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Human-Environment Interactions: Sea-Level Rise and Marine Resource Use at Eleanor Betty, an Underwater Maya Salt Work, Belize

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Degree

Doctor of Philosophy (PhD)

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Geography and Anthropology

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Abstract

Dissertation excavations were performed in the spring of 2013 at the underwater site of Eleanor Betty in Paynes Creek National Park, Belize. The marine environment preserved wooden architecture associated with the salt works. Excavation goals included: 1) excavating and defining the boundaries of the submerged shell midden; 2) collecting sediment samples for paleoenvironmental analyses; and 3) recovering cultural remains to determine the site's purpose (residence versus production workshop).

Four transects were added to the existing transect from excavations performed during the 2011 field season. The shell midden measured 5 meters in length (north-to-south throughout all transects) by 0.5-to-1 meters in width (east-to-west across all transects).

Sediment samples were subjected to loss-on ignition (the burning of sediment to determine the percent of organic matter present) and microscopic identification of sediment to identify the type of organic matter present. Analyses revealed a high organic content coupled with an abundance of *Rhizophora mangle* (fine red mangrove roots), which keep pace with sea-level rise and fall. Results indicate that Eleanor Betty was built on the cleared red mangrove stands and submerged by sea-level rise.

The shell midden was determined to be a cultural midden as charcoal and archaeological material were recovered throughout all levels of the submerged midden deposit. Approximately 4,733 pieces of shell resulted from the excavations. Of the 4,733 pieces, 3,979 fragments were identified as *Crassostrea rhizophora* (red mangrove oysters). Microscopic analyses suggest the shell were part of a meal, perhaps a feasting ritual, as evidenced by the break patterns on the shells' ventral margins. Assessment of height-length ratios for predation indicates the procurement of shells was a one-time event.

An abundance of charcoal (~16,000 grams) and briquetage (~215,000 grams) – pottery used to evaporate brine over fires to make salt, was recovered from the 2013 field excavations. No household items, such as figurine whistles or pottery used for food storage, were recovered. The excavation results indicate that Eleanor Betty was a salt production workshop.

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Global sea level is rising—and at an accelerating rate—largely in response to global warming. The global average rise has been about eight inches since the Industrial Revolution. However, many U.S. cities have seen much higher increases in sea level (NOAA 2012a; NOAA 2012b). Global warming is the main contributor to the rise in global sea level since the Industrial Revolution. Human activities such as burning coal and oil and cutting. © AP Photo/Michael Dwyer. Sea level rise, combined with worsening storm surge, threatens to harm people, property, and ecosystems in coastal communities around the country. As the water levels increase, the damage caused by sea storms also penetrates inland regions with successive rise in intensity. Such water is unfit for consumption, and cannot be used for agricultural purposes. Possible Solutions and Mitigation Measures. Building tall walls and similar structures might help reduce sea water intrusion up to a certain level, but this solution is of no help when the sea level rises drastically and even during tsunamis striking the coastal regions. Constructing levees might help on a small scale, especially if the particular coastal region experiences less increase in ocean water over a longer period of time. Global sea level rise began around the start of the 20th century. Between 1900 and 2016, the sea level rose by 16–21 cm (6.3–8.3 in) on average. More precise data gathered from satellite radar measurements reveal an accelerating rise of 7.5 cm (3.0 in) from 1993 to 2017;¹⁵⁵⁴ which is a trend of roughly 30 cm (12 in) per century. This acceleration is due mostly to human-caused global warming, which is driving thermal expansion of seawater and the melting of land-based ice sheets and glaciers. Between Sea level rise, explained. Oceans are rising around the world, causing dangerous flooding. Why is this happening, and what can we do to stem the tide? 4 Minute Read. By Christina Nunez. When sea levels rise as rapidly as they have been, even a small increase can have devastating effects on coastal habitats farther inland, it can cause destructive erosion, wetland flooding, aquifer and agricultural soil contamination with salt, and lost habitat for fish, birds, and plants. They also point out that the extent to which countries work together to limit release of more greenhouse gases may have a significant impact on how quickly seas rise, and how much. PUBLISHED February 19, 2019. Continue Reading.