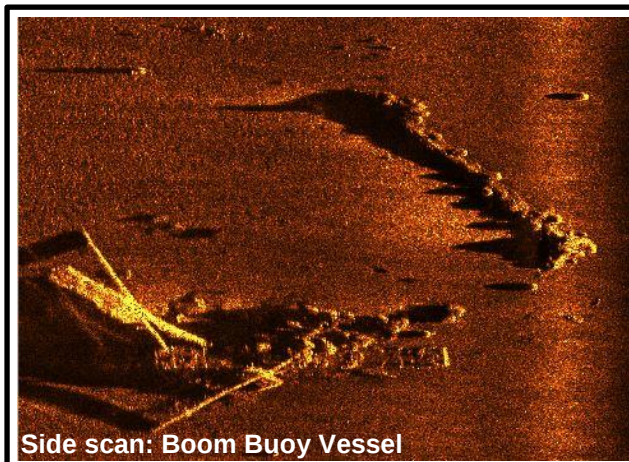




Roan Head, Flotta



Side scan: Boom Buoy Vessel



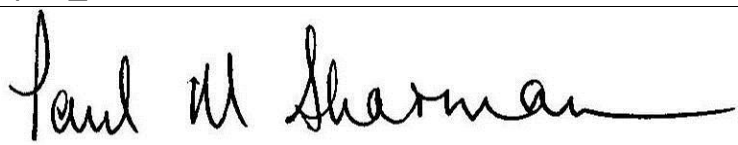
Diving Survey: Boom Buoy Vessel

Roan Head Boom Buoy Vessel

Project Report

March 2015

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EXECUTIVE SUMMARY

This report presents the outcomes of side scan sonar surveys and archaeological diving evaluations of two boom defence vessels located off the north coast of Flotta within Scapa Flow, Orkney (Canmore ID 102201). The site was initially dived by Rob Baxandall off the MV *Valkyrie* in September 2014. He reported that the wreck was a long narrow vessel that was associated with World War II boom defence debris (boom netting and buoys) – which overlay and surrounded the site.

The remains were described to Kevin Heath and Annalisa Christie and following discussions with Hazel Weaver (of the MV *Valkyrie*) a project was proposed to Historic Scotland to conduct an assessment of the site and surrounding area to confirm the identification, survival, character and condition of the remains.

Desk based assessment of archival sources, in light of diver surveys of the vessels, indicate that these are the remains of experimental Anti-Torpedo Close Protection Pontoons, used in the close protection of vessels at anchor from aircraft launch torpedoes. The pontoons were only in operation for 13 months (March 1941 – April 1942) and few were brought into service – with the majority of the units deployed in Scapa Flow and Rosyth. As such they represent a rare heritage resource for which very little is known about their operation.

Side scan sonar surveys of the surrounding area resulted in the identification of numerous features including three other rectangular contacts, which could represent the remains of other pontoons. Further surveys of these sites using a Remote Operated Vehicle (ROV) is recommended, to confirm the identity of the remains and to further elucidate the configuration and operation of these vessels.

While it is not within the remit of this survey project to address management issues, the evidence from this project (and the outcomes of previous surveys) should contribute to HS and stakeholders formulating appropriate management and monitoring strategies for heritage assets with Scapa Flow resource more broadly.

ACKNOWLEDGEMENTS

ORCA Marine would like to thank Rob Baxandall and Hazel Weaver for bringing the remains to light. Had the site not been reported, a unique heritage asset would have been overlooked and the identity of similar vessels on Flotta and at Hoxa would have remained unconfirmed. We would also like to thank Philip Robertson for his comments on early drafts of this report and his advice throughout the project. Finally, thanks to UKHO for permission to use their charts.

Annalisa Christie, Kevin Heath and Mark Littlewood authored this report. In addition, Malcolm Thomson and Brett Green completed the side scan sonar and diving surveys, facilitating the data collection.

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1. INTRODUCTION

This report presents the outcomes of a project commissioned by Historic Scotland (HS) to undertake an archaeological assessment of submerged wartime defences off Roan Head, Flotta with particular reference to the reported remains of a vessel indicated by the symbol Wk 19 on the chart (Canmore ID 102201). The wreck is situated in an area of foul ground.

The site was initially dived by Rob Baxandall off the MV *Valkyrie* in September 2014. He reported that the wreck was a long narrow vessel that was associated with World War II boom defence debris (boom netting and buoys) – which overlay and surrounded the site. It was hypothesised that the vessel could be the wreck of a boom gate vessel which would have been used to deploy the boom nets and buoys. The remains were described to Kevin Heath and Annalisa Christie and following discussions with Hazel Weaver (of the MV *Valkyrie*) a project was proposed to Historic Scotland to conduct an assessment of the site and surrounding area using side scan sonar and diver ground truthing.

The surveys aimed to confirm the identification, survival, character and condition of the remains in support of the HS *Strategy for the protection, management and promotion of marine heritage 2012 - 15*. The strategy aims to help advance knowledge, understanding and enjoyment of marine heritage, disseminating such information widely and to improve stewardship of key marine heritage assets.

2. PROJECT BACKGROUND

The surveys undertaken build on the work of previous projects conducted in Scapa Flow, which have provided baseline and monitoring data to document the extent and condition of submerged heritage assets in the area. These projects include:

- Multibeam Echosounder (MBES) surveys in 2001 and 2006 as part of the HS funded ScapaMap project to map the remains of the scuttled German High Seas Fleet and the area of the Royal Navy Anchorage including the dispersed remains of the HMS *Vanguard* (<http://www.scapamap.org>);
- Ministry of Defence (MoD) surveys of the HMS *Royal Oak*;
- HS-funded MBES surveys completed by Wessex Archaeology (WA) in 2011 to map the blockships in Burra Sound and other wartime wrecks (HMS *Strathgarry*; *UB116*; the *F2* and *YC21* barge; *S54*; *V83*; and *Dewey Eve*) (Dresch and McCarthy 2012);
- Desk-based assessment (DBA) work to improve the record of the marine historic environment conducted as part of HS and the Royal Commission for Ancient and Historic Monuments of Scotland (RCAHMS) Project Adair (Pollard et al. 2012); and

- Side scan sonar and diving surveys of the blockships at the Churchill Barriers and lesser known wartime wrecks around Scapa Flow conducted by ORCA Marine and SULA Diving in 2013 as part of the HS funded *Scapa Flow 2013 Marine Archaeology Survey* (Christie et al. 2014).

3. AIMS AND OBJECTIVES

The project aimed to:

- Build on work conducted by previous projects (detailed above) by undertaking survey and evaluation work to provide information on the extent, survival and condition of a submerged vessel directly associated with boom nets and buoys off Roan Head, Flotta (Canmore ID 102201);
- Provide information to aid HS in its consideration of potential designation of an Historic Marine Protected Area (HMPA) that would focus on the key surviving submerged wartime heritage assets in Scapa Flow; and
- Ensure that the information collected is disseminated widely and made available for public study, appreciation and enjoyment.

These aims fit into Objectives 1 and 2 of the HS *Strategy for the protection, management and promotion of marine heritage 2012 – 15*, which are to:

1. Collaborate with all relevant parties to enhance the record of the marine historic environment and disseminate this information widely to support marine planning; and
2. Make recommendations, including input from stakeholders, to Scottish Ministers on the selection, designation and management of HMPAs, establishing a well-managed group in Scottish Territorial Waters.

The specific objectives of the project were to:

- Conduct side scan sonar surveys around the vessel and in the surrounding area to record and identify any associated submerged remains; and
- Complete a diver survey on the submerged vessel and any other key targets noted on the side scan sonar surveys to assess the character and condition of the remains.

4. METHODOLOGY

4.1 DESK BASED ASSESSMENT DATA SOURCES

The project team identified a number of sources to collect historical data to provide contextual information about the site. These were assessed to aid in the identification of the remains:

The initial datasets acquired included:

- Historic Scotland data;
- RCAHMS data (via Canmore and Project Adair);
- Orkney Sites and Monuments Record (SMR); and
- United Kingdom Hydrographic Office (UKHO).

Other data sources included:

- Orkney Archives;
- Local diver reports, videos and photos (via Orkney Marine Archaeology Forum (OMAF)); and
- Orkney Harbours surveys.

As part of the DBA a number of Admiralty files from the National Archives at Kew were also consulted. These provided a rich resource of documentary evidence and historical photographs of the vessels while in service, confirming the identity of the remains.

4.2 GIS

A Marine Environmental Data and Information Network (MEDIN)-compliant ArcGIS Project was created using a WGS1984 geodetic datum projected to UTM Zone 30N. The acquired data and fieldwork results were entered into ArcGIS. ESRI's ArcGIS software was chosen as the most suitable program for use on this project due to its advanced tools, database connections and graphical output capabilities. A shapefile was created within an ArcGIS *.mxd project, ensuring compatibility with the RCAHMS Canmore database and HS data management systems. Each asset in the GIS and the database has been assigned a Unique ID number allowing easy spatial querying of the GIS, enabling the auditing and assessment of the sites and anomalies.

Images, including all of the side scan mosaics have been geo-rectified into the GIS where necessary and worldfiles created for appropriate image files such as TIFFs and JPEGs. Relevant datasets have been imported into this database, and have been linked to the mapped shapefiles of records within the GIS. These have been modelled closely on existing National Monuments Records (NMR) and Orkney SMR databases and data fields allowing for easier integration.

4.3 SIDE SCAN SONAR SURVEY

The side scan sonar surveys were completed using a standard C-MAX Sonar CM2 Digital Towfish with depth sensor. A medium frequency setting of 325kHz was used during the surveys, with the range set initially to 75m (7 pings per second) and subsequently reduced to 50m (9.1 pings per second) once the target site had been located. This resulted in either a 100m or 150m swathe during each run, at a resolution which enabled the technician to distinguish both wrecks and smaller objects such as mooring ropes, spars and boom defence debris (boom net buoys and nets).

Spatial data was collected using an Evermore SA380 Marine GPS which was attached to the winch. The layback of the towfish was calculated using a counter-pulley secured to a davit at the stern of the vessel. The distance between the GPS and the counter pulley is used during post processing to determine the location of the towfish (and thus the site) relative to the boat. This has an accuracy of +/- 3m.

