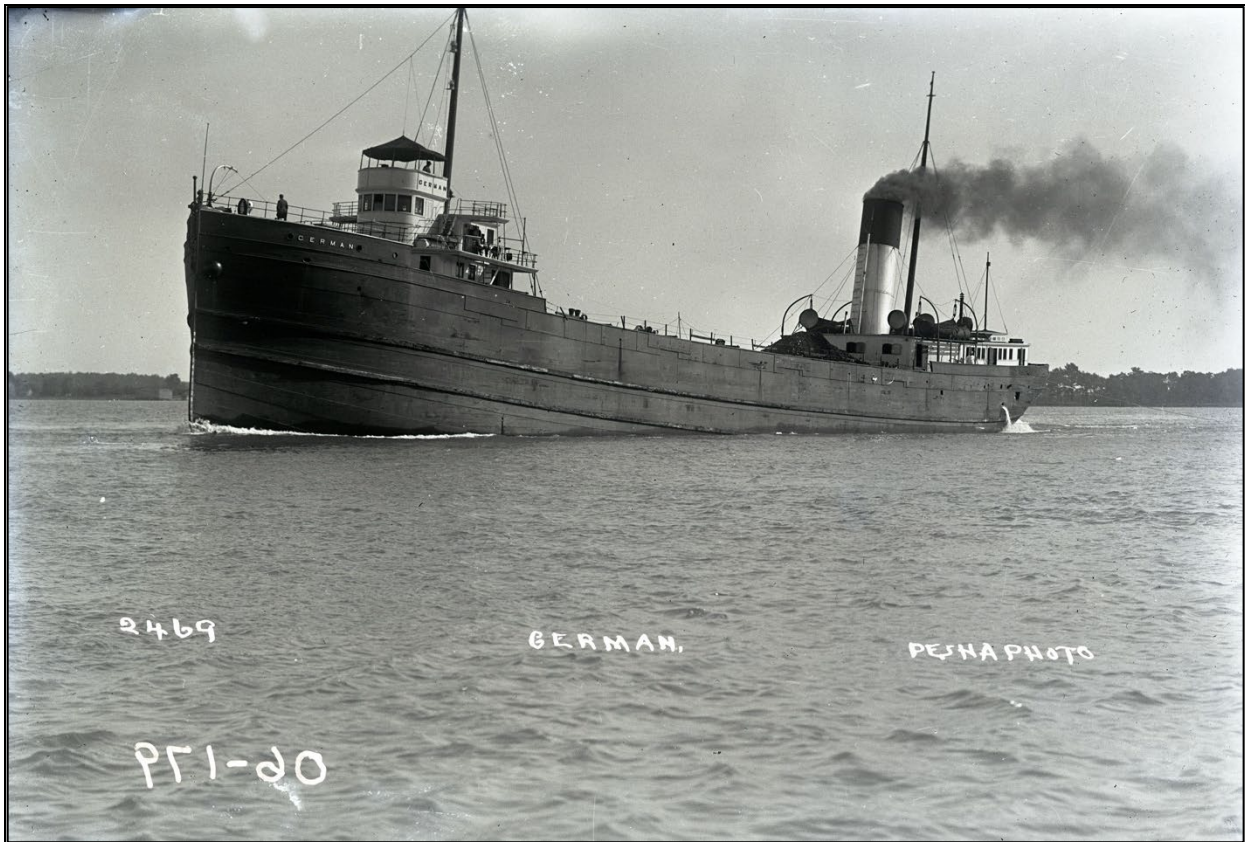


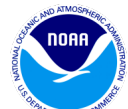
New York Collaborative Archaeological Survey



US Department of the Interior
Bureau of Ocean Energy Management
Office of Renewable Energy Programs



NATIONAL
MARINE
SANCTUARIES



US Department of Commerce
National Oceanic and Atmospheric
Administration

New York Collaborative Archaeological Survey

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Authors:
William Hoffman
Joseph Hoyt
William Sassorossi

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By:

BOEM's Office of Renewable Energy Programs
45600 Woodland Road, Sterling, VA 20160

and

NOAA's Office of National Marine Sanctuaries
Monitor National Marine Sanctuary
100 Museum Drive, Newport News, VA 23606

DISCLAIMER

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ABOUT THE COVER

German (Yankee) - Monochromatic glass-plate negative from the studio of Louis James Pesha depicting the bow and port side of the freighter *German*, under steam (Detroit Historical Society).

ACKNOWLEDGMENTS

The *New York Collaborative Archaeology Survey* represents the fifth in a series of successful research studies conducted by the Bureau of Ocean Energy Management (BOEM) and the National Oceanic and Atmospheric Administration's (NOAA) Monitor National Marine Sanctuary, along with other partners. These field studies are designed to survey and ground truth potential archaeological sites to support environmentally responsible renewable energy development on the Atlantic Outer Continental Shelf (OCS). These studies follow a model—first tested and vetted offshore Massachusetts and reported in *Collaborative Archaeological Investigations and Sound Source Verifications within the Massachusetts Wind Energy Area*—that relies upon federal and state agencies, university partners, and others working together. Previous partnerships with NOAA under this framework include the *Virginia Collaborative Archaeological Survey*, the *Maryland Collaborative Archaeological Survey*, the *North Carolina Collaborative Archaeological Survey: Kitty Hawk Wind Energy Area*, and the *North Carolina Collaborative Archaeological Survey: Wilmington East and West Energy Areas*. These reports are available at: <https://www.boem.gov/renewable-energy/state-activities/completed-studies>.

Like its predecessor studies, this survey is the result of the concerted efforts of many individuals and organizations who brought to the project the necessary instruments, field equipment, dive operations support, and knowledge to ensure a safe, successful field season. Without committed individuals and their contributions, none of these studies would have been possible.

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List of Abbreviations and Acronyms

3D	three-dimensional
ASD	Atlantic Shipwreck Database
AWOIS	Automated Wreck and Obstruction Information System
BOEM	Bureau of Ocean Energy Management
CSI	University of North Carolina Coastal Studies Institute
DOI	US Department of the Interior
ECU	East Carolina University
ESPIS	Environmental Studies Program Information System
ft	feet
m	meters
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
OCS	Outer Continental Shelf
RGB	Red, Green, Blue
UAB	Underwater Archaeology Branch
UD	University of Delaware
WEA	Wind Energy Area

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1 Introduction

With the passage of the Energy Policy Act of 2005, the Bureau of Ocean Energy Management (BOEM) acquired regulatory authority for renewable energy activities on the Outer Continental Shelf (OCS), including wind energy development. As part of this responsibility, BOEM conducts detailed environmental analyses of projects proposed for development. The potential direct, indirect, and cumulative impacts on the human, coastal, and marine environments must be evaluated for BOEM to make environmentally sound decisions about managing renewable energy activities and developing mitigation measures to avoid or minimize impacts.

BOEM's overarching strategic goal is to achieve expeditious and orderly development of energy resources while minimizing impacts on the environment. BOEM accomplishes this goal, in part, by developing and employing sound science and partnerships. As such, BOEM unites its need to gather baseline data with efforts to leverage partnerships with other federal agencies, state agencies, universities, and tribal governments. Doing so creates efficiencies in BOEM's processes; reduces expenditures; builds relationships that will extend these efficiencies and cost reductions into the future; and provides needed data to inform sound decision-making in the present.

BOEM has issued a commercial wind energy lease offshore New York (OCS-A 0512) and, at the time of this study, was planning for additional areas suitable for wind energy development within the New York Bight (Figure 1). BOEM has a need for baseline archaeological data within wind energy areas in order to make sound decisions about how to minimize impacts, to form post-construction comparisons during monitoring of environmental changes that might be discernable later, and to assist in meeting the bureau's responsibilities under Sections 106 and 110 of the National Historic Preservation Act (NHPA) and the National Environmental Policy Act (NEPA). Identified geophysical targets (e.g., side-scan sonar contacts and magnetic anomalies) in these areas may prove to be archaeological resources that should be avoided, or they may prove not to be resources and therefore should not prevent development within a specific area of the seafloor. Archaeological identification and ground truthing of these targets is necessary for informed, responsible decision-making and to assist BOEM in considering the effects of its undertakings subject to review under the NHPA and NEPA.

To meet these needs, BOEM invited the National Oceanic and Atmospheric Administration (NOAA) to collaborate via an Interagency Agreement to conduct a baseline archaeological survey in the vicinity of the New York Bight Lease and Call Area. NOAA provided scientific and technical services, shared its resources, and assisted BOEM with conducting and analyzing the resulting data. This partnership afforded both BOEM and NOAA a unique opportunity to share equipment and expertise for mutual benefit. BOEM and NOAA finalized a research design, collaboratively performed the survey and investigations, analyzed results, and produced this jointly authored report.

A single technical Appendix was prepared to supplement this report. It contains sensitive information pertaining to the location of potential archaeological resources identified during this survey. In order to protect the locations of potential archaeological resources, the technical Appendix is not included in the publicly available version of this report.

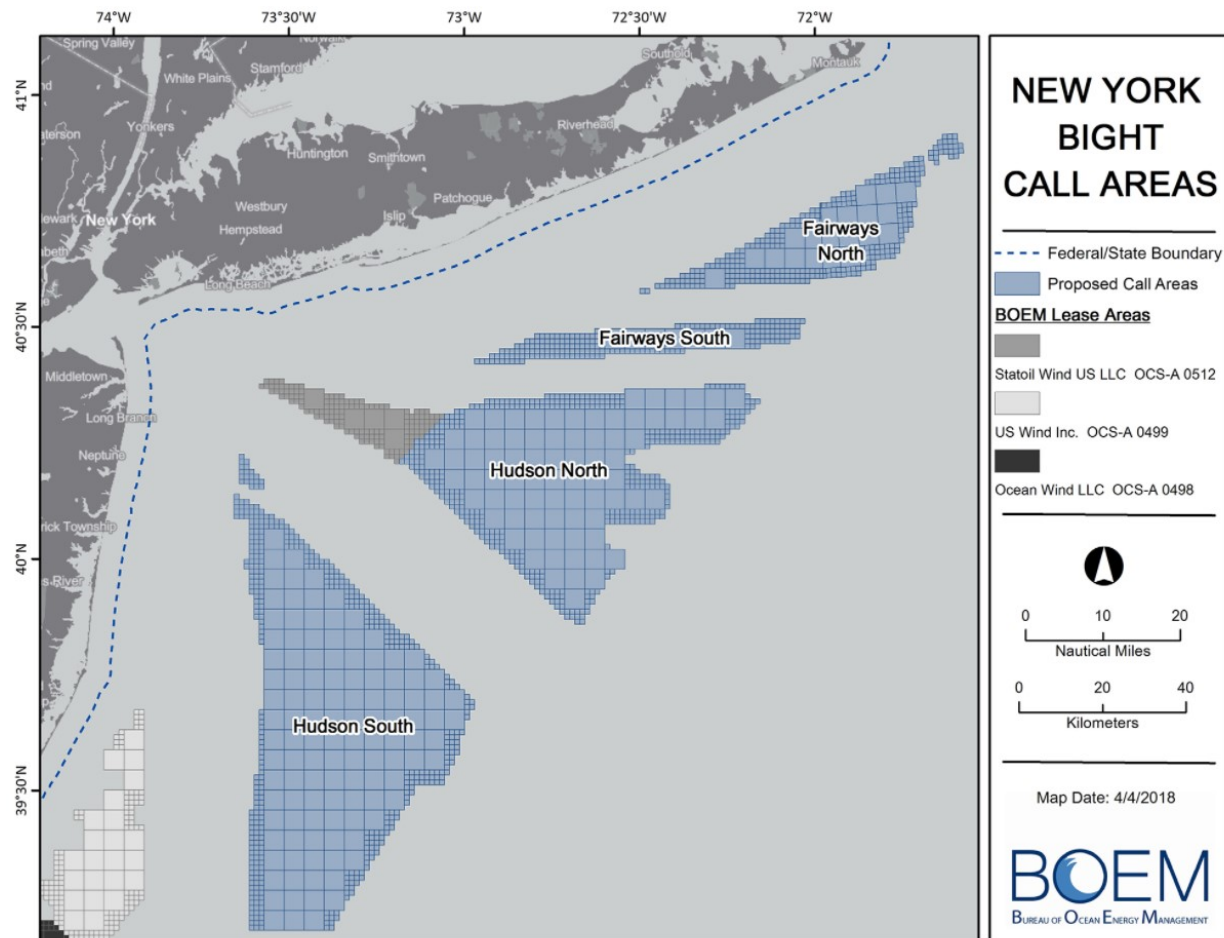


Figure 1: Location of New York Bight Lease Area and Call Areas (2019).

1.1 Objectives

The goal of the 2019 project was to obtain baseline archaeological data within and adjacent to the New York Lease Area and Call Areas to inform future decision-making. This goal was achieved by conducting side-scan sonar surveys, followed by ground-truthing, via diver-based investigation, of selected targets of archaeological interest. The primary objective was to determine if geophysical survey targets represent archaeological sites, and, if so, to gather additional documentation to assist in considering their eligibility for listing in the National Register of Historic Places. BOEM and NOAA worked together to achieve these goals and objectives, performed the surveys and investigations necessary to obtain data and analyze results, documented herein.

The 2019 project leveraged the results of a reconnaissance-level geophysical survey conducted under separate BOEM studies. The *Comprehensive Seafloor Substrate Mapping and Model Validation in the Atlantic* study (Battista et al. 2019), conducted via a separate Interagency Agreement between BOEM and NOAA, National Centers for Coastal Ocean Science (NCCOS), included a multibeam echosounder survey within the New York Lease area conducted from NOAA ship *Nancy Foster*. Although not designed as an archaeological investigation cruise, the NCCOS reconnaissance survey identified potential archaeological

targets warranting further investigation. The 2019 archaeological survey additionally investigated potential site locations reported in BOEM's Atlantic Shipwreck Database (ASD) (TRC 2012).

The New York Bight Collaborative Archaeological Survey was conducted during summer 2019. Designed as an archaeological investigation cruise, the survey collected acoustic data as well as performed diver investigations with photography, videography, and other forms of documentation, as appropriate, on selected geophysical targets with archaeological potential.

1.2 Research Design

The research goals of the project were twofold: (1) determine if previously identified remote sensing targets represent archaeological resources, and if so, (2) conduct an initial assessment and documentation to inform future investigations and to provide preliminary consideration regarding a site's potential eligibility for listing in the NRHP. The targets investigated were prioritized according to the following:

- First priority targets included potential shipwreck locations within the New York Lease Area identified during the NCCOS multibeam survey conducted from NOAA ship *Nancy Foster* (Battista et al. 2019).
- Second priority targets included unconfirmed site locations reported in the vicinity of the New York Lease and Call Areas from BOEM's ASD.

1.3 Scope and Limitations

This project was not designed to represent a comprehensive investigation, and therefore should only be considered as a preliminary baseline assessment upon which future investigations may be based. Furthermore, this investigation does not replace the need for additional site-specific archaeological identification surveys to take place prior to future renewable energy development within the New York Lease Area and adjacent Call Areas.

As with any project, certain limitations are expected and accounted for in preparing the expedition. Fiscal constraints limited the amount of time and the availability of resources, which ultimately governed the duration of the project. It was not expected that all potential targets would be ground-truthed; therefore, targets were prioritized to ensure that areas with the highest archaeological potential were investigated. The order of investigation for individual sites within these priority categories was determined in the field based on sea state, weather conditions, target depth, and distance between targets to most efficiently investigate as many sites as possible within the fieldwork window.

Additionally, working in the underwater environment poses certain limitations. Weather and sea state conditions offshore New York vary greatly, and days of inactivity were anticipated and accounted for during the survey effort. Visibility ranged from zero to more than 5 meters (m) (15 feet [ft]). These factors produced differing degrees of in-water efficiency from day-to-day. Furthermore, the depth of many of the sites, which ranged roughly from 15.2 to 33 m (50 to 110 ft), limited the amount of time spent on any site. Finally, target investigation was limited only to exterior observations of archaeological sites. The research team did not conduct any activities that would impact a site in any way. This precluded establishing permanent baselines, recovering artifacts, or disturbing anything on-site.

1.4 Personnel and Roles

The following individuals participated in the investigation:

- Kevin Beam – University of Delaware (UD): Captain
- William Hoffman – BOEM: Co-Principal Investigator
- Joseph Hoyt – NOAA: Co-Principal Investigator
- John McCord – CSI: Photography and Videography
- Jason Nunn – CSI/ECU: Diving Safety and Logistics
- Will Sassorossi – NOAA: Co-Principal Investigator

2 Methods

2.1 Scientific Diver Investigation

Fieldwork consisted of at-sea operations from the UD R/V *Joanne Daiber*, a 14-m (46-ft) research vessel which provided the platform for diving operations (Figure 2). Onshore operations were staged out of Freeport, New York.

The methodology for diver investigations consisted of the direct visual inspection of targets by scientific divers to ground-truth the remote sensing data and determine if targets represent archaeological resources. Diving operations were conducted in a “live boat” mode. This method eliminated the need for, and mitigated the possible impact of, anchoring into an archaeological resource. If, upon inspection by scientific divers, a target was determined to not be archaeological in nature, no additional investigation was conducted. If, however, targets were confirmed as archaeological resources, the following protocols were employed to guide additional documentation and assessment. The protocols were designed to provide flexibility and adaptability based on the nature of the individual site under investigation.

To achieve the project objectives, the following protocols were followed at each target:

- Conduct diver investigation to confirm the presence or absence of an archaeological site;
- Perform a rapid visual assessment of each target that is confirmed to be an archaeological resource;
- As conditions allow, produce a cursory photogrammetric model of each confirmed archaeological resource for interpretation and use in potential follow-up inquiries;
- As conditions allow, conduct additional video and photographic documentation of the site;
- Identify to what degree archaeological site preservation is influenced by environmental conditions, site formation processes, and anthropogenic impacts;
- Assess the historical significance and integrity of each confirmed archaeological resource;
- Determine whether the archaeological resource warrants further investigation; and
- If possible, determine if any confirmed archaeological resource possesses the characteristics of significance making it eligible for listing in the NRHP.



