26 UNDERWATER EXCAVATIONS OF CLASSIC PERIOD SALT WORKS, PAYNES CREEK NATIONAL PARK, BELIZE

Elizabeth C. Sills and Heather McKillop

Underwater excavations are described at Early Classic Site 24 and Late Classic Site 35 salt works in Punta Ycacos Lagoon, Paynes Creek National Park in southern Belize. The salt works are associated with a massive coastal salt industry that produced salt for the inland cities during the Classic Maya, where salt was scarce. The salt works are submerged below sea level and associated with the only known wooden architecture in the Maya area. Both the wooden buildings and salt works are preserved because of their environmental location in an underwater mangrove peat bog. Transect excavations were conducted at both sites to establish the function of the wooden architecture. Marine sediment was excavated at both sites in order to examine anthropogenic disturbances in relation to the wooden architecture. Transect excavations reveal an abundance of briquetage—ceramic vessels used to evaporate brine over fires to make salt—indicating the function of the wooden architecture is for workshop production of salt.

Introduction

Classic Maya wooden architecture is preserved underwater in a peat bog below the seafloor in Punta Ycacos Lagoon—a shallow lagoon system in Paynes Creek National Park, southern Belize (Figure 1). The wooden architecture forms buildings and structures for workshop production of a biological necessity, salt (McKillop 1995, 2002, 2005a; Sills and McKillop 2010). Underwater excavations were undertaken at two ancient Maya salt works. These sites are Early Classic (A.D. 300-600) Site 24 and Late Classic (A.D. 600-900) Site 35. The salt works are associated with the Classic Maya salt industry that produced salt for inland trade. With the only known preserved ancient Maya wooden buildings, the underwater excavations have the advantage of exploring salt production inside and around actual structures.

Organic artifacts in the tropics usually have poor preservation due to exposure to warm, moist, and unprotected environments. However, underwater environments can preserve artifacts such as wood and other organics not commonly found at terrestrial archaeological sites. Underwater archaeology in the Maya area has focused on cenotes on the Yucatán Peninsula, coastal islands, and nautical investigations (Andrews and Corletta 1995). These particular environments have preserved extinct animal bones, Paleo-Indian skeletons, and charcoal from hearths in submerged caves near the coast in the Mexican states of Yucatán and Quintana Roo (González et al. 2008). Recent investigations of cenotes in the Yucatan have uncovered numerous well-preserved human skeletons (Rojas et al. 2008). Underwater diving in pools associated with Cara Blanca in Belize yielded well preserved fossilized mega fauna (Lucero et al. 2011).

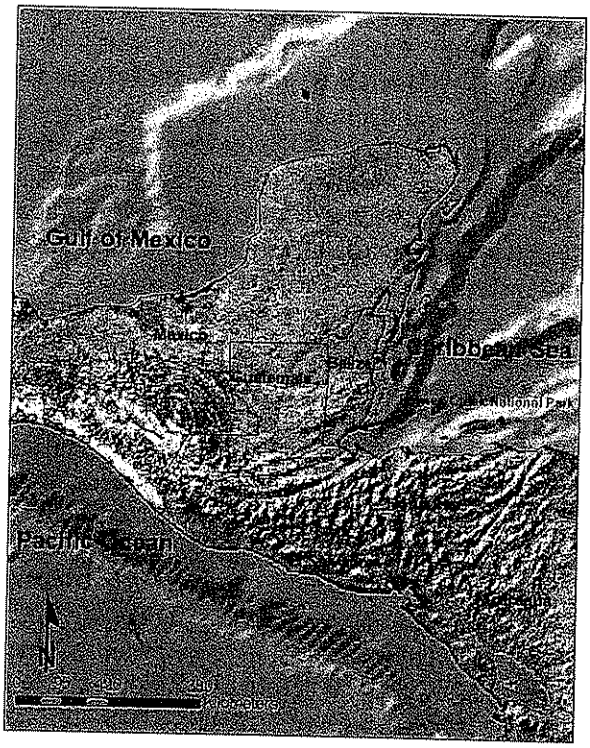

Figure 1. Map of Belize and surrounding countries showing location of study area. Map by C. Sills adapted from ESRI® ArcMap™ 9.3.1 ©1999-2009.