Side scanning was an appropriate survey methodology for this project as it provided a detailed overview of seabed features with sufficient detail to create a detailed plan of the target site.

The surrounding area was also scanned using this method, situating the site within its broader context. A mosaic of the survey runs completed during this project can be seen in **Figure 1**.

4.4 SIDE SCAN DATA PROCESSING

Side scan sonar data was collected and post processed using SonarWiz 5 following guidance in the *2013 Marine Geophysics Data Acquisition, Processing and Interpretation: Guidance Notes* (Plets et al. 2013: 34-36). SonarWiz 5 software allows other data such as basemaps in ESRI shapefile format to be viewed alongside the side scan sonar data. Additionally, it can be used to produce a mosaic of several survey transects achieving the best possible images of the sites. To avoid losing data by using slant range correction (where the water column is removed during processing), where possible the scans were completed to ensure the target was within either the port or the starboard mosaic channel.

4.5 DIVER GROUND-TRUTHING

Following the side scan sonar surveys, the target site was assessed by divers who evaluated the remains to determine their survival, identification, character and apparent condition. A shot line was deployed on the target coordinates using the position determined by the Evermore SA380 Marine GPS (approximate accuracy 3m) in relation to the echosounder return.

Divers were followed around the site using a marker buoy but it was not possible to provide precise diver tracking. Four dives were made on the site. Video footage and photographs of key features of were collected on all four dives. These were reviewed by a marine archaeologist and marine historian upon return to shore.

SCUBA diving followed all recommendations of the *Scientific and Archaeological Diving Projects Approved Code of Practice* and a complete Health and Safety Risk Assessment was completed by the diving contractor to ensure diver and crew safety.

5. RESULTS

5.1 SIDE SCAN SONAR SURVEY

The surveys identified the target site as well as the remains of three other similar rectangular contacts. These features are described below. Numerous spars, several square blocks, a large circular contact (CC1) (2m in diameter which stands over 2.4m proud of the seabed) and several concentrations of boom defence debris (piles of net and associated buoys) were also found in the survey area. The boom defence debris was interpreted as such on the basis of previous side scan sonar and drop camera ground truthing completed during the *Scapa Flow 2013 Marine Archaeology Survey* (Christie et al. 2014: 56-60). Each of the contacts identified by surveys was given a unique ID number and a contact report was produced. A list and description of these features can be found in **Annex 1**. Detailed descriptions of the target site and the other three rectangular contacts observed in the surveys are provided below. Their distribution is shown in **Figure 1**.

5.1.1 TARGET SITE (CANMORE ID 102201)

The target site comprises two overlapping rectangular contacts, three mast-like features (hereafter referred to as spars), and large quantities of boom defence debris situated in a charted depth of 19m (**Plates 1 & 2, Figure 2**).

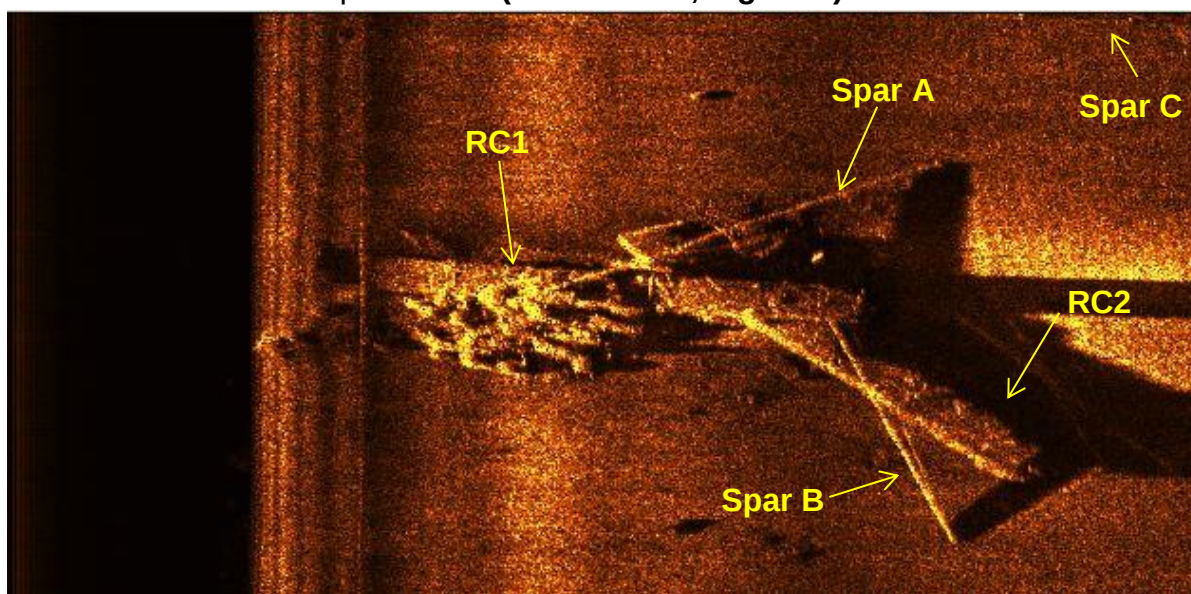


PLATE 1: SIDE SCAN SONAR IMAGE OF THE TARGET SITE (RC1 AND RC2)

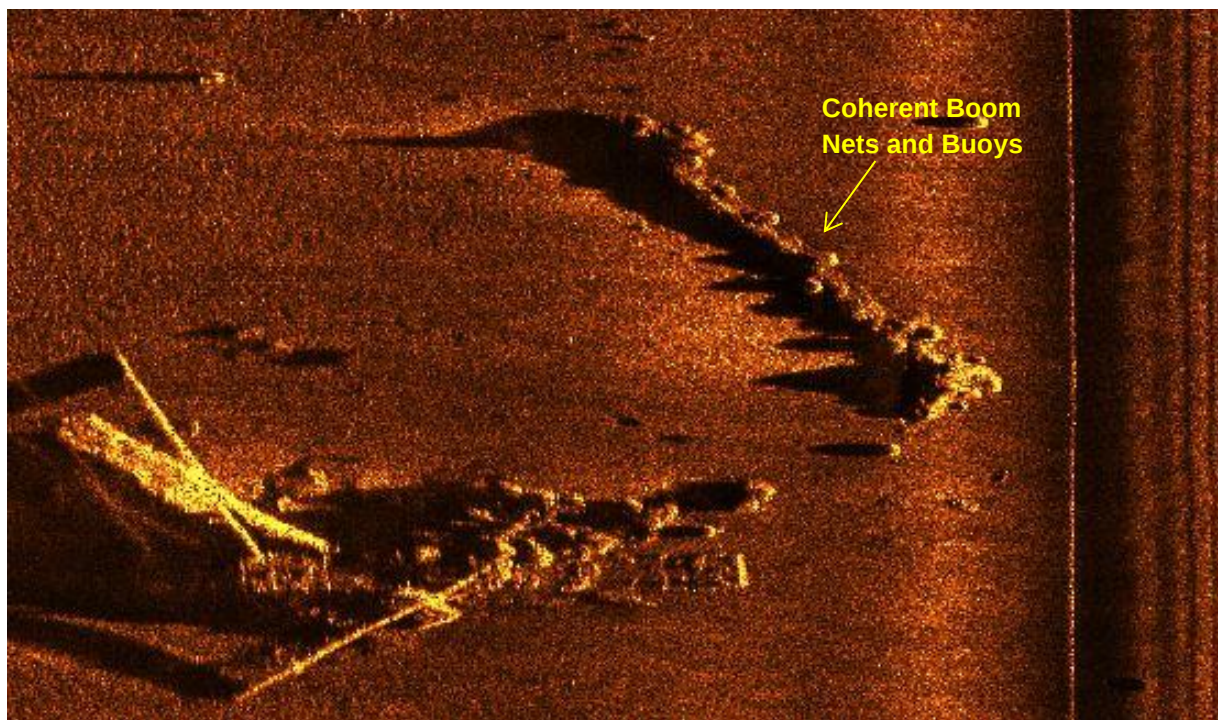


PLATE 2: SIDE SCAN SONAR IMAGE OF ASSOCIATED BOOM DEFENCE DEBRIS

The first rectangular contact (RC1) is 30m long by 3m wide, oriented north to south. There is a large pile of boom nets and buoys abutting the northern end of the remains to the west of the contact. This feature overlays a second rectangular contact of the same dimensions (RC2). RC2 is oriented northeast to southwest with RC1 overlaying the northeastern end.

Both contacts lie under two spars (Spar A and Spar B respectively). Spar A is approximately 22.6m is oriented northwest to southeast; while Spar B is approximately 24.9 and is oriented east-northeast to west-southwest. Subsequent assessment of the survey data following the diver surveys indicates the presence of a third spar (Spar C) approximately 5m to the east of the main target site. This is visible as three strong returns, which mark the position of flanges visible on the spars underwater (**Plate 3**). Spar C is at least 16m long, however the contact extends beyond the range of the side scan runs.

There is a coherent pile of boom net and buoys (30m long by 2m wide and standing between 1m and 2m proud of the seabed) approximately 13m to the northwest of the target site, oriented northeast to southwest.

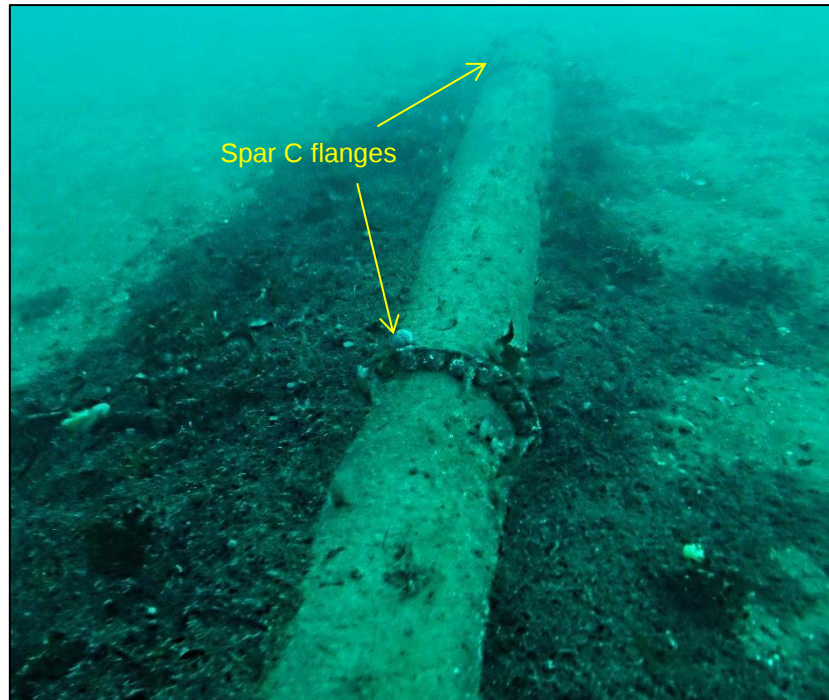


PLATE 3: PHOTOGRAPH OF SPAR C

5.1.2 OTHER KEY SIDE SCAN SONAR CONTACTS

The three other rectangular features identified in the surrounding area are described below.

