The Relocation of Laurel Hill Plantation Rice Barges in the Waccamaw River, SC, using Multibeam Echosounding

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**ABSTRACT:**

A study done in the lower Waccamaw River neck, inland of Murrells Inlet, South Carolina, is done to relocate and bathymetrically map antebellum rice barge wrecks, last seen near the old Laurel Hill Plantation area. Sites investigated are Laurel Hill, Collins Creek, Cow House Creek, and the Wachesaw portion of the Waccamaw River. Magnetometer data contained multiple anomalies along the locations, mostly due to modern wrecks. Successful multibeam echosounding performed at the Laurel Hill site reveals two identifiable barges. Following archeological scuba diving provided that one barge was partially buried and upside-down, containing civil war era metal fastenings. Barges found are more than likely belonging to the adjacent antebellum Laurel Hill Plantations and were potentially sunk by their owners due to the threat of the Union Army’s advance on that area at the time.

**INTRODUCTION:**

Presented in this research is the application of geophysical sonar methods in shallow fluvial environments. Methods are used in locating three wreck sites from sport diver descriptions. Research area is just inland of Murrells Inlet on the northern coast of South Carolina (Figure 2). Three sites of interest are Collins Creek, Cowhouse Creek, and the riverbanks near Laurel Hill Plantation (Figure 3&8).

Around the 1860’s in the lower Waccamaw River area of South Carolina, there existed many rice plantations. Prominent, wealthy southerners owned and managed these lands. During this time, landowners had created spatial distributions of rice paddies, which can still be seen from aerial images today. Each plantation had a system of barges that would transport goods either to processing or to the rice mill. During this time, the Civil War was going on and there was
the threat of the Union army accessing these river systems to ransack wealthy plantation owners. Many plantations sunk their watercraft in attempt to protect their property from being used against them or stolen. Also, many homes and plantations were damaged or destroyed by the Union; in turn they may have also sunk the rice plantation barges and watercraft. In 1982, a recreational diver, Ralph Wilbanks, reported a series of submerged vessels he described as “barges” in the Wachesaw River portion of the Waccamaw River system. The three major plantations in this part of the river were Wachesaw, Richmond Hill, and Laurel Hill Plantations. Wilbanks filled out a site inventory form to the University of South Carolina Institute of Archeology and Anthropology, SCIAA (Figure 1). Since 1982, these wrecks were not queried again.

For optimal preservation, conditions are fresh water and artifacts are buried in aerobic conditions to prevent erosion and oxidation, which would further break down and disassociate artifacts. Sedimentary processes in rivers involve deposition on the point bar, and erosional scouring on the cut bank, due to the natural flow of the meandering river. Rivers that transport lots of sediment can create sand-ripple bed forms. Whether these ripple bed forms are symmetrical or asymmetrical can tell the directions of flow, whether its one direction or tidal in two directions.

This research addresses the practical use and application of multibeam echosounding in river environments for objectively mapping the river bottom. The bathymetry data is a highly accurate method for producing a primary visual of wreckages.

METHODS&MATERIALS:

Multibeam sonar scanning method begins with the sending of sound waves to the seafloor below the vessel. The echosounder itself contains a transducer where the radio waves are emitted in a wide fan shaped coverage called a swath upon the subaqueous bottom. Those waves reflect off
of the bottom, causing them to return to the receiver on the echosounder, which is located next to the transducer in most cases. The time for each wave to be sent and received is called two-way travel time. Times will vary depending on the depths and reflectors on the bottom. Two-way travel times and the angle at which they arrive at the receiver are then compiled into a specific algorithm used by the device to formulate depths and positions.