Figure 2: University of Delaware's R/V Joanne Daiber. Image courtesy UD.

2.2 Photogrammetry

This project utilized photogrammetry for rapid documentation of archaeological sites. Photogrammetry is a scientific process in which photographs are digitally combined to create detailed and measurable three-dimensional (3-D) models. Photogrammetric models were created on several of the identified shipwreck sites yielding accurate 3-D models that are valuable for research, education, and outreach. The photogrammetric process is similar to creating a photomosaic. Divers using digital, single-lens reflex cameras equipped with wide-angle rectilinear lenses in underwater housings take photographs of the shipwreck site or feature in a systematic manner. Overlapping photographs are taken in succession, capturing the subject from all angles. After image color correction and processing, photographs are then exported into high resolution .jpg or .tiff files and imported into the photogrammetry software.

Agisoft's Photoscan Pro was used to process the photogrammetric models created for the project. After importing the photographs, Photoscan Pro aligns the photos in 3-D space, matching similar features in each of the photos and assigning X, Y, and Z coordinates to the images. In addition, a sparse point cloud is produced creating a rough 3-D image (Figure 3).

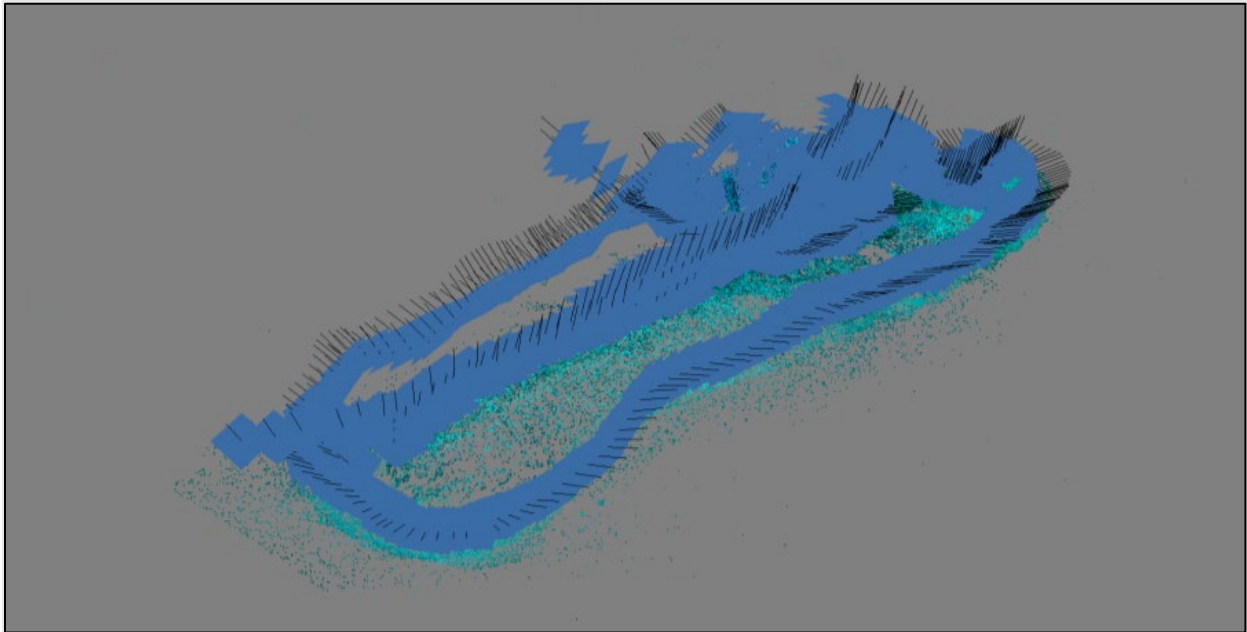


Figure 3: Example of a sparse point cloud during processing of a photogrammetric model. The blue squares indicate the location of each individual photograph taken of the site.

After the images are correctly aligned, the next step in model construction is the creation of a dense point cloud (Figure 4). The point cloud is created in 3-D space, based on the aligned photographs, and their matching features. The resulting dense cloud is made up of numerous points, often as many as several million, each with their own Red, Green, Blue (RGB) and luminance value. Following dense cloud creation, the next phase of the workflow includes building the model mesh, or wireframe. Connecting the dense point cloud into a series of polygons creates the mesh. The polygons create a solid surface on which the photo texture can be applied. Edits of the mesh, including mesh decimation of outlying mesh and closing of mesh holes, can be done at this stage.

Finally, after all steps have been executed, a photo texture is applied and wrapped over the solid surface. The high-resolution photo texture is created from the aligned photographs and provides accurate photorealistic detail on top of the 3-D model. If gaps in the data are observed, they can be re-photographed on subsequent dives to ensure total coverage. Once a 3-D model is created, accurate measurements can be taken after producing a digital scale bar from a known measurement or providing a physical scale bar within the photos. The ability to take measurements and compare meshes between models made at different times allows one to track site change over time and is a valuable tool in site monitoring and management. Photogrammetric models are additionally valuable education and outreach tools, as they provide an accessible way for the public to experience sites in an immersive and interactive 3-D way.

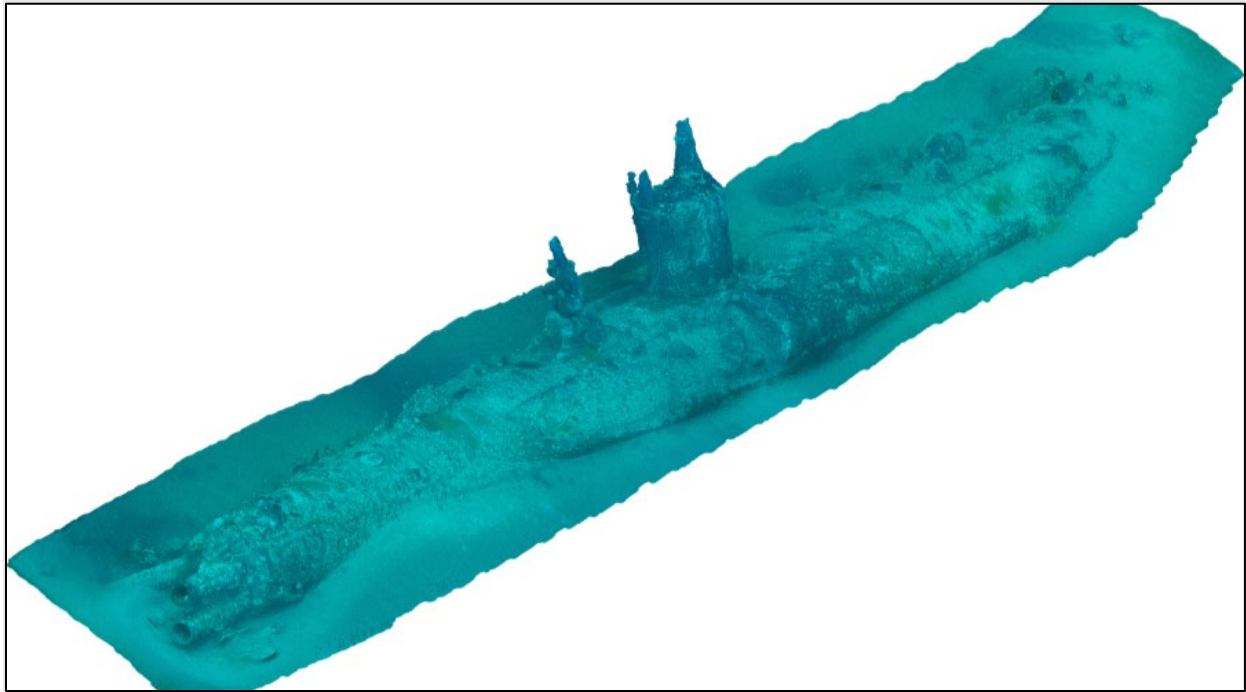


Figure 4: Example of a dense point cloud created during processing of a photogrammetric model of German U-boat.

2.3 Side Scan Sonar Survey

The survey utilized a Klein 3000 side-scan sonar operating at a frequency of 100/600 kilohertz (kHz) to acquire acoustic imagery at potential site locations. Sonar data were acquired using Sonar Pro and processed in SonarWiz. Navigation information was input from a Trimble GPS unit mounted at the sonar tow point on the vessel's A-Frame. The sonar was towed at a speed that varied between 3 to 5 knots (kt).

3 Results

Field operations were conducted July 25 through August 9, 2019. The study sites, for the purposes of this report, are presented in two sections: potential sites located during the 2019 NCCOS survey and reported sites from the BOEM Atlantic Shipwreck Database. The results of these investigations are detailed below.

3.1 NOAA NCCOS Study Sites

The NCCOS survey identified seven potential shipwreck sites (Battista et al. 2019). These potential sites had not been previously documented or investigated by archaeologists. As these targets have a high degree of positional accuracy, the archaeological investigations conducted under this study focused on in-water documentation to determine if the sites represent shipwrecks and, if so, to gather information to assist in identifying the sites and considering their eligibility for listing in the National Register of Historic Places.

3.1.1 Potential Wreck 1

On July 28, 2019, one dive was made by Nunn and Hoffman on the coordinates provided from the multibeam survey of a target designated as Potential Wreck 1, which was noted as a potential ballast scatter

or possible shipwreck site (Figure 5). Following an orderly search, the dive investigation resulted in no observed evidence of any potential cultural remains. On August 6, 2019, the research team returned to the coordinates to make multiple side-scan sonar passes over the target area (Figures 6 and 8). Using a 100-m range with the side scan-sonar, the resulting information did not identify any evidence resembling the results from the previous multibeam survey. As observed by the divers (Figure 7), the location included an extensive patch of common sand dollar (*Echinarachnius parma*) which may have caused the seafloor reflectivity imaged in the previous multibeam survey. No cultural materials were identified at this location.

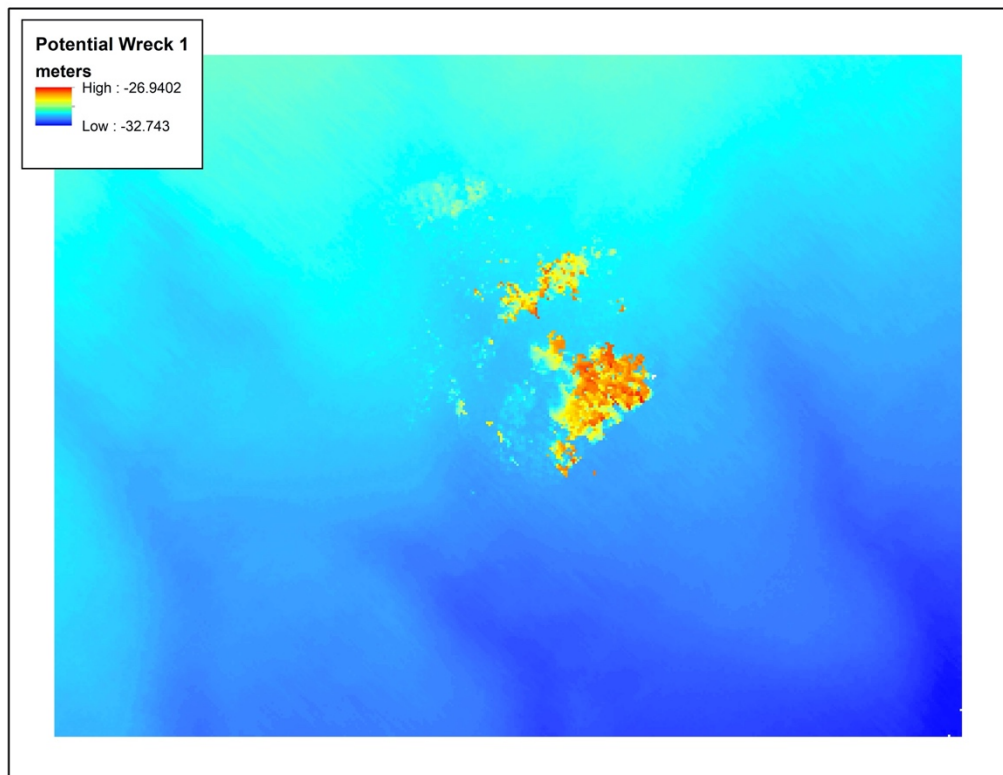


Figure 5: Multibeam Imagery of Potential Wreck 1 (NCCOS).

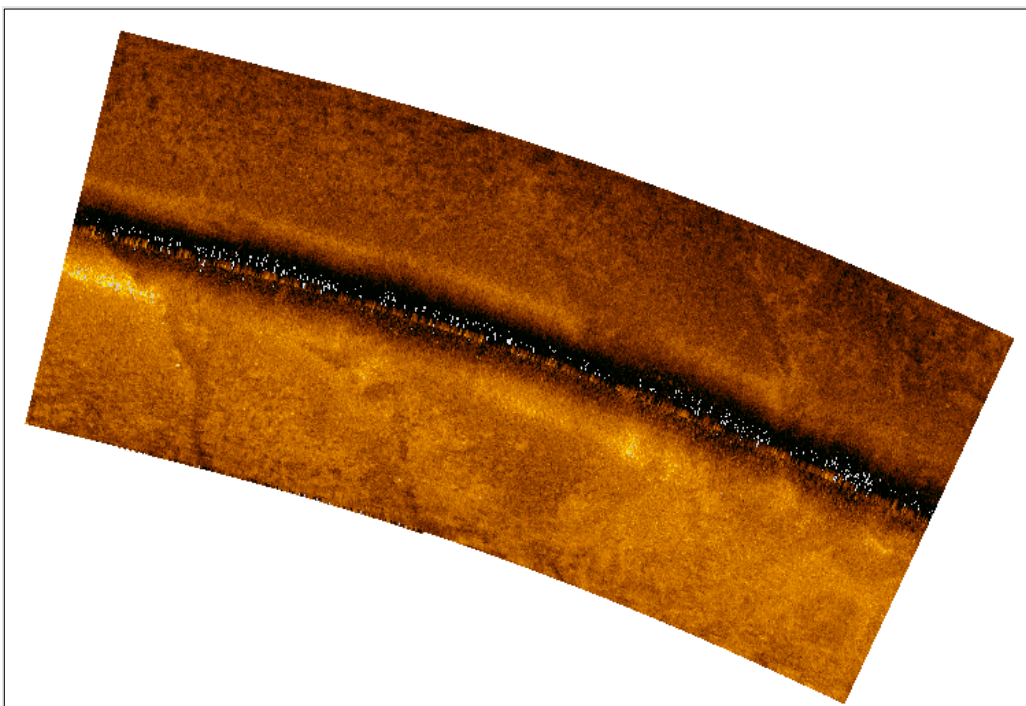


Figure 6: Side scan sonar image of Potential Wreck 1 location.



Figure 7: Image of Seabed at Potential Wreck 1 location.

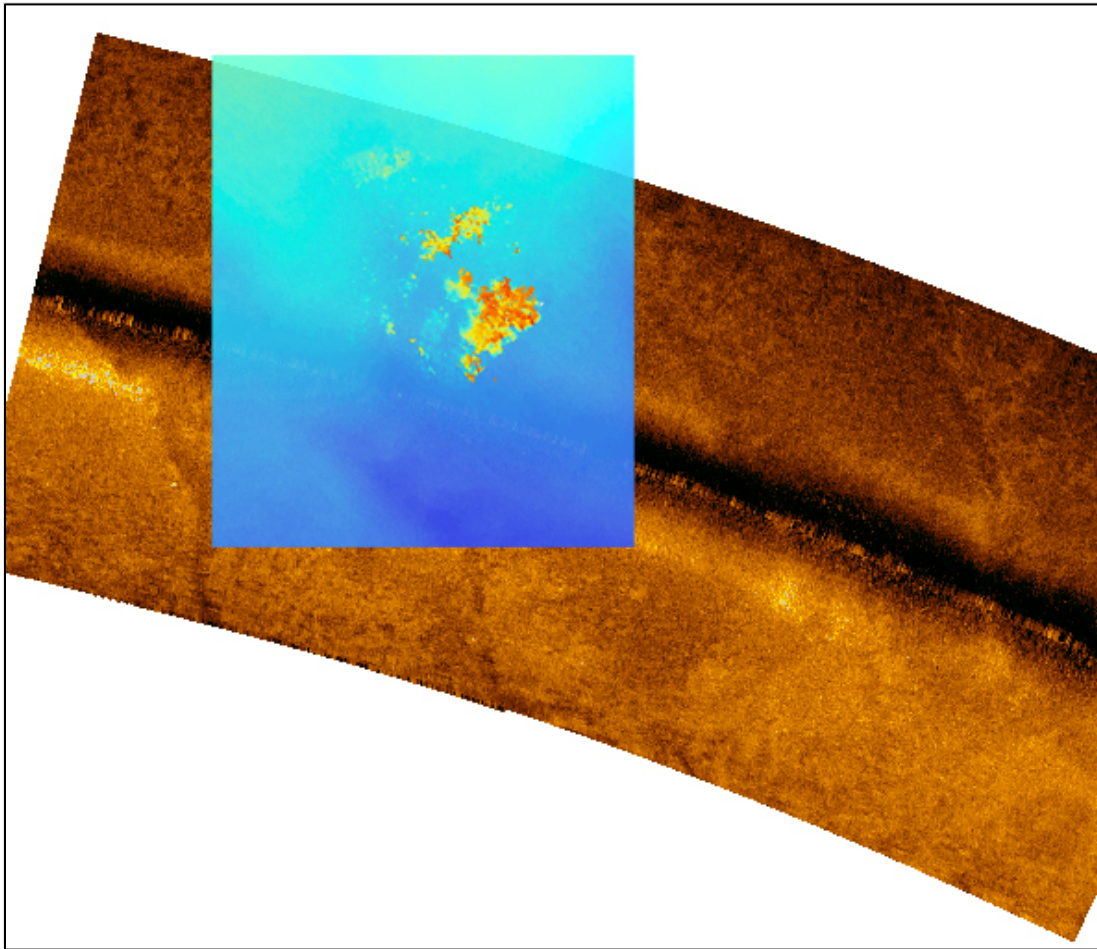


Figure 8: Overlay of NCCOS multibeam data on side-scan image collected by survey team at Potential Wreck 1.