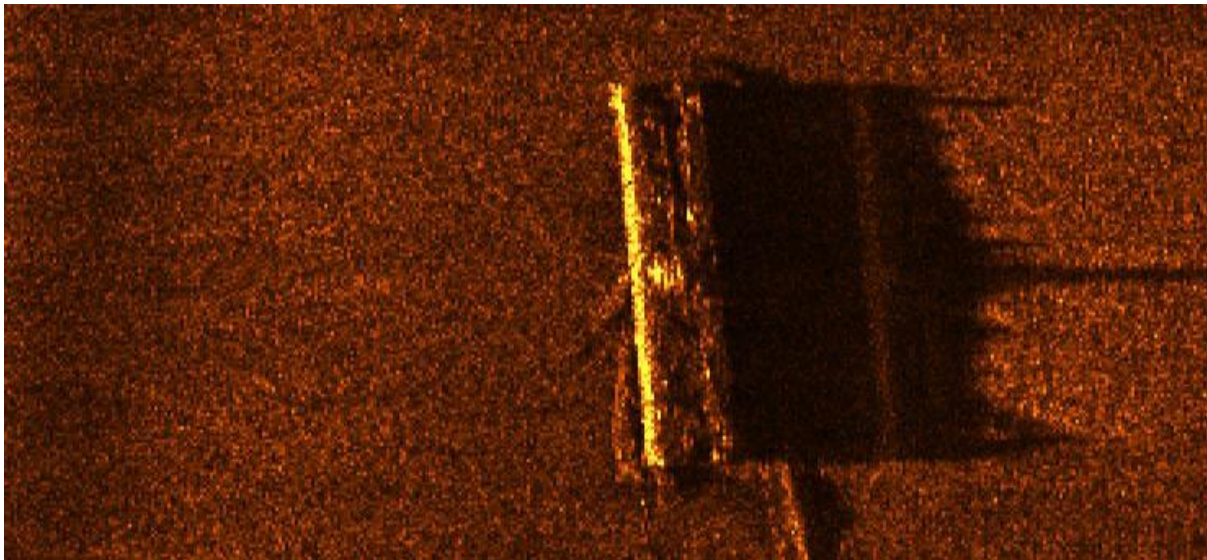


PLATE 4: SIDE SCAN SONAR IMAGE OF RC3

Rectangular Contact 3 (RC3) is an isolated contact to the northwest of the target site in a depth of approximately 26m. Measuring 30m long by 3m wide, the remains stand approximately 1.2m proud of the seabed. The shadow from the image indicates a single high point in the centre of the contact (approximately 2.9m at its highest point) and in addition suggests the presence of numerous smaller features

protruding from it. Some of these smaller features are visible as strong returns on the main contact (**Plate 4**). RC3 is oriented east to west with a slight scour in the seabed at the southwest corner of the remains.

Rectangular Contacts 4 and 5 (RC4 and RC5) are located to the west of the target site in a depth of approximately 5m. RC4 measures 30m long by 3m wide and the remains stand approximately 1.2m proud of the seabed. The shadow from the image indicates a single high point in the centre of the contact (approximately 2.4m high). The feature is likely to be slightly higher as the shadow extends beyond the side of the survey record. Similar to RC3 there are a number of strong returns on the main contact suggesting the top of the feature is populated with smaller features (**Plate 5**). RC4 is oriented northeast to southwest.

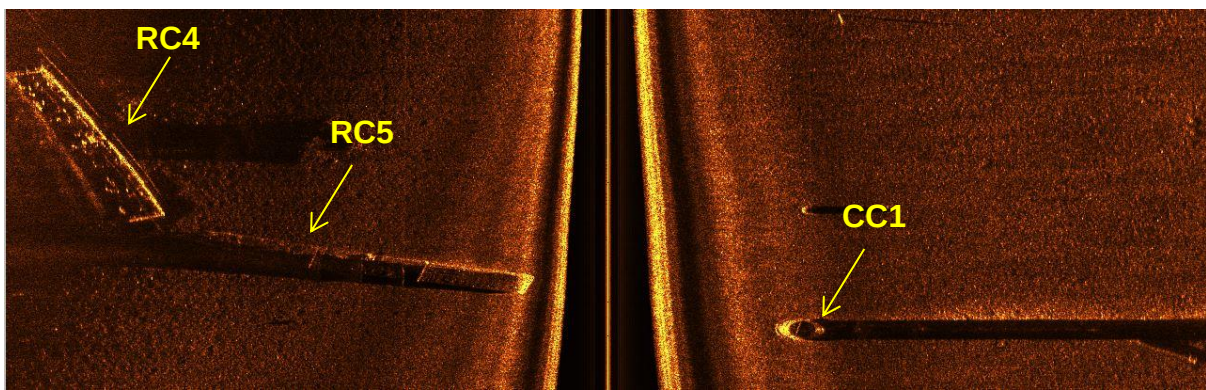


PLATE 5: SIDE SCAN SONAR IMAGE OF RC4, RC5 AND CC1.

RC5 is situated approximately 4m to the north of RC4, and has the same dimensions. Unlike RC3 and RC4, there is no high point in the shadows. There are two strong linear returns approximate 10m from either end of the contact (**Plate 5**). RC 5 is oriented north to south. CC1 is situated approximately 6m to the north of the remains of RC5.

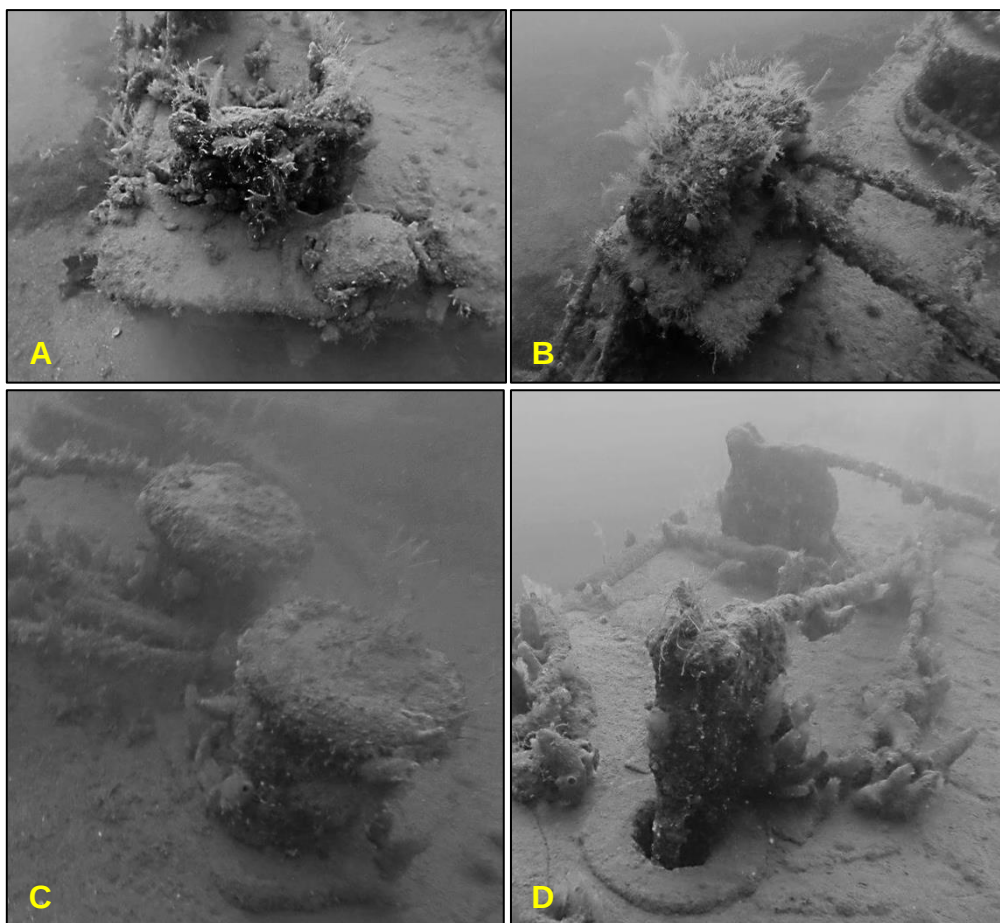
5.2 DIVING SURVEYS

Diving surveys were only conducted on the target site incorporating the remains of RC1, RC2, Spars A, B and C and the associated pile of boom netting and buoys to the northwest.

The remains are on a silt bottom off the north coast of Flotta, in a charted depth of 19m. They are covered with short animal turf and a large number of plumose anemones. There is no evidence of human interference (discarded fishing gears, or tangled lines) on, or in the vicinity of the wreckage.

Upon descent divers encountered the wrecks of two long, narrow vessels. RC1 was upright, and the 'deck' was divided into three 10m sections. The sections at each end were populated with a number of pulleys (running both along and across the vessel), posts (with wire guides), cleats, fairleads, bollards and bitts (**Plate 6A – 6F**).

Each of the pulleys was associated with a 0.16m diameter aperture, and wires *in situ* in the pulleys passed through tubes to the underside of the vessel. The central section comprises several other pulleys and posts, surrounding a large winch which has the capacity to operate twelve wires (**Plate 6G and 6H**).