Data collection was performed on consecutive days one, two and three. Day four consisted of archeological diving. Three methods used were Multibeam Echosounding, Magnotometer scanning, and archeological diving. This research used the multibeam echosounder by Kongsberg, model 3002. The vessel used for research is the Coastal Carolina University Privateer. This is a 24ft craft with the multibeam echosounder fastened to the front. Seatex and Seapath systems are motion compensators and positioning equipment, giving x-y coordinates and vertical position. MBES data is then processed using Caris program HIPS and SIPS to reduce data noise. Magnetometer data is used to detect anomalies indicating metallic facets along the riverbed. After initial river survey, archeological scuba diving in structured sweeps provides visual proof of wrecks and eyewitness observations in marine conditions. Cow House Creek, Collins Creek, Wachesaw Landing, and Laurel Hill are each inspected by Archeological Divers from the South Carolina Institute of Archeology and Anthropology.

RESULTS:

Of the four sites investigated, only two of them are able to be scanned with the Multibeam Echosounder; Laurel hill barges and the archeological scatter site located directly next to the Wacca Wache Marina.

Magnetometer data is taken in entire research area. Data shows anomalies near Laurel Hill, Wacca Wache marina, Collins Creek, and at the northern mouth of Cow House Creek, along with
multiple smaller anomalies along the river (Figure 10). A closer look at the Laurel Hill site shows anomalies congruent with multibeam data, but not as strong as other locations (Figure 12).

The archeological scatter site MBES data did not show anything recognizable from the riverbed. Further down the river near antebellum Laurel Hill Plantation (Figure 8), bathymetric imagery shows three identifiable barge-like wrecks (Figure 4). They are rectangular in shape and seen at a depth of approximately 12 meters. Barge wrecks are located on the cut-bank of the river, where the most sediment is being eroded and transported and the river velocity is higher. The point-bar of the river directly across shows dramatic sand-ripple bedforms where much sediment is deposited. Archeological diver inspection on the most prominent barge, barge number two on the right of figure 4, shows that the barge is actually upside-down. Further inspection of the sand ripple bedforms shows that these are asymmetrical formations. This is indicative of only one direction of flow down river as opposed to two directional tidal fluctuations.

**DISCUSSION:**

Multibeam sonar is the standard instrument in the hydrographic community with its wide data collecting swath width and high angular resolution (Anderson et. al 2008). This method is the most accurate instrument in representing seafloor models and even fishery models. This geophysical method is a very important preliminary data collection that gives scientists visualization of the seafloor or riverbed before further inquiry. Habitat conservationists use multiple maps, with multibeam bathymetry, to locate habitats and use that data to manage and preserve (Brown et. al). Danish researchers used yearly MBES scans on a shipwreck in the inlet of the Danish Wadden Sea (Ernsten et. al 2006). From the years 2002 to 2005, only three of those years had usable data (Ernsten). One year there was a storm significant enough to skew the data. Research done in the San Francisco bay aimed at creating a better technique for correcting
research vessel movement and providing smoother, "quieter" data meaning less noise (Barnard et. al 2011). This study takes place in a shallow river setting with maximum depths of approximately 13 meters. Conditions here are very quite and data had barely any noise or anomalies. Noise can originate from objects in the water reflecting MBES waves differently, or can be due to the external beams of the swath not returning or coming at a very wide angle.

Where did these barges come from? In Civil War era Waccamaw River, there were many rice plantations as seen in Figure 8. A closer look shows the research location and the three plantations in that area is the Wachesaw, Richmond Hill, and Laurel Hill Plantations. Laurel Hill plantation is directly adjacent to the bend in the river where the barges were located. James L. Michie describes the antebellum south in this location was primarily focused on the rice industry and rice mills. Laurel Hill Plantation had a rice mill on the property and would process other farmer’s rice as well as their own (Michie).