3.1.2 Potential Wreck 2

On July 27, 2019, one dive was made on the coordinates provided from the multibeam survey on a target designated as Potential Wreck 2 by Hoyt, McCord, and Hoffman. Similar to Potential Wreck 1, the NCCOS survey noted this area of limited relief as a possible ballast scatter or shipwreck (Figure 9). Following an orderly search, the dive investigation resulted in no observed evidence of any seafloor relief or potential cultural remains. Side-scan sonar data was not acquired at this site. With the inability to locate visible remains, either cultural or geological during the dive investigation, it was concluded that an archaeological site is not present at this location and that the area may represent seafloor reflectivity caused by biological materials. However, an additional remote sensing survey is recommended to confirm.

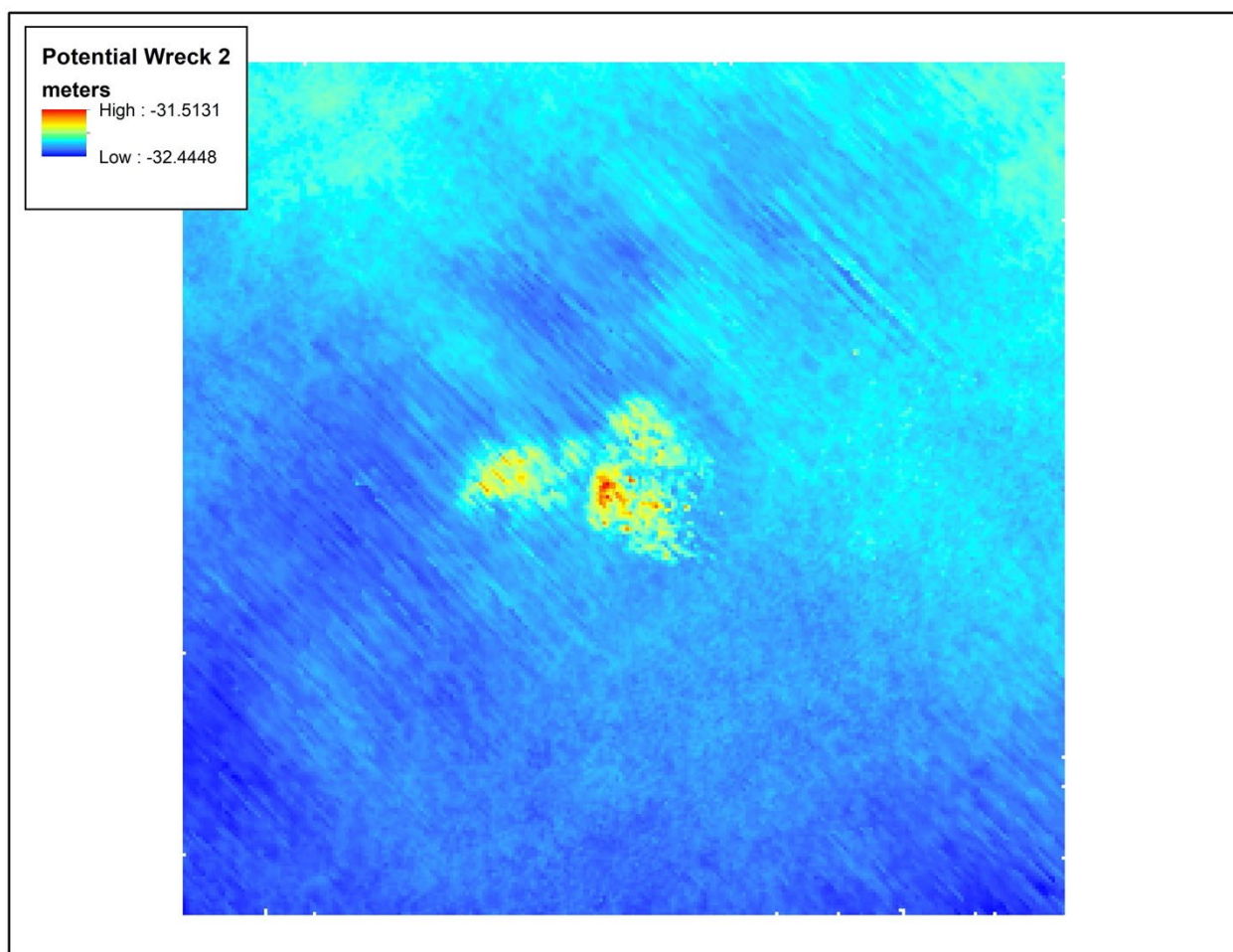


Figure 9: Multibeam Imagery of Potential Wreck 2 (NCCOS).

3.1.3 Potential Wreck 3

On July 29, 2019, one dive was made by Sassorossi and Hoffman on the coordinates provided from the multibeam survey of a target designated as Potential Wreck 3. The target was identified during the previous survey as a discrete area of limited relief possibly indicating the presence of a ballast pile or shipwreck site (Figure 10). Following an orderly search, the dive investigation resulted in no observed evidence of any seafloor relief, cultural or geological in nature, and no potential cultural remains were identified. On August 6, 2019, the research team returned to the coordinates to make multiple side-scan sonar passes over the target area (Figure 11). Using a 100-m range with the side-scan sonar, the resulting information could not determine any evidence resembling the results from the previous multibeam survey (Figure 12). In summary, one dive investigation and multiple passes of side-scan sonar operations over the coordinates were unable to locate any cultural remains. No archaeological materials were identified at this location.

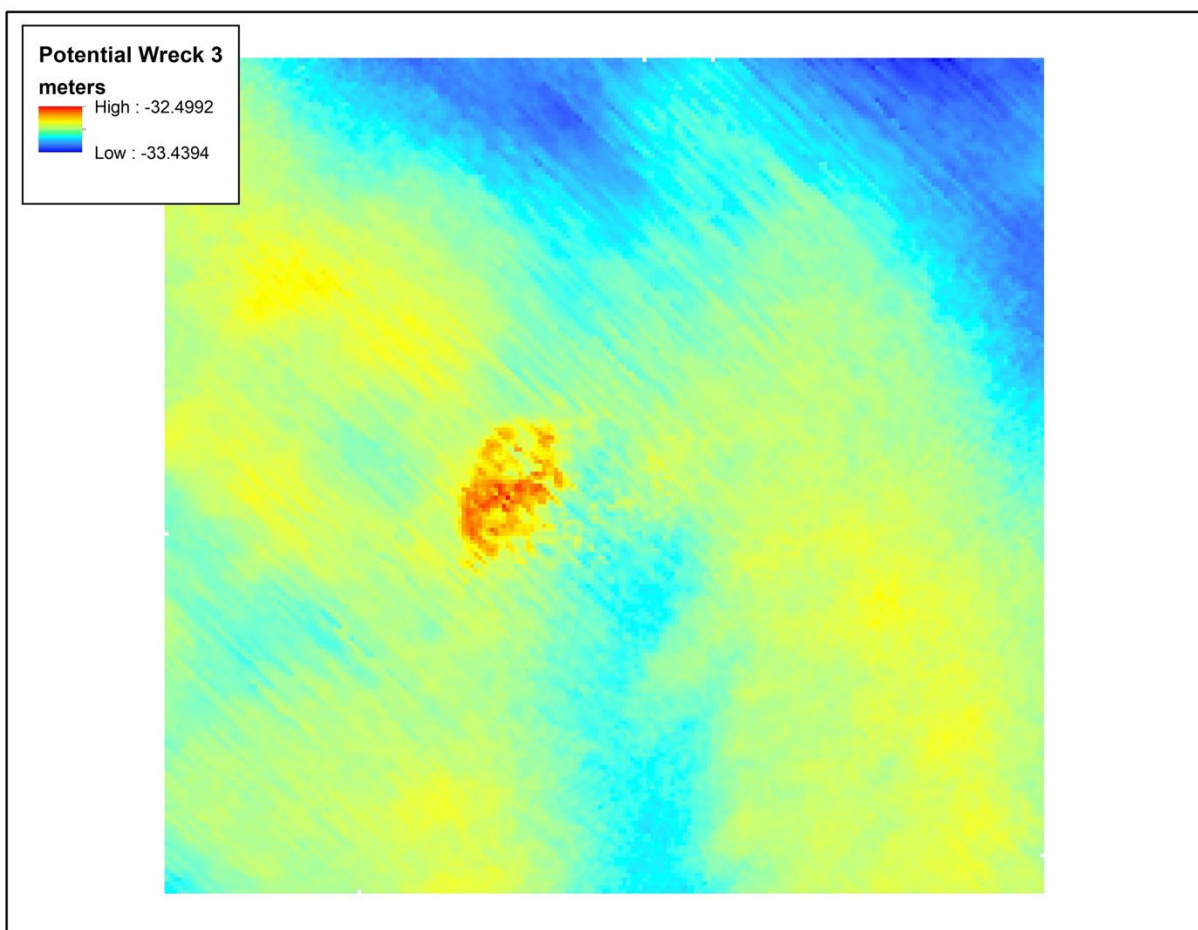


Figure 10: Multibeam sonar image of Potential Wreck 3 (NCCOS).

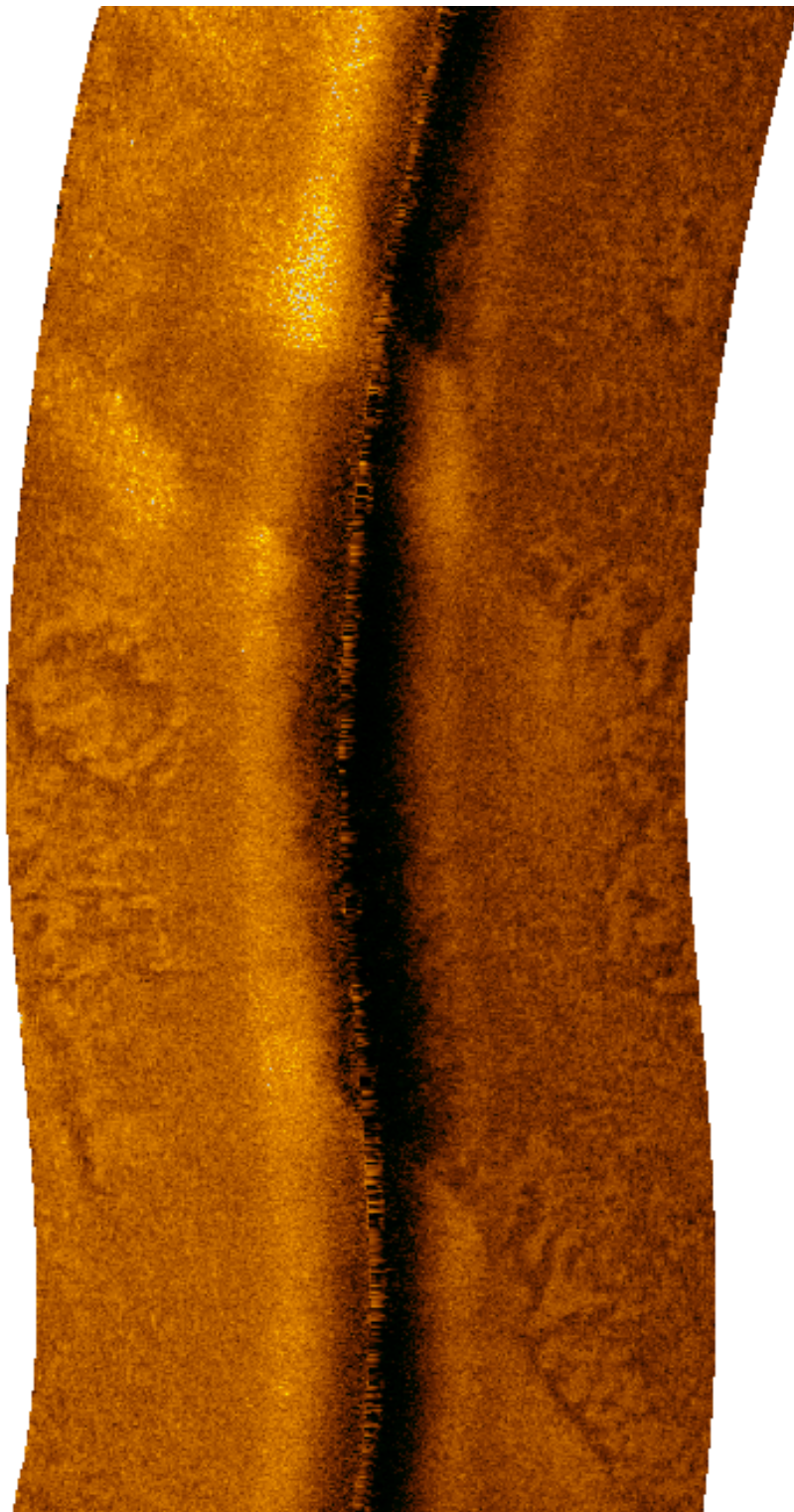


Figure 11: Side-scan sonar survey results at Potential Wreck 3 location.

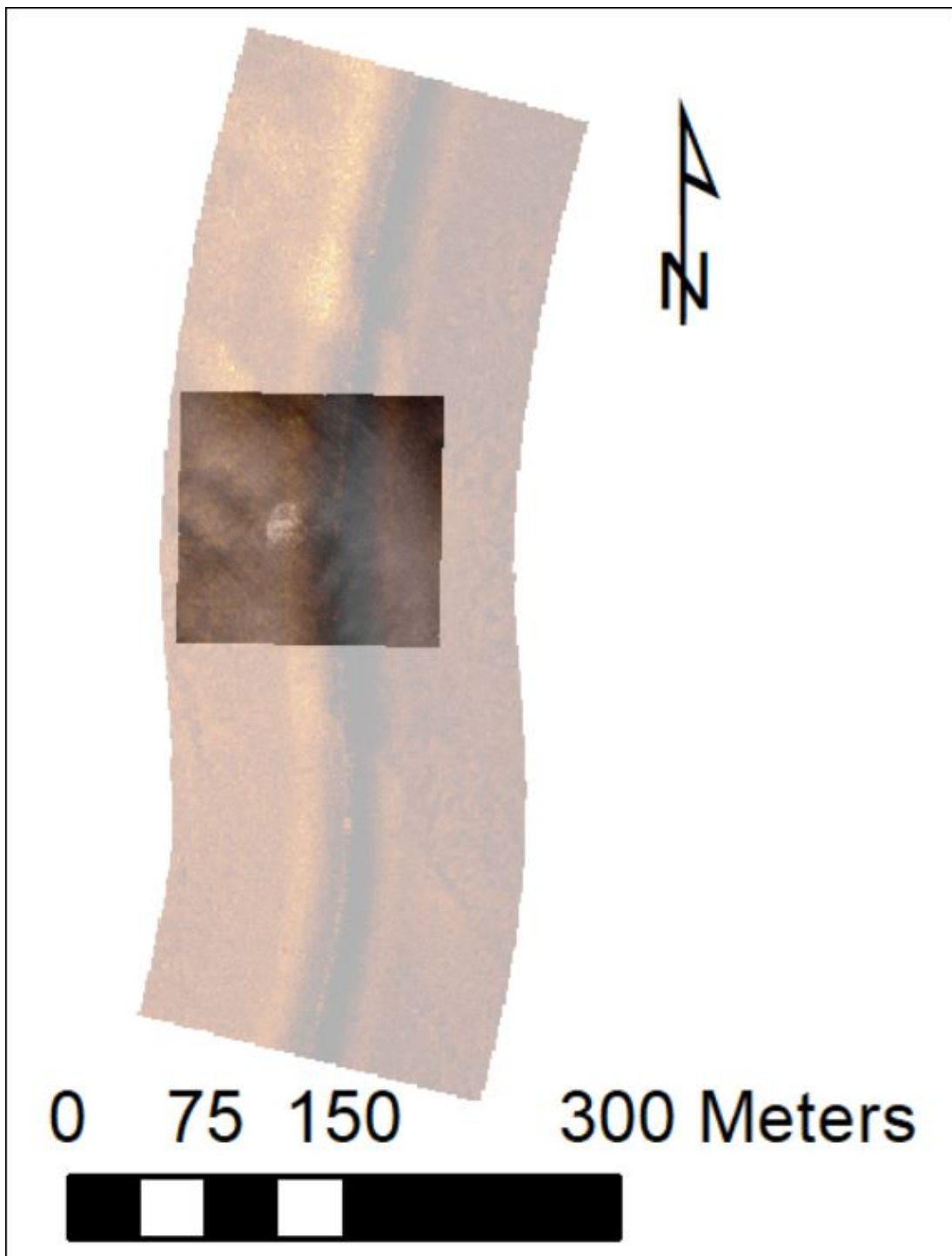


Figure 12: Overlay of MBES and side-scan at Potential Wreck 3 location (NOAA/NCCOS).

3.1.4 Wreck 1

The target designated as Wreck 1 was the first priority site visited that was definitively a cultural feature observed in the NCCOS survey (Figure 13). Initial interpretations of the multibeam imagery were that the

findings represented the remains of a small craft, potentially a sport fishing vessel, given its dimensions. Through diver investigation, it was immediately apparent the located remains were in fact a vessel and that the orientation and features of the remains could be determined. The vessel remains are oriented along a NNE to SSW direction, bow to stern. The vessel is laying on its port side, listing close to a 45-degree angle. On August 6, 2019, the research team returned to the coordinates to make multiple side-scan sonar passes over the target area. Using a 100-m range with the side-scan sonar, the resulting information confirmed the exact location of Wreck 1 to be the same as from the previous multibeam survey. In summary, four dive rotations with video and still photographs, and multiple passes of side-scan sonar operations over the coordinates were able to confirm the presence of cultural remains, specifically, a shipwreck (Figure 14).

