

**Sonar and Diver Analysis of Magnetic Targets**

**in the Vicinity of 31CR314**

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***Queen Anne's Revenge Shipwreck Project*** '99

in collaboration with:

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## Project Background

The *Queen Anne's Revenge* site, state archaeological site 31CR314, lies on what was once the outer lobe of Beaufort Inlet's ebb-tidal delta where ships entering the harbor were most likely to have run aground and been lost (Wells et al 2001). Extensive magnetometer surveys conducted by Intersal Inc. have identified scores of anomaly targets in this area (Masters 1996-2005) (Figure 1). Magnetic signatures and precursory diver investigations indicate that many represent cultural materials, such as historic anchors, and several potential shipwrecks (Masters 1996 - 2005). It is also possible that some targets represent debris associated with 31CR314 that arrived at its present location after the vessel's loss. It is possible that one target represents *Adventure*, lost at the same time and in the immediate vicinity of its sister ship *Queen Anne's Revenge (QAR)*. In any case, identification of associated eighteenth century materials would be extremely important to overall interpretations of the cultural activities and subsequent deterioration of 31CR314.

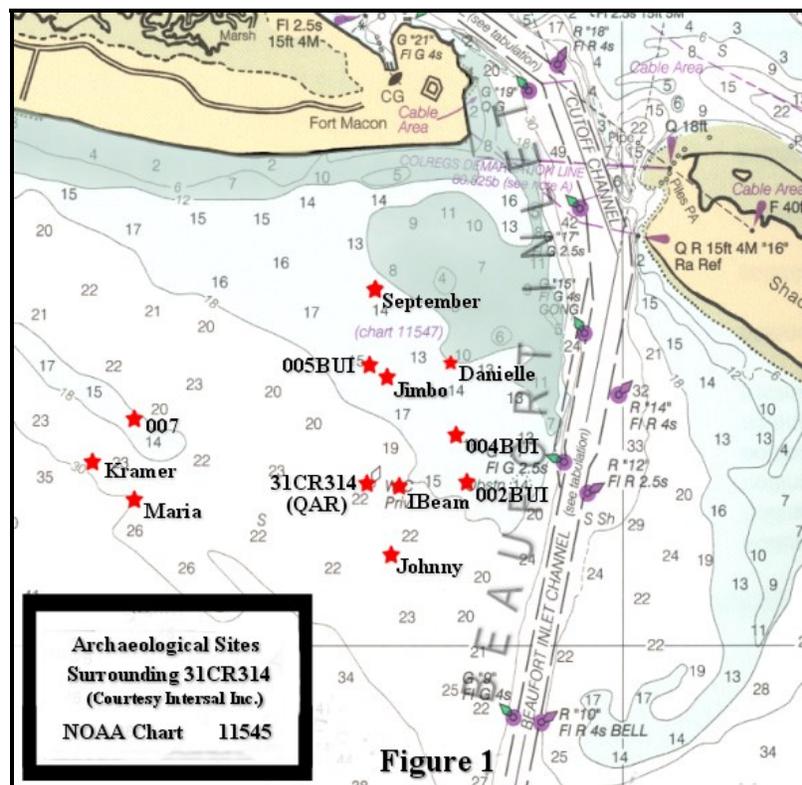


Figure 1: Map with locations of anomaly targets

Geological investigations conducted over the last ten years as part of an examination of 31CR314 have enabled marine geologists to develop a scour-burial model that predicts the

sequence of natural events that affect shipwrecks in energetic, shallow marine environments (McNinch and Wells 2001, Trembanis and McNinch 2003; McNinch et al 2006). Recent sub-bottom investigations (McNinch et al 2006: 9) and multi-beam surveys (Freeman 2005) indicate the presence of a deflated area extending shoreward in the scour-resistant paleo-terrace that underlies the debris field of 31CR314. Similar ‘wreck scours’ have been identified at another famous site, *Mary Rose*, in the Thames River (Quinn et al 1996). A 2005 multi-beam survey shows scour marks not just associated with exposed wreckage at 31CR314 but in several places removed from the site (Figure 2). Currently, there has not been an integration of sonar and magnetic data to determine their relationship, nor has a thorough investigation of the source materials of scour marks other than the one related to 31CR314.