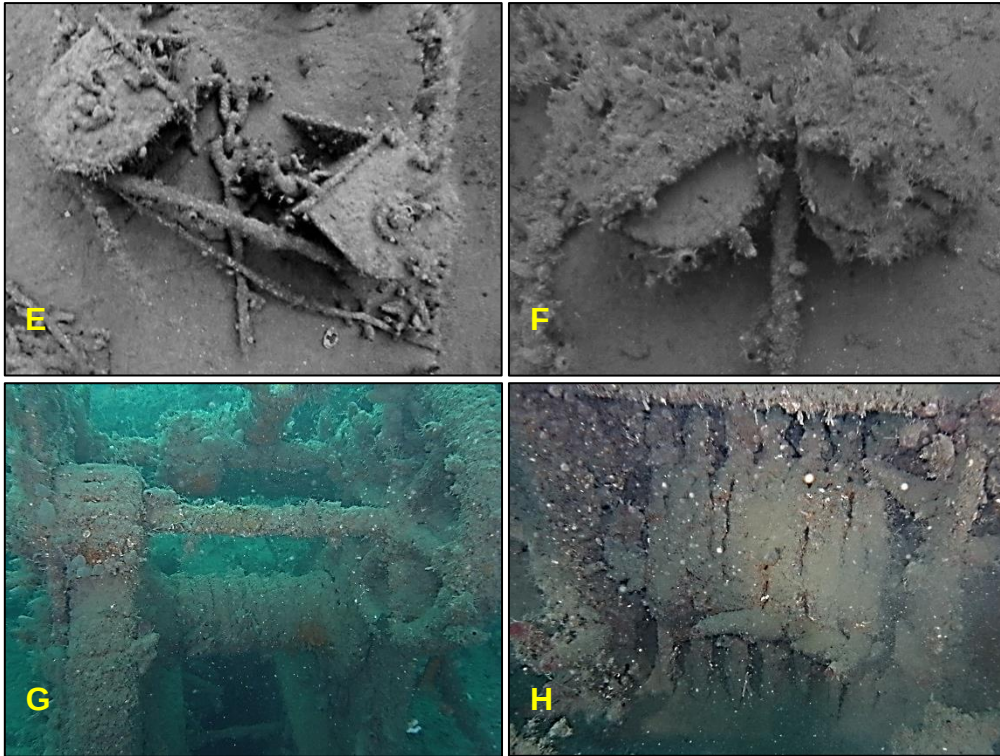


PLATE 6: PHOTOGRAPHS OF VESSEL MACHINERY - A) CLEAT; B) FAIRLEAD; C) BITTS; D) PULLEYS (RUNNING ALONG AND ACROSS THE VESSEL); E) BOLLARDS; F) POSTS WITH WIRE GUIDES; G) PART OF THE WINCH MECHANISM SHOWING CENTRAL MOON-POOL; H) CLOSE UP OF PART OF THE WINCH MECHANISM THAT OPERATE 6 OF THE 12 WIRES.

The machinery present on the vessel is in good condition with all elements intact. Networks of wires from various points cover the remains. There are two clear walkways with a tread-plate – either side of the centre line of the vessel, with machinery inboard and outboard of these lines (**Plate 7A**). These features are also present on RC2 (**Plate 7B**).

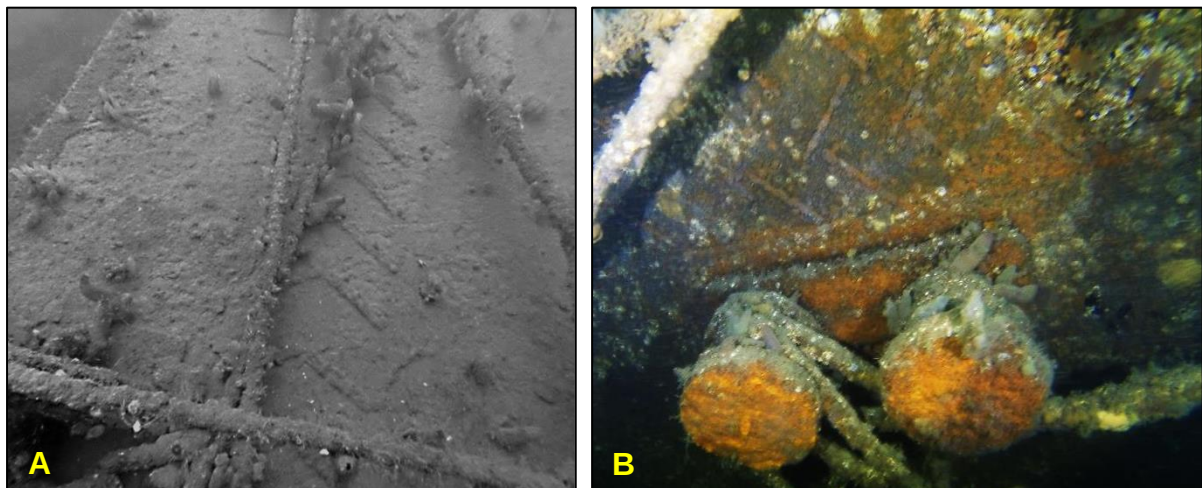


PLATE 7: PHOTOGRAPHS OF TREAD-PLATE ON A) RC1 AND B) RC2

In the northwest corner of the site, a large pile of circular and ovular boom buoys and associated nets was observed. The buoys showed evidence of corrosion around distinct circular holes but were otherwise intact (**Plate 8**). The circular holes are likely to have been caused by small artillery shells used to sink the buoys. It is probable that these buoys were sunk after RC1 as they overlay the wreckage around the middle section.

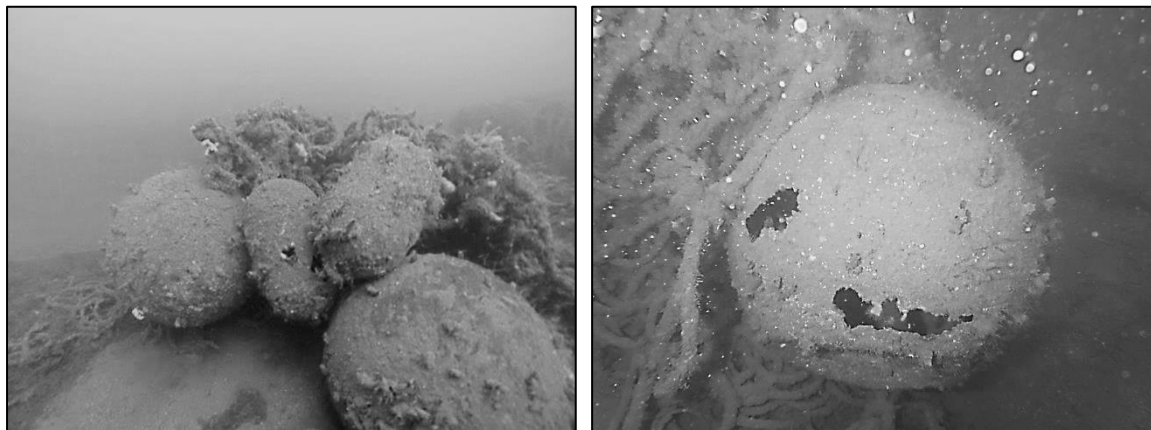


PLATE 8: PHOTOGRAPHS OF BOOM BUOYS AND NETTING IN THE NORTHWEST CORNER OF THE SITE

RC1 overlies the remains of RC2. RC2 appears to have been the same type of vessel as RC1, however the wreck has capsized. The joins between the three sections like those observed on RC1 are clearly visible and there are a number of correlating apertures on the underside of the vessel. Several wires protrude from these apertures. These are attached to steel beams onto which linear piles of boom netting are secured (**Plate 9**). This boom netting lies off to the southeast side of RC2.

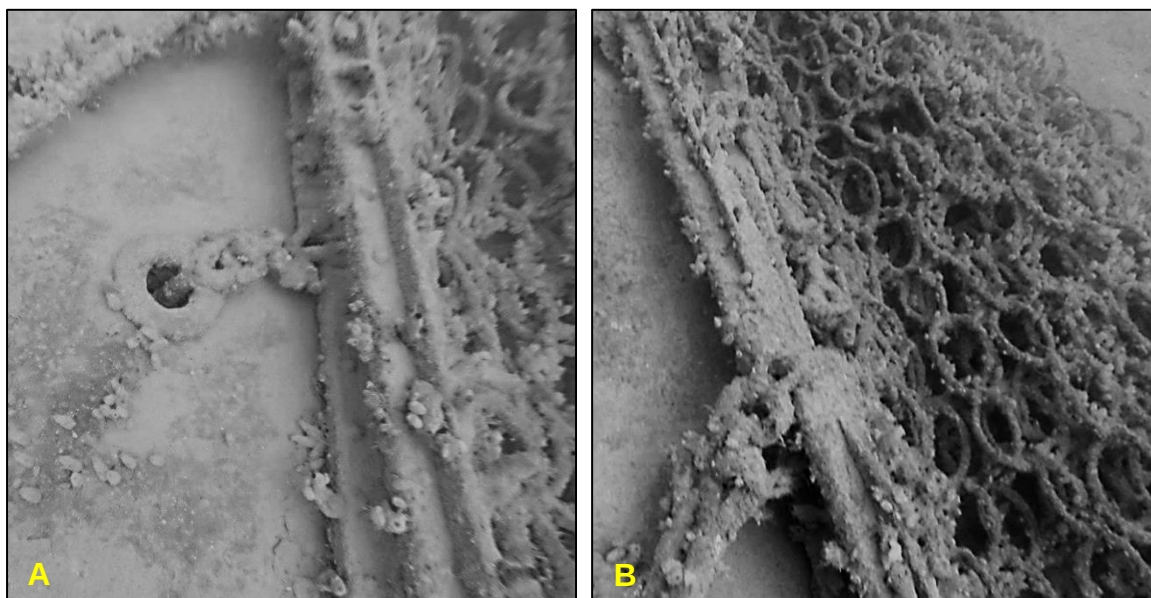


PLATE 9: RC2 BOOM NETTING: A) SHOWING WIRES CONNECTING TO STEEL BEAMS FROM UNDERSIDE OF RC2; B) BOOM NET ATTACHED TO THE STEEL BEAMS

In the centre of the middle section there is a large circular aperture (known as a moon-pool, which is a hole in a vessel that provides access to the water). This was directly over the remains of a crushed winch (**Plate 10**) – supporting the above interpretation that the two vessels are likely to be identical.