Wreck 1 is not charted nor does it show up on fishing databases to aid with identification (e.g. Fishing Status 2020). In conducting research for vessel losses of this type, there were multiple reported losses in the larger vicinity of the located Wreck 1. The closest match for a potential identity as determined through this preliminary research is referenced in a New York Times article, dated December 24, 1981 (New York Times 1981). This article references a 65-foot fishing trawler lost 27 miles off of Long Island. Included in the article is a map that displays the search area for the lost trawler, *Phoenix* (Figure 15). The location of the search area for *Phoenix* is relatively close to the location of the identified Wreck 1. However, details within the article do not necessarily coincide with evidence located at the wreck site for Wreck 1, such as there were no lobster pots found and the hull's color is not green, as would have been found with *Phoenix* (New York Times, 1981, 1984). Further investigation of this wreck site might provide more conclusive evidence.

Four dive rotations were completed over four days (July 27-28 and August 1-2, 2019) at the site by Hoyt, McCord, and Nunn. A wreck site was identified on the first dive and over the course of the following dives the site was documented through video and still photography. The diver investigations confirmed the presence of a shipwreck, and from the video and still photography images, a partial photogrammetric model of the wreck site was completed (Figure 17). Wreck 1 is a contiguous site, with an overall length of approximately 18.40 m (60.37 feet [ft]) and a width of approximately 4.39 m (14.40 ft). Relief on the site is approximately 4 m (13.12 ft). Upon diver investigation, and subsequent confirmation with side-scan sonar, the wreck site does not extend beyond the hull structure and there is no discernable debris field located beyond the wreck site.

Located at the stern is a large winch and drum indicative of a fishing trawler. This winch is used to deploy and haul in either fishing nets or other bottom trawling gear. The fishing nets are spooled on the drum and are deployed at the stern and dragged behind the vessel. Fishing nets can still be seen spooled on the drum of the winch, along the centerline of the vessel. Other noticeable features are red hull paint at the water line, as well as yellow hull paint above the red paint. The paint is visible in only a few areas, as the majority of the hull is encrusted with marine growth.

Moving forward from the stern along the outer starboard edge, the hull is intact and contiguous. Amidships is a structure, resembling a fishing tower or trawl towing boom or outrigger, that is folded in on itself, indicative of a fishing trawler (Figure 16). The red circled areas on Figure 16 indicate similar location placement for the winch and drum at the stern, with the stabilizer boom amidships. The vessel type in Figure 16 is a wooden longline/dragger of similar length and breadth to Wreck 1 (Transportation Safety Board of Canada 2019). Further investigation is recommended at this site to gather additional information to determine the vessel's identity.

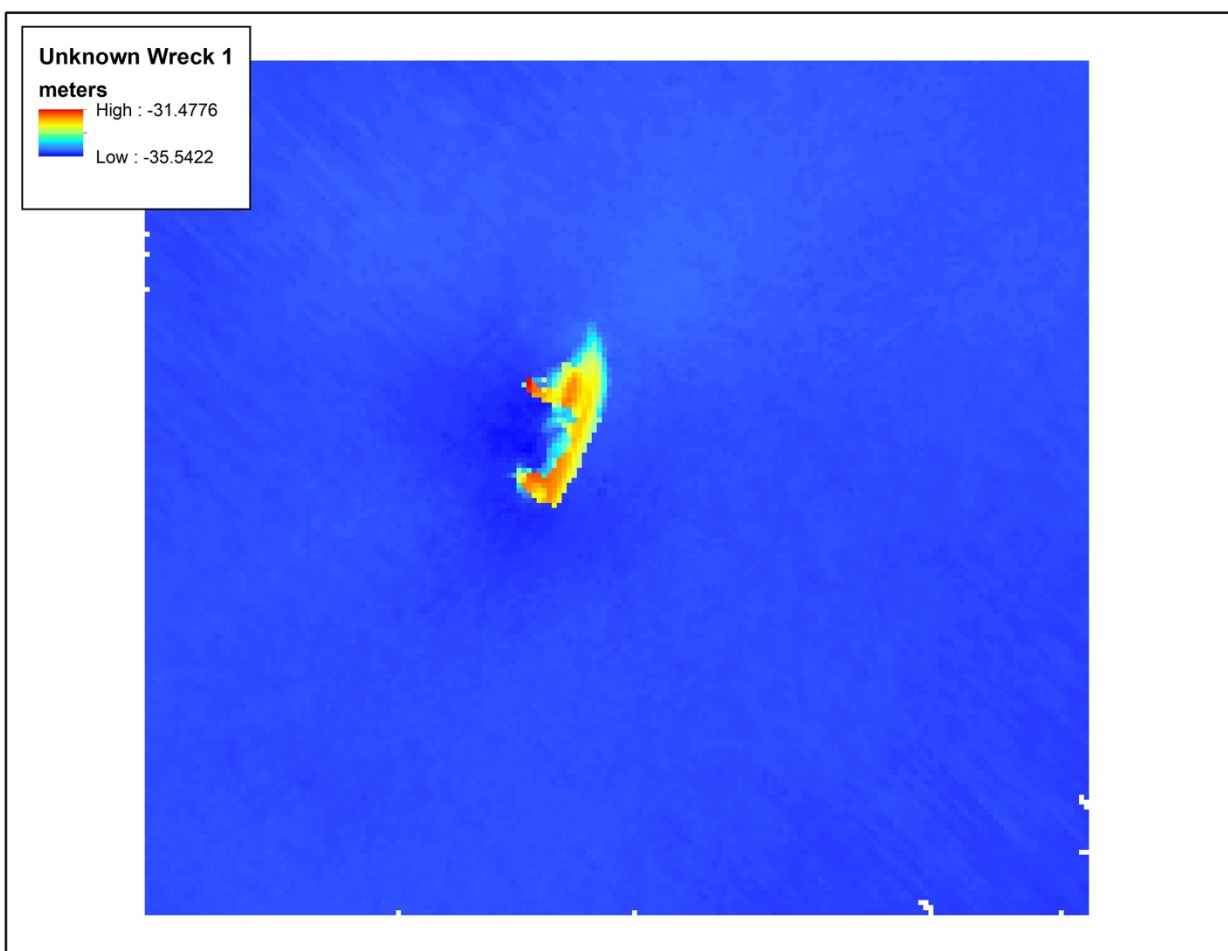


Figure 13: Multibeam imagery of Wreck 1 (NCCOS).

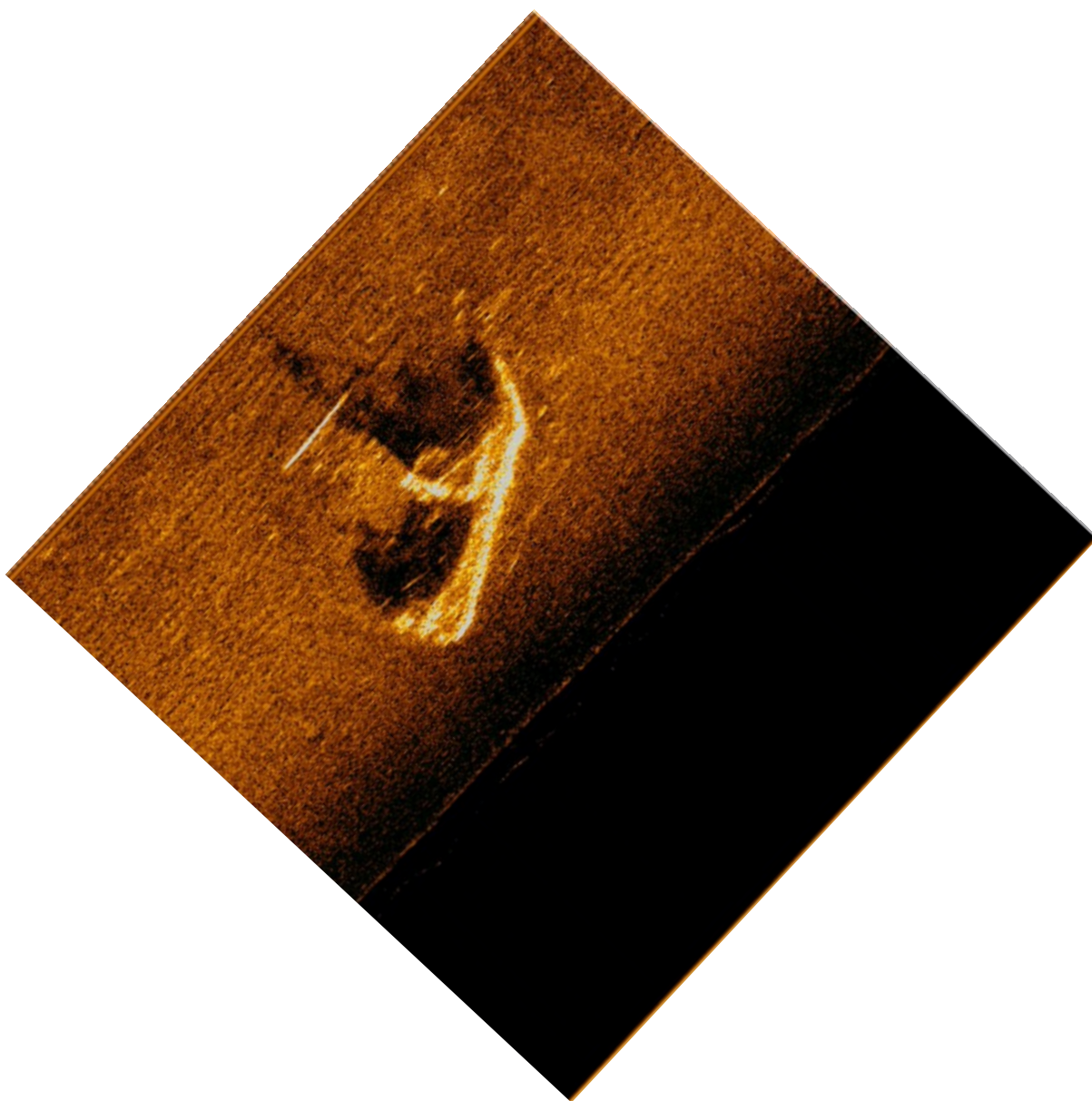


Figure 14: Side-scan image of Wreck 1.

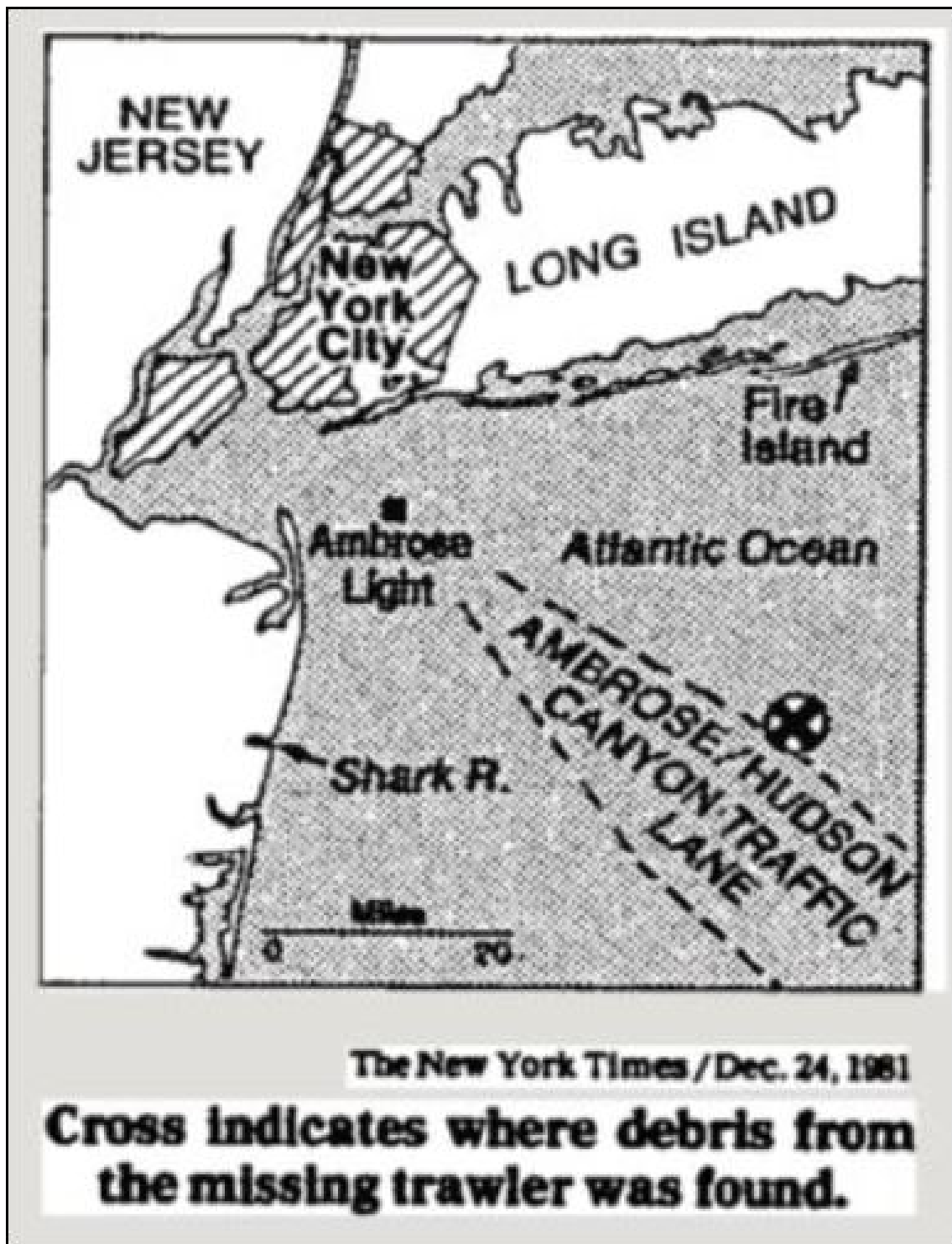


Figure 15: New York Times article depicting approximate location of Phoenix loss (New York Times 1981).

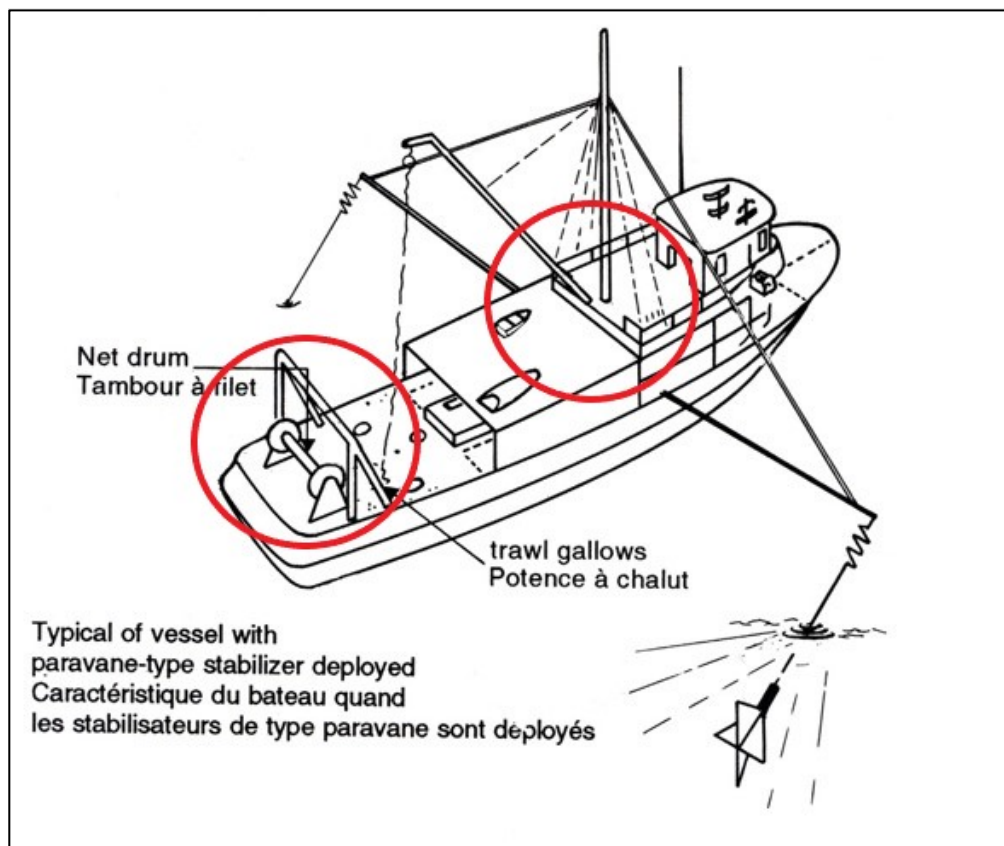


Figure 16: Image showing general arrangement of fishing vessel with features observed on Wreck 1 (Transportation Safety Board of Canada 2019).

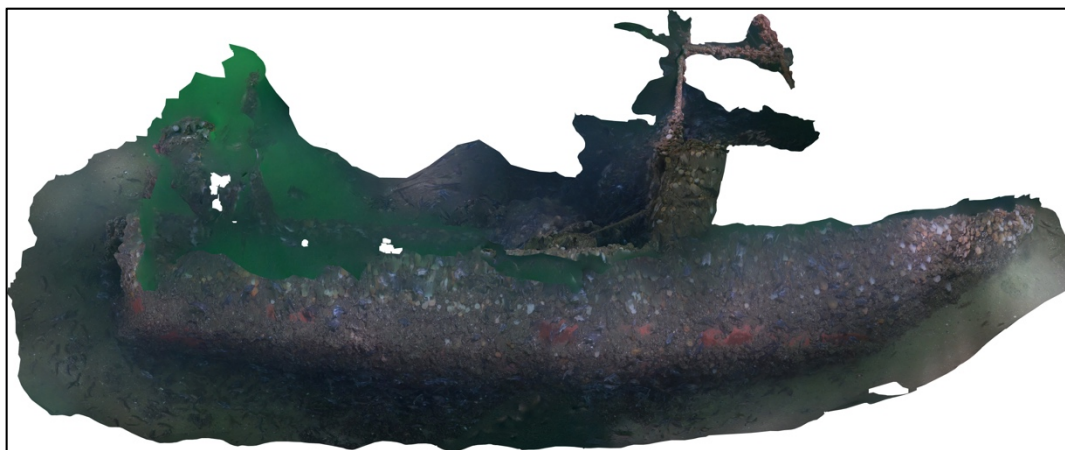


Figure 17: Partial orthomosaic of the stern and starboard of Wreck 1.