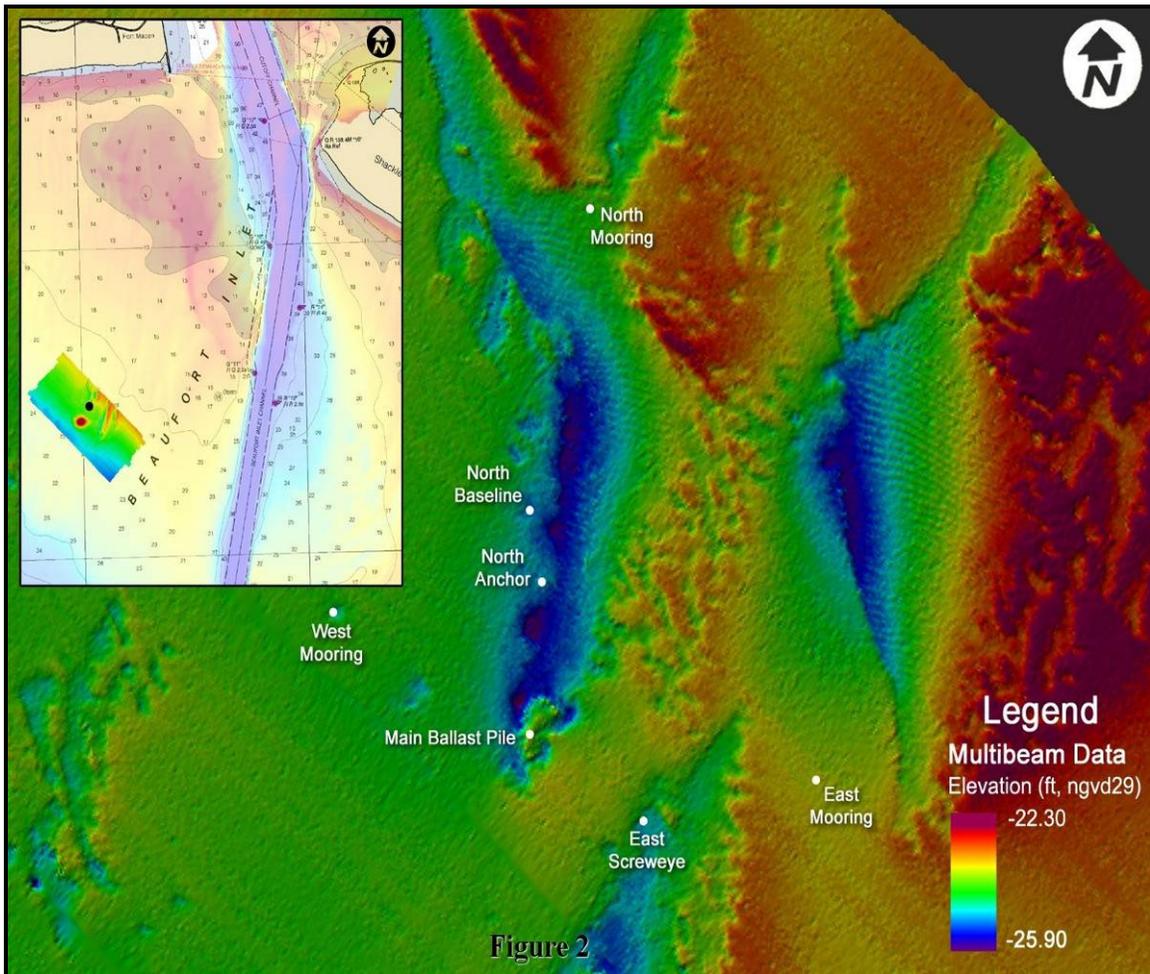


Figure 2: Scour areas around the site of *Queen Anne's Revenge*

## Project Proposal

The North Carolina Department of Cultural Resources/Underwater Archaeology Branch (UAB) under the direction of Mark Wilde-Ramsing in collaboration with UNC-Chapel Hill's Institute of Marine Sciences and the Coastal Resource Management Program from East Carolina University (ECU) proposed to meld together and focus geological and archaeological science on an historically important and time-sensitive portion of North Carolina's submerged bottom lands. This area represents the eighteenth century outer shoal of Beaufort Inlet where the *QAR* and other historically significant ships are likely to have been lost; an area that today is undergoing dramatic changes due to loss of sediment tied to inlet channel dredging at its fixed location.