Submerged archaeological deposits on the coast and cays of southern Belize can explore the nexus of human interaction and the environment. Excavations at the Classic to

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Postclassic (A.D. 300-1500) trading port on Wild Cane Cay in the Port Honduras nearby the Paynes Creek underwater sites revealed deeply buried deposits extending to 140 cm below the water table (McKillop 2005b). Offshore excavations at Wild Cane Cay yielded intact buried deposits submerged by eustatic sea-level rise (McKillop 2002, 2005b). Excavations of two mounds on nearby Frenchman's Cay yielded coral architecture platform foundations 80 cm below present-day sea level (McKillop et al. 2004). Transect surveys away from the coral architecture revealed midden deposits well below the water table, as at nearby Wild Cane Cay (McKillop et al. 2004).

Other Classic Maya sites with buried deposits in Port Honduras include Pelican Cay and Pork and Doughboy Point. At the small mangrove island of Pelican Cay, Late Classic deposits are found buried under 40 cm of mangrove peat (McKillop 2002). Stratigraphic excavations revealed mangrove peat underlain by mixed mangrove peat and clay that overlays a base layer of coral sand and finger coral. Sea-level rise occurred before the Late Classic occupation with the formation of mangroves over the base layer and then continued after site abandonment as the mangroves kept pace with rising seas. At the partially inundated coastal site of Pork and Doughboy Point excavations revealed at 55 cm below sea level that the site dates to the Late Classic and Terminal Classic periods (A.D. 600 to 900; Brandehoff-Pracht 1995; McKillop 2002). The presence of intact stratigraphy that is currently below sea-level indicates that sea-level rise occurred after site abandonment.

On the southern coast of Belize, specialized salt making sites are submerged below sea level in Punta Ycacos Lagoon, Paynes Creek National Park. The excavated sites of Stingray Lagoon, David Westby, Orlando's Jewfish, and the Killer Bee site have artifacts embedded in mangrove peat (McKillop 1995, 2002). Stingray Lagoon is at least one meter underwater whereas David Westby and Orlando's Jewfish are in shallower water. The Killer Bee site is located in a mangrove ecosystem inundated by tidal fluctuations.

Submerged archaeological sites that yield organic artifacts and materials not often found at terrestrial sites can add a new assemblage for interpreting sites that are on dry land. The conjunction of human occupation with environmental data has the ability to integrate different types of data sets for interpreting the archaeological record. Investigations at the underwater salt works in Paynes Creek have yielded an abundance of preserved wooden architecture as well as artifacts and are a good environment to explore the salt makers occupation and environmental conditions before, during, and after occupation.

Marine Landscape of Punta Ycacos Lagoon

Punta Ycacos Lagoon is an estuarine lagoon dominated by a typical mangrove ecosystem. The surface of the sea floor is firm mangrove peat overlain with a layer of loose silt. Rhizophora mangle (red mangrove) is the dominant species found fringing the edges of the lagoon and in isolated stands in the lagoon. Avicennia germinans (black mangrove) and Laguncularia racemosa (white mangrove) are found behind R. mangle away from the fringe of the lagoon. The successionary location of mangroves in Punta Ycacos Lagoon is typical of mangrove forest environments (Tomlinson 1986).

The lagoon system is supplied with salt water from the Caribbean Sea to the east and fresh water from Freshwater Creek. In the past, the lagoon system may have been part of the Monkey River deltaic system to the north (McKillop 2002; Wright et al. 1959). Water depths in the lagoon system reported by Purdy and Gischler (2003) range from 20 cm to 6 m in deeper channels. The deepest underwater sites in the lagoon discovered so far are 1.5 m below water at the seafloor surface of the sites. Field observations at Sites 24 and 35, located in the shallow Eastern Lagoon, recorded an average of 44 cm below sea level.