3.1.5 Wreck 2

On July 29, 2019, one dive was made by McCord and Nunn on the target designated through the NCCOS survey as Wreck 2 (Figure 18). The target was interpreted through the previous survey as a vessel-shaped area of relief, possibly indicating the location of a shipwreck. Following an orderly search, the dive investigation resulted in no observed evidence of any relief, cultural or geological, and no potential cultural

remains were identified. On August 6, 2019, the research team returned to the coordinates to make multiple side-scan sonar passes over the target area (Figure 19). Using a 100-m range with the side-scan sonar, the resulting survey did not identify any features resembling the results from the previous multibeam survey (Figure 20). With the inability to locate visible remains, either cultural or geological, during both in-water diver investigation and through the side-scan survey, the team concluded that no archaeological remains are present at this location.

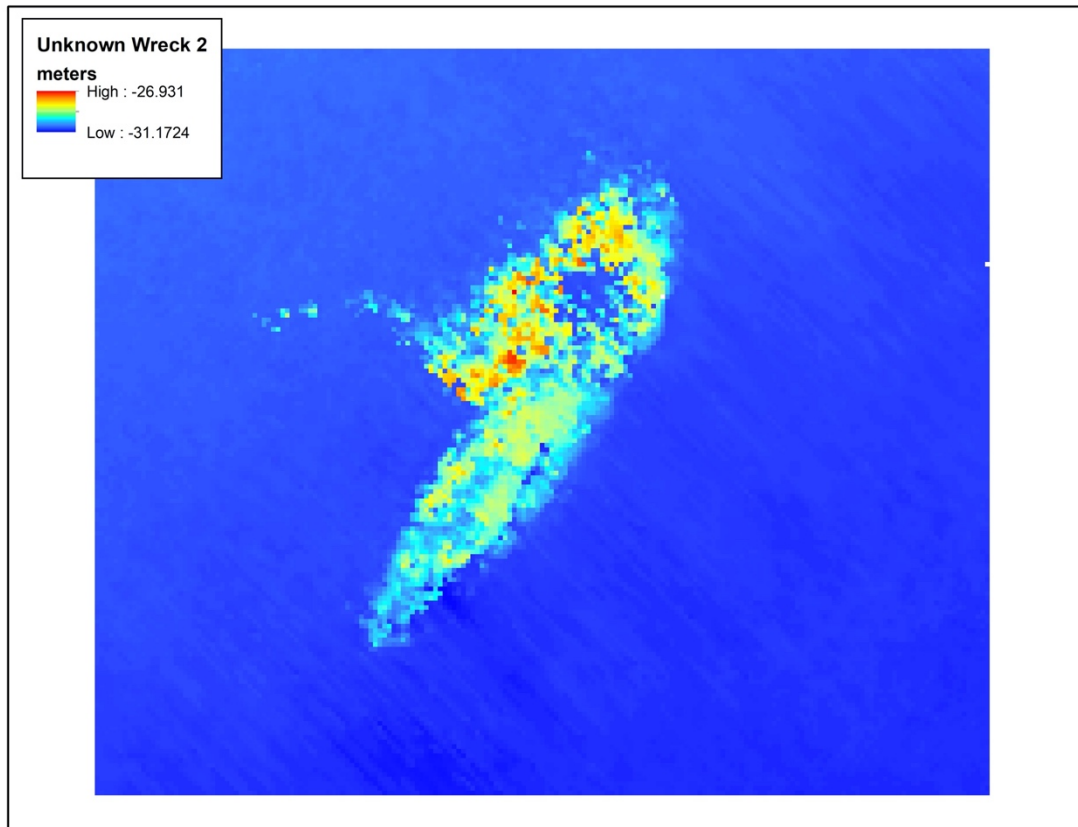


Figure 18: Multibeam imagery of Wreck 2 (NCCOS).

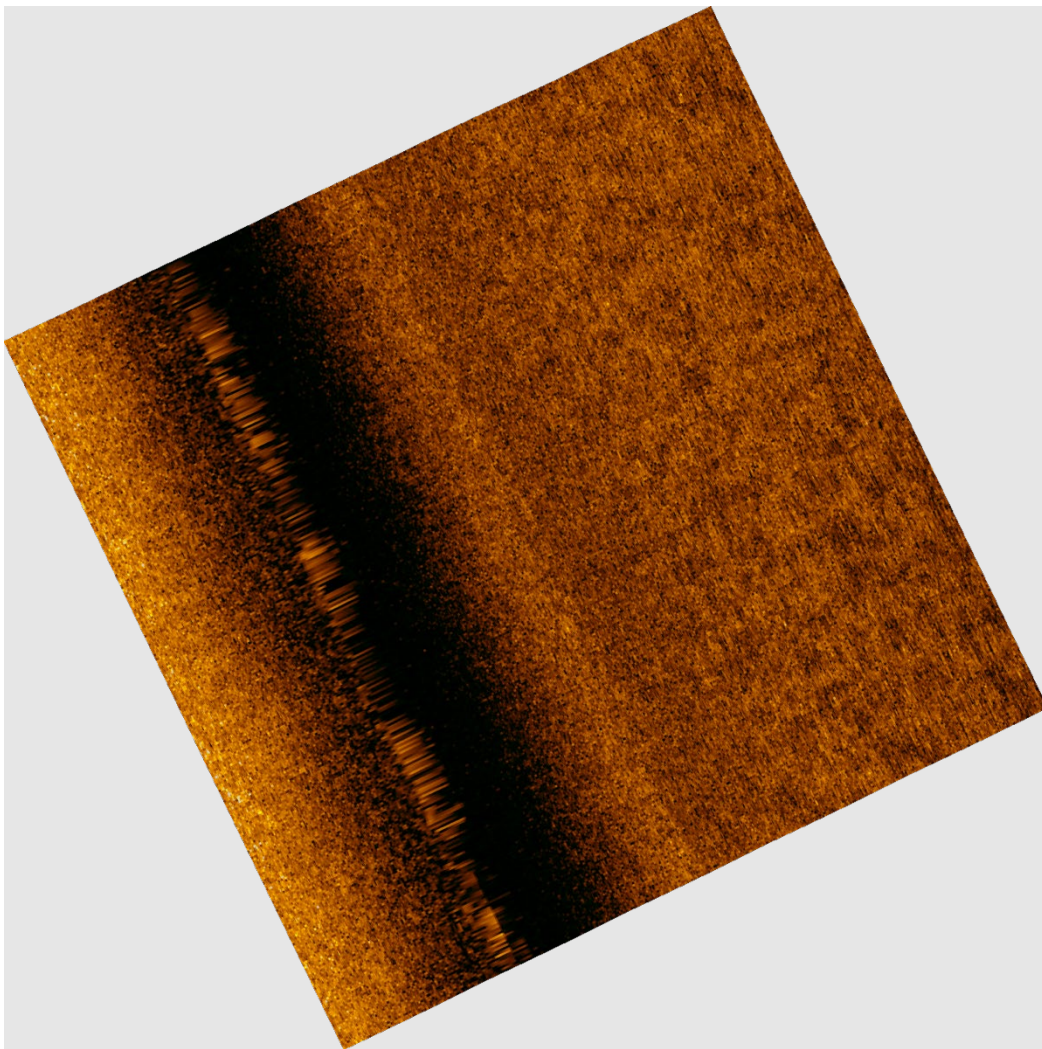


Figure 19: Side-scan sonar image of Wreck 2 location.

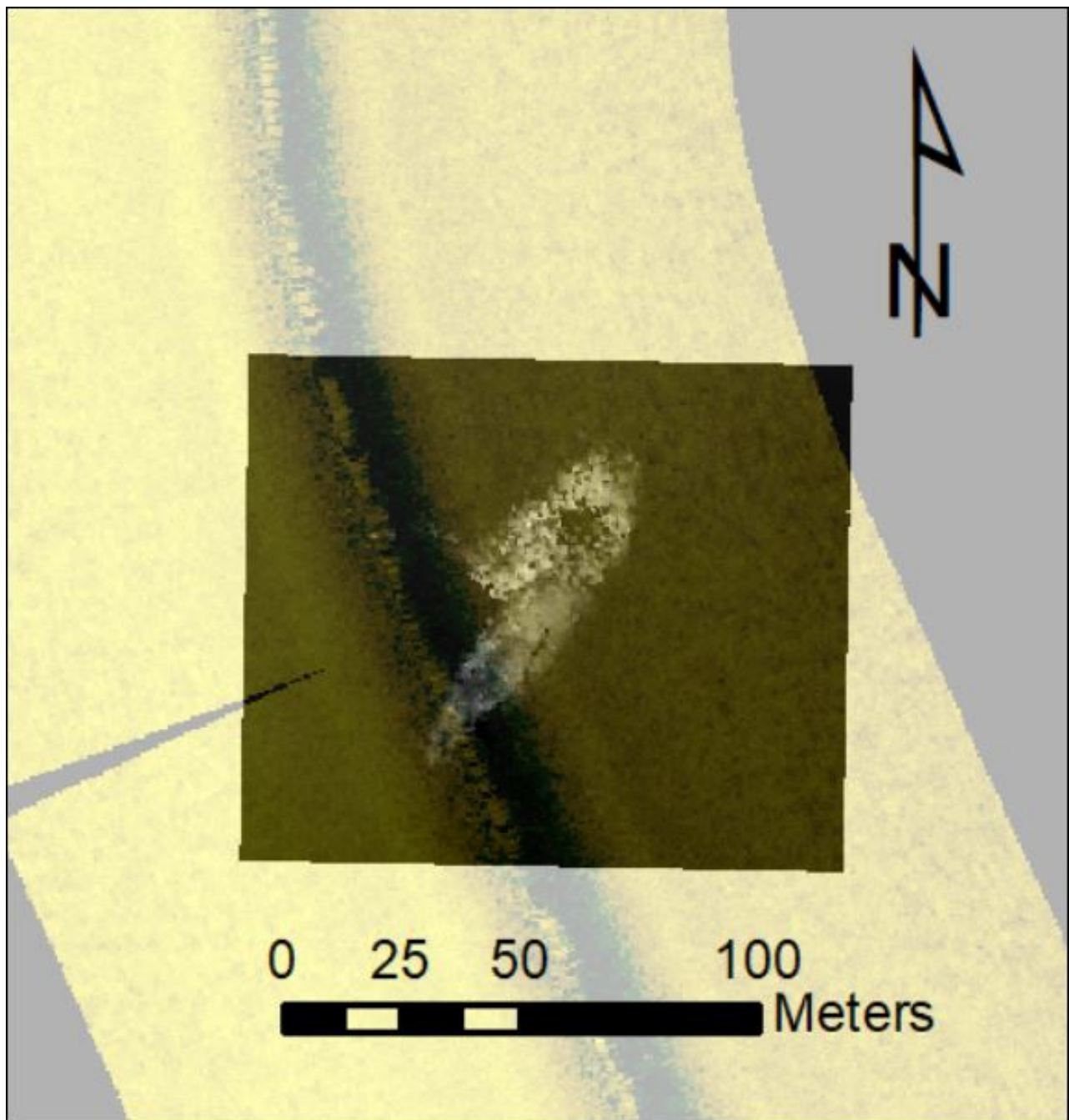


Figure 20: Overlay of MBES data on side-scan sonar data at Wreck 2 location (NOAA/NCCOS).

3.1.6 Wreck 3

On July 28, 2019, one dive was made by McCord and Hoffman on the target designated through the NCCOS survey as Wreck 3. The target was interpreted through the previous survey as a vessel-shaped area of relief possibly indicating the location of a shipwreck (Figure 21). Following an orderly search, the dive investigation resulted in no observed evidence of relief, cultural or geographical, and no potential cultural remains were identified at the target location. On August 6, 2019, the research team returned to the

coordinates to make multiple side-scan sonar passes over the target area (Figure 22). Using a 100-m range with the side-scan sonar, the resulting acoustic imagery did not identify any features resembling the results from the previous multibeam survey (Figure 23). No archaeological remains were identified at this location.

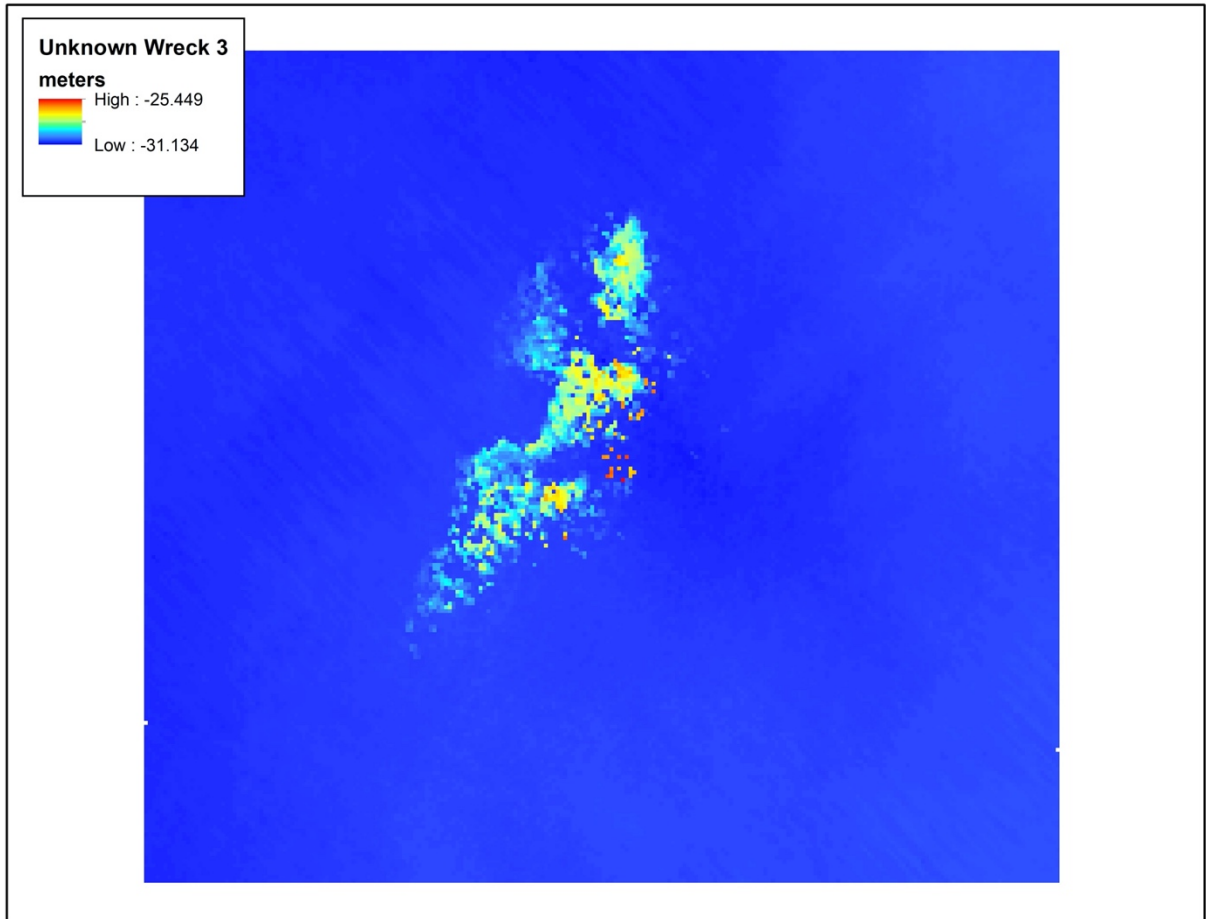


Figure 21: Multibeam Imagery of Wreck 3 (NCCOS).

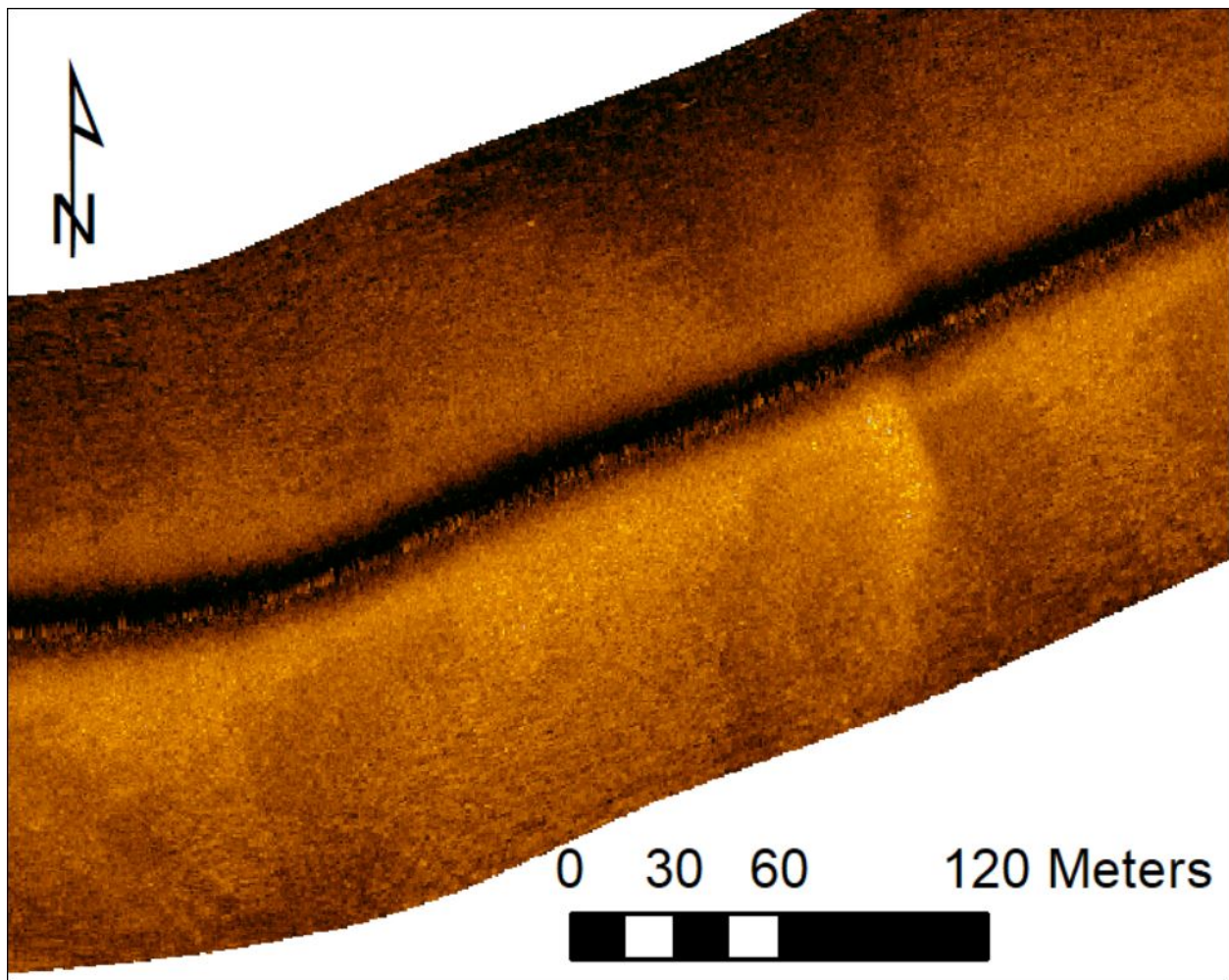


Figure 22: Side-scan sonar image of Wreck 3 location.