The preservation of these barges is promoted by fresh, brackish water of the Waccamaw River. Being only partially buried, there is still minor erosion going on. The large asymmetrical sand ripple bed forms indicate one direction of flow down river, transporting sediment and creating dune-like ripples. The steep face of the ripple is in the direction of flow. Due to large amounts of sediment transport, the other two barges are most likely buried. From the Wilbanks report, four barges are shown, but due to the lack of details, it is unknown whether he was trying to indicate that two were seen and two were buried. Further scans over times of high erosion rates could reveal the locations of the other barges. In figure 4 on the far left at approximately 5.5 meters deep is a 90° angle indenture in the sediment which could very well be one of the missing barges. There is also a semi-wide rectangular impression in the sediment to the right of the right most prominent barge, which could also be indicative of a buried vessel. Further research may tell.
CONCLUSION:

The usage of multibeam sonar scanning is key for preliminary research site investigation. In this study, an entire area was scanned using MBES, magnetometer, and visual archeological diving inspection. In that order, researchers are able to precisely locate areas of interest and even investigate further imagery. Multibeam bathymetry gives a clear concise map of the riverbed where two barges are clearly identified as well as the large sand ripple bedforms. The origin of these barges is suspected to be the antebellum Laurel Hill Rice Plantation due to the adjacency of the barges. These vessels were used to transport rice up and down the lower Waccamaw River neck, which used to be a popular trade route in this area in the 1800’s (Michie). Many plantation owners at that time sunk their own vessels to prevent possession by the threatening Union Army during the Civil War. In this location, further studies would include additional MBES survey during higher water levels in Collins Creek and Cow House Creek to obtain bathymetry. Also, repetitive MBES scanning of the river would further the understanding of the sedimentary morphology in this location.
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Figure 1: Above is the hand-drawn map from the University of South Carolina Institute of Archeology and Anthropology, Site Inventory Record report made by hobby diver Ralph Wilbanks on June 10th, 1982. Wilbanks denotes locations with colored in rectangles where he observed wrecks he believed looked like “barges” with other scatter sites labeled by the Wachesaw Landing point.
Figure 2: Image above is an aerial photograph of the South Carolina shoreline at Murrells Inlet. Point indicated is the Wacca Wache Marina where the research vessel put into the river to begin survey. Seen are many human developments on one side of the Wachesaw River, while there is mostly plant life and old rice farms on the west side.
Figure 3: A closer look at the aerial view of the research location, focusing on the Wachesaw River. The yellow circle designates the Wacca Wache Marina and the nearby archeological scatter site where the research vessel was put in to begin survey. The red triangles show the four wrecks in the bottom of the hand drawn maps, seen by Wilbanks. The green triangle indicates the Cowhouse Creek location where Wilbanks indicated another wreck. The blue triangle indicates the Collins Creek wreck noted by Wilbanks.
Figure 4: Located near antebellum Laurel Hill Plantation, two identifiable rectangular barge-like wrecks are seen in the Multibeam Echosounder bathymetric map overlaid upon the aerial photograph of the area. Barge number two on the right is upside-down upon diver inspection.
Figure 5: A part of the lower Waccamaw River neck is shown with MBES bathymetric data with blue showing lower depths in meters and red showing shallower depths in meters. This contains figure 4 in the lower part of the river.
Figure 6: Full backscatter data from MBES scanning of the entire research area are located on the Waccamaw River.
Figure 7: Backscatter data from the Laurel Hill barge site show two barges.
**Figure 8:** This is a hand drawn map of the plantations of the Lower Waccamaw River neck. Zoomed in is the important information to the study, with Laurel Hill Plantation just south of Richmond Hill. Richmond Hill in this figure is misspelled.
Figure 9: Hand drawn map from the book *Richmond Hill and Wachesaw: an archaeological study of two rice plantations on the Waccamaw River, Georgetown County, South Carolina* by James L. Michie. This shows Richmond Hill Plantation just south of Wachesaw Plantation and Cow House Creek.
Figure 10: Total Magnetometer data taken from the area of interest located on the Waccamaw River, in nano Teslas.
Figure 11: Magnetometer anomalies measured near Wacca Wache Marina on the Waccamaw River in nano Teslas.
**Figure 12:** Magnetometer data taken in the Laurel Hill area of the Waccamaw River in nano Teslas.
Works Cited


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