The proposed research had several project objectives:

1. Initially, conduct a sonar survey to record the depth and nature of bedforms at previously recorded archaeological sites in Beaufort Inlet and to determine whether any cultural materials extended above the site and if so, ascertain their GPS coordinates. Target selection was based on magnetic significance (intensity and duration) recorded during the Intersal work and relative position with relation to the *QAR* site (within 1000 m).
2. Based on the results of the side scan sonar data survey and analysis, as well as previous diver assessment, select targets for dive examination to assess the source and character of the site and confirm its location.
3. Create a comprehensive map encompassing 1000' surrounding 31CR314 that plots magnetic survey targets, highlighting those targets where cultural materials are exposed, and paleo-scour marks from the 2006 multi-beam survey.
4. Based on these findings, provide an assessment of any relationship or lack of relationship between cultural materials to 31CR314 and cultural materials to scour marks.

## Expected Outcomes

By focusing on magnetic and scour related targets, the potential debris field deposited during the deterioration of 31CR314 will be investigated and outlying pieces of the shipwreck identified. Similarly, anomaly sites will be examined as potential remains of the *Adventure*, which sank 'within a gunshot' of *QAR*. A relationship between scour marks and the potential source creating them will also come to light if indeed it can be demonstrated that cultural materials are involved. The results of the survey will be contained in a project

report by Wilde-Ramsing and submitted to Dr. Charles Ewen as fulfillment of course ANTH 6993 and as part of overall doctoral studies in the Coastal Resource Management at East Carolina University. Findings will be shared with project archaeologists and associate geologists for integration in their on-going studies of 31CR314 and surrounding areas.

## **Field Investigations**

### *Background Research*

Prior to fieldwork, compilation of past research was necessary to determine what magnetic targets had been recorded in the vicinity of 31CR314 and the results of any site inspection that had been previously been conducted. The permit files at the North Carolina Underwater Archaeology Branch were initially examined to compile a list of targets for investigation based on past survey and diver inspections. These efforts were greatly assisted by Phil Masters, President of Intersal Inc. and his son John Masters, who graciously shared their company's research files and extensive knowledge of the area and sites based on their prior fieldwork. This background work lead to a total of thirteen anomaly targets identified as potentially significant targets for this study.

### *Survey*

Sonar survey was conducted aboard University of North Carolina at Chapel Hill research vessel *Capricorn* (Captain J. Purifoy) using an EdgeTech 4200-FS side-scan sonar with an integrated positioning system. Surveys were conducted on September 28, 2006 under the direction of Dr. Tony Rodriguez. After surveying the *QAR* site (Image 1) and sand berm area, attention was turned to specific magnetic targets designated Jimbo, I-Beam, 002BUI, and 004BUI (see Figure 1). Attempts to also gather sonar data at the Wanda site were dropped due to shallow water. After surveying several targets, the best settings for the sonar were determined to be 75m for High Frequency and 100m for low frequency. This included several passes over the *QAR* site (Image 1).

