

Forgotten Wrecks
of the
First World War



LED BY IWM

April
2018

SM U-90

Site Report

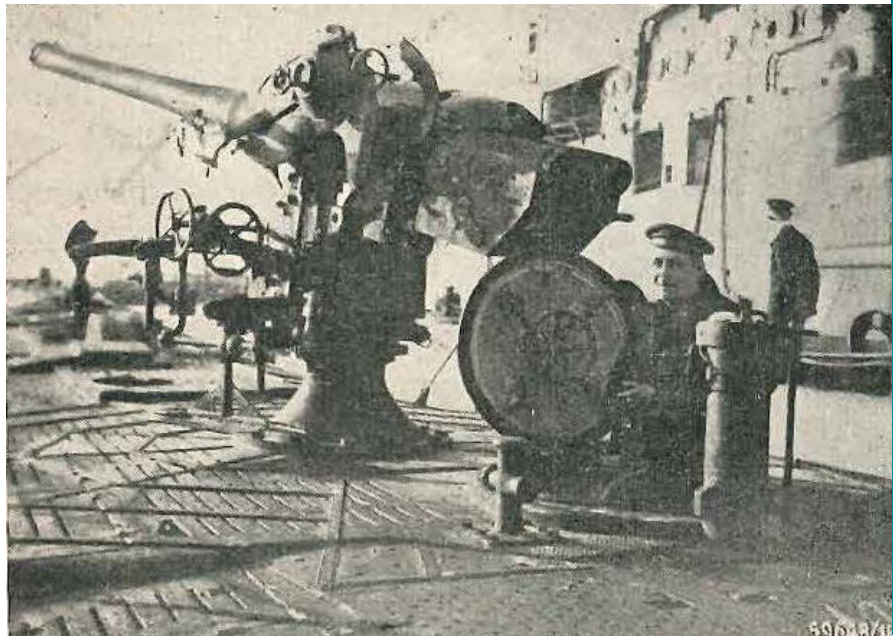
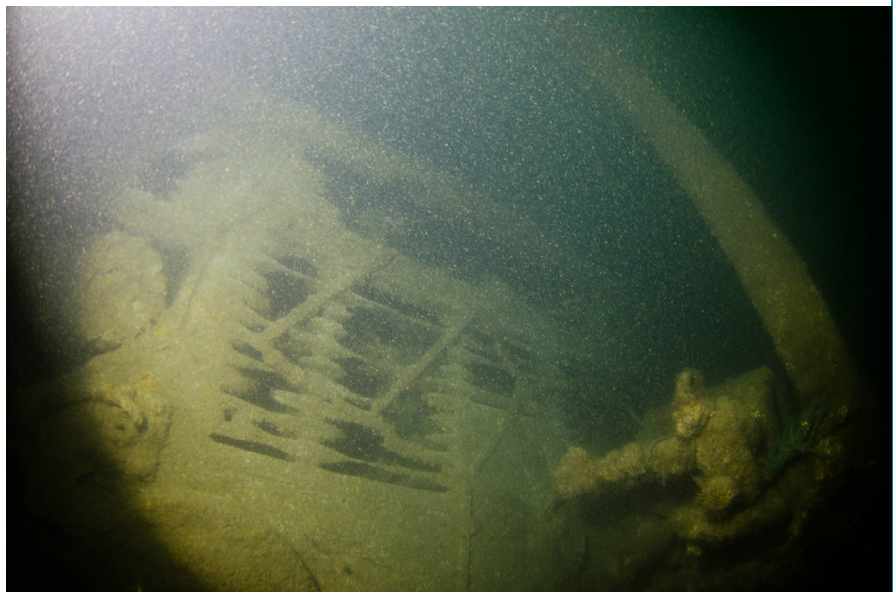


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MAT staff involved in the recording: Jan Gillespie, Christin Heamagi, Brandon Mason, Garry Momber
 MAT staff involved in research and reporting: Amanda Bowens, Jan Gillespie.

ii Copyright Statement

This report has been produced by the MAT with the assistance of funding provided by the Heritage Lottery Fund through their Heritage Grants Programme. Unless otherwise stated all images are copyright of the MAT.

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1 Project Background

Forgotten Wrecks of the First World War is a Heritage Lottery Funded project which is dedicated to raising the profile of a currently under-represented aspect of the First World War. While attention is often focused on the Western Front and major naval battles like Jutland, historic remains from the war lie, largely forgotten, in and around our seas, rivers and estuaries.

With over 1,100 wartime wrecks along England's south coast alone, the conflict has left a rich heritage legacy and many associated stories of bravery and sacrifice. These underwater memorials represent the vestiges of a vital, yet little known, struggle that took place on a daily basis, just off our

shores. The study and promotion of these archaeological sites presents a unique opportunity to better interpret them and improve physical and virtual access.

The project focuses on underwater and coastal sites between Kent and Cornwall, which include merchant and naval ships, passenger, troop and hospital ships, U-boats, ports, wharfs, buildings and foreshore hulks. These sites, under water, on the foreshore and around the coast, have been degrading and deteriorating due to natural and human processes for approximately 100 years and, as a result, are extremely fragile. In many cases, this project represents a final opportunity to record what remains before it is lost forever.

The project aims to characterise the nature and extent of the maritime First World War archaeological resource surviving on the south coast's seabed and around the coast. This will enable an understanding of maritime activity just off our shores during the conflict and provide a window onto some of the surviving sites. While it will not be possible to visit and record all c.1,100 vessels dating to the First World War, lost off the south coast of England, a representative sample of sites have been selected for more detailed study, analysis and interpretation.

This report collates information collected during the project, relating to one of the south coast's First World War wrecks, namely that of *U-90*. The report constitutes one of the project outputs and will be lodged with the Archaeological Data Service, ensuring free public access beyond the life of the project.

2 Methodology

General detail on the methodologies employed during the project are outlined within the *Forgotten Wrecks of the First World War: Project Methodology Report*. This report section concentrates on approaches and resources in relation to *U-90*.

2.1 Desk Based Research

2.1.1 Online Information/Sources

The wreck of *U-90* is listed in the National Record of the Historic Environment (NRHE), Monument Number: 895338, NMR Number: SZ 66 NE 3. The record was last updated in 1999 and has limited detail.

The Wrecksite.eu record for *U-90* gives the date of loss as the date the U-boat was surrendered at Harwich and reports that it was lost under tow to the breakers yard. In August 2007 the wreck was reported as being in sand with only the conning tower visible. A year later it is reported that the wreck "sits approximately 5m proud of the sea bed – listing at around a 45 degree angle. Fairly intact – good dive to a 35m bottom".

