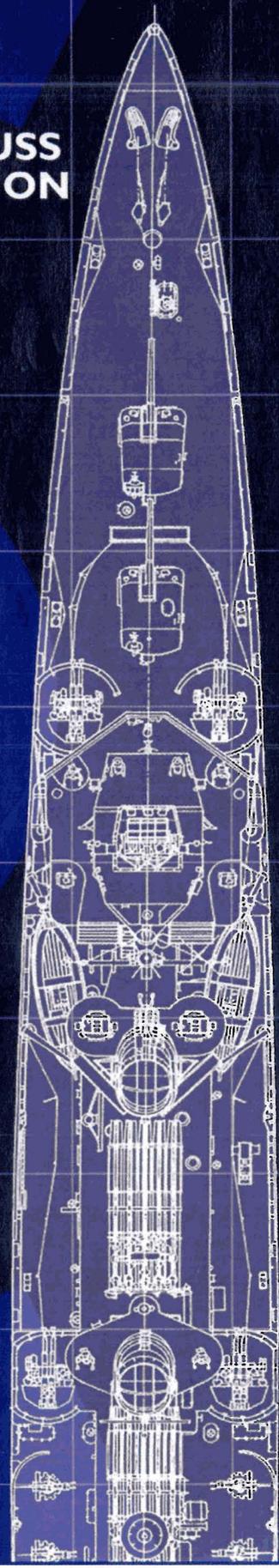


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FINAL REPORT

ADDENDUM TO: EX-USS KILLEN SITE INVESTIGATION

THE SPLIT-UP WRECKAGE OF THE EX-USS KILLEN, VIEQUES ISLAND, NAVAL STATION ROOSEVELT ROADS, PUERTO RICO



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1.0 INTRODUCTION

Throughout the ex-USS Killen (Killen) site investigation and biological characterization conducted in 2001 at Bahia Salina del Sur, Vieques Island (Vieques), two shipwrecks were consistently described as the Killen and the barge, and were assumed to have been separate vessels (DoN 2002). However, physical evidence that was first noted during the data analysis phase of the initial site investigation suggested that the barge might in fact be the aft section of the Killen.

This addendum to the report of the initial investigation of the ex-USS Killen as conducted in 2001 (DoN 2002) presents evidence that the wrecks of the Killen and the barge are in fact a single split-up target vessel. This evidence has resulted from the assimilation of historical information from photographs of the USS Killen, underwater photographs of the wrecks taken in 2001 and 2002, photographs of an intact Fletcher class museum ship, Fletcher-class destroyer design specifications, and field measurements taken at the wreck sites.

The Killen was one of 175 Fletcher-class destroyers built during World War II (WWII) and used as a target hulk in the Atlantic Fleet Weapons Training Facility (AFWTF) during the 1970's (DoN 2002; NHC 2002; Haze Gray & Underway 2003). Upon further investigation, the barge wreck site has been found to include several features that are consistent with Fletcher-class destroyers: (1) the presence of a propeller shaft, (2) a power ammunition hoist (a mechanism for delivering munitions up from the magazine level of a destroyer), and (3) two circular structures, 3 meters (m) (10 feet [ft]) in diameter, that closely resemble 5 inch/38 caliber gun mount foundations (barbettes) used on WWII era destroyers. Other features such as mooring chocks and bits and side mounted depth charge racks match structural deck features noted in historical pictures taken of the Killen during WWII and during the time of the ship as a target hulk. Dimensional characteristics also match those of Fletcher-class destroyers. Furthermore, the primary Killen wreckage is missing its entire stern section aft of its second engine room (an approximate length of 36.6 m [120 ft]); while at the same time, the length of the barge as measured on the seafloor is 36.4 m (119 ft), which would account for the missing aft section at the primary Killen wreck site.

2.0 MATERIALS AND METHODS

2.1 STUDY SITE

The Killen and barge wreck sites are located in Bahia Salina del Sur, at the southeastern end of Vieques (Figure 1). Vieques is a municipality of the Commonwealth of Puerto Rico and is part of the Greater Antilles island chain in the Caribbean Sea. The island is approximately 6 nautical miles (NM) southeast of mainland Puerto Rico and 22 NM southwest of St. Thomas, U.S. Virgin Islands. Vieques is approximately 35 kilometers (km) (22 miles [mi]) long and 7.2 km (4.5 mi) wide, and covers about 133.5 square kilometers (km²) (33,000 acres [ac]). The island principal city of the island, Isabel Segunda, is located on the north shore.