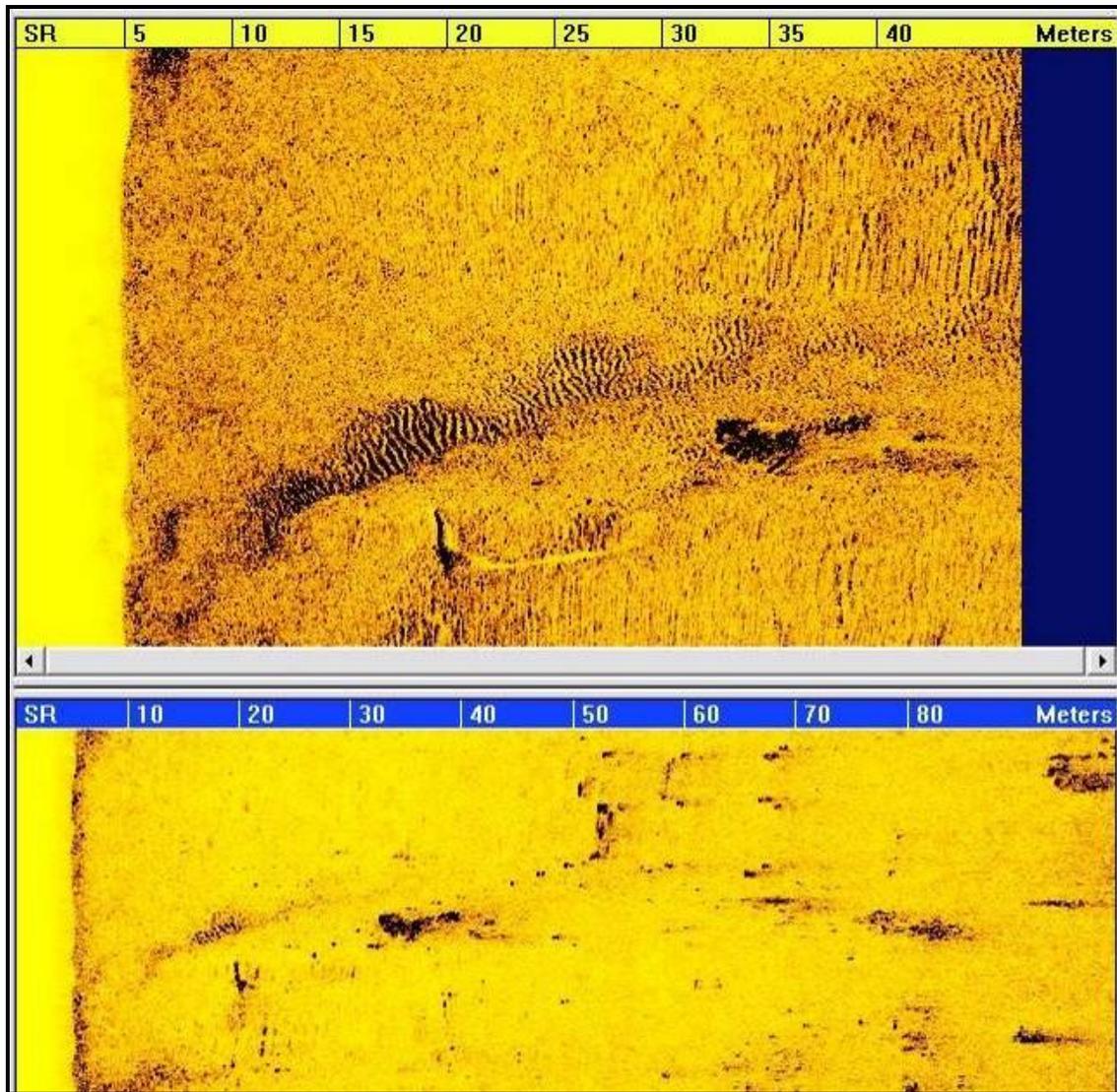
The results of the sonar survey over the four chosen targets are as follows:

Jimbo – This was the first target examined. Multiple passes detected no evidence of cultural materials extending above the bottom.

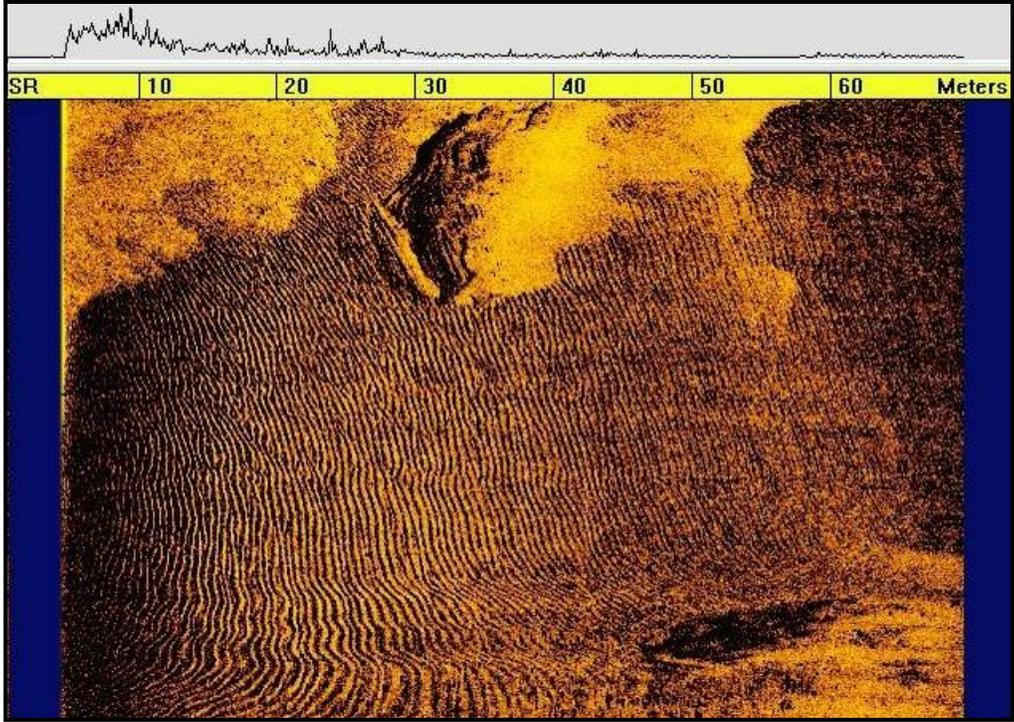
I-Beam – A number of passes were made on the numbers given for I-Beam but no evidence of debris was seen extending above the bottom.

