise the majority of the community….. An unavoidable asymmetrical relationship between the archaeologists (as employers…) and villagers (as workers and impoverished community members…) hindered the reality of the cooperative relationship that both sides had hoped to form.

From its inception in 2004 the UAP made the decision to actively engage with the community as a major, albeit unfunded, component of the project. We also realized that this would be a long term initiative. Initially several steps were taken. Dr. Rebecca Zarger (University of South Florida) a cultural and applied anthropologist with almost a decade of experience working with Q'eqchi' communities in southern Belize, joined the project as co-PI. At the same time Shoshaunna Parks, a PhD student at Boston University and current Director of the Maya Cultural Heritage Initiative (MACHI), joined the project to study the relationship between the UAP and the community and to aid in implementing programs beneficial to the community.

Working under permits issued to Zarger by the Belize Institute of Social and Cultural Research and in consultation with the Institute of Archaeology we worked alongside the local elected leadership of Santa Cruz to implement two critical programs to help further the goals of the community.

Archaeology classes for the children of Santa Cruz. Prior to 2006 Pre-Hispanic Maya studies were not a part of the primary school curriculum in Santa Cruz. Consequently, beginning in 2005 the UAP began offering a summer class to primary school students. This course included both classroom and "field" exercises, when the students would visit the site. The goals of this course were twofold: First, to educate the community in areas of cultural heritage with hopes of restoring meaning and value to the remains of the Pre-Hispanic past; and second to help conserve the ruins by discouraging looting and vandalism (Figure 22).

Figure 22. Shoshaunna Parks teaching Mopan Students in a makeshift classroom in the village community center.

In 2006 thirty households in the village allowed their children to participate in the educational program. Classroom materials were purchased with the assistance of a Boston University Graduate Research Abroad Fellowship (to Parks) and funds from the UAP provided each participant with a "textbook," notebook, pen and pencil, and transportation for 80 people to visit to the local archaeological parks of Lubaantun and Nim Li Punit. Two separate classes were scheduled, one for children in Standards 5 and 6 in the morning and one for children in Standards 3 and 4 in the afternoons. Parks wrote textbooks for the classes that included basic information on settlements, architecture, ancient Maya customs, archaeology, conservation, while focusing on local ruins of the Toledo District, including Uxbenká. The "textbooks" were professionally printed in the United States (a local printer in Carbondale Illinois (The Printing Plant) donated printing of the textbooks).

The students attended classes on four consecutive Saturdays at the Santa Cruz community center. The students were taken to Uxbenká during the first and second classes and instructed about their local ruins; during the third class all students and several parents were taken in a charter bus to the ruins of Lubaantun in San Pedro Columbia and Nim Li Punit in Indian Creek (Figure 23). During the class periods held at the community center, children were asked to interact by reading aloud from the "textbook," answering questions, making drawings, and playing games. Many students arrived early to class or stayed late to look at several picture books of the ancient Maya provided by the UAP.

Figure 23. Field school children, parents, and project archaeologists during an educational trip to Lubaantun in June 2006.

The formation of a community based organization (CBO). Following consultation with the village leadership in 2005, the UAP recognized that the primary goal of enabling the villagers to benefit directly from expanding archaeological tourism would hinge on the formation of a community based organization (CBO) that could work for the benefit of the community as a whole. The CBO, as envisioned, would be representatives of the desires of the entire community, run by a committee of seven executive members democratically elected by the village (including women), and two ex-officio members, the village *alcalde* and chairman. The executive would liaise directly with the UAP, the Institute of Archaeology, and other tour groups and organizations that enter the community, and would insure that benefits were spread equally among the families in the village. Control over the ruin was not a goal of the CBO as Belize law places control of all archaeological sites with the Institute of Archaeology.

The barebones concept of a CBO was presented to the community by Prufer and Zarger during a *faena* meeting in 2006. To our surprise the community response was overwhelmingly positive. Although we expected the formation of the group to be a deliberative and contentious process, the seven members of the first executive committee were immediately elected at the *faena*. The executive met repeatedly with the Prufer, Zarger, and Parks to draft a Memorandum of Understanding and Memorandum of Association for the CBO which they named the Uchbenkah K'in Ajaw Association (UKAA). The Executive also undertook the initial task of determining the structure of the organization, short and long terms goals, and fund raising strategies. All this was done with interference from the UAP, which played only an advisory role on technical issues. In the penultimate meeting, Dr. John Morris of the Institute of Archaeology came to the village

to speak to executives (Figure 24) and share with them his previous experience in assisting in the formulation of a similar organization in San Benito Poite.

Figure 24. Members of the Uchbenkah K'in Ajaw Association Executive Committee following a meeting with Dr. John Morris (IA), Prufer, and Parks.

In 2007 organizational work with the UKAA has continued and we are currently exploring sources of funding sources for a visitors' center and craft facility at near Uxbenká. As tourism has increased so has the need for local guides and craft specialists. Goals for 2008 include securing funding for training for tour guides in the village and the development of interpretive gardens to be run by the CBO.

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Sources Cited

Asmerom, Y., Polyak, V., Schwieters, J., and Bouman, C.
2006 Routine High-Precision U-Th Isotope Analyses for Paleoclimate Chronology: Geochimica et Cosmochimica Acta, v. 70, p. 18-24.