Microscopic analysis of excavated sediment from below the sea floor at the underwater site of K'ak' Naab' indicates the peat is composed of R. mangle (McKillop, Sills, and Harrison 2010a and b). R. mangle is the dominate species throughout the entire 1.5 m excavated sequence. Loss-on ignition testing of sediment indicates that the organic content of the excavated marine sediment averages over 65%,

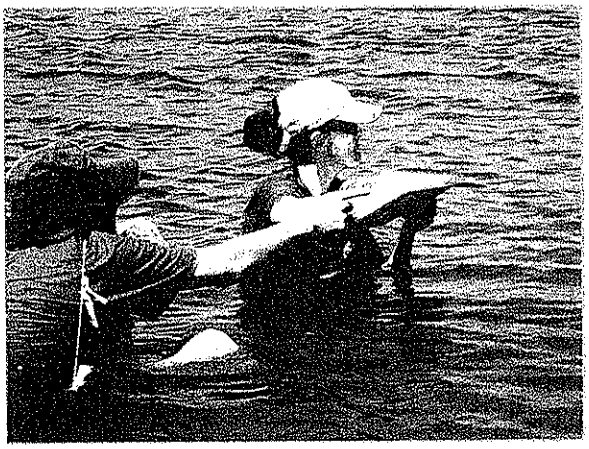

Figure 2. Relocating wooden posts at Site 24 (photo by H. McKillop).

which is high and typical of mangrove peat sediment. Radiocarbon dating of the uppermost and lowermost samples shows a 4,000 year record of mangrove accumulation. The analysis of excavated sediment resulted in establishing an occupation surface at the time of the Paynes Creek Classic Maya salt industry of approximately 132.7 cm below the current sea level (McKillop, Sills, and Harrison 2010a and b).

Previous investigations of the Paynes Creek sites indicate that the artifacts lie directly on or are embedded in the sea floor (McKillop 2005a, 2007; Sills and McKillop 2010). The peat, an anaerobic sediment, creates an environment that preserves organic remains such as wooden posts and the only known ancient Maya canoe paddle from the site of K'ak' Naab' (McKillop 2005a; McKillop, Sills, and Harrison 2010a and b). The preserved wooden posts are embedded into the peat with only the worm eaten portions of the wood to mark their presence protruding above the seafloor (McKillop 2005a; Sills and McKillop 2010). The slightly acidic quality of the mangrove peat does not provide a suitable matrix for the preservation of bone or shell.

Investigations within Paynes Creek confirm that salt works were close to the source of brackish water required to evaporate in pots over fire to make salt. The presence of artifacts on the surface of the peat and wooden posts driven into mangrove peat indicates that the mangroves in Paynes Creek National Park were able to keep pace with sea-level rise until sometime after the Late Classic abandonment (McKillop, Sills, and Harrison 2010a and b).

Underwater Excavations

Underwater excavations were undertaken at Sites 24 and 35 in 2010 with a team of nine researchers, including the authors. Prior to underwater excavations, Sites 24 and 35 were relocated using a GPS unit to find the PVC datum marker for each site. The datum markers had been sunk into the seafloor to hide the sites, so once relocated, the PVC pipes were pulled up above the water to help relocate posts that had been discovered and mapped in 2007. The wooden posts were relocated by referring to a site map created in our project GIS. The paper map was placed into an archival plastic bag to keep the map dry in the water and attached to a clip board (Figure 2). The map was useful in determining the general location of the wooden posts and by feeling the sea floor for the markers that had been sunk into the seafloor on the north side of each post after discovery and total station mapping. The markers consisted of plastic flags labeled with the post number. The flags were furled and placed inside plastic drinking straws that were sunk into the seafloor. Furling flags into straws and sinking them protected the sites, since their locations were clearly marked by a sea of flags during each field season. Once the posts were relocated we placed a red pin flag into the peat on the north side of each wooden post so the post locations were visible above the water. A systematic flotation survey on research flotation devices (RFDs) was conducted across the site to determine the spatial extent of the artifacts. The boundaries of artifacts were marked by flags. The team snorkeled on the RFDs shoulder to shoulder, pivoting at the end of each row to cover the entire site, marking posts on the way.