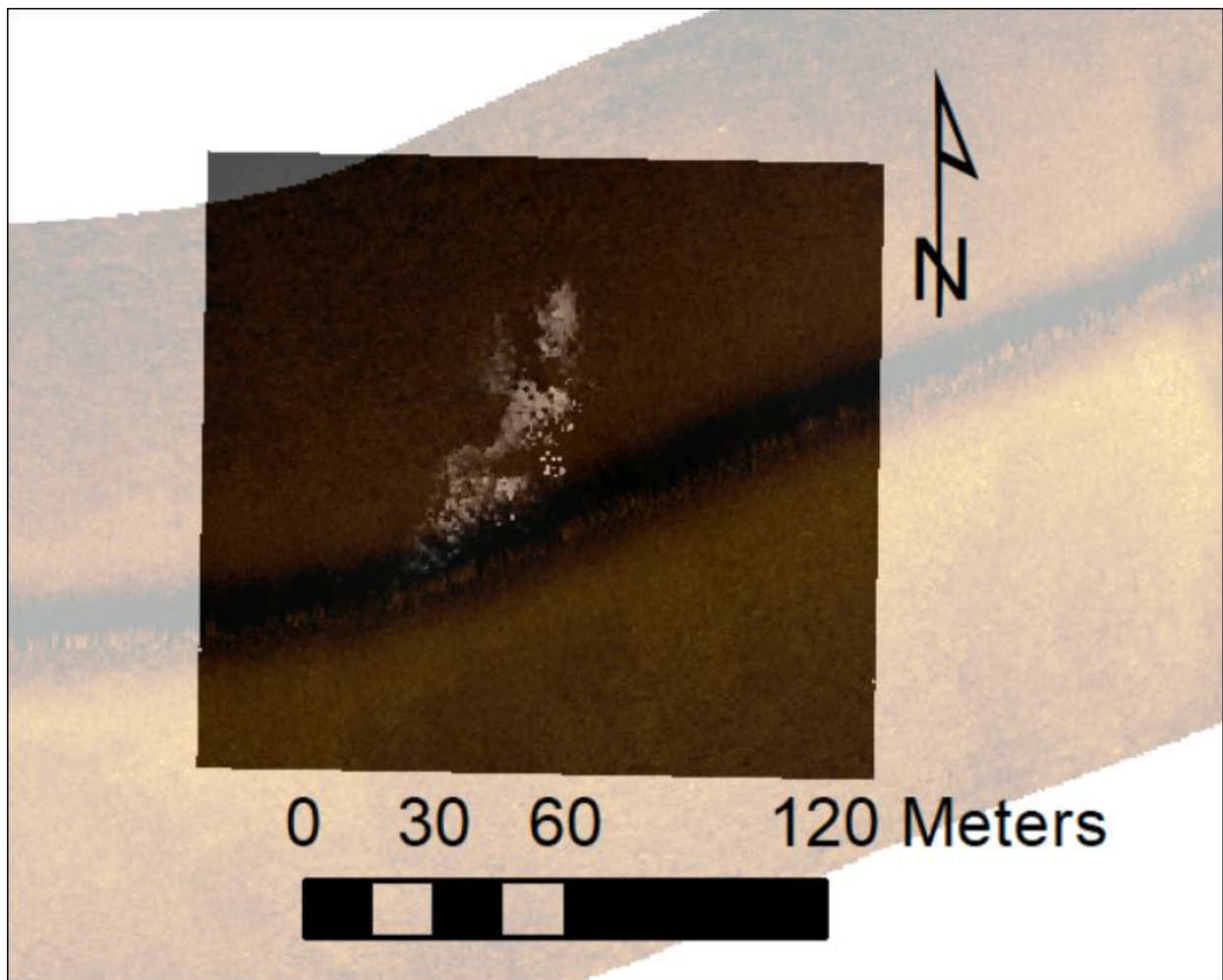


Figure 23: Overlay of MBES data on the SSS imagery collected at Wreck 3 location (NOAA/NCCOS).

3.1.7 Wreck 4 (*Yankee*)

The NCCOS target designated as Wreck 4 is the location of the shipwreck identified as *Yankee* (Figure 24). Discovered by a local diver in the 1950s, the site has been referred to as “Gloria and Doris” or the “G&D” and the name remained until further avocational investigations revealed the shipwrecks’ identity. In 1995, a dining plate was recovered from the site and later identified as from the Pittsburgh Steamship Company. Further research revealed that five vessels from the company, which mainly had vessels operating in the Great Lakes, were moved to other locations during World War I. Four of those vessels were barges without engines, with the fifth being the vessel *Yankee* (Berg 2010; New Jersey Scuba Diving 2018; New York Times 1995; Wrecksite 2013).



Figure 24: German (Yankee) pictured in 1915 (Detroit Historical Society).

The vessel *Yankee* was built in 1890 at the Globe Iron Works shipyard in Cleveland, OH, and originally named *German*. The steel hulled *German* was built as a cargo steamer to operate in the Great Lakes. *German* measured 296.20 ft (89.06 m) in length, by 40.40 ft (12.31 m) at beam. Displacing 2,418 tons, the vessel was powered by coal fired steam, utilizing two boilers and a triple expansion engine. *German* operated for the Calumet Transportation Company from 1891 to 1901 when it was then sold to the Pittsburgh Steamship Company, operating in the Great Lakes until 1917. In 1917, the United States Shipping Board bought the vessel and transported it from the Great Lakes to work on the East Coast. In order to get the large vessel to the Atlantic Coast, *German* had to be cut in two for transport through the canal system and then reassembled. *German* was subsequently named *Yankee* and began operating as a coal transport along the East Coast (Berg, 2010; Great Lakes Vessel Database 2020; Great Lakes Vessel History 2015; New York Times 1995; Sheard 1998; Shipbuilding History 2015; Wrecksite 2013).

Following the end of the war, *Yankee* remained in operation in the coal trade along the East Coast. On the night of June 11, 1919, while traveling from Norfolk, VA, to Boston, MA carrying a cargo of coal, *Yankee* entered a dense fog. At the same time, the Italian liner, *Argentina*, was crossing the same area. Lights were seen by *Yankee*, but it was too late. *Yankee* stopped its engines and both vessels turned away from each other, almost running parallel at a time. Unfortunately, the starboard bow of *Argentina* crashed into *Yankee*, which in turn forced the stern of *Argentina* into the hull of *Yankee*, ripping a hole in the side of *Yankee* with the propeller, and causing *Yankee* to sink. Captain Dennis Mugan, of *Yankee*, ordered his entire crew of 22 and all eight passengers to abandon ship. They were all able escape without injury (Berg 2010; Great Lakes Vessel Database 2020; New Jersey Scuba Diving 2018; New York Times 1995; Sheard 1998).

The research team was able to reacquire the NCCOS MBES target (Figure 25) and gather additional side scan-sonar data (Figure 26). The site is a mostly contiguous structure, oriented north to south, bow to stern. Resting at a depth of 110 ft (33.53 m), the overall site length measures approximately 108.94 m (357.41 ft) and approximately 28.85 m (94.65 ft) at the widest beam. Prominent features like the boilers measure approximately 6.25 m (20.50 ft) in length, and approximately 5.36 m (17.58 ft) wide. The engine, directly aft of the two boilers, measures approximately 8.38 m (27.49 ft) in length, and approximately 3.83 m (12.56 ft) at the widest point. The prominent bow section is sitting upright on the sand, listing toward the port side. The stern section is also sitting upright on the sand, with the steering mechanism visible.

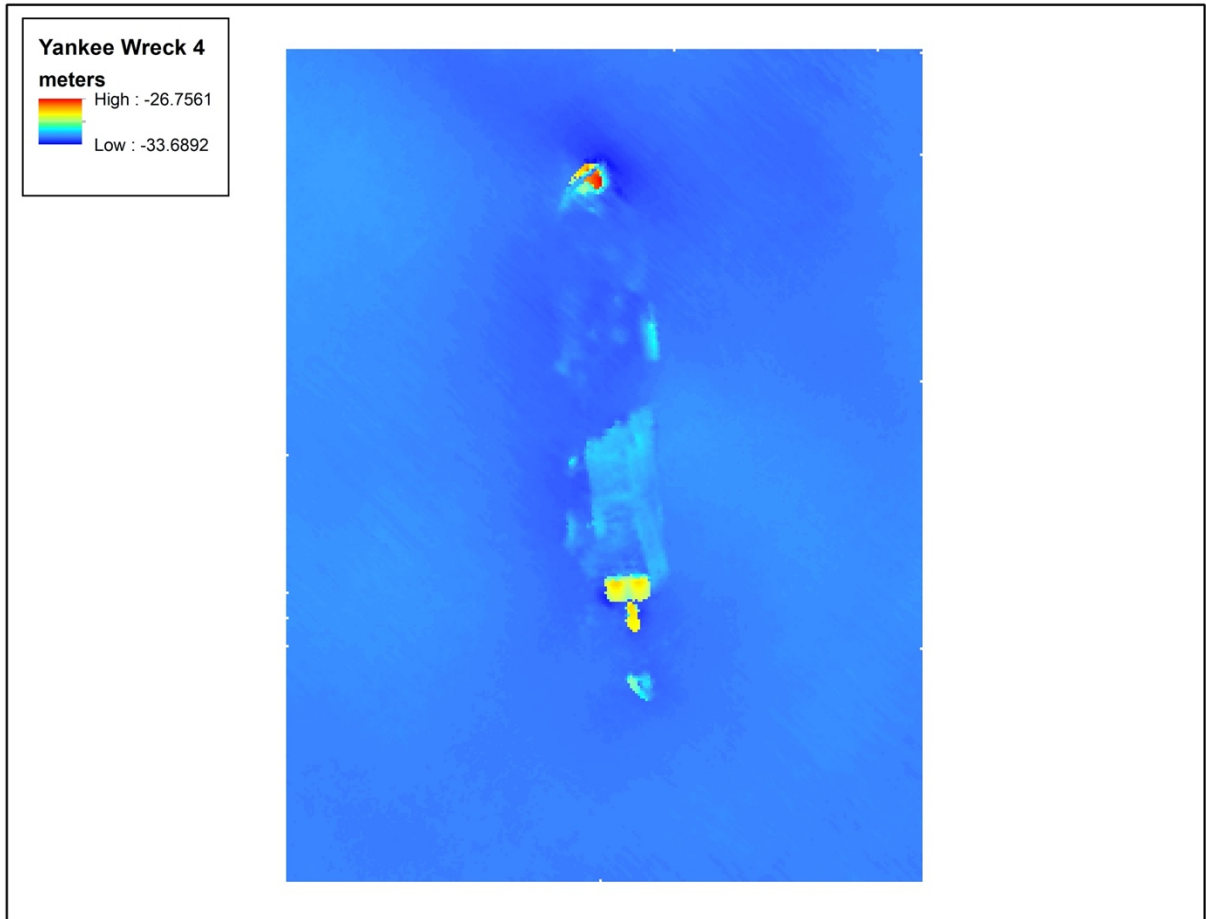


Figure 25: Multibeam imagery of Wreck 4, Yankee (NCCOS).

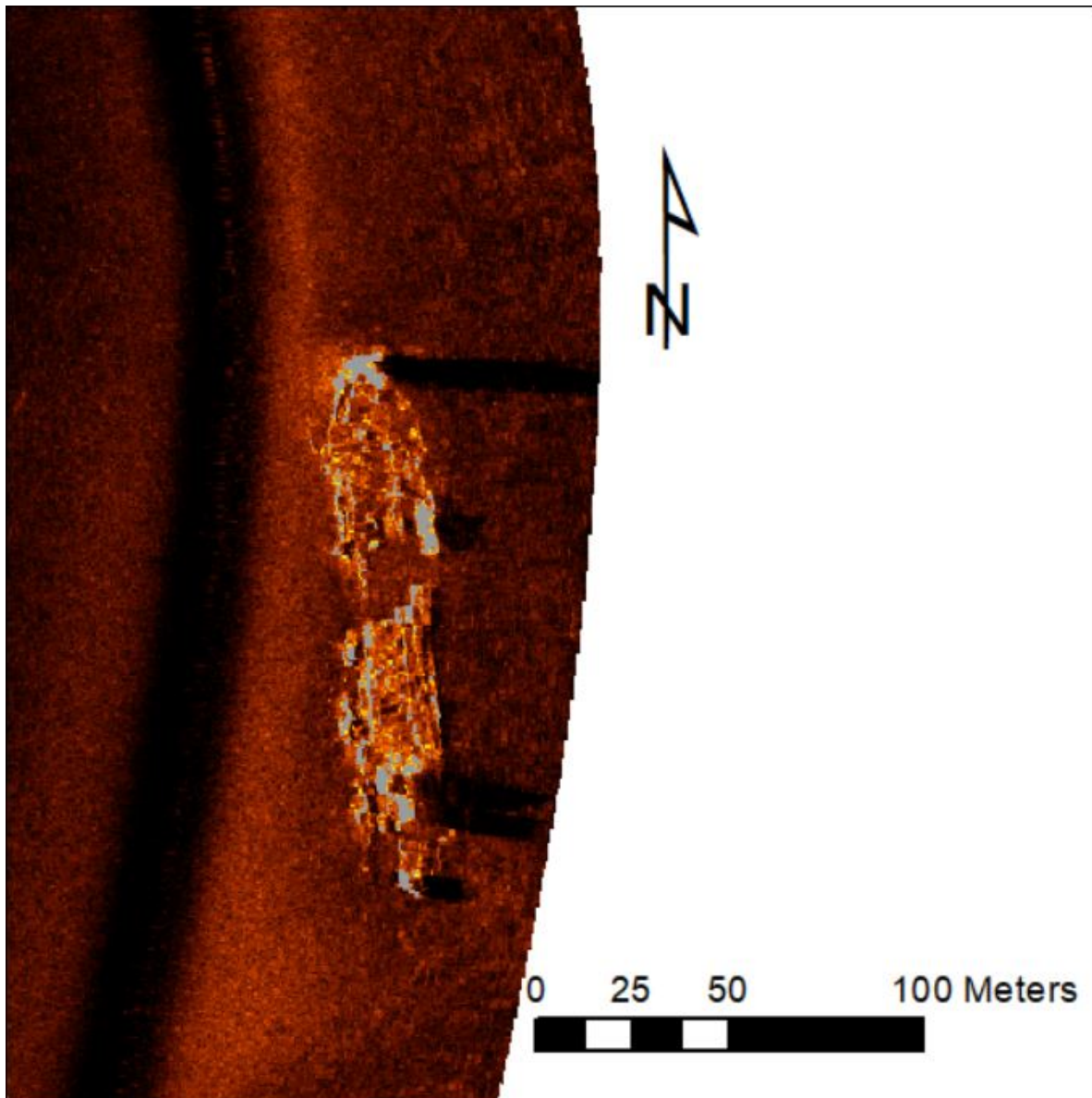


Figure 26: Side-scan sonar image of the Wreck 4/Yankee wreck site.

While the entirety of the *Yankee* wreck site was not examined, the main priorities of the dive investigations focused on the bow, engine, boilers, and the stern sections. These sections are the most prominent and allowed for the ability to document utilizing photogrammetry. The bow section is generally intact with the stem post still attached to hull plating, resting upright on the sand (Figure 27). The bow section is listing to the port side, but still in-line along the keel. Minimal deck plating is evident towards the stem post, as well as horizontal framing patterns attached to the outer hull plating. The most prominent part of the bow section, as documented with photogrammetry, is the stem post, with high degree of relief of approximately 6.09 m (20.00 ft). The overall bow section measures approximately 8.45 m (27.72 ft) in length and 8.89 m (29.17 ft) at beam.

Continuing aft of this section are the remains of a low lying hull structure and potential deck structure, before reaching a distinct gap in the sand measuring approximately 9 m (29.52 ft). Aft of this gap, marks continued from various low relief hull/deck plating or other mechanical remains, before reaching the two boilers and the triple expansion engine. Both boilers are intact and upright, along with the engine itself (Figure 28). Relief at this section measures approximately 6.09 m (20.00 ft). The engine machinery is consistent with the details outlined in the historical narrative, providing evidence for the site's attribution as *Yankee*.