Uboat.net reports that *U-90* was surrendered on 20th November 1918 and that it was broken up at Bo'ness in 1919-20. Dates, technical details, career details and Commanders are also given, along with a list of ships sunk and damaged by the U-boat.

The Wikipedia entry for *U-90* uses Guðmundur (U-boat.net) and Gröner (1991) as sources.

In relation to the guns on the wreck of *U-90*, help was sought from the 'Fortifications and Artillery' section of the 'Axis History Forum' and several forum contributors generously shared their extensive knowledge in this area (see below).

A number of SCUBA divers/dive clubs have uploaded video of dives on the wreck of U-90. The 39 minute long video of a dive on the wreck thought to be U-90, taken by Hamish Morrison on 31st July 2015 was particularly useful for site orientation and understanding. See Section 8.3 for detail.

Pastscape	https://www.pastscape.org.uk/hob.aspx?hob_id=895338&sort=4&search=all&criteria=U-90&rational=q&recordsperpage=10
Wrecksite EU	https://wrecksite.eu/wreck.aspx?10220
Uboat.net	https://uboat.net/wwi/boats/?boat=90
Wikipedia	https://en.wikipedia.org/wiki/SM_U-90
Axis History Forum	https://forum.axishistory.com/viewtopic.php?f=70&t=234184&p=2130017#p2130017
You Tube:	See 8.3

2.1.2 Records at The National Archives

A number of documents held at The National Archives (TNA), Kew were consulted for information likely to be helpful in confirming (or otherwise) the identity of the wreck believed to be U-90. Of particular interest were the interrogation reports of survivors of German submarines 1917-1918, which includes descriptions of Type U-87 submarines (ADM137/3872), the statement of Lieutenant Edouard Victor Isaacs, who was a prisoner on U-90 in 1918 (ADM 137/3909), the original history sheets for U-type German submarines (ADM137/3914) and documents relating to the disposal of enemy submarines (ADM1/8558/132 and ADM 1/8576/337).

2.1.3 Other Historical Sources

Technical detail and identifiable characteristics for U-90 were derived from a number of primary and secondary sources, including Rössler (2001), Michael Lowrey (pers. comm.), Fischdick (1937), King-Hall (date unknown), Techel (1940) and uboat.net.

Arnold Fischdick was a member of U-90's crew during the First World War who published a book called: *Uboot Krieg und Kameradschaft – Uboot 90 Frontfahrten-Erlebnisse* in 1937. The book contains many photographs of U-90 and its crew, at sea and in port, prior to its surrender in November 1918. It therefore provides very useful reference material for comparison with the U-boat wreck on the seabed. MAT have been unable to find the publisher (W. Wessels, Gelsenkirchen, Buer) or information relating to Arnold Fischdick's date of death. Photographs from this publication have therefore been used in good faith, given that more than 70 years has passed since the publication of Fischdick's book.

Information about the whereabouts of U-90 following its surrender at Harwich in November 1919 has been gleaned from a number of contemporary newspaper reports (in addition to the documents listed above at The National Archives).

2.1.4 Geophysical Datasets

Desktop research included studying bathymetric imagery of the wreck thought to be U-90. Data was kindly provided by the Maritime & Coastguard Agency: *2016 HI1499 Southern Approach to Eastern Solent 1m CUBE, MBES – Kongsberg EM2040D Catzoc Polygon & RoS*.

2.2 Associated Artefacts

While the Forgotten Wrecks project had a non-recovery policy, where possible, the project aimed to record and 'virtually reunite' artefacts historically recovered from the Forgotten Wrecks. Four objects were identified as having been recovered from the wreck of U-90. Three were recorded and a photograph was obtained for the fourth (see Section 5).

2.3 Fieldwork

Forgotten Wrecks, HLF-funded diving from the dive boat *Wight Spirit* took place on the wreck of the *U-90* submarine on 11 July 2014 and 23 September 2014.

Initial dives aimed to assess the condition of the remains and obtain a site sketch, measurements and a photographic survey.

A total of 13 divers (4 professional divers from MAT and 9 volunteers) undertook a total of 935 minutes diving on the wreck over 2 days. The dive team used self-contained breathing apparatus (SCUBA) with a breathing gas of nitrox using accelerated decompression procedures.

Diving was carried out over slack tide, the conditions were dark and visibility was in the region of around 1m on the first dive and 2-3m on the second dive with the help of good torch light.

A further dive was undertaken on 14th July 2017 for photographic recording.

3 Vessel Biography: *U-90*

U-90 (Figure 1) was chosen as one of the Forgotten Wrecks case study sites as an example of an ocean-going diesel-powered torpedo attack boat from the First World War. *U-90* was one of only six Type U-87 U-boats built and was a post-war loss. There is uncertainty surrounding its fate, with some historical records stating that it was broken up at Bo'ness following its surrender in November 1918.

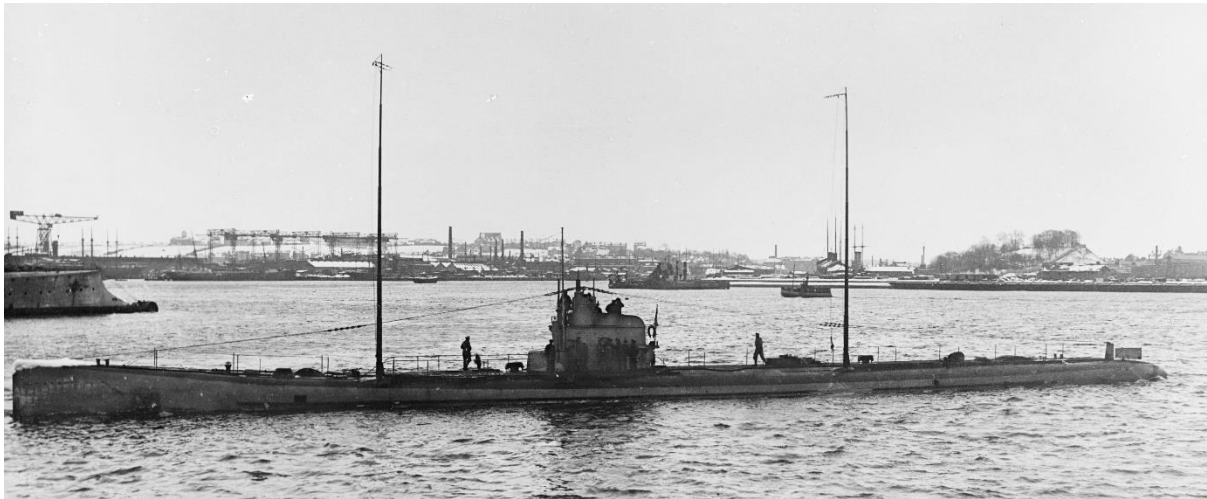


Figure 1: *U-90* in 1917, prior to guns being fitted (National Maritime Museum, Greenwich, London)

The above photograph (Figure 1) was part of a larger collection of photographs recovered from Germany at the end of the Second World War. The collection was transferred to the National Maritime Museum by the Admiralty in the 1950s.