Two transects were placed across Sites 24 and Site 35 respectively, forming a cross shape. The transects were placed to extend across the site—as defined by the surface distribution of artifacts—and to include inside and outside areas of buildings. The transects were also laid out using a compass and a 30 m tape. The ends of each transect were marked with long PVC pipes pushed into the seafloor. The tape was stretched tight between the two PVC pipes. Short lengths

of ¼" PVC pipes were placed into the sea floor at each meter mark (Figure 3). Excavations proceeded along each transect using a metal grid frame measuring one by one meters. The frame was oriented by placing it along the PVC pipes that marked the meter marks. The grid was weighted down with five pound weights to keep it in place during excavations. Excavators placed their hands firmly on the seafloor and collected all surface artifacts. The artifacts were placed into a bucket with holes on all sides to drain the water. Each bucket with the excavator was photographed showing the relative amount of artifacts collected before transferring the artifacts into labeled plastic bags (Figure 4). Gross estimates of the excavated material and unit sediment descriptions were written in an underwater notebook. At night at our field camp, the notes were transferred into our daily field journals. The plastic bags were labeled using a black sharpie and included the site number, unit designation, date, and the collector's initials. Fragile artifacts were placed into separate labeled bags. The plastic bags were ordered by unit and placed into the Portable Research Station before transferring them to our larger ocean going vessel. The location of the transects were mapped using a Topcon GTS-725 total station and downloaded each evening and attached to the GIS GeoMedia® by IntergraphTM for analysis in relation to the previously recorded wooden architecture.

The artifacts were studied at the field lab in Belize. After fresh water rinsing and drying, the artifacts were separated into material classes. The ceramics were sorted according to the type-variety classification for Maya pottery which is useful for developing a site chronology. Most types fit within existing classifications for the Paynes Creek area (McKillop 1995, 2002). All ceramics and stone tools were drawn and photographed.

Marine sediment was excavated to explore the relationship of the environment to the salt works (Rosado, McKillop, and Sills n.d.). The purpose the study is determine the species composition of the sediment, the amount of organic material, and to establish an occupation level at the time the salt works were in use.

Figure 3. Setting up a transect at Site 24 (photo by H. McKillop).

Figure 4. Artifacts collected from a unit on the sea floor (photo by H. McKillop).

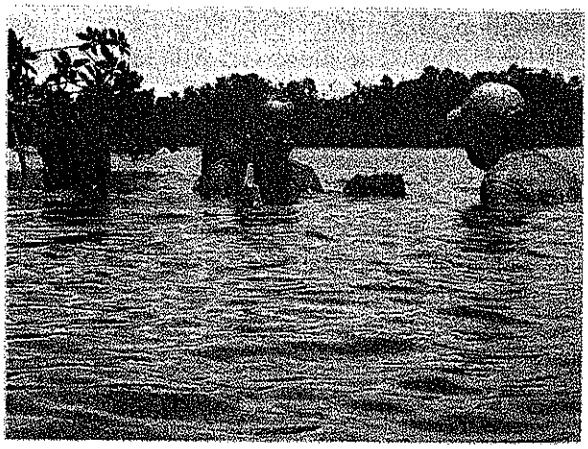

Figure 5. Roberto Rosado excavating a sediment column sample at Site 24 (photo by H. McKillop).