Burns, S.J., Fleitmann, D., Mudelsee, M., Neff, U., Matter, A., and Mangini, A.

2002 A 780-year annually resolved record of Indian Ocean monsoon precipitation from a speleothem from south Oman: Journal of Geophysical Research, v. 107D, p. 4434, doi:10.1029/2001JD001281.

Cannariato, Kevin, Douglas Kennett, Keith M. Prufer and Brendan Culleton
2006 Paleoclimatic Reconstruction in the Uxbenká Region: Preliminary Studies Utilizing Speleothem Fragments from Yok Balum Cave as Rainfall Proxies. In *Report of the 2006 Field Season in the Toledo District, Belize, Central America* pp. 44-47, Edited by Keith M. Prufer, (Report to the Belize Institute of Archaeology Belize Institute of Social and Cultural Research National Institute of Culture and History).

Cheng, H., Edwards, R.L., Hoff, J., Gallup, C.D., Richards, D.A., and Asmerom
2000 The half-lives of uranium-234 and thorium-230: Chemical Geology, v. 169, p. 17-33.

Fleitmann, D., Burns, S.J., Mudelsee, M., Neff, U., Kramers, J., Mangini, A., and Matter, A.
2003 Holocene forcing of the Indian monsoon recorded in a stalagmite from Southern Oman: Science, v. 300, p. 1737-1739.

Laporte, Juan Perdo and Paulino I. Morales
1994 Definicion Territorial en Centros Classicos de Tierras Bajas: Una Aplicacion Metodological a la Region de Dolores. *VII Simposio de Investigationes Arquelogicas en Guatemala, 1993,* J. P. Laporte and H. L. Escobedo, eds., pp. 247-330. Instituto de Cultura y Desportes, Instituto de Antropologia e Historia, Associacion Tikal, Guatemala.

Hammond, Norman
1975 Luubantun: A Classic Maya Realm (Peabody Museum Monographs, Number 2). Harvard University, Cambridge.

1978 Cacao and Cobaneros: An Overland Trade Route Between the Maya Highlands and the Lowlands. In *Mesoamerican Communication Routes and Culture Contacts,* edited by T. Lee and C. Navarette, New World Archaeological Foundation, Paper No. 40, Provo.

Leventhal, Richard
1990 Southern Belize: An Ancient Maya Region. *Vision and Revision in Maya Studies*, edited by F. S. Clancy and P. D. Harrison, pp. 125-141. University of New Mexico Press, Albuquerque.

1992 The Development of a Regional Tradition in Southern Belize. In *New Theories on the Ancient Maya,* edited by E. C. Danien and R. J. Sharer, pp. 145-154. The University Museum, University of Pennsylvania, Philadelphia.

McDermott, F.

2004 Palaeo-climate reconstruction from stable isotope variations in speleothems: A review: Quaternary Science Reviews, v. 23, p. 910-918.

Mickler, P.J., Banner, J.L., Stern, L., Asmerom, Y., Edwards, R.L., and Ito, E.
2004 Stable isotope variations in modern tropical speleothems: Evaluating equilibrium vs. kinetic isotope effects: Geochimica et Cosmochimica Acta, v. 68, p. 4381-4393.

Neff, U., Burns, S.J., Mangini, A., Mudelsee, M., Fleitmann, D., and Matter, A.
2001 Strong coherence between solar variability and the monsoon in Oman between 9 and 6 kyr ago: Nature, v. 411, p. 290-293.

Parks, Shoshaunna
2006 Community-Based Anthropological Objectives in Santa Cruz, Toledo District, Belize. In *Report of the 2006 Field Season in the Toledo District, Belize, Central America* pp. 48-53, Edited by Keith M. Prufer, (Report to the Belize Institute of Archaeology Belize Institute of Social and Cultural Research National Institute of Culture and History).

Prufer, Keith M.
2002 Communities, Caves, and Ritual Specialists: A Study of Sacred Space in the Maya Mountains of Southern Belize. Ph.D. Dissertation, Department of Anthropology, Southern Illinois University at Carbondale.

2005 The Early Classic in Southern Belize: A Regional View from Uxbenká and Ek Xux. In *Research Reports in Belizean Archaeology: Investigations in the Eastern Lowlands*. J. Morris and J. Awe, editors. pp.169-178, Institute of Archaeology, Belmopan, Belize.

Rozanski, K., Araguás-Araguás, L., and Gonfiantini, R.
1993 Isotopic patterns in modern global precipitation, in Swart, P.K., ed., Climate change in continental isotope records, Volume 78: American Geophysical Union Geophysical Monograph, p. 1-36.

Sharer, Robert J.
2003 Tikal and the Copan Dynastic Founding. In Tikal: Dynasties, Foreigners, & Affairs of State, J. A. Sabloff, ed., pp.319-354, School of American Research, Santa Fe.

Wang, Y.J., Cheng, H., Edwards, R.L., An, Z.S., Wu, J.Y., Shen, C.-C. and Dorale, J.A.
2001 A high-resolution absolute-dated late Pleistocene monsoon record from Hulu Cave, China: Science, v. 294, p. 2345-2348.

Wright, A. C. S., D. H. Romney, R. H. Arbuckle, and V. E. Vial
1959 *Land Use in British Honduras*. Colonial Research Publications No. 24. Her Majesty's Stationary Office, London.