004BUI – This target produced a very clear large linear feature composed of long thin debris. The site was located on the edge of a sand ridge exhibiting sand waves. Approximately, 60 feet in a northeast direction appears to be additional wreckage. (Image 2)

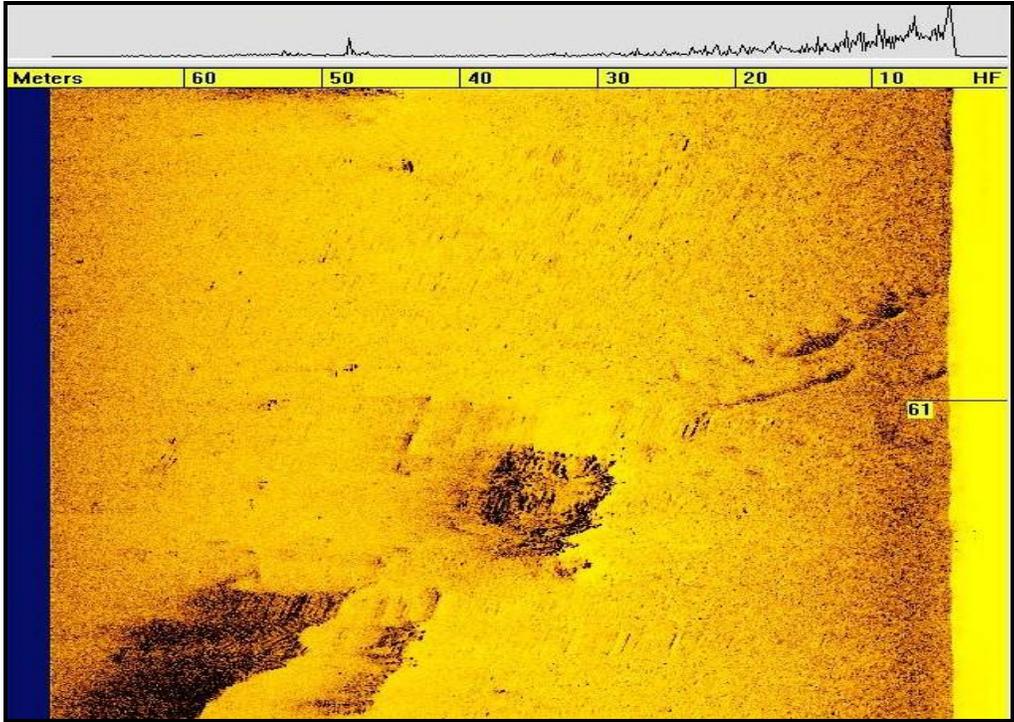
002BUI – A large round shaped debris field on a relatively featureless seabed was detected. The curious linear features nearby are unexplained. (Image 3)