3.1 Vessel Type and Build

U-90 was a Type U-87 Mobilization submarine built at the Kaiserliche Werft shipyard in Danzig and commissioned in August 1917. Only six Type U-87 submarines were built (U-87 to U-92).

With a length of 65.8m, a beam of 6.2m and a draught of 3.9m the vessel was powered by two 1,200 hp diesel engines. It had two 600 hp Electric engines.

Type U-87 U-boats had a maximum speed of 15.6 knots on the surface and 8.6 knots submerged. They had 6 torpedo tubes: 4 in the bow and 2 in the stern and carried twelve 50cm torpedoes (Rössler, E. 2001: 330).

The pressure hull of the Type U-87 U-boats was 50.07m in length (uboa.net).

Michael Lowrey, U-boat historian and moderator of U-boat.net states in connection with U-90: "As the war began, KWD (Kaiserliche Werft Danzig) had just introduced a new design, that of the U 43, which featured six torpedo tubes (four forward, two aft). The conning tower was located forward of the midway point of the boat. And the submarine was externally framed. Only 14 of these boats were completed (U 43 to U 50, U 87- U 92)" (Lowrey, 2006).

ADM137-3872 at The National Archives, includes technical information derived in December 1917 through the interrogation of prisoners from German submarine U-48 as follows:

While for the majority of 'modern' ocean-going U-boats, the tops of the tanks were externally visible "forming a deck at a lower level on either side of a central superstructure", for a small number, including U-90 (i.e. U87-92, U43-50 and U63-65) "the outer hull is rounded off over the tops of the tanks on either side to meet the superstructure" (Figure 2).

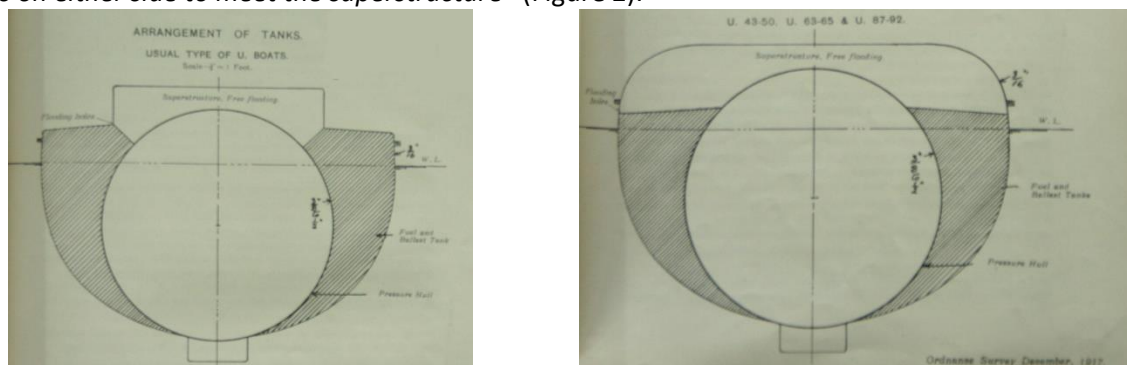


Figure 2: Sections showing the shape of the tanks and superstructure for "usual type" (left) and Type U-87 (right) submarines (ADM137-3872: 8, Plate 2)

As can be seen from the diagram in Figure 2 above, the outer hull of the Type U-87 submarines had a thickness of 3/16" (4.8mm) and the thickness of the pressure hull varied from 3/8" to 1/2" (9.525 to 12.7mm).

While most modern ocean-going U-boats were fitted with three periscopes, U43-50 and U87-90 were fitted with only two, with the forward periscope being for anti-aircraft use (ADM137-3872: 7).

Other characteristics of Type U-87 submarines included:

- the pressure hull's frames were externally fitted;
- close to where the outer hull met the superstructure, "grated man-holes" were fitted (for venting when diving);
- deck hatches, including those in the conning tower, were dished;
- flooding holes were fitted in the outer hull between the rubbing strake and the tops of the tanks;
- two vertical rudders (upper and lower) were fitted;
- wing passages inside the pressure hull were present, for bypassing the living spaces, i.e. from control room to forward torpedo room (port side) and control room, aft to the engine room (starboard side). They had watertight doors on each end;

- two types of 4.1 inch gun were used, both L/45 guns, one on a low destroyer mounting, the other on a higher mounting specially designed for submarines. No shields were fitted to the guns;
- 2 propellers: 3-bladed with a diameter approximately 1.3m; and
- hinged exhaust funnels could be used when lying on the deck or tilted up to an angle of 30 degrees.

(ADM137/3872/1).

Armament carried by the Type U-87 U-boats varied between U-boats and, in the case of a single U-boat, over time. According to Arnold Fischdick, one of U-90's crew who published a book between the wars on the U-boat and his experiences, U-90 carried two 10.5cm (4.1in) guns, one forward of the conning tower and one aft (Fischdick 1937: 16, Figure 3). This was confirmed by Lieutenant Edouard Victor Isaacs, who spent some time as a prisoner on U-90 in June 1918 and Stephen King-Hall, who boarded U-90 at Harwich after the U-boat's surrender in November 1918 (see Section 3.2).

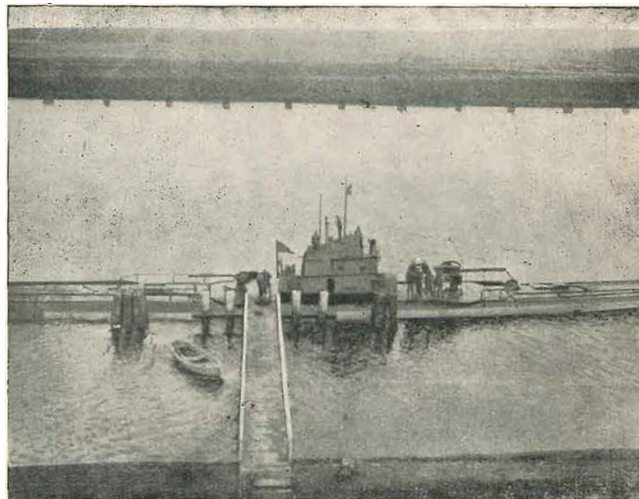


Figure 3: U-90 in the Kaiser Wilhelm canal, the two 10.5cm deck guns can clearly be seen (From Fischdick 1937: 81)

The plan for Type U-87 U-boats in Rössler (2001: 49) confirms the detail provided in ADM 137/3909 and ADM137/3872. However, these plans show only one gun platform (forward) and in Fischdick's photographs, it can be seen that U-90 had two circular gun platforms, one forward of the conning tower and one aft (Figure 4 & 5).