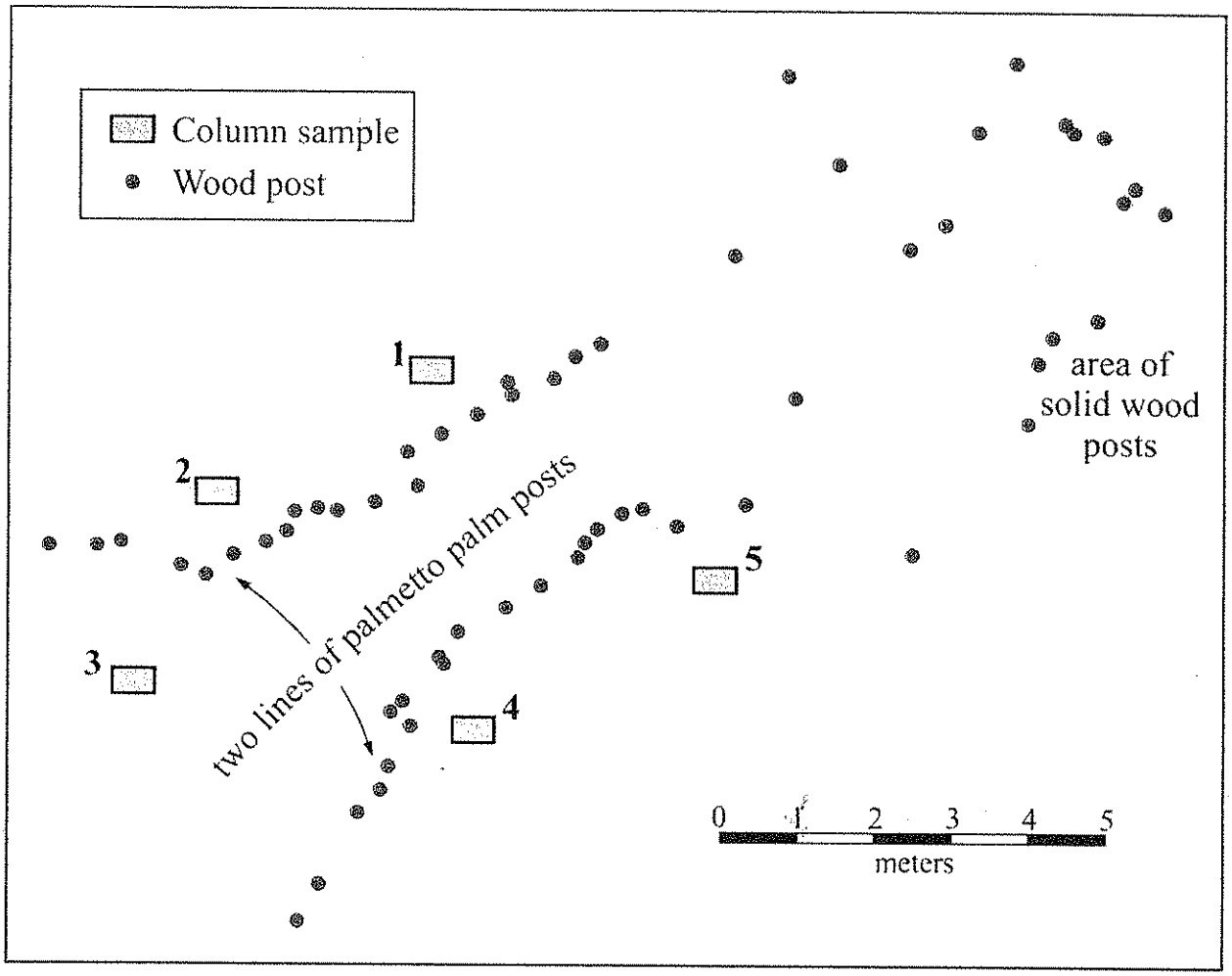

Figure 6. Map of Site 24 showing wooden architecture and excavation locations of sediment columns (drawing by Mary Lee Eggart from GIS map by H. McKillop).

Each sediment column was excavated to a depth of 60 cm. A hole was excavated in the sea floor to expose a vertical face from which to excavate 10 cubic cm blocks of mangrove peat. The mangrove peat was cut in 10 cm levels using a clean stainless steel knife. The depth of each excavated level was measured with a cloth tape (Figure 5). The excavated samples were wrapped in plastic cling wrap and placed into a larger plastic bag marked with provenience. The sediment was exported to the Louisiana State University Coastal Archaeology research lab under permit from the government of Belize Institute of Archaeology.

Excavations at Site 24 and 35

Site 24 consists of at least one rectangular building with room divisions. The site also has two lines of palmetto palm posts (Acceloracea wrightii) that fan out from the building (Figure 6). Two transects were placed perpendicular to each other in order to excavate the inside and outside of the building. Transect excavations were placed based on the layout of the structure and observations recorded during the 2006 systematic survey of the site conducted to locate wooden posts. The abundance of briquetage observed during the 2006 survey suggested that the architecture at the site is associated with a salt production workshop and not a residential structure.