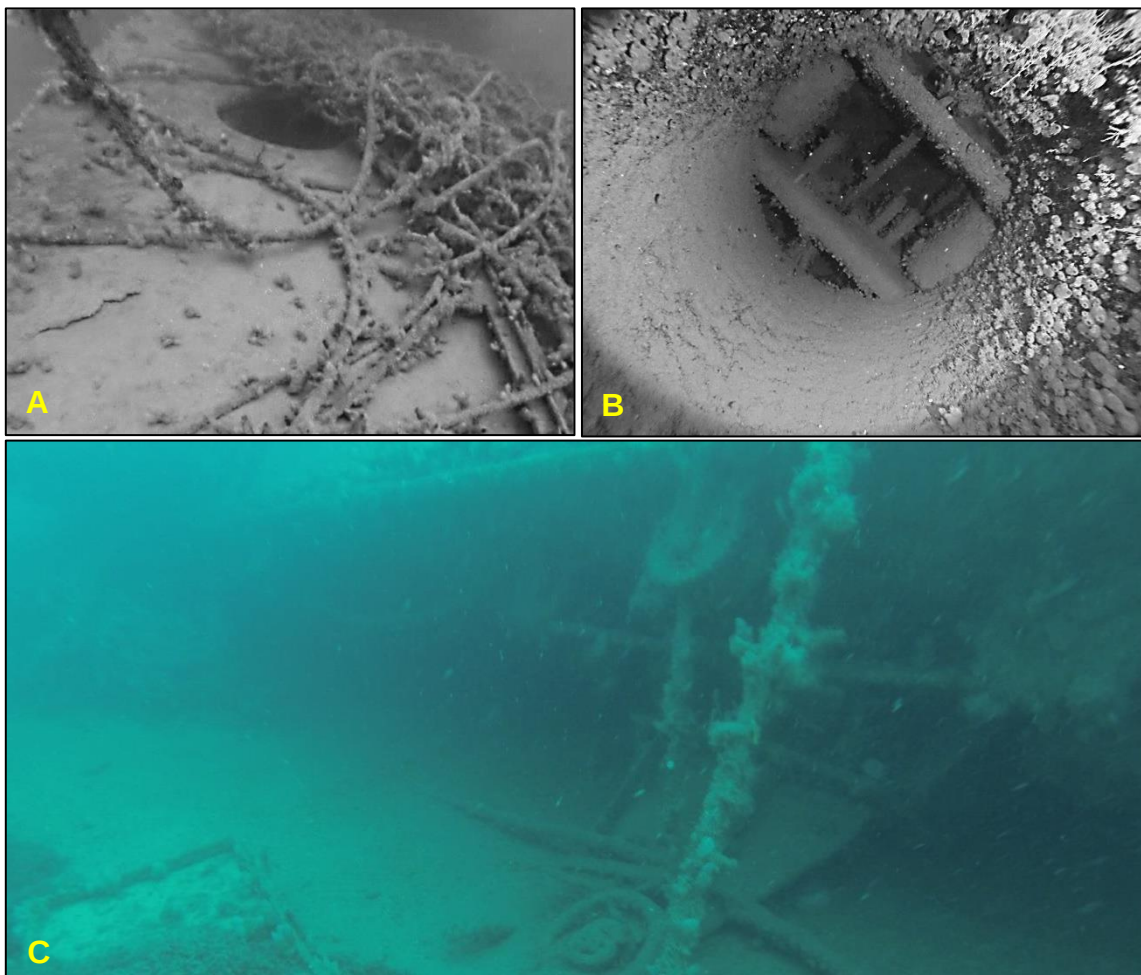


PLATE 10: RC2 WINCH AND MOON-POOL: A) MOON-POOL ON UNDERSIDE OF RC2; B) VIEW INTO MOON-POOL SHOWING PART OF THE WINCH; C) REMAINS OF INVERTED CRUSHED WINCH ON THE 'DECK' OF RC2

Spars A, B and C are long steel tubes comprising several sections of piping joined together with flanges. As discussed above, the flanges of Spar C are visible on the side scan sonar survey data, and this has led to the identification of several other spars in the surrounding area.

Divers also made an assessment of the boom buoys and netting to the northwest of RC1 and RC2. This was found to be a coherent unit of boom netting and buoys. The buoys were spaced at regular intervals, likely in their original positions along the nets. The remains are largely intact, though some of the buoys are broken up. There is very little marine growth (short animal turf) on either the buoys or nets. The buoys have clear small artillery shell holes and there is some moderate corrosion around these edges.

6. DISCUSSION

6.1 IDENTIFICATION

RC1 and RC2 are the remains of Anti-Torpedo Close Protection Pontoons (ATCPP) (ADM116/5790: 70). Admiralty records indicate that the pontoons were brought into service in Scapa Flow in March 1941 to act as close protection for vessels in the Flow from aircraft launch torpedoes.

In November 1940 the British launched an air attack on the Italian harbour of Taranto. The battle resulted in large Italian losses (half the capital ships of the Italian Navy were lost in one night) because although anti-torpedo baffles were deployed, there was no close protection for the ships at anchor (ADM223/336).

Fearing that such an attack could be used against British assets, the Royal Navy trialled a number of approaches for ATCP (including concrete barges, dumb barges, roller nets, spar protection and pontoons), before finally opting for deployment of Landing Craft Tanks (LCTs) adapted to take close protection nets (ADM1/12757). It should be noted that the Spars A, B and C identified during the side scan sonar and diving surveys are not considered representative of spar protection defences. Historic photographs show that the pontoons are held away from the ships they are protecting by linear beams known as spars. Spars A, B and C are examples of these (Plate 11).

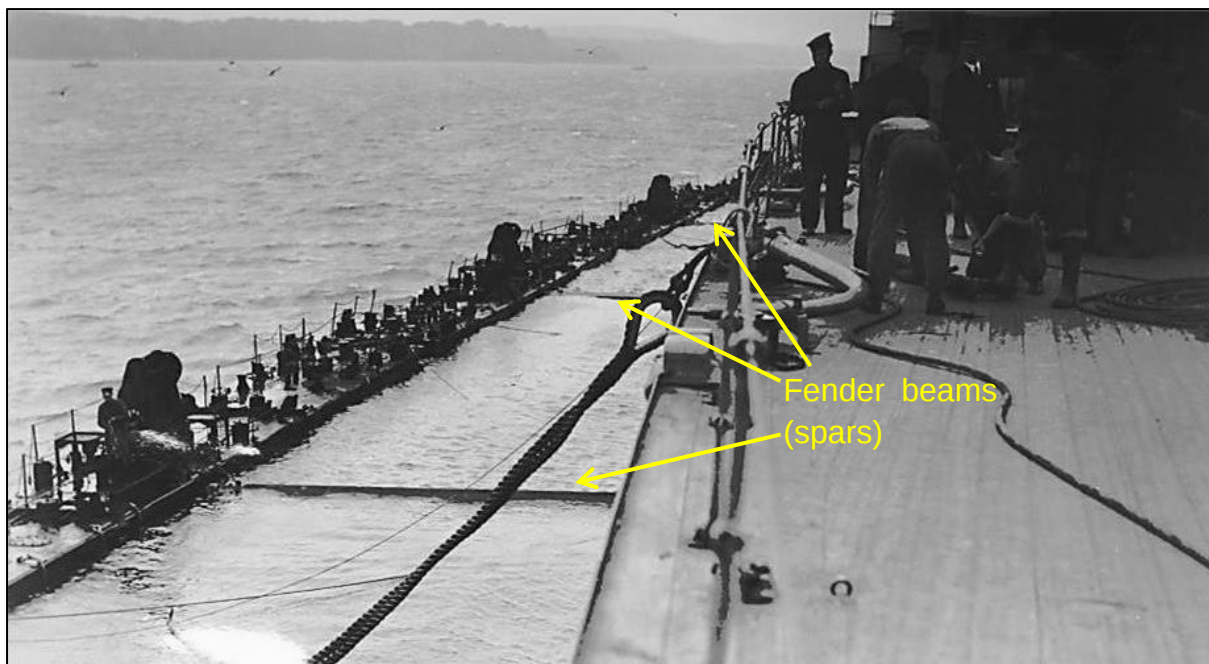


PLATE 11: EXAMPLES OF SPARS USED TO KEEP PONTOONS AWAY FROM THE SHIPS THEY ARE PROTECTING

ATCPP are described as being 90 foot long, replicating the dimensions of all the rectangular contacts identified by the surveys completed during this project. Individual pontoons would have been “secured end to end to the required length of defence” (ADM1165790: 70). The pontoons would have had nets secured underneath one side of them to a depth of 40 feet (the standard depth of close protection anti-torpedo netting) (ADM1/12757).

These pontoons were found to be unsatisfactory, as they were hard to manoeuvre, required a lot of maintenance and were not suitable for the conditions prevailing in Scapa Flow. As a result they were unrigged and decommissioned in April 1942 and were replaced by spar defence nets.

The depth of netting beneath the vessel also restricted the docking of the pontoons alongside harbour facilities, suggesting that they would have been stored on nearshore moorings. Historic charts of the area to the north of Flotta show the positions of eighteen mooring buoys close to shore but in sufficient water depth to facilitate the storage of these vessels with their associated netting. Post processing of the side scan sonar data show that the target site (RC1 and RC2) and the second pair of rectangular contacts (RC4 and RC5) are situated close to specific moorings indicated on the historic chart. This could support the interpretation that these moorings were used to store the pontoons when not deployed (**Figure 3**).

Historic photographs of the pontoons indicate that boom buoys were not part of the deployed ATCP system. It is possible that additional boom netting and buoys were also stored alongside these vessels in light of the extensive and coherent piles of boom net associated with RC1 and RC2.

There are potential discrepancies within the Admiralty records as to how many pontoons would have been in use during this period. Admiralty file (ADM116/5790: 70) indicates that there were 17 units at Scapa Flow, noting that each unit was sufficient to protect one ship. At present it is unclear as to how many pontoons made up a unit – as a single pontoon would not have had sufficient length to protect an average sized vessel. Admiralty file ADM1/12757 (Sheet A: Close Protection Summary) which dates to the 16 October 1942, indicates that one “set” of pontoons was still “in use” at Scapa. It is unclear as to how many pontoons comprise a “set”. It should be noted however that this document post-dates the reported decommissioning of the pontoons.