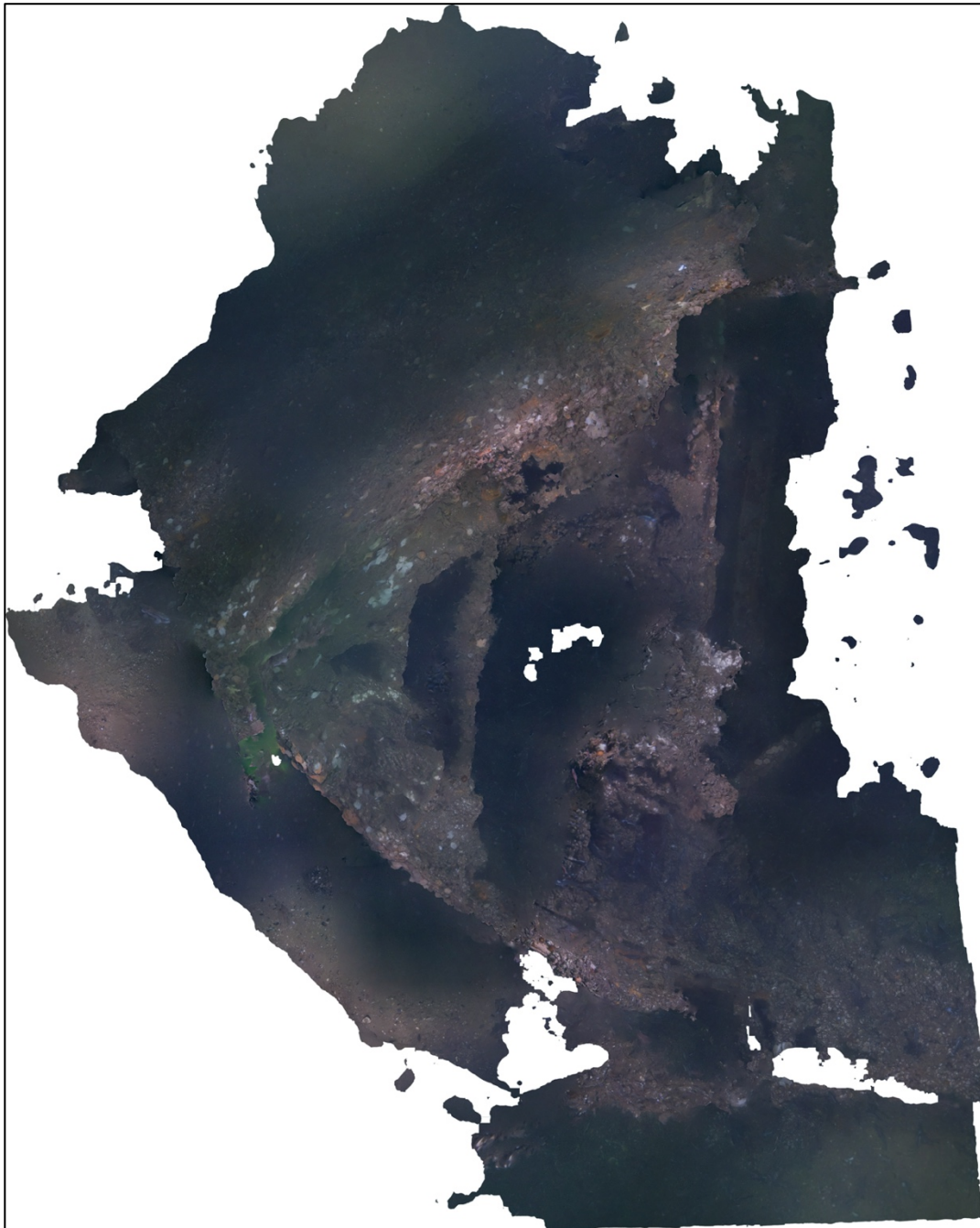


Figure 27: Partial plan view orthomosaic of the bow section of Wreck 4/Yankee.

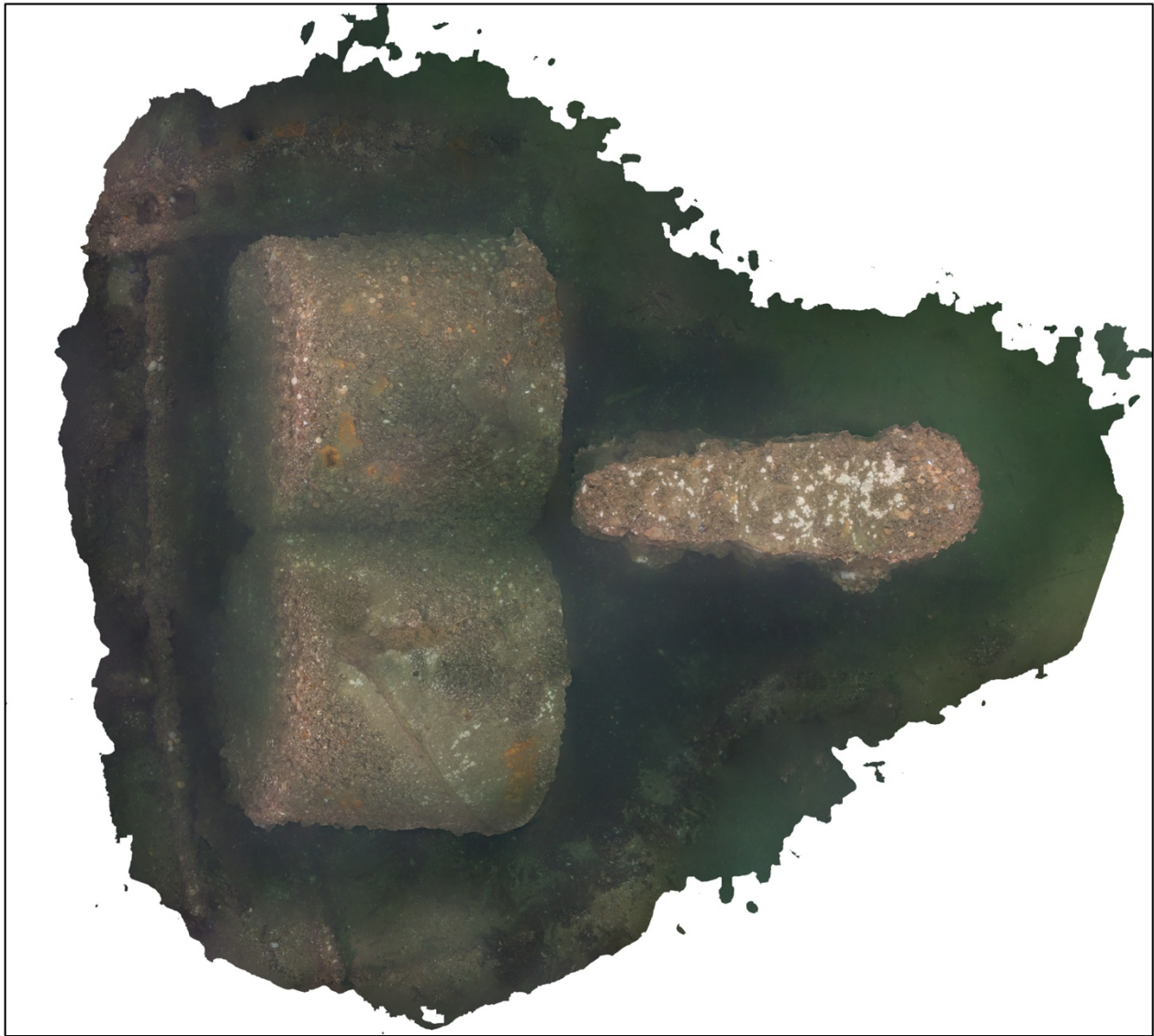


Figure 28: Partial plan view orthomosaic of the engines and boilers on Wreck 4/Yankee.

Further aft of the engine is mostly sand until the stern and steering mechanism is located. This stern section measures approximately 5.73 m (18.79 ft) in length and 5.70 m (18.70 ft) at beam. Slightly tilted at an angle on the port side, the stern section still contains evidence of deck and hull plating. The tiller post is evident as part of the steering mechanism, with the rudder post and rudder potentially buried in the sand (Figure 29). Each section, as described, is oriented along the keel axis of the vessel with little evidence of disarticulated features outside of the main wreck site.

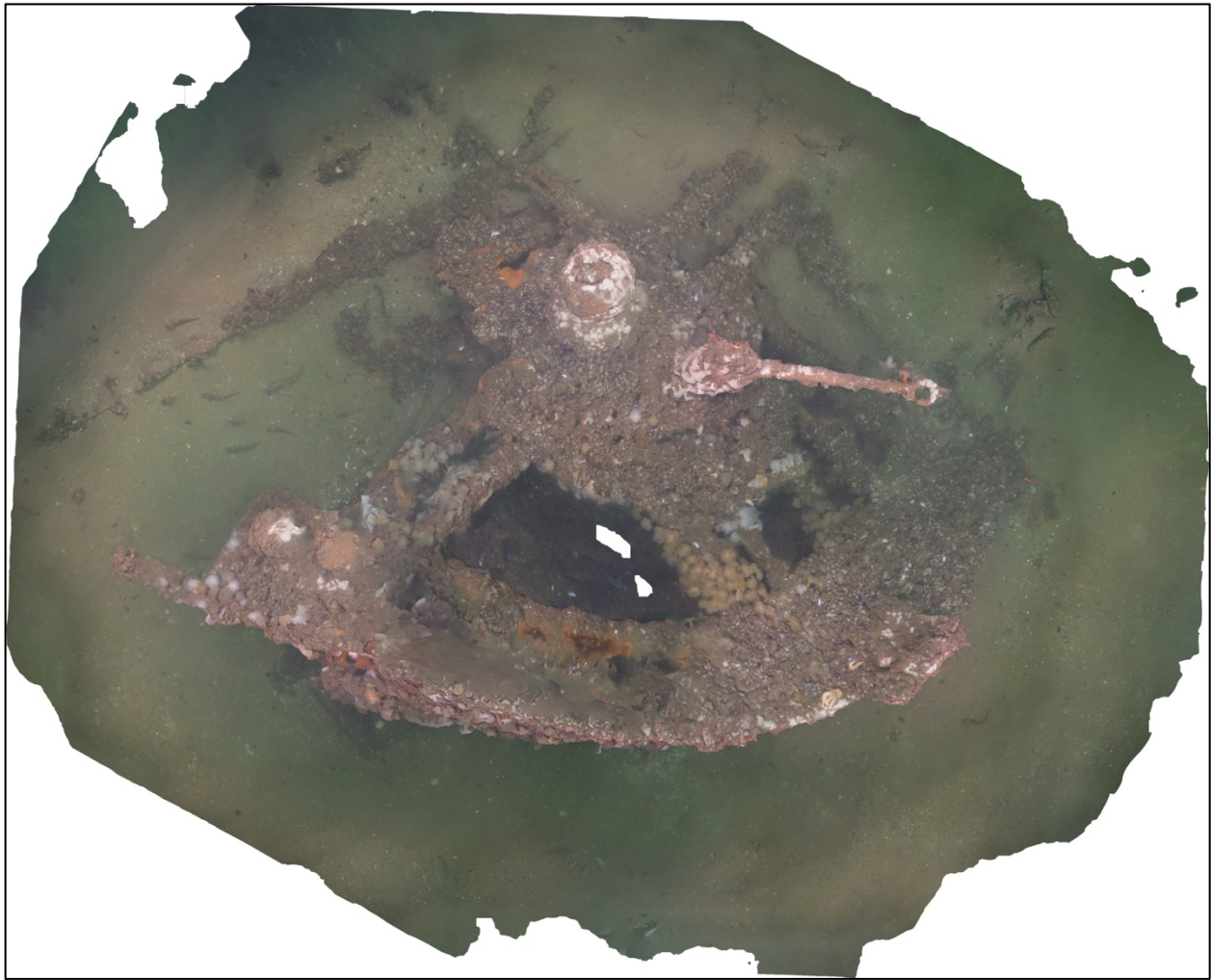


Figure 29: Partial plan view orthomosaic of the stern assembly on Wreck 4/Yankee.

3.2 Atlantic Shipwreck Database Sites

Three sites from the ASD were also investigated during this study. BOEM completed a study of archaeological resource potential on the Atlantic OCS that compiled information on reported shipwrecks into the ASD (TRC 2012). The ASD does not represent a complete listing of all potential shipwrecks located on the Atlantic OCS, but rather it serves as a baseline source of existing and available information for the purposes of corroborating and supporting identification efforts. In many cases, the locational accuracy of database entries varies greatly. The ASD is comprised of many sources of data, some of which were obtained when locational accuracy of navigational equipment was far less reliable and many entries are based solely on reported locations that have not been verified. As these sites only represent reported locations, investigation focused on side-scan sonar surveys to confirm presence or absence of material at the historically reported locations. If an archaeological site was present, the sites were ground-truthed by divers.

3.2.1 Durley Chine

Durley Chine was a steam freighter built in Sunderland, England, by the Osbourne, Grahm and Company Shipbuilders in 1913. It was built to a length of 279 ft (85.03 m) and 40.10 ft (12.22 m) at beam. It was powered by a triple expansion engine and grossed 1,918 tons. In the early spring of 1917, *Durley Chine* was traveling from Halifax, Nova Scotia to Norfolk, VA. As it traveled south, on April 22, 1917, the British steamer, *Harlem*, was traveling from New York to Bordeaux, France, carrying munitions for the war effort. It was evening, with a dense fog, making transiting difficult, and soon the two ships were on a course for each other. In the midst of the fog, the two vessels collided, with *Durley Chine* bearing the brunt of the damage, and blame, and sinking. The 28-person crew of *Durley Chine* all made it safely aboard *Harlem* as *Durley Chine* sank into the sea (Berg 2010; Dominion Law Report 1919; Wrecksite 2013). Ultimately *Durley Chine* was held responsible for the incident, for not giving the proper right of way.

Later, recreational divers would locate what was thought to be *Durley Chine*. For many years, the wreck locally referred to as “G&D” was thought to be that of *Durley Chine*. As was later reported in the New York Times, the identity of the “G&D” wreck would be confirmed as the vessel *Yankee*, which was investigated during this project (Aqua Explorers, Inc. 2020; Berg 1990; New York Times 1995). In 1987, local divers located the ships’ bell while exploring another site, with the engraving, “S.S. Durley Chine-1913-Cardiff,” inscribed on the outside (Aqua Explorers, Inc. 2020).

On August 6, 2019, the research team utilized the coordinates from the ASD to make multiple side-scan sonar passes over the reported *Durley Chine* target area (Figure 30). Using a 100-m range with the side-scan sonar, the resulting survey did not identify any visible remains at the location reported. Based on the information from the local diving community the site does exist; however, it is not located at the position as reported in the ASD.

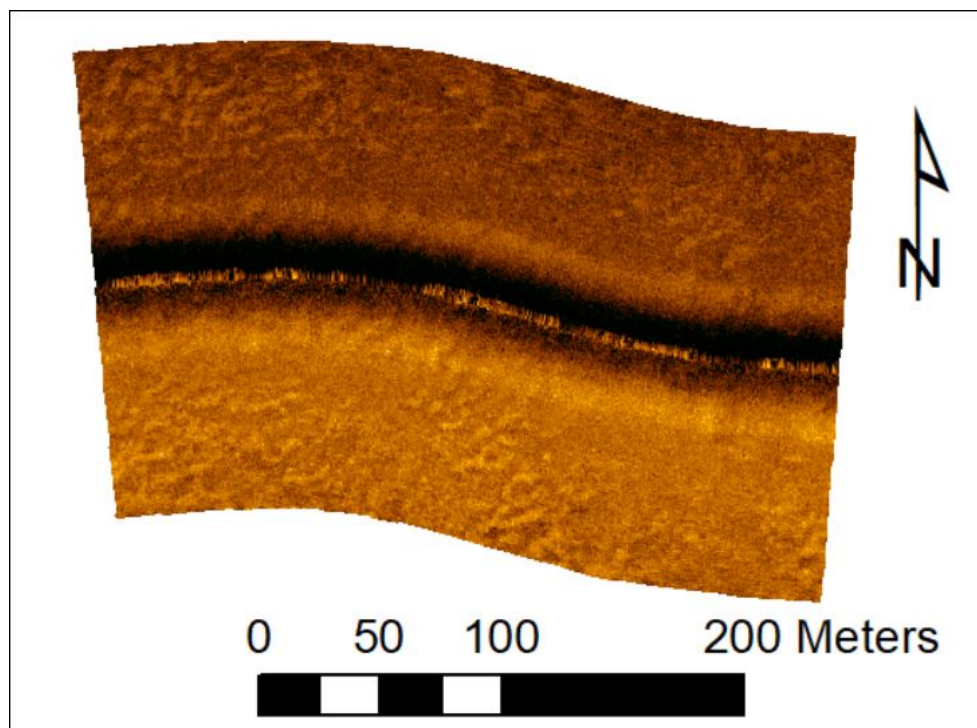


Figure 30: Side-scan Sonar Image of reported Durley Chine Location.

3.2.2 “Happy Days”

The wreck named “Happy Days” is a local reference to the unidentified remains of a potential wooden schooner. The site is locally reported to contain the remains of a mechanical winch and wooden hull planking (Berg 2010; New Jersey Scuba Diving 2018; Wrecksite 2008). On August 2, 2019, one dive was made on the coordinates provided from the ASD for “Happy Days” by divers Nunn, Sassorossi, and Hoffman. Following an orderly search, the dive investigation resulted in no observed evidence of any potential cultural remains. A second series of nearby coordinates was investigated, following potential relief identified on the depth finder of the R/V *Daiber*. On August 5, 2019, a single dive was completed on this new location, with the dive team identifying machinery, possibly an anchor windlass, located at a depth of 33.53 m (110 ft). On August 6, 2019, the research team returned to this second set of coordinates to make multiple side-scan sonar passes over the target area (Figure 31). Using a 100-m range with the side-scan sonar, the resulting information located relief, similar to the winch located during the dive, as well as additional relief, closely resembling hull planking or other remains nearby. In summary, two dive investigations and multiple passes of side-scan sonar operations over both sets of coordinates were able to locate cultural remains at the second set of coordinates.