**Image 1: Side-Scan Sonar recording depicting *Queen Anne's Revenge* Wreck Site**



**Image 2: Side-Scan Sonar depiction of 0004BUI Site**



**Image 3: Side-Scan Sonar depiction of 0002BUI**

### *Target Investigation*

Diver inspection was planned for October 16 – 20<sup>th</sup>, 2006, however October 18<sup>th</sup> and 20<sup>th</sup> were lost due to inclement weather. The research vessel was *Bette G* (Captain E. Diaddoria) from ECU with divers John Masters, Lauren Hermley and Mark Wilde-Ramsing. The dive plan prepared for the UAB dive safety officer is attached to this report. A hand-held magnetometer was used to relocate targets since all reportedly had ferrous components. Divers made brief site inspections to confirm the existence of cultural debris, its nature and extent protruding above the seabed. At two sites (005BUI and I-Beam) water-jet probing was attempted without success due to equipment failure and unworkable sea conditions. A brief activity log is as follows:

Monday, October 16, 2006 – Met at the NC Marine Fisheries, Morehead City at 9am and head out to Beaufort Inlet. Buoys were dropped on the numbers for three sites – Danielle, Julep and Bucy. At each site an attempt was made to relocate the source of the target using a hand-held magnetometer. The only success was at Danielle where the buoy was moved over a distinct magnetic target. Currents very strong and therefore operations moved to 004BUI. Later in the afternoon investigation focused on the I-Beam site.

Tuesday, October 17, 2006 – Met at the US Coast Guard Fort Macon Facility at 7:30 am and soon got underway. Put buoys out on 005BUI, Jimbo and I-Beam sites. Hand held magnetometer used to located cultural debris at both sites. Attempts to probe at 005BUI were thwarted due to currents and then pump failure. Divers further investigated Jimbo but the sea state soon became unworkable. Leave site at noon and return to dock.

Thursday, October 19, 2006 – Left NCMF dock at 7:30 am and made another attempt to investigate Danielle but were unsuccessful due to strong currents. For most of the day we spent time helping out at *QAR* site. At the end of the day we briefly investigated the I-Beam site before heading back to the dock at 4:30 pm.

Results of the target inspection are as follows:

I-Beam site [34 40.516 - 76 40.858] - The measured depth was 22 feet and it was represented by a 10-foot piece of channel metal sticking straight up out of the bottom 21 inches high. It is associated with more debris on the offshore side buried a couple of feet below the seabed.

Jimbo site [34 40.887 - 76 40.943] - The seabed depth measured 17 feet below sea level and was found to be a large rectangular machinery, possibly a steam winch and if so, likely to date to the late nineteenth/early twentieth centuries. The approximate

measurements were not recorded at the site but the object was approximately 8 feet by 5 feet and rose 3 feet above the surrounding seabed. This site and 005BUI located a short distance away may be part of the same shipwreck.

005BUI [34 40.409 - 76 40.839] – This site was listed also as a component of the Jimbo site and after checking records was found to be the same site designated 005BUI during Intersal's 1996 investigations. At a depth of 17 feet a large metal plate was found laying flat just below the surface.

Danielle [34 40.915 - 76 40.629] – Located in 15 feet of water fast moving currents, the target source lying beneath unconsolidated sand could not be assessed using available equipment.

004BUI [34 40.632 76 40.574] – This site lies in 20 feet with wreckage extending up to 5 feet off the bottom. It was made up of 3 foot lengths of railroad iron. The wreckage is approximately 77 feet in length and 24 feet wide. This is probably the ship *L. A. Bailey* lost while entering Beaufort Inlet carrying a load of railroad iron in 1870.

002BUI [34 40.510 76 40.400] – This site is likely the schooner *Louise Howard* lost while attempting to enter Beaufort Inlet in 1921 with a cargo of rock for jetty construction. The exposed debris field consists of rock boulders, chain and ship's rigging elements approximately 40 feet by 15 feet.