6.2 CONSTRUCTION AND USE

RC1, RC2 and historic records of the ATCPP's indicate that each 90 foot pontoon comprises three 30 foot sections, made of steel. The top edges of the pontoons have a wooden rubbing strip for protection (**Plate 12**).

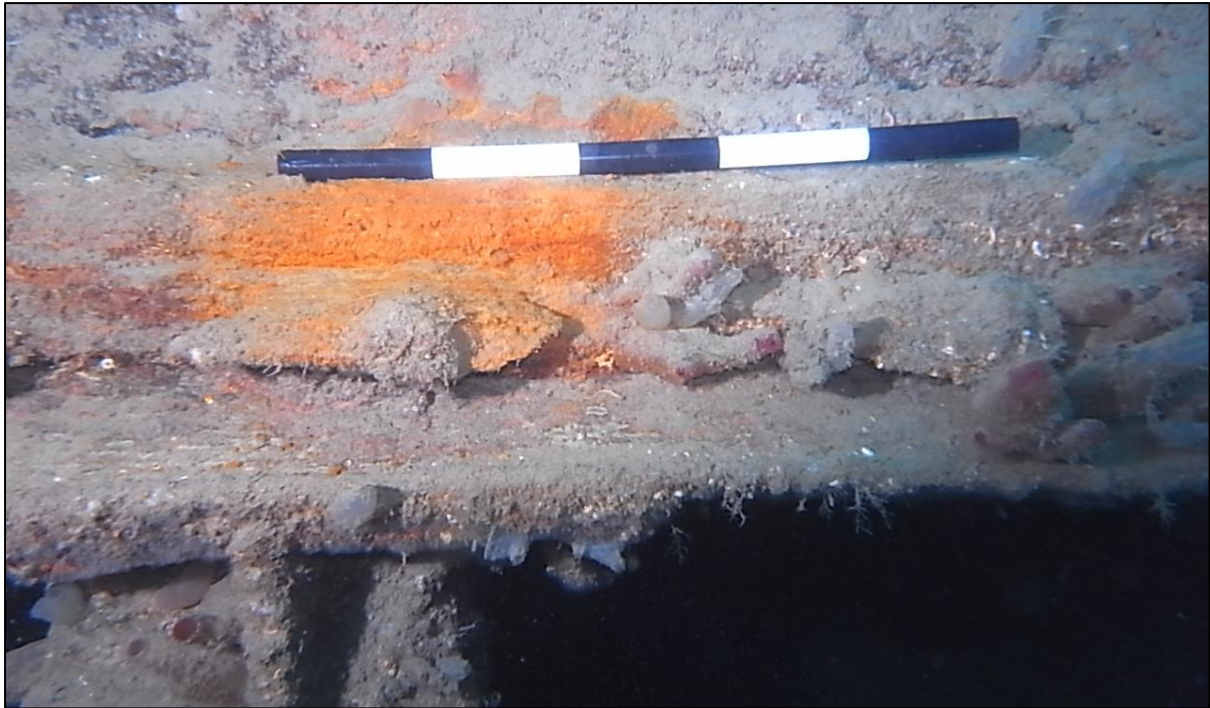


PLATE 12: EVIDENCE OF WOODEN RUBBING STRIP

There is an oval access hatch on each section facilitating access to the inside of the pontoon. The sections are bolted together as shown in **Plate 13**.



PLATE 13: JOIN BETWEEN TWO SECTIONS OF THE PONTOON

There is a large winch on the centre section, which operates twelve wires – six to each end of the pontoon. This winch would have been used to raise or lower the anti-torpedo netting on one side of the vessel. This would have created a net wall that would have protected the ship. For this to be effective the nets secured by the pontoons needed to be more than 60 foot away from the ship that was being protected (Bureau of Ordnance 1944: 63).

The winches on the pontoons that were recorded during this survey indicate that wire was pulled along the pontoon, whereas similar pontoons in operation at other bases (e.g. Rosyth) show winches to operate at 90 degrees to those at Scapa Flow (**Plate 14**) – pulling wire laterally across the pontoon, rather than along it.

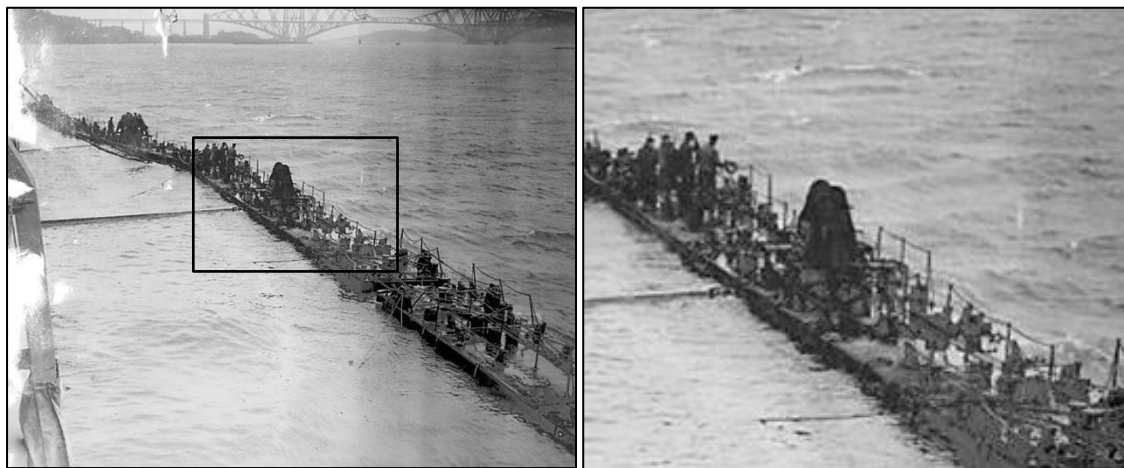


PLATE 14: ALIGNMENT OF WINCH ON PONTOONS DEPLOYED FROM ROSYTH (ADM244-26).

The historic photos of the pontoons in operation protecting the HMS Duke of York in the Firth of Forth clearly show the operational challenges involved with their deployment. Sailors are shown standing on the pontoons, several of which are attached together, whilst they are being towed into position. The images suggest that there would have been some railings around the edges of the pontoons. These are no longer present on the pontoons identified and recorded during these surveys (**Plate 15**).



PLATE 15: PONTOONS IN OPERATION PROTECTING HMS DUKE OF YORK IN THE FIRTH OF FORTH (ADM 224/26)

6.3 OTHER KNOWN ATCPP SITES

In addition to the submerged pontoons at the target sites, a further two shore based sites can now be confirmed as ATCPP.

6.3.1 ROAN HEAD, FLOTTA (CANMORE ID 249683)

The first is the largely intact remains of a pontoon on the beach on Flotta, referenced in the Canmore record for the remains of anti-submarine boom defences (Canmore ID 249683) as “...a flat metal structure extends into the intertidal zone on the Flotta side of Calf Sound. It is 1m wide and at least 5m long. The remnants of winding gear are attached to the seaward end”. Images of this pontoon are shown in **Plate 16**.



PLATE 16: REMAINS OF A PONTOON ON ROAN HEAD, FLOTTA

Two sections of the pontoon currently rest in the inter-tidal zone to the west of a large pile of discarded boom netting and the reported remains of a 20th-century beacon (**Plate 16C**), although it should be noted that there are no charted beacons in the area. It is possible that this is the remains of an anchor for one of the Hoxa booms. The third section has broken away and is resting perpendicular to the midsection in the water. There is evidence to suggest that some salvage has taken place, particularly on the remains of the larger section, as some of the fittings have been removed or partly removed and there is evidence of sections of burning (**Plate 17**).



PLATE 17: EVIDENCE OF BURNING INDICATING SALVAGE OF MACHINERY

The features on this pontoon replicate exactly those found on the sites underwater. Examples of these can be seen in **Plate 18**.

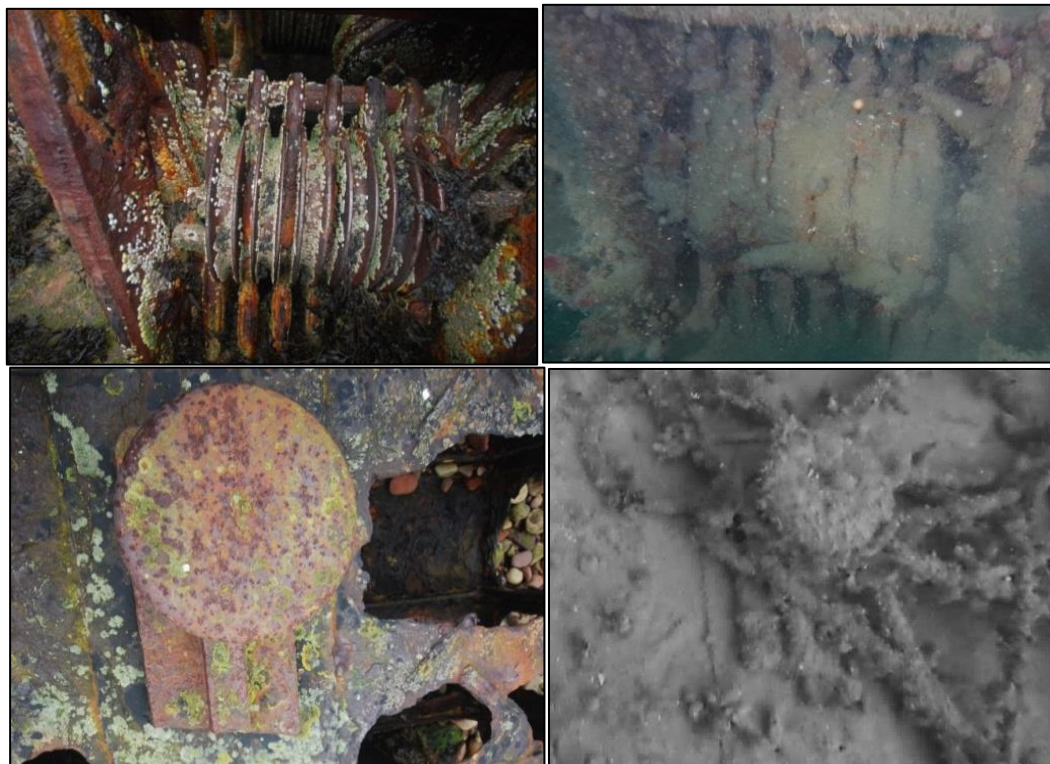


PLATE 18: EXAMPLES OF FEATURES ON THE FLOTTA BARGE REPLICATED UNDERWATER

6.3.2 HOXA HEAD (CANMORE ID 314006)

The more dispersed remains of a second pontoon can be found on the rocks beneath Hoxa battery. The debris is described in the Canmore site record for Leynei Geo (Canmore ID 314006) as “fragments of a large metal structure, possibly part of a ship or boom, are wedged fast between the rocks” (**Plate 19**).