The wrecks of the barge and the Killen cover 1,200 square meters (m²) (0.3 ac) and 300 m² (0.07 ac) respectively and are situated in 2.5 to 10 m (8 to 33 ft) of water in a large seagrass area. The latitude and longitude coordinates of the wreck sites are 18°07'37.5"N, 65°18'09.2"W for the barge and 18°07'29.7"N, 65°18'09.0"W for the Killen (Figure 2). The wrecks are separated by approximately 240 m (787 ft) in a north-south orientation.

2.2 UNDERWATER SURVEYS

Photographic and dimensional data were recorded at both wreck sites in November of 2001 as part of the site investigation and biological characterization fieldwork (DoN 2002). Additional photographic images of the barge were taken in November of 2002.

In 2001, a team of six marine scientists conducted the underwater field research diving with SCUBA gear and regular compressed air. Six to seven hours were spent daily at the study sites with a total of about 21 hours at the primary Killen wreck site and 21 hours at the stern section wreck site. Security personnel at

Naval Station Roosevelt Roads (NSRR) and Camp Garcia authorized access to the work sites. Explosive Ordnance Disposal NSRR briefed all the researchers on ordnance safety and the sites were checked for unexploded ordnance before the work began (DoN 2002).

The dimensions of the wrecks were determined using underwater fiberglass measuring tapes. The heights and depths were measured using the depth gauge of a dive computer. A series of downward looking underwater digital photographs were taken to produce the photographic mosaics (photo-mosaics) of the wrecks (Sony TRV-20 and Olympus C-3030) (**Figure 3**). Video still images were taken from near the sea surface and the camera stills were taken from approximately 1 m (3.3 ft) above the wreck. Geographic information system (GIS) software and digital photo editing software were used to produce photo-mosaics of the wrecks (DoN 2002).

The survey performed at the barge site in 2002 was needed to further investigate the possibility that the barge wreck was in fact the missing stern section of the Killen. During this survey, we photographed with a digital camera (Olympus C-3030) structural features that include deck housing, a power ammunition hoist, and what appeared to be a propeller shaft. We also performed a visual inspection of the main Killen wreck site to reassess key structural features including the propeller shaft.