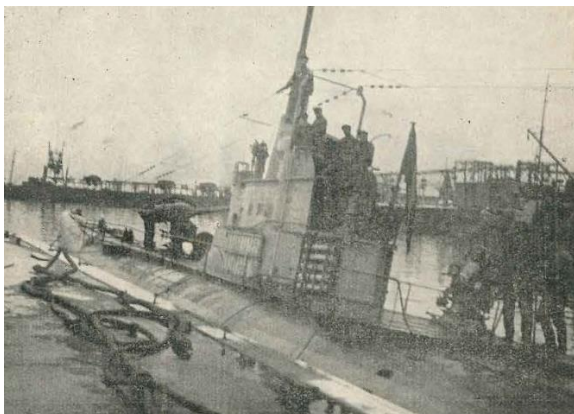


Figure 4: U-90 viewed from the port side. The forward and aft guns and platforms can be seen (Fischdick 1937: 99).

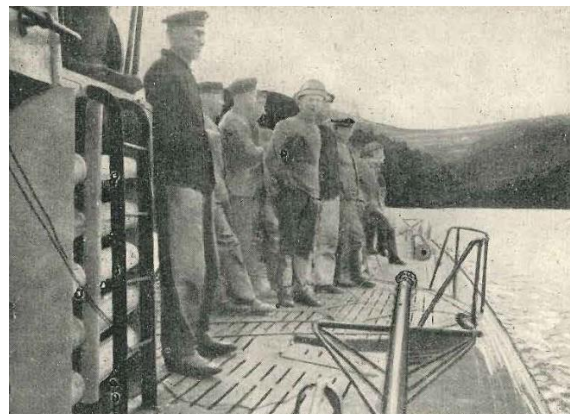


Figure 5: Looking aft down the port side of U-90, the crew are standing on the aft gun platform (Fischdick 1937: 97)

3.2 First World War Use & Loss

U-90 was built specifically for the First World War, laid down on 29th December 1915, launched on 12th January 1917 and commissioned on 2nd August 1917.

The submarine undertook seven patrols under 3 commanders:

- Kptlt. Walter Remy (2nd August 1917 – 31st July 1918)
- Oblt. Helmut Patzig (1st August 1918 – 31st August 1918)
- Kptlt. Heinrich Jeß (1st September 1918 – 11th November 1918)

(Uboat.net A)

U-90 Patrols

The following information was kindly provided by Michael Lowrey (2018 pers. comm. 19 March):

16-Sep-17 to 16-Oct-17: West of English Channel and off French west coast, out via Scotland, home via Dover.

15-Nov-17 to 10-Dec-17: W of Biscay and then Irish Sea, out via Dover, home via Scotland.

16-Jan-18 to 7-Feb-18: French Channel coast and off Ushant via Dover.

11-Mar-18 to 11-Apr-18: Western English Channel, NW of Ireland, and Bristol Channel via Scotland.

10-May-18 to 11-Jun-18: South and West of Ireland via Scotland.

5-Aug-18 to 29-Aug-18: West of English Channel via Scotland.

29-Sep-18 to 31-Oct-18: Irish Sea and West of Biscay via Scotland.

On 31st May 1918, the American Troop Transport, USS *President Lincoln* was torpedoed and sunk 600 miles off the French coast by U-90 under Kptlt. Walter Remy. The most senior surviving officer from the *President Lincoln*, Lieutenant Edouard Victor Isaacs, was taken prisoner and spent several weeks on board the submarine. During this time he was treated well and subsequently made a statement to the authorities which provides interesting information about the time he spent on the submarine, including useful detail about U-90 in June 1918 (ADM 137/3909).

Isaacs' statement confirms that U-90 had a crew of 42 men and 4 officers and was carrying "two 10.5cm guns, one forward and one aft of the conning tower". A "small bateau" (boat) was "carried between the inner and outer hull of the submarine".

Isaacs states that the wardroom was approximately 6ft by 8ft and contained a small table and food lockers along the bulkhead. Forward of the wardroom was the captain's cabin, containing a desk and bunk, sandwiched between this and the forward torpedo room was one of the sleeping compartments for the men.

Abaft the wardroom on the starboard side, was an officers' cabin approximately 4ft by 6ft, with the radio room across the passage on the port side of the submarine. To the rear of these two rooms was the control room, aft of which was the other living compartment for the men, where food was cooked and meals were eaten. Aft of this, towards the stern of the submarine, were the engine room and after torpedo room.

Isaacs also reports, from his conversations with Remy, that U-90 was generally on patrol for five to six weeks at a time. Between patrols the U-boat was typically in port for three weeks at a time (ADM 137/3909).

A North Sea diary, 1914-1918: U-90 was amongst the German submarines surrendered at Harwich on 20th November 1918. Stephen King-Hall (1893 to 1966) was amongst the party of four officers that boarded U-90, later recording his thoughts and observations in *A North Sea diary, 1914-1918* (King-Hall, date unknown). This includes reference to the fact that U-90, on this date, was

“..mounting two guns, one each side of the conning-tower”, later mentioning that the crew were “clustered round the after-gun” and that the “U-90 class....armament consists of two 4-inch guns and six torpedo tubes”. King-Hall reports the defective condition of the submarine at surrender and the former Commander explained that U-90, having just returned from a 35-day trip, had been due a refit when ordered to surrender. In addition, further damage was caused by looting mutineers at Kiel (King-Hall: 232 - 247).

The poor condition of U-90 is confirmed by an Admiralty document from October 1919 which classes U-90 as ‘Condition B’: submarines which have not been maintained, batteries run down, and needing considerable refit to bring to sea-going condition (ADM 1-8576-337).