PLATE 19: DISTRIBUTION OF PONTOON WRECKAGE AT HOXA

This site includes the remains of at least one section of a pontoon (broken and present in two portions). One large portion measuring 3.13m long by 3m wide with a height of 1.2m is half way up the beach. Four circular apertures and associated tubes can be seen (**Plate 20**).

A second more fragmentary portion, wedged between rocks closer to the low water mark is 3.18m long, but is too broken up to gauge other dimensions (**Plate 21A and 21B**). This is associated with several corroded piles of wire (**Plate 21C**). Although the machinery and fittings from the pontoon are no longer *in situ*, likely a result of the high energy environment they rest in, a winch with the same configuration of those observed on Flotta and on the target wreck sites was observed close to the low water mark in the vicinity of the rest of the wreckage (**Plate 21D**).

The winch, the join configuration, available dimensions and the presence of the apertures and associated tubes have been used to confirm the identity of the remains.



PLATE 20: MORE INTACT PORTION OF PONTOON SECTION AT HOXA



PLATE 21: DISPERSED PONTOON DEBRIS AT HOXA: A AND B) FRAGMENTARY REMAINS OF A PORTION OF PONTOON SECTION; C) CORRODED NET/WIRES; D) WINCH MECHANISM

7. CONCLUSIONS AND FUTURE WORK

The side scan sonar surveys of the area surrounding the target site revealed numerous features including several concentrations of boom defence debris. That said, there were fewer features than anticipated compared to the quantity of debris observed in foul ground areas surveyed as part of the *Scapa Flow 2013 Marine Archaeology Survey* (Christie et al. 2014: 56-59). These surveys successfully recorded the target site off the north coast of Flotta, highlighting the presence of two distinct vessels, rather than a single wreck. This was associated with two coherent concentrations of boom defence debris and three spars.

The diving surveys have documented that pontoons RC1 and RC2 are in good condition, observing that both pontoons were identical; populated with a variety of machinery including pulleys, posts, bollards, bitts, fairleads and cleats. A large winch was observed in the central section of both vessels. Although directly associated with boom buoys, historic photographs of the pontoons in service indicate that these were not part of the defences deployed by the pontoons (as there are no buoys surrounding the pontoons in these photographs). It is possible that these represent the subsequent sinking of one (or more) coherent units of boom net and buoys.

The vessels were identified as being the remains of experimental Anti-Torpedo Close Protection Pontoons, used in the close protection of vessels at anchor from aircraft launch torpedoes. The pontoons were only in operation for 13 months (March 1941 – April 1942) and few were brought into service – with the majority of the units deployed in Scapa Flow and Rosyth. As such they represent a rare heritage resource for which very little is known about their operation.

The submerged remains have the same configuration as two other vessels - one in the intertidal zone of Roan Head and one on the beach at Hoxa. It is hypothesised that the remains three rectangular contacts (RC3, RC4 and RC5) identified by the side scan sonar surveys are other further examples of these craft. If these contacts are confirmed as pontoons, this could suggest that these vessels were stored on the historic moorings that populate the area when they were not deployed to protect ships in Scapa Flow.

Although the surveys provided an overview of the extent of the remains at the target sites (and others observed), it was not within the scope of the project to produce plans of the vessels and their associated wiring. More detailed diver and ROV mapping surveys undertaken at these sites to record them in detail would contribute to a fuller understanding of the resource, and contribute to longer term management and monitoring programmes.

It is recommended that the RC3, RC4, RC5 and the circular feature (CC1) observed in proximity to RC4 and RC5 should be the subject of further investigation to confirm the identity of the remains, to document their condition and to map their configuration. Evidence from historic photographs suggest that the winches on the

central sections of pontoons deployed from Rosyth were oriented to pull cables across, rather than along the vessel - how does this compare to the three rectangular contacts? More extensive diving surveys around these sites should also be completed to determine whether there is any evidence of mooring blocks in their vicinity.

It may be possible to complete some of these surveys by involving the local diving community through the delivery of training programmes such as the Nautical Archaeology society courses; however, some of the sites are in deep water which would restrict survey time. It is therefore suggested that the initial record of the other submerged sites be conducted using an ROV.

While it is not within the remit of this survey project to address management issues, the evidence from this project (and the outcomes of previous surveys) should contribute to HS and stakeholders formulating appropriate management and monitoring strategies for heritage assets with Scapa Flow resource more broadly.

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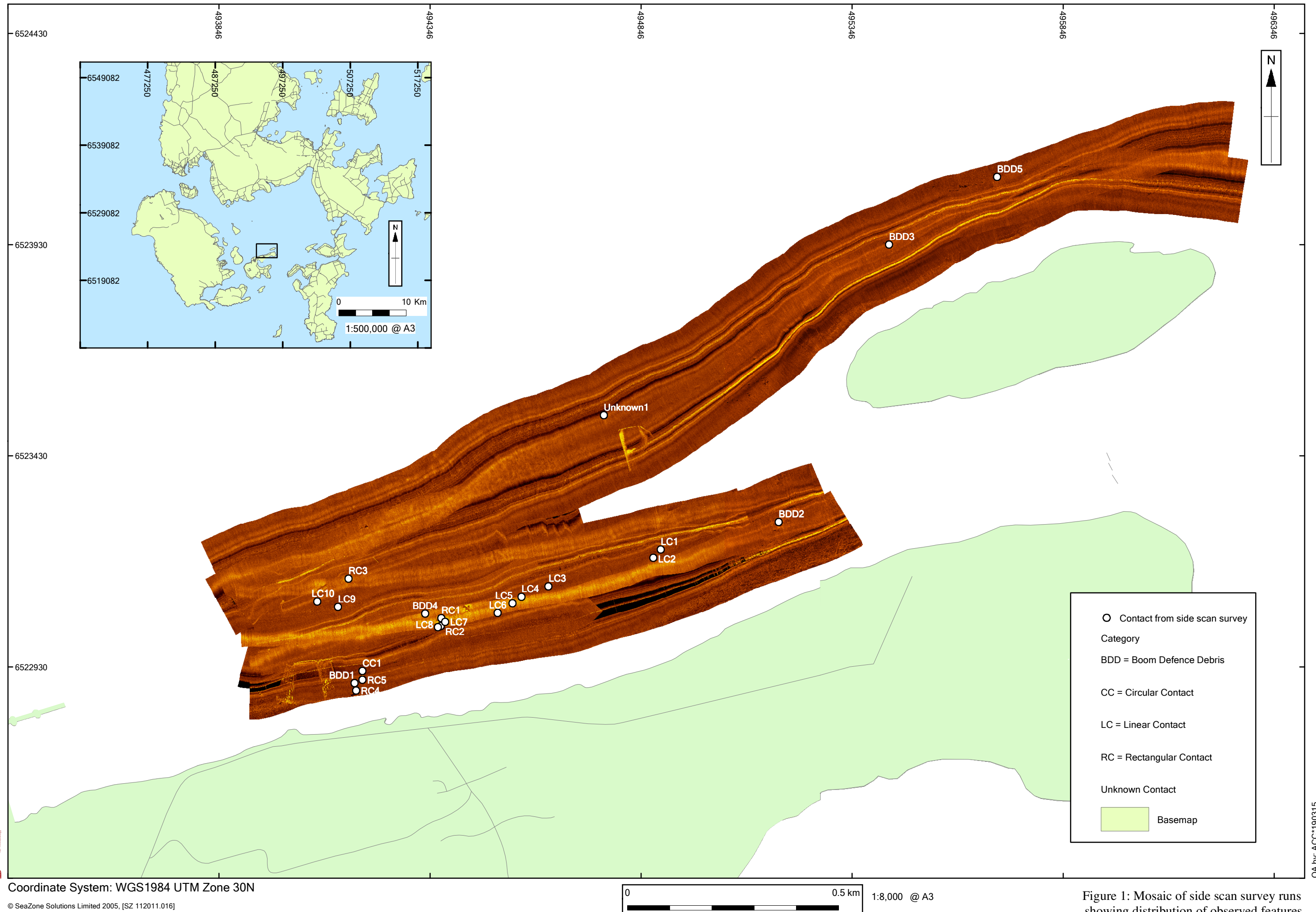
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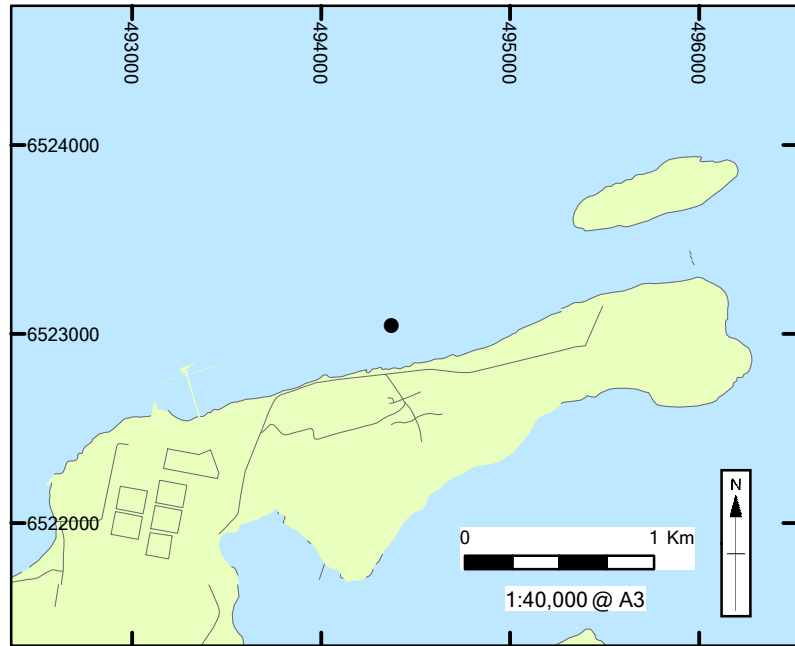
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- ADM1/12757: Ships and Vessels (91): Anti-torpedo close protection craft for capital ships
- ADM244/26: Close protection of HM Ships against torpedoes.
- ADM223/336: Taranto: Attack by Fleet Air Arm