2.3 ARCHIVAL INFORMATION

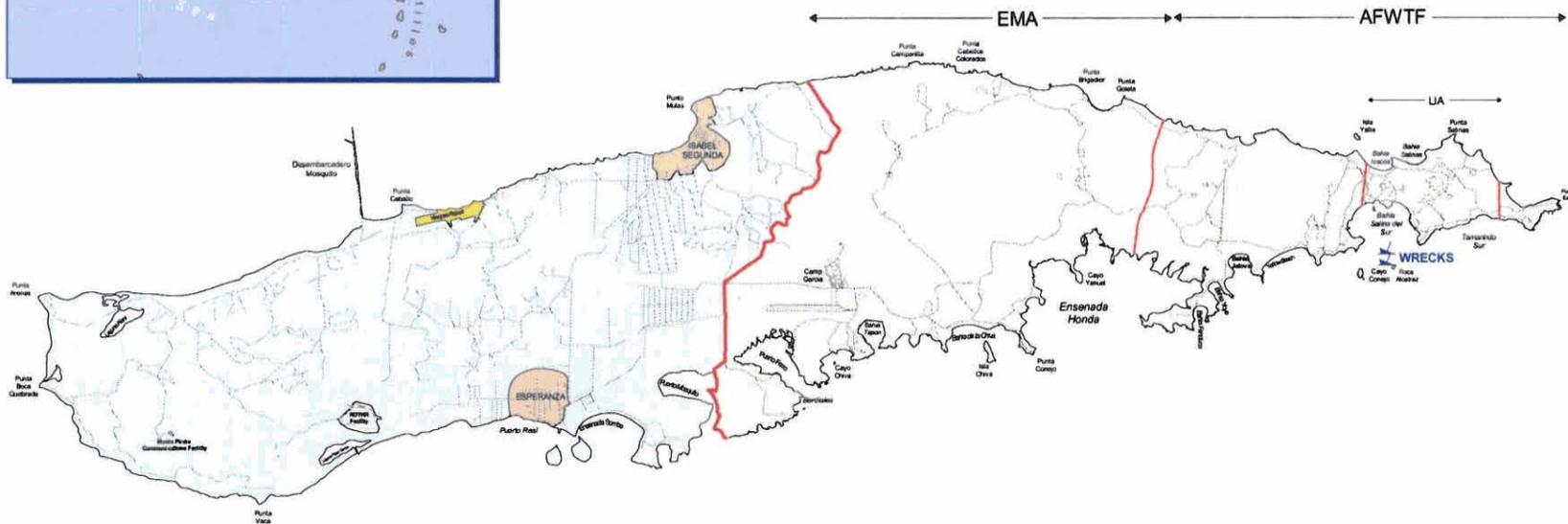
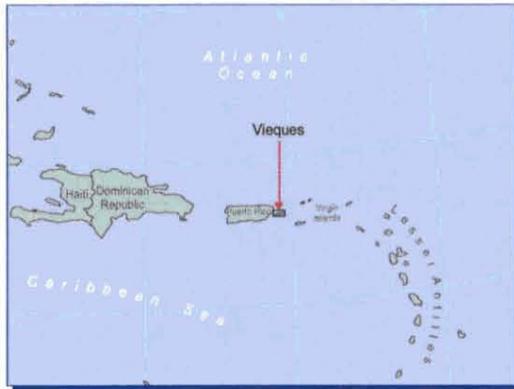
We reviewed and analyzed a variety of archival data while researching the features of Fletcher-class destroyers in general and the USS Killen specifically. Among these data sources was a Navy microfilm preserved by the United States (U.S.) National Archives and Records Administration (NARA) showing naval shipyard design schematics for Fletcher class destroyers built between 1942 and 1943 (DoN 1945). The film contained numerous detailed tracings of the destroyers in overhead, profile, and cross-sectional views. Included were the hull corrected working plans of roughly seven different ship designs all with minor variations on the basic Fletcher Class layout. In particular, the microfilm documented weaponry, compartments, engineering structures, deck and interior fixtures, and superstructure features.

We used historic images of the Killen to find specific identifying features that would help us to match the Killen to the wreckage located in Bahia Salina del Sur. A wide variety of vintage WWII photographs are available on the World Wide Web (the web) via the Internet. A number of private, not-for-profit, and government web sites post images of WWII destroyers and of the Killen (e.g., Destroyers Online 2002; NavSource Naval History 2003). The historic images we used for analysis and display came primarily from the photo archive of the Naval Historical Center (Photographic Section). Their online library offers views of the Killen (and other Fletcher class destroyers) in the various aspects of their career including some of the Killen during years it was used as a target (NHC 2002). Images from the Naval Historical Center were essential in identifying specific structural features peculiar to the Killen and to Fletchers in general.

2.4 USS CASSIN YOUNG AND FLETCHER-CLASS DESTROYER MUSEUM SHIPS

Of the 175 Fletcher class destroyers built during WWII, there are at least 11 that remain intact. Several have been in the service of foreign navies (ex-USS John Rogers in Mexico and seven in Taiwan; Faulkner 1999) and three (USS The Sullivans [DD-537] in Buffalo, New York; USS Kidd [DD-661] in Baton Rouge, Louisiana; and USS Cassin Young [DD-793] in Boston, Massachusetts) are open to the public as museum ships in the U.S. (**Figure 4**). Of these, the USS Kidd is considered to be in the best restored to WWII condition (USSKidd.com 2003). The USS Cassin Young has intact and working boilers and engineering machinery (Boston National Historical Park 2003). The websites of the USS The Sullivans (USSTheSullivans.net 2003) and of the USS Cassin Young (Boston National Historical Park 2003) provide virtual tours of the ships.

During an in-depth visit of the USS Cassin Young with WWII veteran Mario A. Libardoni, in February of 2002, we took over 200 digital photographs of the ship? above and below deck. These photographs included deck housing, engineering rooms (a boiler room and an engine room), and in the aft quarter of the first platform (one deck below the main deck at the aft end of the ship).



