

# MARINE GEOLOGICAL EXPEDITION\*

November 13 – 18, 2003

The Institute of Marine Sciences (IMS), University of North Carolina-Chapel Hill has agreed to provide a study of marine geological processes near the *Queen Anne's Revenge* (QAR) wreck site. This study, under the Direction of Dr. John Wells, and in cooperation with Dr. Jesse McNinch, Virginia Institute of Marine Science (VIMS), is



a continuation of research conducted over the last five years and is necessary to provide a full assessment of the geophysical environment. Preliminary findings suggest that the shipwreck is lying on a scour resistant sediment layer. This layer may be interrupting a natural scour-burial process and consequently expose the site's artifacts to strong currents during storm events resulting in disturbance or loss. The proposed study is specifically designed to

examine and record the nature of sediments lying in and near QAR by using sub bottom sonar equipment (CHIRPS) in conjunction with physical sediment coring. The insight gained from this proposed work will be an important component in deciding the best course of action for preserving the artifacts in-place and scheduling their removal and restoration. This information may also be useful in predicting the exposure and long-term preservation of other wrecks in similar environments.

## *Project Elements*

**Sonar survey** - The underlying geology and sedimentary nature of the seabed surface will need to be examined in order to determine if wreck artifacts have reached a horizon where local currents can no longer effectively complete the scour and burial processes. An Edgetech Chirp (216S) seismic profiler will be used to obtain a record of the underlying stratigraphy in the immediate vicinity of the QAR shipwreck site. The chirp system, which operates at 2-15 kHz, will provide high-resolution imaging of acoustic contrasts from different sediment layers as thin as 8 cm. Specifically, the system will reveal the presence or absence of erosion-resistant strata that may retard the scour and burial cycle. The towfish will be suspended from the survey vessel's bow to minimize layback (towing) errors in



positioning. Towing will be along track lines with a maximum 25-m spacing, and horizontal positioning will be obtained with Real-time Kinematic GPS (Trimble Series 4700). Minimum survey coverage will be 9,000 square meters centered on QAR.

**Coring-** Acoustic sub-bottom profiles are especially useful when sediment cores are available to “ground truth” the interpretations. We will collect a total of 10 vibracores and 10 grab samples for textural (size) analysis. Vibracores will be taken in 6-m long thin-walled aluminum conduit, then returned to the laboratory for analysis. Although vibracoring provides remarkably undisturbed stratigraphy, penetration can be limited by resistant sediment lithologies (gravel, very compact sand, and thick shell layers). With the construction of a unipod to help maintain “suction” above the sediment water interface as the tube moves into the sediment, we anticipate being able to obtain cores that are at least 3 m long. An agreement with the US Army Corps of Engineers will provide additional cores as part of a larger Bogue Banks sand resources study. In the laboratory, each core will be cut lengthwise, visually described, subsampled at 10 cm intervals, and x-rayed. X-ray radiography provides information on sedimentary structures that can help unravel the depositional history of a wreck site and the thickness of erosion-resistant units. Pipette, wet and dry sieve analyses will delineate percentages of gravel, sand, silt and clay (the same analyses will be performed on the grab samples).

**Analysis and report** - The senior geologist will oversee the collection and processing of geophysical data and will produce a report on the results of the proposed work. While this will focus specifically on the underlying sedimentology at the site, the report will relate these findings to the overall geophysical environment within which the QAR shipwreck site has existed since its sinking. In conclusion, the report will address from a geological perspective how the site’s current situation affects long term preservation of cultural materials by discussing the nature and extent of projected natural impacts. Possible preventative or mitigative measures should also be proposed.

\* -Excerpts from the Scope of Work contract between NC Department of Cultural Resources and the University of North Carolina-Chapel Hill. Funding is being provided by the “Save America’s Treasures” grant, which is administered by the National Endowment for the Arts.