Transect 1 was 18 m in length, placed to extend across the site in a northeast to southwest direction. The transect covered the inside of the wooden building and extended beyond in both directions to an open area defined on the outside

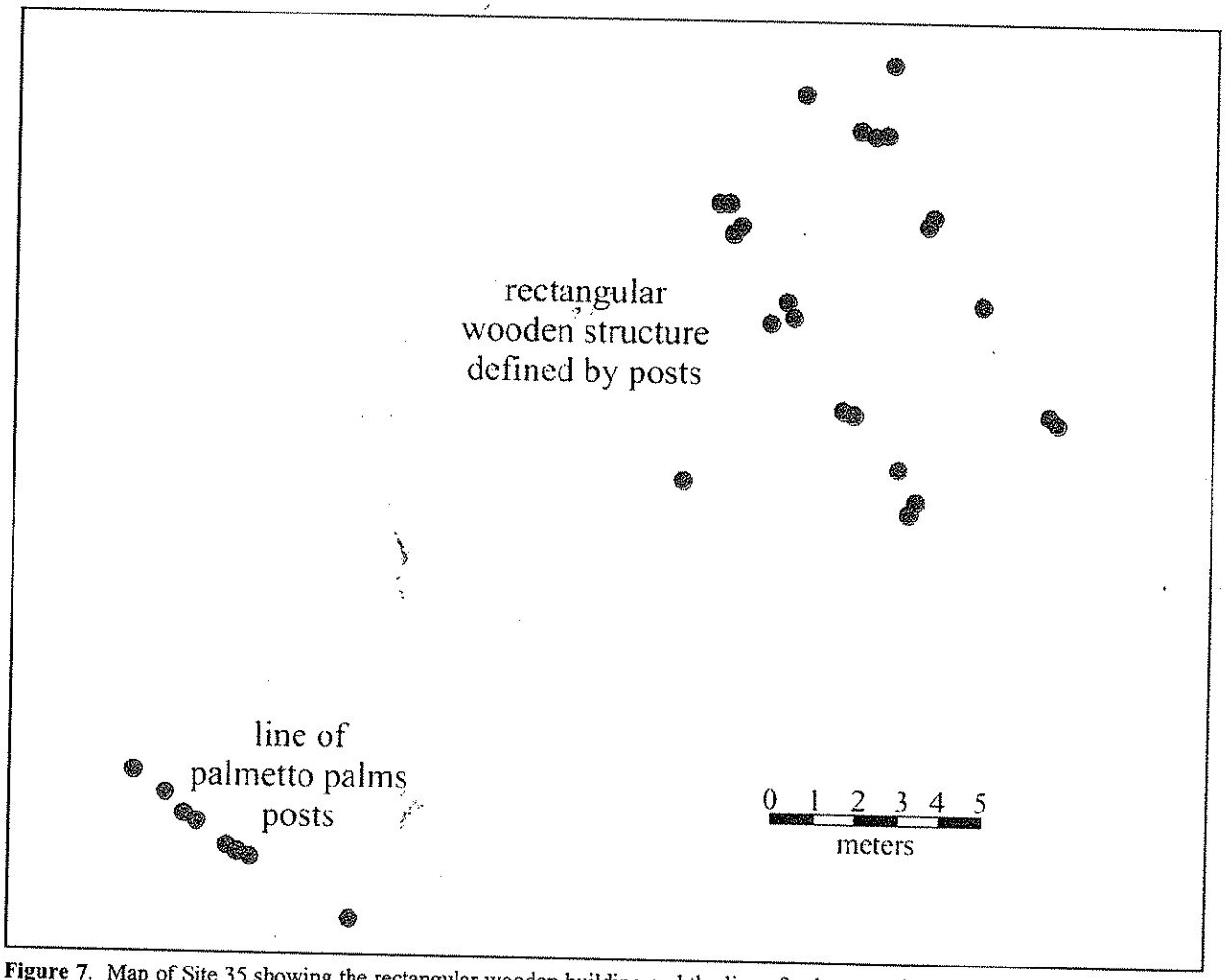

Figure 7. Map of Site 35 showing the rectangular wooden building and the line of palmetto palm posts (Drawing by Mary Lee Eggart from GIS map by H. McKillop).

by lines of palmetto palm posts. Transect 2 was 24 meters in length, at a right angle to Transect 1. Transect 2 also included the interior of the structure as well as the outdoor space defined by the two lines of palmetto palm posts.