EMA: Eastern Maneuver Area
 AFWTF: Atlantic Fleet Weapons Training Facility
 LIA: Live Impact Area

- Base Boundary
- Operational Boundaries
- Towns
- Airport
- Navy Lands
- Non-Navy Lands

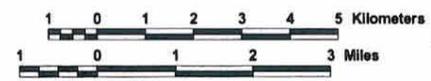


Figure 1. General location map of Vieques and the wreck sites.

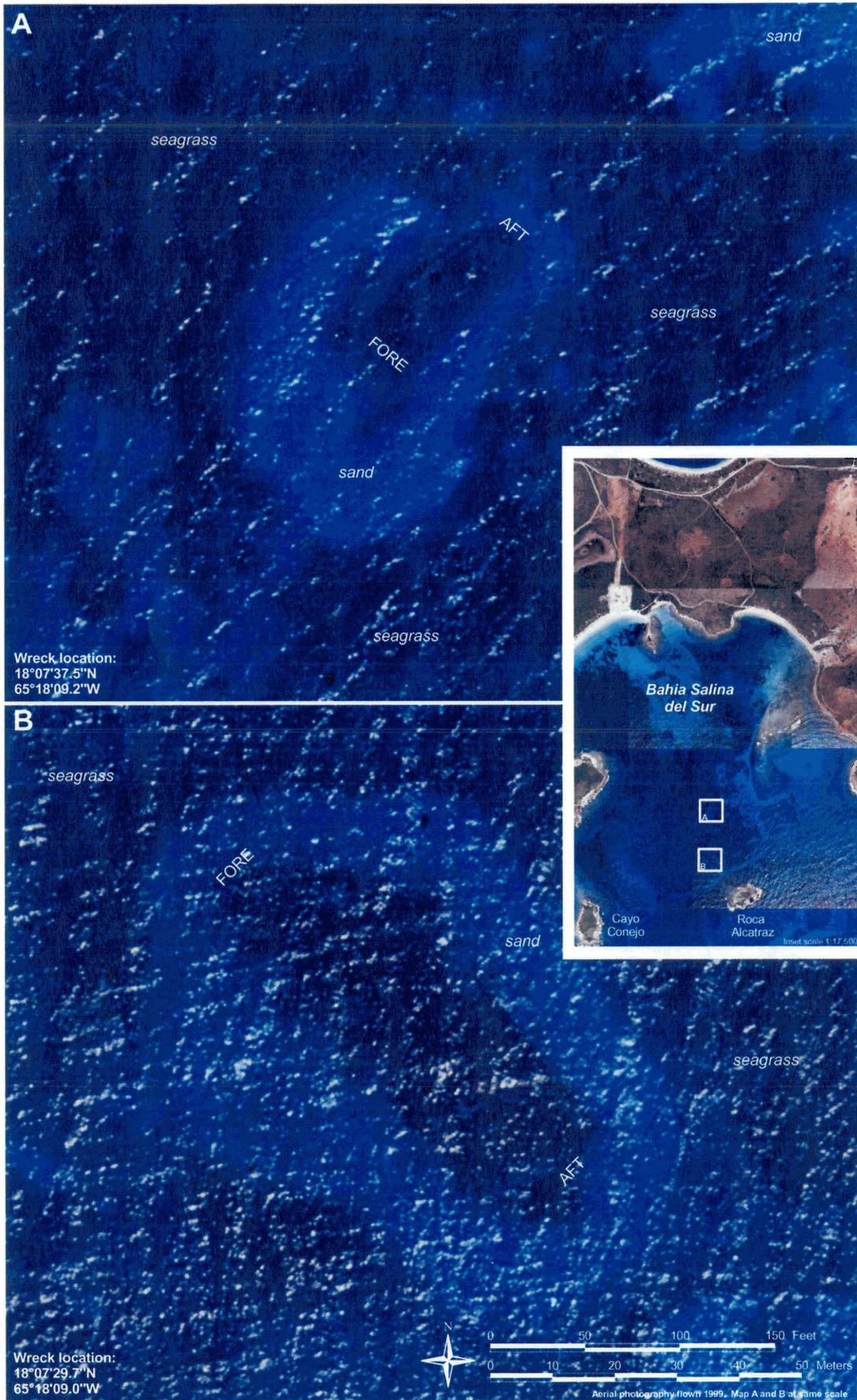


Figure 2. Aerial views of Bahia Salina del Sur showing the wreck sites and seagrass delineation.