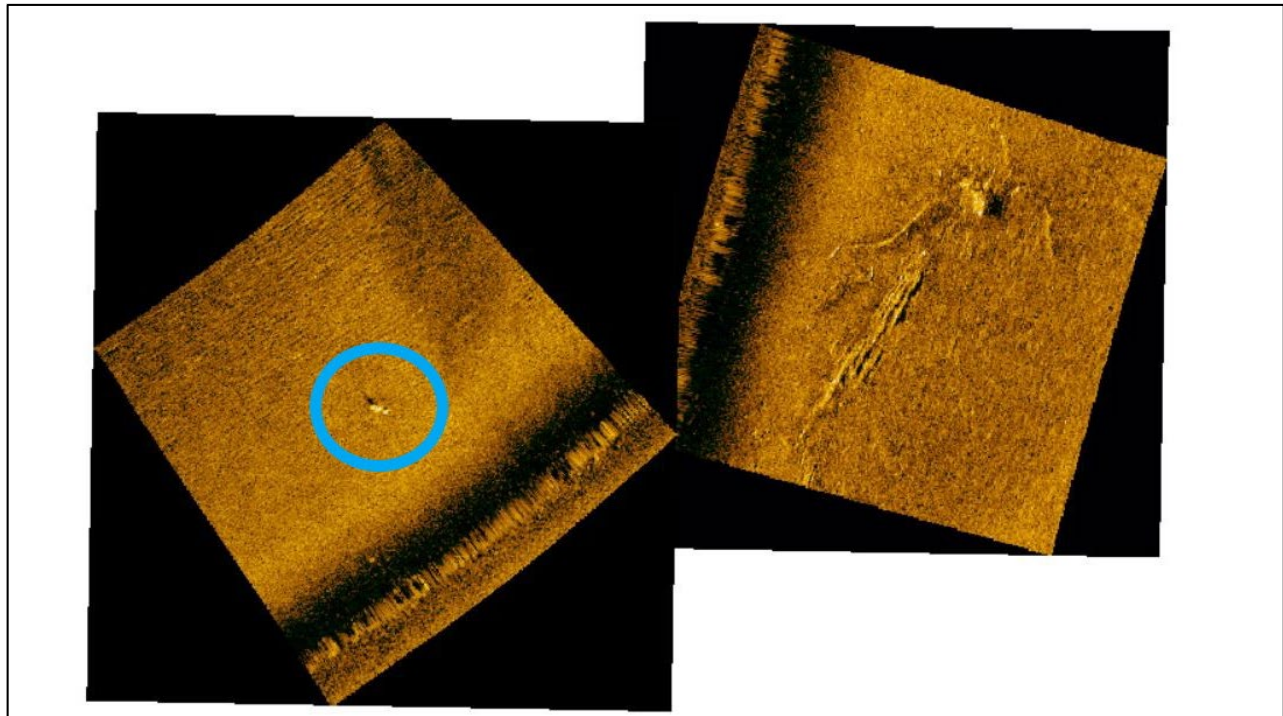


Figure 31: Side-scan Sonar Imagery of the "Happy Days" wreck site.

The overall site measures approximately 88.09 m (289.01 ft) by approximately 41.21 m (135.20 ft) and is oriented roughly NNE to SSW. The site contains two distinct features, as visible in the side-scan sonar image. The first feature is the windlass or other deck machinery remains (Figure 32). This feature measures approximately 3.4 m (11.50 ft) by 1.1 m (3.61 feet) and has approximately 1 m (3.3 ft) of relief. This machinery is located approximately 92.02 m (301.90 ft) due west of the second feature, which is an area of low relief indicating the potential presence of wooden hull remains and other machinery. This area was not investigated by divers during this study. Evaluating the entire site, the vessel remains are disarticulated and spread out over a large area and there is the potential for the presence of buried features or hull remains.

The presence of wood indicates a wooden sailing vessel and, given the size, it was most likely designed for trade rather than recreation, but the function of the vessel cannot be definitively determined at this time.



Figure 32: Image of winch machinery observed at “Happy Days” wreck site.

3.2.3 *Irma C*

Irma C. is reported in the ASD as a wooden hulled coal barge which sunk a few miles east of *Yankee* (Wreck 4). Preliminary background research through this study did not locate additional information regarding the specific loss of a vessel named *Irma C.*; however, it is well documented that the coal trade route to northern ports from Norfolk, VA. was well traveled, and subsequently, numerous coal barges were lost in this large area. For example, multiple newspaper references describe the transit north from Norfolk, VA with barges laden with coal either breaking away from their tug or floundering during a storm (Berg 1990; Berg 2010; New Jersey Scuba Diving 2018; New York Times 1891; Wrecksite 2008).

Following a lengthy surface search utilizing the bottom finder of R/V *Daiber* over coordinates provided in the ASD database, indications of relief were located approximately 60 m (196.85 ft) north east of the ASD coordinates. This area was marked and chosen as the dive location. Over the course of August 1, August 2, and August 3, 2019, a total of four individual dives were completed on these coordinates by divers Hoffman, Hoyt, McCord, Nunn, and Sassorossi. Remains of a potential wreck were identified by the second dive evolution, and over the course of the following dives, video and still photography were taken of the wreck site. The diver investigations did confirm the presence of a shipwreck. On August 6, 2019, the research team returned to the coordinates to make multiple side-scan sonar passes over the target area (Figure 33). Using a 100-m range with the side-scan sonar, the resulting survey information confirmed the exact location of what is reported as *Irma C.* In summary, four diver investigations with video and still photographs, and

multiple passes of side-scan sonar operations over the coordinates were able to confirm the presence of cultural remains, specifically, a shipwreck at this location.

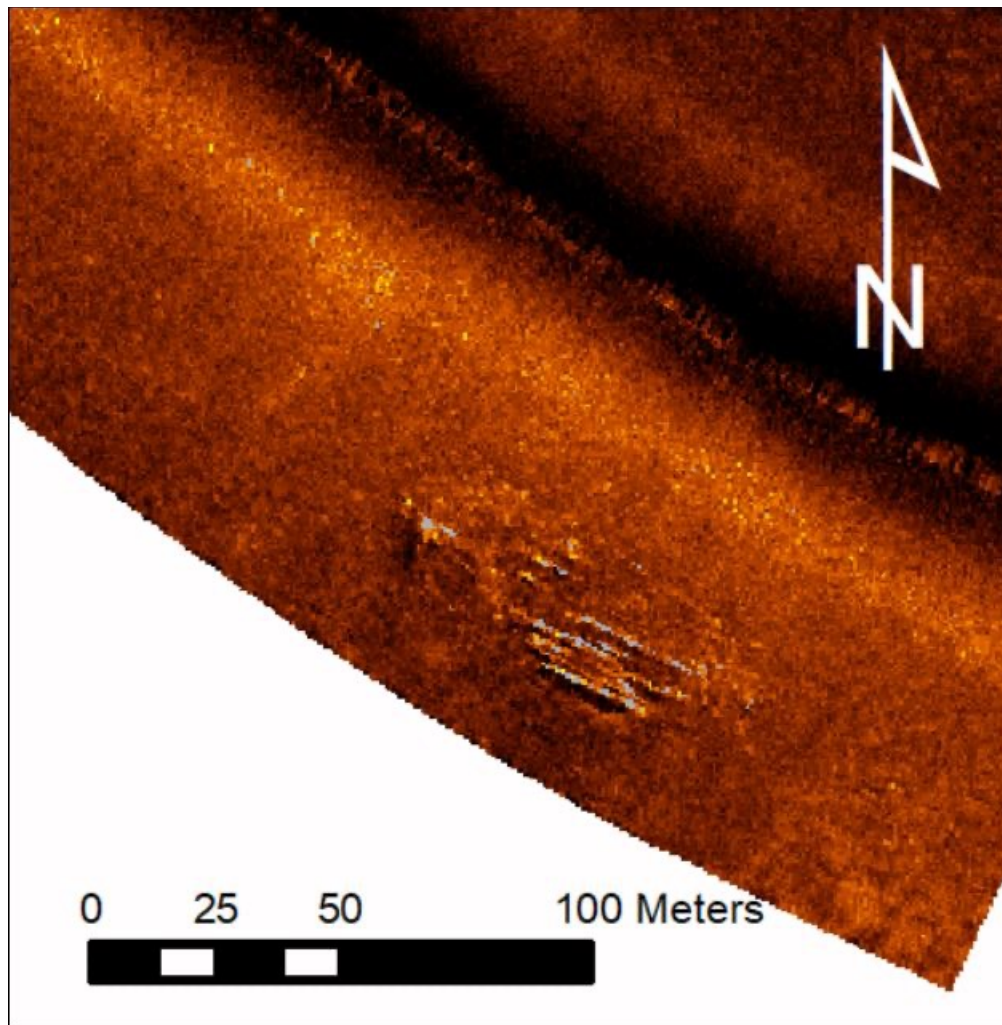


Figure 33: Side-scan Sonar Imagery of Irma C wreck site.

The site has generally low relief and measures approximately 57.25 m (187.83 ft) in length and 21.80 m (71.52 ft) at beam. The highest relief is at the remains of a winch or other deck machinery located at the bow of the wreck which extends approximately 2.10 m (6.89 ft) off the seafloor, as measured by the shadow of the feature in the side-scan sonar imagery. The site is oriented along a northwest to southeast axis, bow to stern. The wreck site is at a water depth of 35.05 m (115 ft).

A large mechanical winch is located toward the bow of the vessel, along with other machinery remains (Figure 34), including a potential capstan (Figures 35). Remains of articulated wooden hull planking and framing are visible and there is a high potential for additional hull remains to be buried at and surrounding the site (Figure 36). Other than the winch, no other machinery pieces were located, indicating it was either a sailing vessel or a barge, and not motorized. No coal was observed at the site. It could not necessarily be confirmed from this investigation that the remains are in fact a coal barge, however, the site does merit further investigation.



Figure 34: Remains of a windlass on wreck site of *Irma C*.

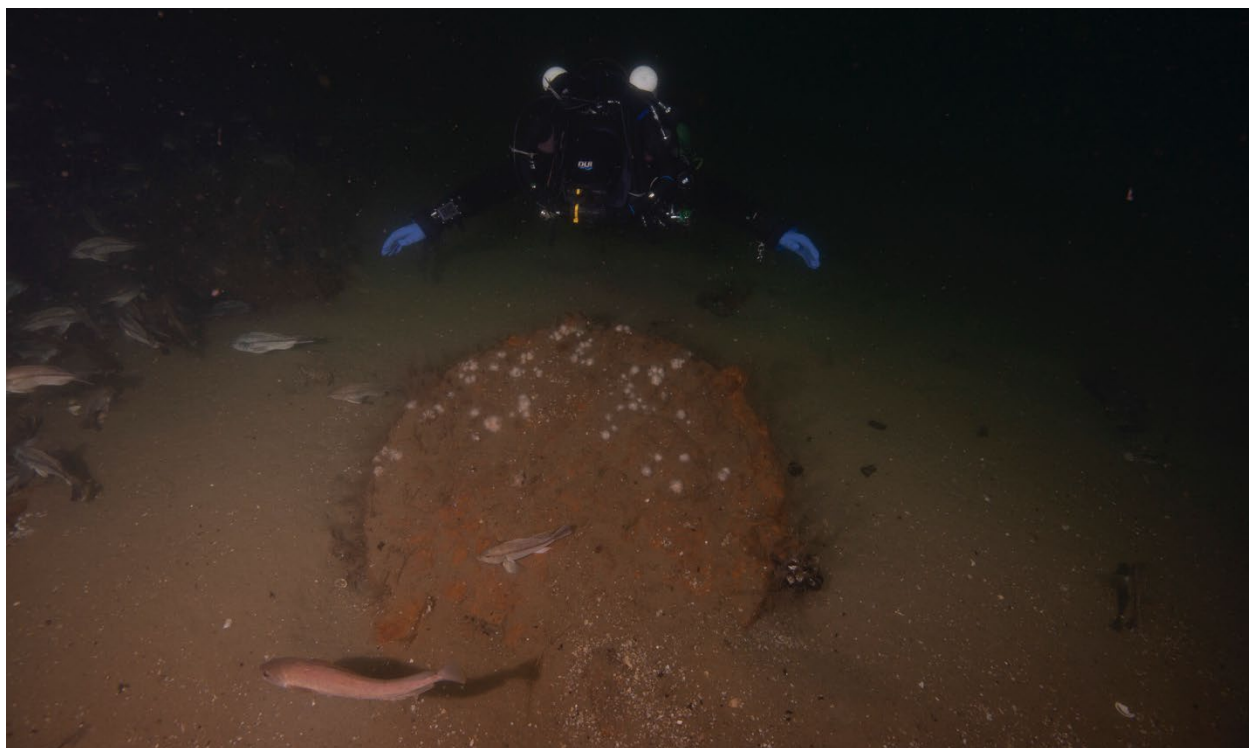


Figure 35: Possible top of capstan observed on *Irma C* site.



Figure 36: Wood frames on wreck of Irma C.



Figure 37: Derelict fishing gear observed on Irma C.

4 Conclusions and Recommendations

This study successfully met the objective of obtaining baseline archaeological information within and adjacent to the New York Bight Lease and Call Areas through the investigation of ten potential archaeological sites, summarized in Table 4-1. These investigations included direct observation and documentation by archaeological scientific divers, including the completion of scaled partial photogrammetric models of Wreck 1 and Wreck 4 (*Yankee*). In addition to confirming the location of each site and documenting the extent of visible remains, limited background research was completed to assist in providing a preliminary recommendation regarding each site's potential eligibility for listing in the NRHP. Additionally, preliminary data that suggested the possibility of cultural material at several sites, upon further investigation were determined to not be locations containing archaeological resources.

Avoidance buffers are recommended for four of the sites based on potential eligibility for listing in the NRHP (Table 4-1). Delineation of preliminary avoidance areas is based on the results of the in-water investigation and acoustic imagery (side-scan sonar or multibeam echosounder), which delineated the extent of exposed features at each site. Acoustic and visual methods are limited, however, and only indicate materials visible on the seafloor; therefore, larger buffers are recommended for sites that have disarticulated hull features and/or may contain debris fields or buried materials beyond or within the extent of any visible site remains. Avoidance areas are presented as extending from the discernable extent of visible hull remains or from a center point, in cases where a site presents disarticulated remains or debris fields.

Table 4-1: Matrix of Targets Investigated and Recommendations

Target	Description	Recommendation
Potential Wreck 1	MBES was suggestive of a potential wreck site. Follow-up investigation determined no archaeological remains to be present at the location. Acoustic signature from MBES may be transient marine life or characteristic of seafloor substrate.	No further investigation recommended at this location.
Potential Wreck 2	MBES was suggestive of a potential wreck site. Follow-up investigation determined no archaeological remains to be present at the location. Acoustic signature from MBES may be transient marine life or characteristic of seafloor substrate.	No further investigation recommended at this location.
Potential Wreck 3	MBES was suggestive of a potential wreck site. Follow-up investigation determined no archaeological remains to be present at the location. Acoustic signature from MBES may be transient marine life or characteristic of seafloor substrate.	No further investigation recommended at this location.
Wreck 1	Unidentified modern-era commercial fishing trawler. Intact site with limited debris field.	Site may be potentially eligible for listing in the NRHP; however identification would be required to further assess significance. Preliminary avoidance of this target is recommended by 50 m (164 ft) from the extent of the intact hull remains. Additional investigation is recommended to document and monitor the site. Additional archival investigation recommended.
Wreck 2	MBES was suggestive of a potential wreck site. Follow-up investigation determined no archaeological remains to be present at the location. Acoustic signature from MBES may be transient marine life or characteristic of seafloor substrate.	No further investigation recommended at this location.
Wreck 3	MBES was suggestive of a potential wreck site. Follow-up investigation determined no archaeological remains to be present at the location. Acoustic signature from MBES may be transient marine life or characteristic of seafloor substrate.	No further investigation recommended at this location.
Wreck 4	Site identified as freighter <i>Yankee</i> , lost in 1919. Bow, stern, and engineering spaces remain intact with disarticulation amidships.	Site is considered eligible for listing in the NRHP. Preliminary avoidance of this target is recommended by 50 m (164 ft) from the discernable extent of the hull remains. Additional investigation is recommended to document and monitor the site.
Durley Chine	Target selected from ASD due to proximity to survey area. SSS survey was unable to locate any observable remains at the reported location.	Update ASD to reflect confidence level in reported site location. Additional survey in the area is recommended to locate site.
“Happy Days”	Unidentified shipwreck consisting of deck machinery and potential wooden hull remains.	Site may be eligible for the NRHP. Preliminary avoidance of this target is recommended by 50 m (164 ft) from the extent of the site, which may contain buried features and additional hull remains. Additional investigation is recommended to document and monitor the site.
Irma C	Remains of reported <i>Irma C</i> steam barge. Site consists of wooden hull remains with deck machinery.	Site is considered potentially eligible. Preliminary avoidance of this target is recommended by 50 m (164 ft) from the extent of the site, which may contain buried features and additional wooden hull remains. Additional investigation is recommended to document and monitor the site.

The preliminary avoidance recommendations presented in Table 4-1 may be refined if additional information is gathered, particularly through methods that may provide information regarding the presence and extent of subsurface features.

The ten locations investigated present a broad range of cultural resources spanning from the late-nineteenth century through the modern era, highlighting the diversity of potential resources likely present within areas offshore around New York Bight. While the assessment of sites under this study is preliminary, the methodological approach employed allowed the project team to complete the important first task of archaeological ground truthing. This allowed the team to distinguish targets that represent potentially significant archaeological sites warranting avoidance and further investigation from those that do not represent potentially significant archaeological resources—a task that cannot always be determined when solely relying on remote sensing data. It is recommended that the methods herein employed (ground truthing, documenting, and monitoring) be applied for other WEAs.

Finally, as this was a preliminary investigation, only a general description of the sites' respective environment was conducted. Depending on future management strategies, it may be valuable to establish more concrete scientific descriptions of the environment and ecosystems present at each site. For example, study of water quality and chemical characteristics at each site would aid in the study of corrosion potential to assist researchers in understanding the various site formation processes acting on these sites.

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