3.2.1 Loss of U-90

Some confusion surrounds the loss of U-90 and how it came to be where it is today. The following details are provided in historical sources:

Date	Location	Event	Source
20/11/2018	Harwich	U-90 surrendered & boarded	ADM137/3914, King-Hall (p232 onwards)
11/01/1919	Cardiff	At Cardiff (report hopes it will go to Swansea)	South Wales Weekly Post (11 th January 1919)
17/01/1919	Pembroke	U-90 requires to be docked due to leak	Telegram from Dockyard Pembroke
21/02/1919	Pembroke Docks	One of five U-boats at Pembroke	ADM1/8558/132
15/10/2019		“that U90 and UC92 have been allotted to Belgium: and that Their Lordships have under consideration the allocation of another submarine, whose number will be considered later, to the Imperial War Museum”	ADM 1-8576-337
15/10/1919	Pembroke	U-90 “Condition B”	ADM 1-8576-337
28/11/1919		“..Belgium has been loaned one for a few weeks.”	ADM 1-8576-337
29/11/1919		From Head of Naval Section, Paris, to Secretary of the Admiralty, London: “...one submarine has been sunk on the way to Belgium....(Your letter M.04715 of 20 th November 1919).”*	ADM 1-8576-337

*NB submarine UC-92 could not have been the submarine that had sunk on the way to Belgium by 29th November 1919 because it was being used for explosives trials at Falmouth in 1921 (ADM189/102). It seems likely, therefore, that the submarine lost on the way to Belgium in 1919 could have been U-90.

In the months and years following the war, U-boats were used as tourist attractions and fund-raisers, with funds generally going to injured servicemen and families. A report in the South Wales Weekly Post (11th January 1919) states the hope that U-90, currently at Cardiff, “will come to Swansea”. It seems that an ex-German U-boat has been at Swansea but was shortly to leave for Newport and that, by charging the public entry to these U-boats, average daily takings were estimated to be £15.

3.3 Associated Vessels

A total of 30 ships (c. 74,000 tons) were sunk by U-90 and two ships were damaged. The majority of U-90’s shipping casualties lie south and west of the Forgotten Wrecks project area, with two being in the Irish Sea, two off the northern tip of Scotland and one off the southern tip of Norway (Figure 6).

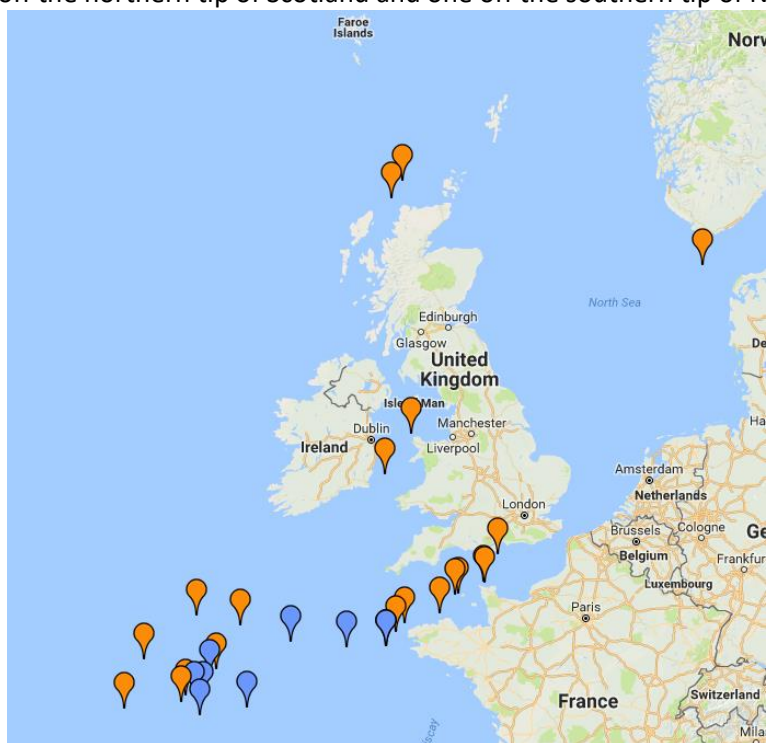


Figure 6: Map showing ships hit by U-90 (Image courtesy of U-boat.net)

In early 1918, U-90 was clearly active in the Forgotten Wrecks project area (south coast of UK) as, under the command of Walter Remy, it torpedoed a British steamer SS *Corton*, 8 miles south of Donnose Head, Isle of Wight on 22nd January. While the vessel was not sunk, it seems that three crewmen were killed in the attack, or died soon after from injuries sustained. Two were from the Indian Merchant Service and one from the Mercantile Marine. They were:

- Ahmad Naseh, Fireman
- Ali, Fireman
- William James Salkeld, Donkeyman, aged 38 and from Bermondsey, London.

(Uboat.net A)

Silent Warriors: Submarine Wrecks of the United Kingdom Volume 2, provides extensive detail of the ships sunk and damaged by U-90, including the names of those who died (Young & Armstrong 2009: 128-141). See Section 8.2 for list of vessels attacked by U-90.

3.4 People associated with the U-90

Kapitänleutnant Walter Remy (1883 to 1965) was the longest serving commander of U-90 (2nd August 1917 – 31st July 1918). Lieutenant Isaacs' report provides some interesting insights into Remy's career, character and working methods, stating that Remy entered the navy in 1905 and had travelled extensively, including to America in 1911 on a cruiser. Isaacs describes how he was hailed aboard the U-boat with a megaphone, given a glass of sherry and, having failed to identify a more senior officer in the life-rafts and boats, was sent below and *"given warm clothing and allowed to lie down in one of the bunks"*. During his time as a prisoner on U-90, Isaacs witnessed Remy's regular habit of visiting the island of North Rona to hunt sheep for consumption by the crew. An officer and three men rowed ashore in the submarine's small boat and shot nine sheep, one of which Isaacs observed falling off the cliff into the water. He recounts: *"Remy, telling me that he knew he was a fool to do such a thing, backed the submarine to within three feet of the cliff where one of the sailors dropped a grapnel and caught the sheep which had fallen over the cliff."*

Isaacs also provides interesting detail of life on board U-90 during the war, including the fact that the men *"slept in hammocks and on the deck"* and *"were very dirty for there was no water to wash with"*. The officers had a little wine and eggs and there were four meals each day, including 'Kaffee' at 4pm. Sausage (wurst) was consumed at every meal, with *"canned bread and lard, which they called marmalade"*. Cards were played after supper and Isaacs states: *"Captain Remy tried in every way possible to make things pleasant for me, and when I asked an impossible question he invariably told me he did not think he ought to answer"*. He also mentions that Remy was *"chagrined that he had not been allowed to go to America with the U-90"* and when he was transferred to a prison room on the *Preussen*, Remy visited him twice, giving him cigarettes, changing a \$5 note into German money and acquiring toothpaste and toiletries for him (ADM137/3909).