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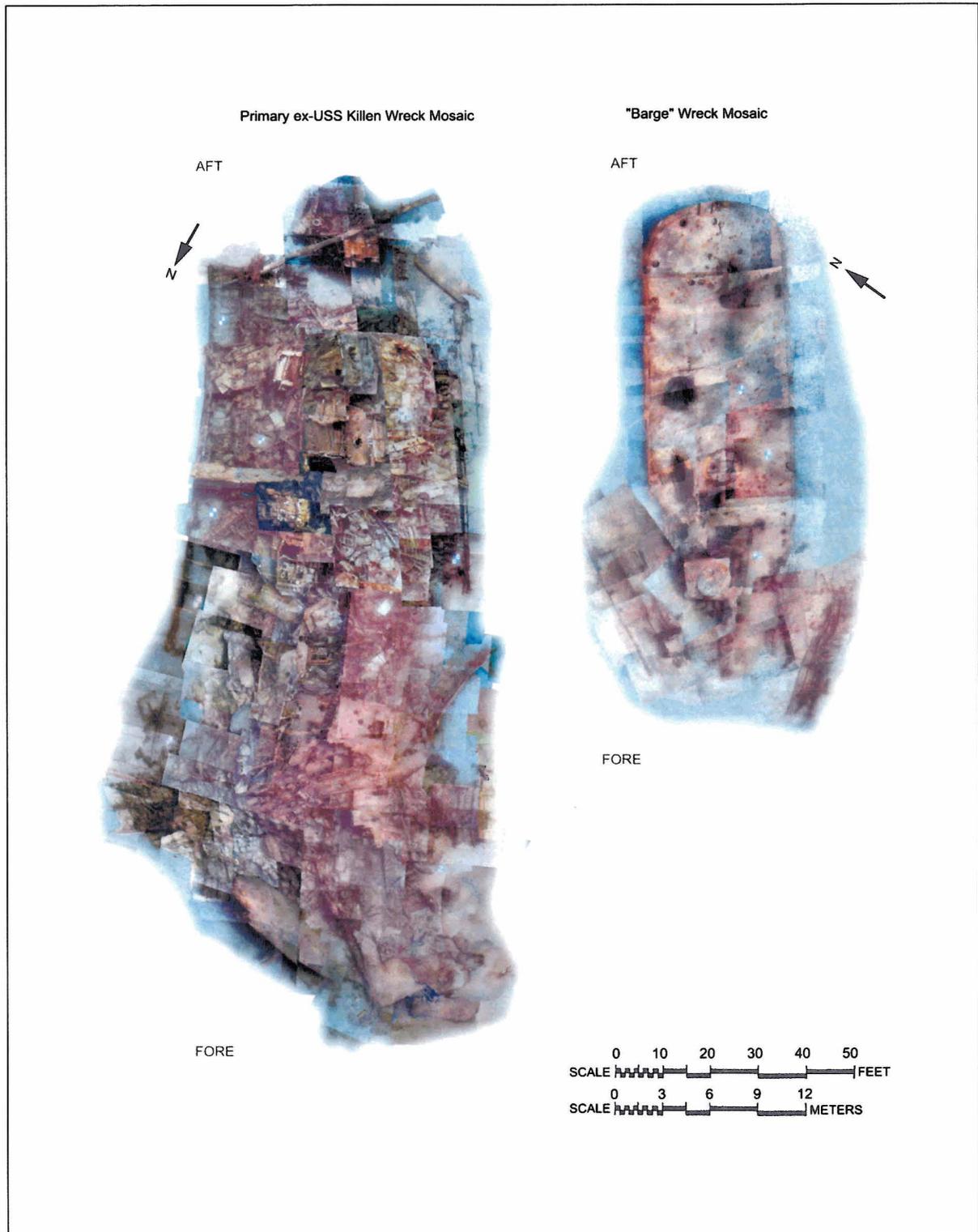


Figure 3. Photo-mosaics of the ex-USS Killen and "barge" wrecks as surveyed in November 2001 (DoN 2002).