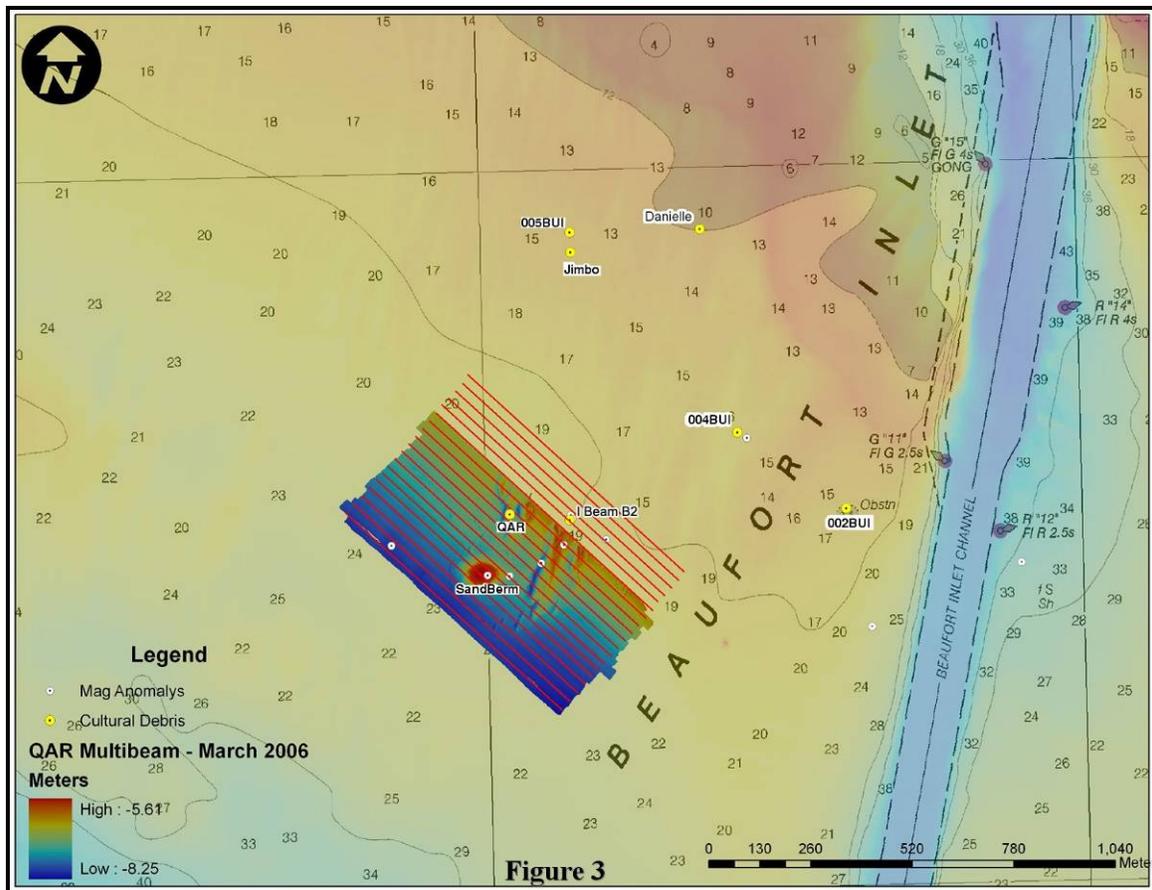
### **Project Summary**

During the project four sites were surveyed with side-scan sonar, which revealed that two sites, 004BUI and 002BUI, displayed extensive debris extending above the seabed. Two other targets, I-Beam and 005BUI/Jimbo, were found by divers to have a small amount of cultural materials extending above the bottom, which were either too small to be detected during the sonar survey or the original site positions were not accurate. A sonar survey was not conducted at a fifth target (Danielle) due to shallow depths. A magnetic presence using a diver held metal detector was confirmed, however, strong currents hampered further investigations.

The results of the survey dismissed three targets, 002BUI, 005BUI/Jimbo, and I-Beam, as consisting of post-eighteenth century materials and thus do not represent the sister ship *Adventure*. While the main part of 004BUI is nineteenth/twentieth century, the second component detected on the sonar survey was not diver investigated and therefore warrants further assessment to determine its potential source. The same goes for the Danielle site,

although strong currents make this site difficult to explore, especially since the remains appear to be deeply buried.

Finally, in terms of a correlation between seabed features and cultural remains, findings were not conclusive. The main shortcoming was that the geographical extent of the existing multi-beam survey was limited and did not extend to any of the targets investigated. (Figure 3). It is recommended that the next survey be expanded. Ultimately, if high resolution side-scan sonar data is integrated with multi-beam surveys and diver confirmed cultural assessments, a better understanding of how natural forces react to cultural debris and how they are expressed in the surrounding geomorphology is likely to be achieved.



**Figure 3: QAR Multi-beam Survey**

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