Oblt. Helmut Brümmer-Patzig (26th October 1890 – 11th March 1984) commanded U-90 from 1st – 31st August 1918. Earlier that year he had commanded U-86 and was responsible for the torpedoing of the *Llandovery Castle*, a Canadian hospital ship, on 27th June 1918. Only the occupants of one life-raft survived the attack, with 234 doctors, nurses, Canadian army medical staff and crew being killed either during the sinking or by the U-boat running down the lifeboats and machine-gunning survivors. Brümmer-Patzig fled German jurisdiction to evade conviction for the *Llandovery Castle* atrocity at the Leipzig War Crimes Trials in 1921. During the Second World War he served as a commander of the 26th U-boat Flotilla (https://en.wikipedia.org/wiki/Helmut_Br%C3%BCmmer-Patzig).

Kptlt. Heinrich Jeß (2nd May 1884 to 1st September 1962) commanded U-90 from 1st September 1918 – 11th November 1918 during which time the U-boat was responsible for the sinking of two British steam ships, the *Dundalk* (14th October 1918, five miles off the Skerries) and the *Pentwyn* (16th October 1918 20 miles off the Smalls).

All three of U-90's commanding officers were awarded the Royal House Order of Hohenzollern, a title that was awarded to a total of only approximately 320 naval officers during the First World War (<https://uboat.net/wwi/men/decorations/5.html>)

In his account, Isaacs mentions one of the crew of U-90 in June of 1918 by name: *"a reserve ensign from the merchant fleet by the name of Wiedermann, who spoke English very well having been in America and England in peace time on various steamers"*. On the surrender of the U-boats in November 1918, it is clear that German merchant seamen were considering how they would return to such a living. A reservist officer from U-90 *"kept on asking whereabouts in the world he might be*

able to get a job in the Merchant Service. He finally said: "Do you think if I went to China or Japan I could find a job for a German?"" (King-Hall: 237).

3.5 Post-loss Activity

The wreck of U-90 was discovered (uncharted) by Mr Martin Woodward in 1988. It was purchased from the Ministry of Defence by Martin on 20th April 1994. Conscious of the potential for salvage, Martin was cautious about sharing the position of the wreck and this may have contributed to its relatively good survival. The wreck has, however, been dived over the years by sport divers, some of whom have kindly shared video and photographs of the wreck. No prior archaeological recording or assessment of the site is known of.

4 Seabed Remains

4.1 Site Location and Environment

The wreck thought to be U-90 lies approximately 3 miles south east of St Catherine's Point, Isle of Wight, position: 50 30.656N 001 09.051W (Figure 7).

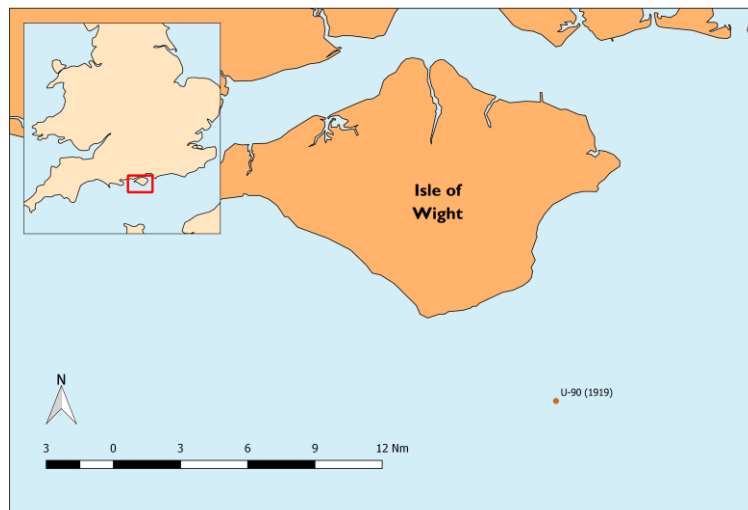


Figure 7: Location of U-90 wreck

The wreck is at a depth of 33-39m on a sand and shingle seabed (Figure 8). Marine life is abundant, with star fish (see Figure 21), conger eels and pouting being particularly common.

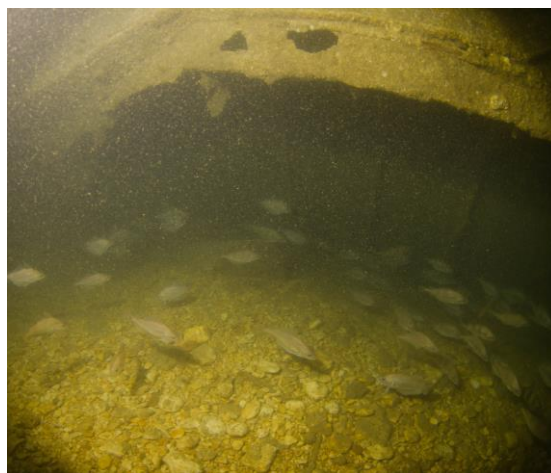


Figure 8: Seabed and marine life of the wreck of U-90

4.2 Archaeological Methodology

The site assessment of U-90 included MAT dives which aimed to:

- swim the length of the wreck and produce a site sketch with notable features;
- lay a baseline along the wreck to determine length and measure distances to significant features;
- locate, draw and measure the propellers;
- sketch, measure and photograph conning tower;
- count and measuring torpedo tubes at the bow;
- search for hydroplanes (fore and aft);
- examine propeller boss for identifying detail; and
- examine and sketch the stern of the wreck.

A photographic survey was undertaken in July 2017 comprising 376 photographs of the wreck. Brandon Mason from the MAT undertook the photographic survey along the following route: from near the stern of the submarine, along the deck, past the breach of the aft gun, from the seabed on the starboard side, up the hull and the aft of the conning tower, back down to the seabed, back up the hull to the starboard side of the conning tower, around the aft end of the conning tower, around the starboard side of the tower, the forward end of the conning tower, down to the hull and seabed, moving back up the base of the forward end of the conning tower, up and down the forward end of the conning tower, then forward along the deck to the forward gun around the breach of the gun, off the starboard side at the forward gun platform, moving forward at deck level towards the bow. Photos from this dive are included in this report and will form part of the project archive.

In addition, the excellent dive video taken by Hamish Morrison on 31st July 2015 (see Section 8.2) was studied for information it could provide on features, identifying characteristics, the condition of the wreck in 2015 and any changes to the site between then and the photographic record undertaken in 2017.

4.3 Description of Surviving Vessel Remains

As can be seen from Figure 9 below, the charted position for U-90 matches very closely to the physical remains on the seabed.