Figure 4. Fletcher class destroyer museum ships in the United States: (A) the USS Cassin Young at the Charlestown Naval Shipyard, Boston, Massachusetts; (B) the USS Kidd in Baton Rouge, Louisiana; (C) the USS The Sullivans in Buffalo, New York.

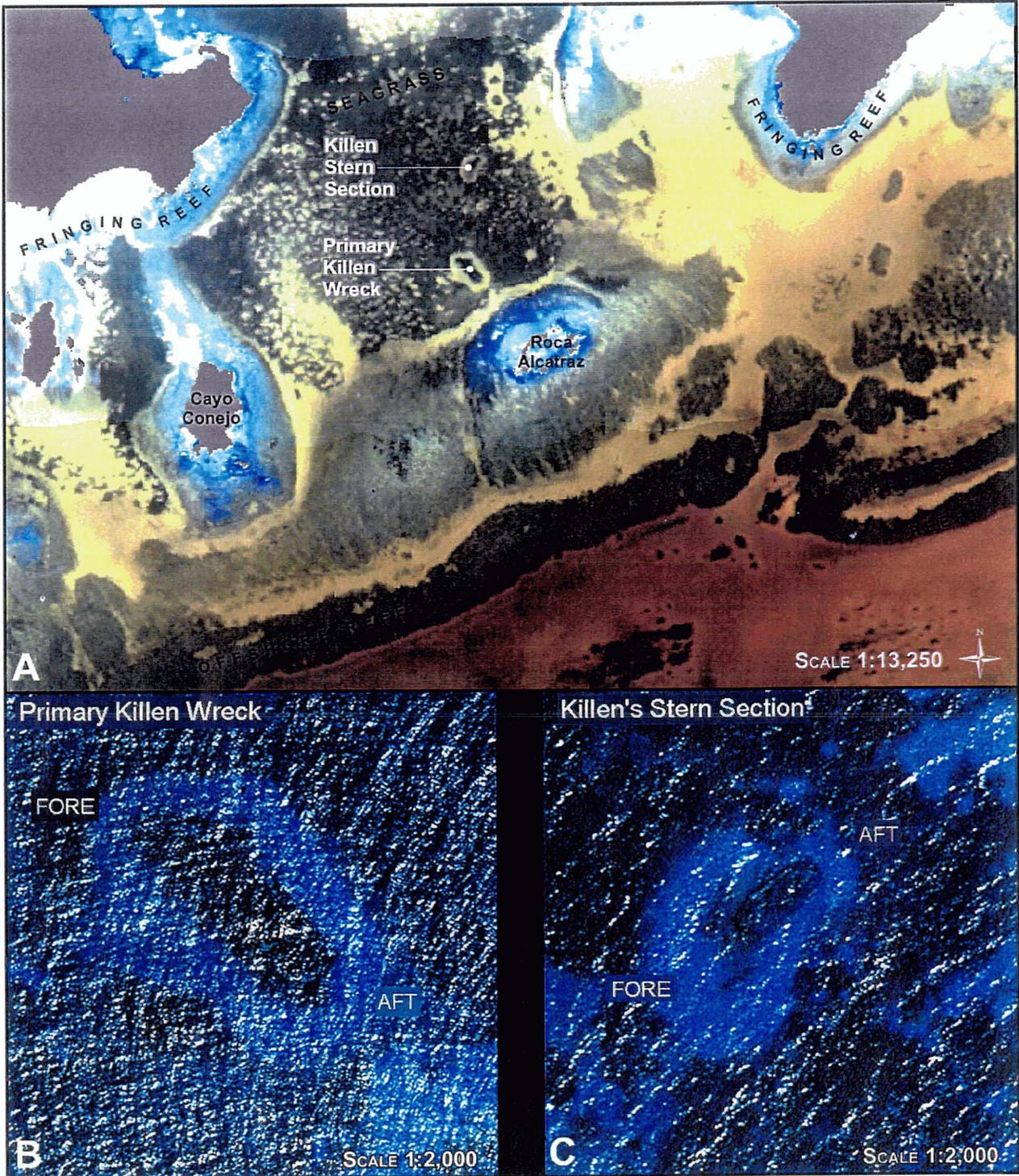


Figure 5. (A) Hyperspectral imagery of Bahia Salina del Sur; (B) Aerial view of the Killen primary wreck site; (C) Aerial view of the Killen secondary wreck site.