Five sediment columns were excavated by Roberto Rosado for his M.A. research. Only Column's 1 and 3 were analyzed for research. Four of the sediment columns were excavated on the outside of the two lines of palmetto palm posts and one column was excavated between the two lines.

Site 35 was systematically surveyed for wooden architecture in 2006 and determined to be another salt work associated with wooden architecture. The site has one rectangular building with no visible room divisions (Figure 7). Seven palmetto palm posts that form a line were mapped 15 m to the southwest of the building. Underwater excavations were placed to examine differences in the presence, type, and abundance of artifacts inside and outside of the building.

Two long transects were laid out and excavated in 1 x 1 m units. Transect 1 was 15 m in length and placed along the interior of the rectangular wooden building. Transect 2 was placed perpendicular to Transect 1 and was 24 meters long. Transect 2 intersects Transect 1 inside the building and extends to the line of seven palmetto palm posts.

The two sediment columns were excavated directly to the north and the south of the seven palmetto palm posts. As with the sediment column at Site 24, these two columns were excavated to 60 cm below the sea floor.

The majority of artifacts at both sites are briquetage—ceramic vessels used to evaporate brine over fires to make salt. Both Site 24 and Site 35 had an abundance of briquetage inside the buildings. The term briquetage includes ceramics associated with salt production including pottery vessels, cylinders, spacers, sockets, bases, and amorphous clay lumps (ACLs). The majority of pottery vessels are Punta Ycacos Unslipped jars and bowls that are easily identifiable due to their friable nature and sand temper. There was also an abundance of ACLs that include the fragmentary pieces of the support structure for holding the pots over fires. The solid clay cylinders are vessel supports used to lift the pots over fires and are made from clay that is not well mixed as evidenced from the rolling formation of the cylinders visible in cross sections. Very few spacers, used to separate the individual pots, were collected. Few complete sockets, the part at the top of the cylinder for placing the pot, were recovered. Lacking also are bases which are the clay on the base of the solid clay cylinders. There was abundant charcoal, which was mixed with ACLs that may have been placed in the fires to help retain heat over the slow evaporation process of making salt.

Other types of pottery comprising a minimal amount of the overall assemblage were also found inside of the wooden buildings. These types include Mangrove Unslipped, Warrie Red, and Moho Red (see McKillop 2002 for type descriptions). Mangrove Unslipped and Warrie Red have the function of water jars and were used as vessels to store water or brine. Moho Red is defined as serving vessels. There are some artifacts used in ritual such as a figurine whistle fragment, candeleros, and fragments of an incense burner.

There is an absence of briquetage between the wooden buildings and inside the lines of palmetto palm posts. The diminished amount of artifacts in this area is as interesting as the presence of artifacts within the buildings. This absence of artifacts indicates that most likely no fires or salt making was occurring in this area. Instead, we interpret the lines palmetto palm posts as retaining walls to keep water out of the salt works (Sills and McKillop 2010). No artifacts were collected outside the lines of palmetto palm posts.

An NSF dissertation grant is providing funding for ongoing analyses of excavated material and typological analyses of artifacts. The ongoing analysis includes chemical testing of marine sediment, neutron activation analysis of pottery, 3D imaging, and radiocarbon dating. Three-dimensional imaging is under way at Louisiana State University on the Digital Imaging and Visualization (DIVA) Lab in order to scan pottery sherds.

Conclusions

The underwater excavations along with the sediment column excavations demonstrate the benefits of environmental and archaeological research. The artifacts lying on the surface and embedded in the mangrove peat have undergone cultural and environmental transformations. The settling of the salt makers in the lagoon along with rising sea levels and peat development has impacted the environment at the two sites.

Evidence of physical architecture in the Maya area includes the urban center temples made from limestone and sandstone, post molds located below the topsoil during excavation, and rarely, as at Cerén where a village is preserved by volcanic tephra, actual wood (Sheets 2002). The underwater sites in Paynes Creek National Park have the wooden architecture preserved due to peat, anaerobic sediment. Sea-level increased sometime after the Late Classic period and inundated the salt works, protecting them in mangrove peat and saline water. The submersion of these sites preserved the wooden architecture, as well as large fragments of briquetage, the remains of salt making vessels.

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