A: Machinery on RC1 showing fairlead, post (with wireguide) and pulley



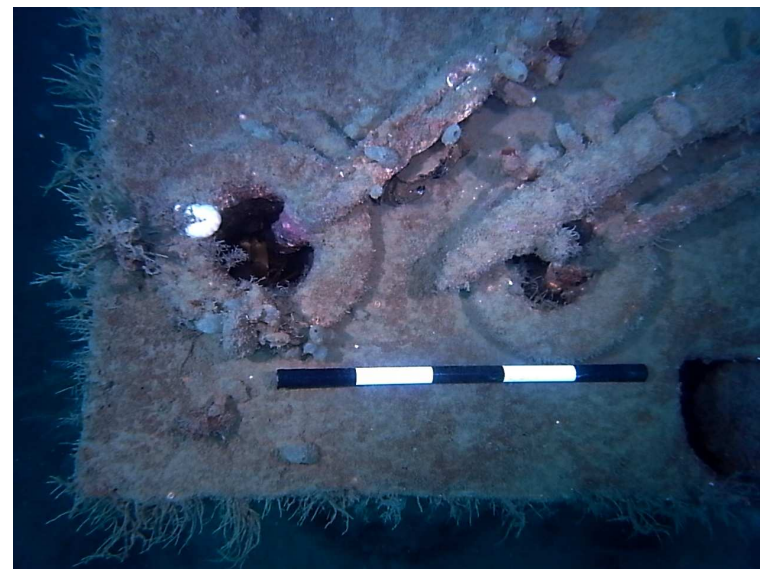
B: Winch on RC1



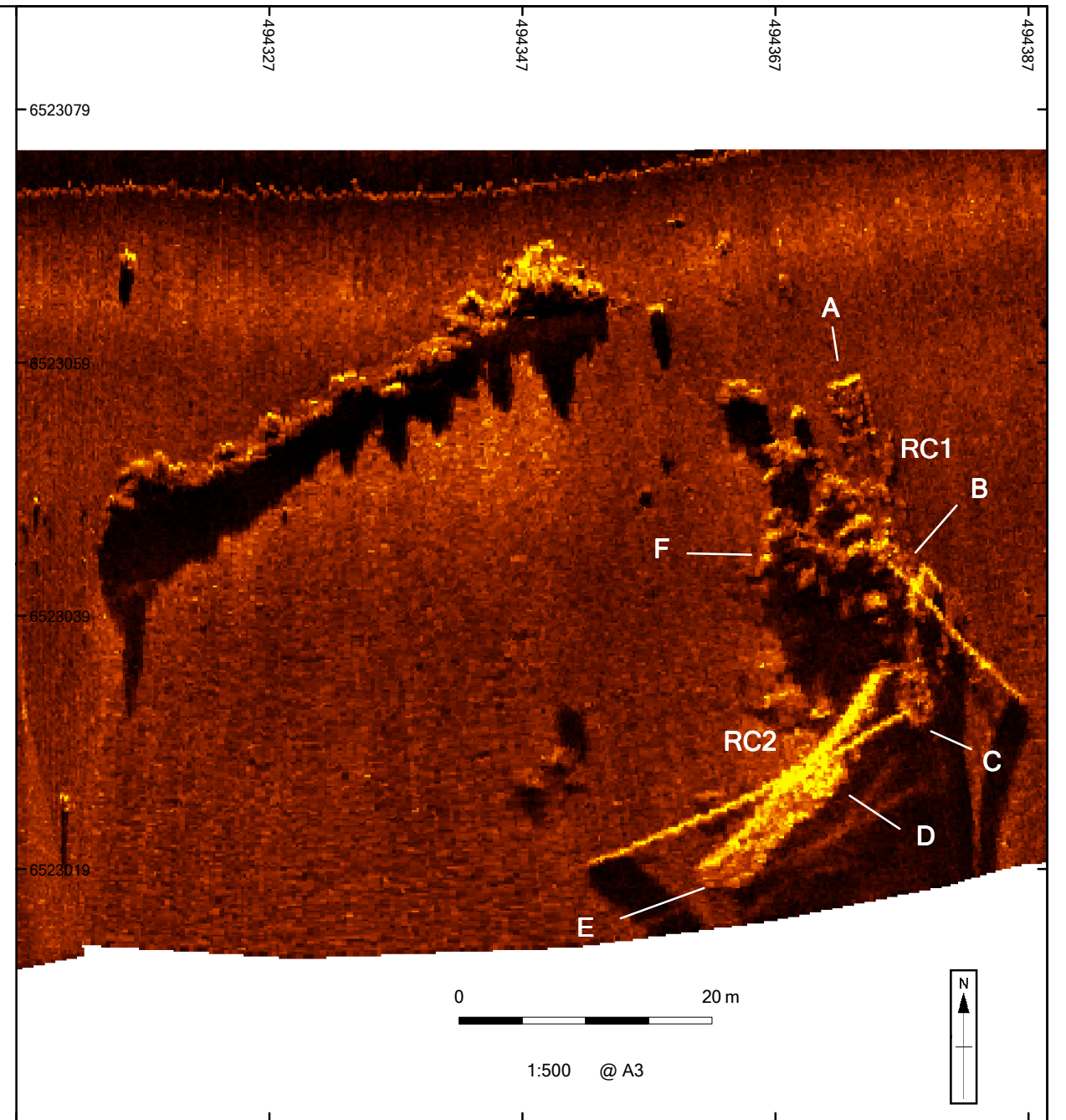
C: End of RC1 showing rubber joining mechanism



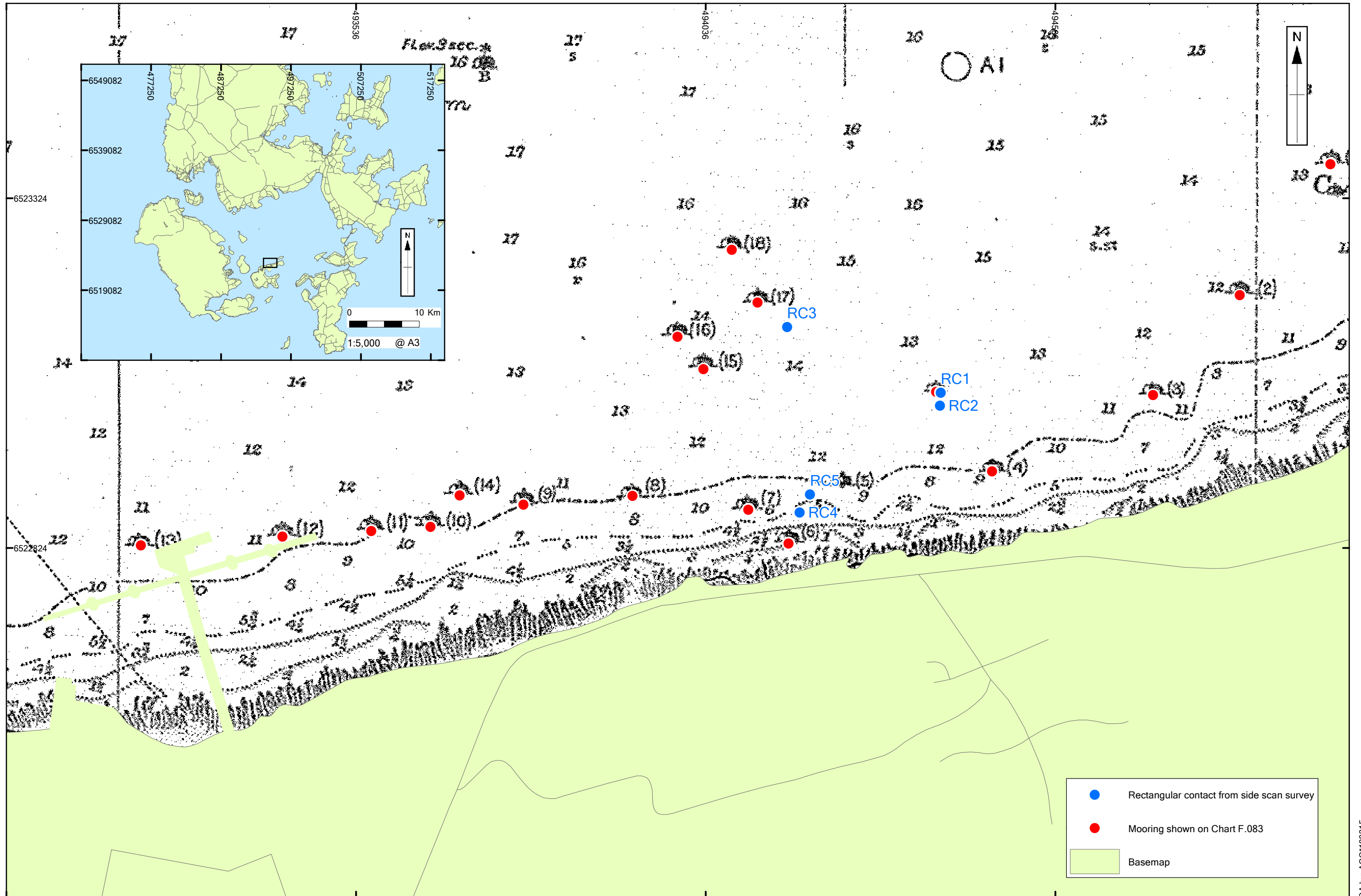
D: Netting attached to steel beams with spar B in the background



E: Apertures and wire on underside of RC2. Wires join steel beams like those shown in D



F: Boom buoys and net on northwest side of RC1, with RC1 visible in the background



UKHO 1940, Chart F.083 South West Portion of Scapa Flow
Including Cantick and Switha Sands

Coordinate System: WGS1984 UTM Zone 30N

Figure 3: Distribution of rectangular contacts in
relation to moorings detailed on historic chart