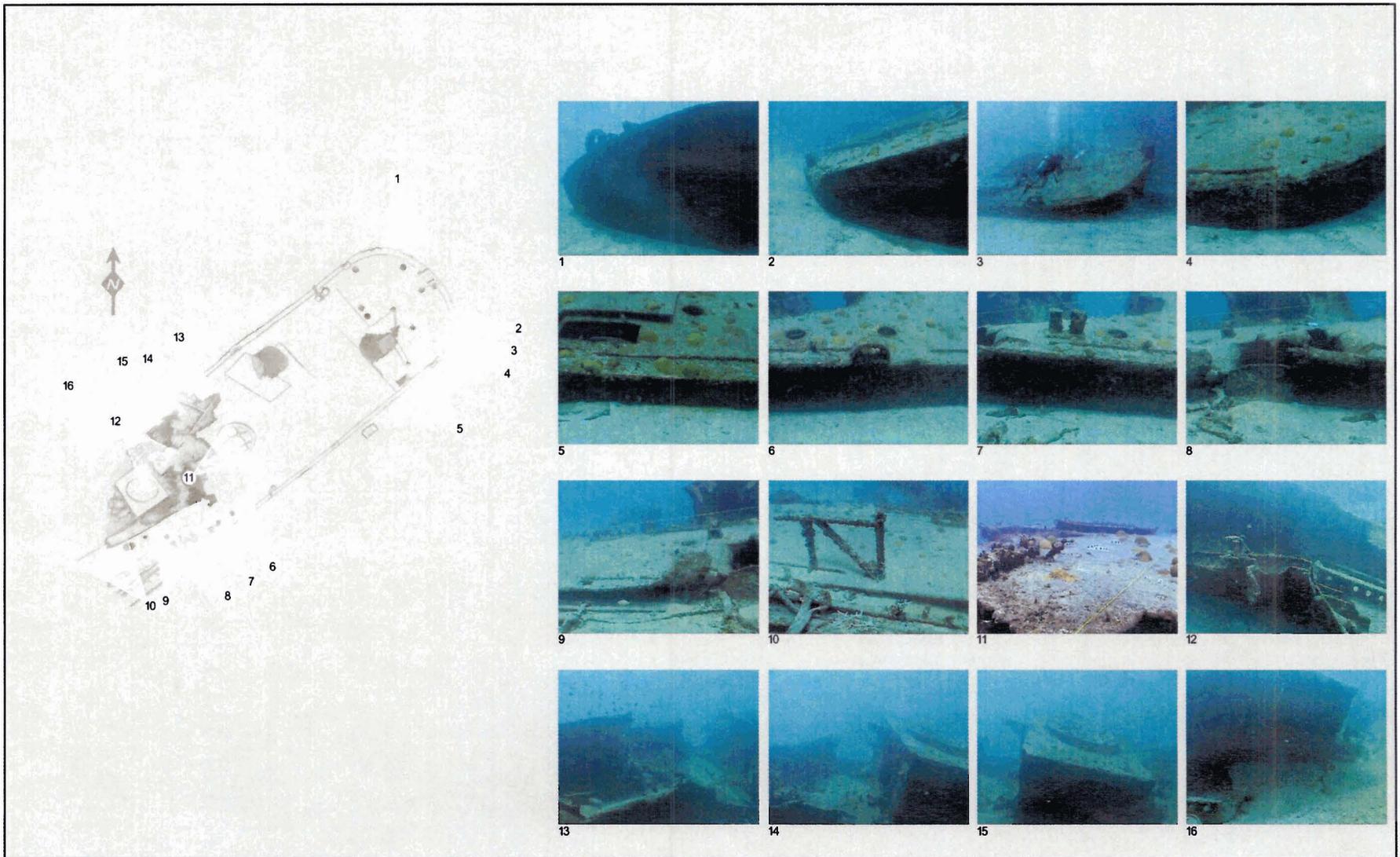


Figure 6. Artist's rendering and views of the wreckage at the secondary wreck site.