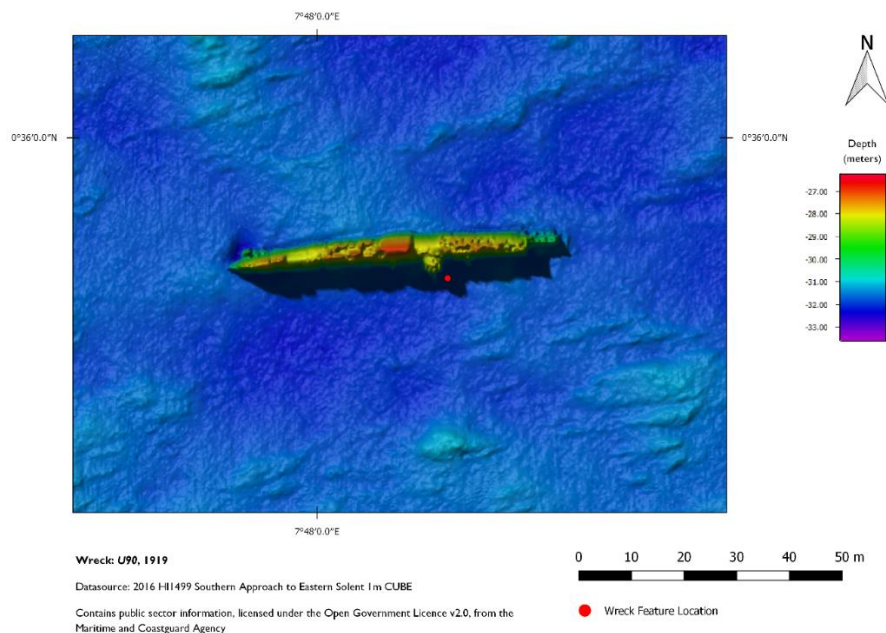
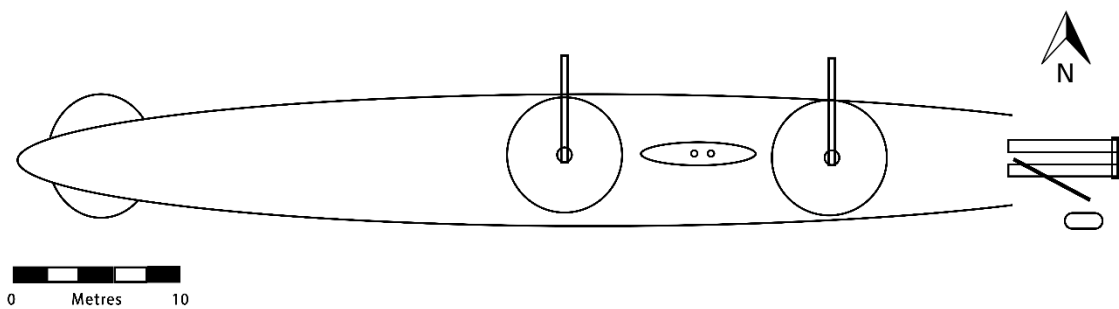


Figure 9: Bathymetry of the wreck of U-90

The bathymetry shows the wreck of a submarine, measuring approximately 63m in length, with bows to the east and stern to the west. It is largely intact, though a 6m long section of outer hull and superstructure at the bow is missing. Here, the forward torpedo tubes are recognisable and some unidentified upstanding structure. The wreck is leaning to starboard on a relatively flat and level seabed, with signs of scouring at the port stern, where the port propeller and hydroplane can be seen. The conning tower and parts of at least one periscope are apparent, as well as the forward and aft guns. A section of the port side in the area of the aft gun seems particularly intact. From the stern to the centre of the conning tower measures just under 39m, from the centre of the conning tower to the bow, just under 25m, demonstrating that the conning tower is forward of amidships, as expected for a Type U-87 U-boat.

The dive team found the wreck to be well preserved, with the bows lying to the east (Figure 10), leaning over onto its starboard side at an angle of approximately 45 degrees (Figure 11). A baseline tape measured the length of the wreck to be approximately 65m. See Appendix 8.1 for Dive Logs.



**Figure 10: Scale representation of seabed remains.
The U-boat leans to starboard at an angle of approximately 45 degrees.**



**Figure 11: Forward gun platform.
Diver at seabed level, starboard side, forward gun-platform, shining torch through outer-hull.
The submarine's 45 degree lean to starboard can be clearly seen.**

The stern of the U-boat lies to the west and is leaning to starboard at an angle of approximately 45-50 degrees (Figure 12).



Figure 12: The stern from behind.

The diver's torch to the right can be seen pointing down to the deck of the U-boat which is leaning to starboard.

Image: Martin Davies

The frame of the upper vertical rudder is still *in situ* on the top of the stern (Figure 13). This can be seen on the top of the stern in the 1917 photograph U-90 (Figure 1). Upper vertical rudders are an unusual feature on the later U-boats (U-51 onwards – excepting the minelayers U-71 to U-80) but were present on the Type U-87 U-boats (see 3.1). The same feature can be seen in video of the wreck of U-89 (another Type U-87) sunk in action off Donegal in 1918 (see Section 8.2).

On 11th July 2014, MAT divers observed a wooden element with iron sheathing buried in sand at the stern of the wreck. It is possible that this is part of the upper vertical rudder.



Figure 13: Stern with upper vertical rudder frame

Image: Hamish Morrison

The lower vertical rudder is still *in situ* underneath the hull. The foot is intact and rests on the seabed aft of and between the two aft hydroplanes. Immediately above the rudder is the keel of the U-boat

and the two closed torpedo tubes. The aft hydroplane guards can be seen above and the port aft hydroplane can be seen protruding to the left of Figure 14.



Figure 14: Stern of U-90.

Looking up from underneath the stern, the two closed torpedo tubes can be seen, the aft hydroplane guards, the rudder (bottom left) and the port aft hydroplane.

Image: Martin Davies

Forward of the leading edge of the bottom part of the rudder is the skeg, immediately above which, on either side, are the attachment points for the propellers. The aft hydroplanes sit immediately behind each propeller (Figure 15).



Figure 15: Port propeller.

Left to right: port propeller shaft, propeller, hydroplane.
The bottom leading corner of the rudder can be seen bottom right.

Image: Hamish Morrison

The trailing edge of the rudder is jagged and damaged revealing that the rudder is hollow (Figure 16).



Figure 16: Trailing edge of rudder
Image: Hamish Morrison

Both three-bladed propellers are still fitted to the propeller shafts on either side of the hull. The port propeller (Figure 17) is missing its cone, which is known to have been recovered by divers in the 1980s and is currently in private ownership in Chichester. The boss of the port propeller was found to have the same markings as those on the cone, i.e. **D. 90. B.B.** (see Figure 54 & 55 and Section 5.2 for meaning). The starboard propeller (Figure 18), with cone *in situ* is underneath the hull, which leans to starboard.



Figure 17: Port propeller (note the missing cone) and aft hydroplane.
Bottom right: the lower leading edge of the rudder can be seen.