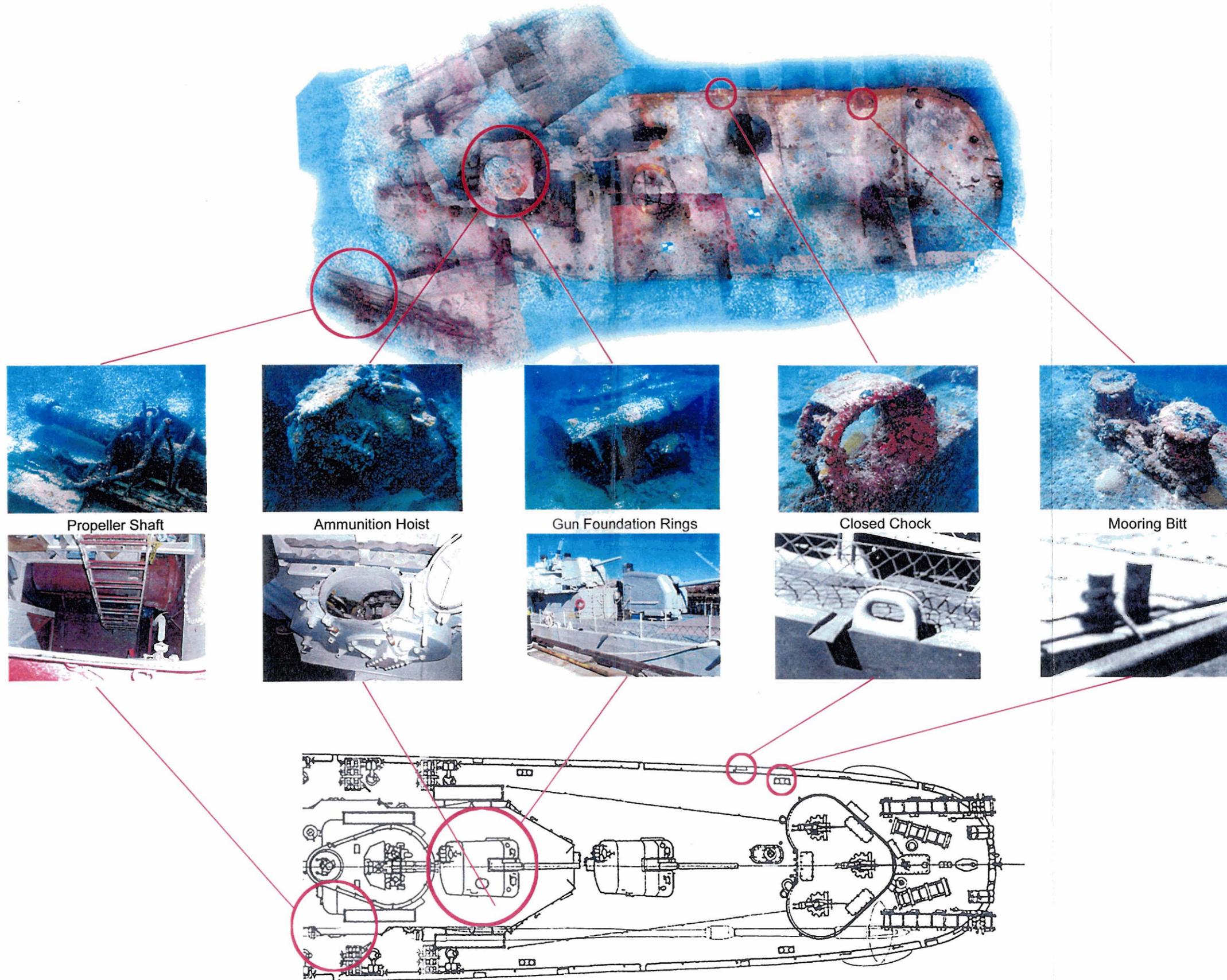


Figure 17. Summary of photographic and line drawing evidence identifying the barge as the stern section of the Killen.