Figure 18: Starboard propeller (with cone and aft hydroplane)

Images: Martin Davies

Beneath and slightly forward of the starboard propeller, an unidentified metal feature lies on the seabed underneath the prop shaft (Figure 19).

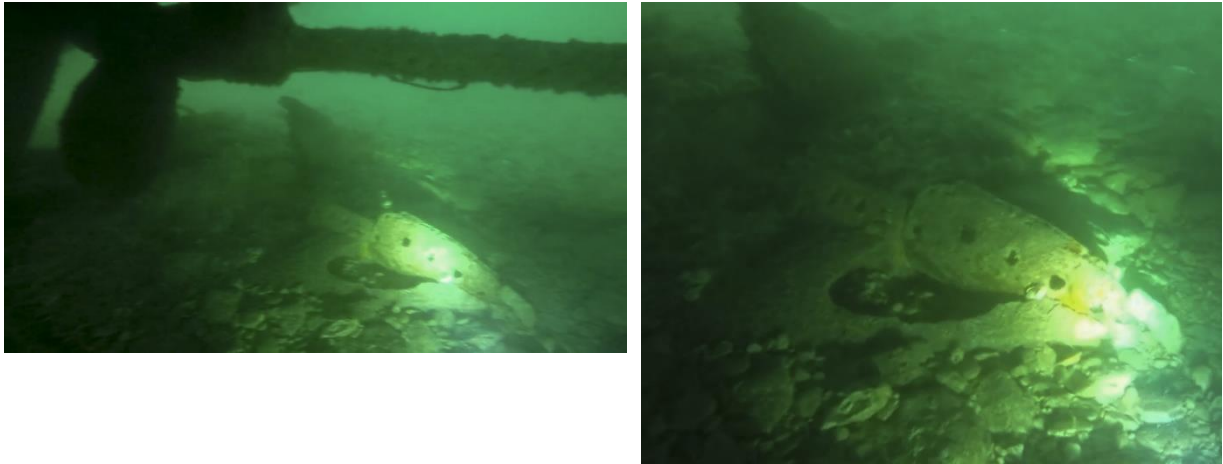


Figure 19: Unidentified metal feature underneath starboard propeller.
Image: Hamish Morrison

Continuing forward, the outer hull and deck is well preserved and two deck mooring bollards can be seen, one behind the other, in the centre of the deck. Forward of this, a circular deck hatch can be seen in the starboard side (Figure 20).



Figure 20: Aft circular deck hatch (starboard aft).
Fixed deck bollards can just be seen centre top.
Image: Hamish Morrison

Slightly further forward (between the stern and the aft gun platform) a rectangular opening/hatch can be seen in the wooden decking (Figure 21). This appears to be for retractable mooring bollards.



Figure 21: Retractable mooring bollards

Continuing forwards there is a break in the outer hull and the pressure hull of the submarine can be seen (Figure 22). It is well preserved and the riveted construction and externally fitted frames (see Section 3.1) can clearly be seen.



**Figure 22: Pressure hull.
With riveted construction, external frames.**

The absence of outer hull in this area enables a good view of the hydraulic ram, which would have operated the rudder. This runs down the starboard side, between the pressure and outer hull, just under the deck (no longer present) (Figure 23).



Figure 23: Hydraulic ram (starboard side, between pressure and outer hull)

At the forward end of the hydraulic ram, where it penetrates the pressure hull, an area of concretion has been knocked away causing fresh corrosion (Figure 24). It is not clear if this was the result of deliberate or accidental activity but the damage must have taken place between July 2015 (Figure 25) and July 2017.



Figure 24: Forward end of hydraulic ram (July 2017)



Figure 25: Forward end of hydraulic ram (July 2015)
Image: Hamish Morrison

Compared to other First World War U-boat wrecks, the submarine's outer casing is in relatively good condition (Figure 26 & 27).



Figure 26: Outer casing.

A section of hull, aft of the conning tower, where the outer casing is still intact.



Figure 27: Pressure hull, outer casing and HP cylinder.

A section of hull beneath the conning tower, where little of the outer casing remains but the pressure hull and pressure cylinders between the two hulls can be seen.

Figure 26 above shows that “the outer hull is rounded off over the tops of the tanks on either side to meet the superstructure” as would be expected for U-90 (see Section 3.1).

Pressure cylinders can be seen all over the site, many still *in situ* between the pressure hull and outer casing (Figure 28) but a number have fallen from the wreck and lie on the seabed off the starboard side.



Figure 28: Pressure cylinders

Between the pressure hull and outer casing, aft of the aft gun platform.

The wooden deck is well preserved in places, particularly in the area of the aft gun (Figure 29) and forward gun (Figure 30).



Figure 29: The aft gun platform with extant wooden deck planking



Figure 30: The forward gun platform with extant wooden deck planking

Exhaust Funnel

A pipe-like feature lies off port side of the submarine, level with the conning tower, possibly the vessel's exhaust funnel.

U-90's Guns

A number of historical accounts from during and immediately after the First World War refer to the U-90 having two 10.5cm/4.1 inch guns (see Section 3.1). Two guns survive on the wreck and, while they both appear to be 10.5cm/4.1 inch guns, they are clearly not the same model.

Aft Gun

The aft gun and its mount (Figure 31) are well preserved. While heavily concreted, the ranging wheels, hydraulics, breech block and top-mounted recoil cylinder can clearly be seen and both gun and mount appear to be a very good match for the U-boat gun at Ward Park, Bangor, Northern Ireland (Figure 32).



Figure 31: Aft gun on the wreck of U-90



Figure 32: 10.5cm U-boat gun at Ward Park, Bangor, Northern Ireland.
Image: Maurice Bowens

A commemorative plaque on the Ward Park gun states that it is the gun from UB-19. This U-boat was sunk by gunfire from Q-ship *Penshurst* on 30th November 1916 but as a Type UBII, UB-19 would have had an 8.8cm gun, not a 10.5cm gun like the one at Ward Park. Furthermore, the identity of UB-19 was confirmed by Dr Innes McCartney who surveyed the wreck in 2006, reporting that “the mount of UB-19’s gun remains” on the wreck (McCartney 2015 :89) and the gun in Ward Park is complete with mount. The information board with the Ward Park gun confirms that the gun is, in fact, a 10.5cm gun thought to be from U-19, which survived the war, was surrendered in November 1918 and reportedly broken up at Blyth in 1919/20 (u-boat.net). Like U-90, U-19 was built at Danzig, though some five years earlier.

The recuperator on the Ward Park gun is marked:

10.5cm Tbts. Laf. C/1915

Nr. 705

Fu 625L

Tbts. = Torpedoboat

Laf. = mount

C/1915 = construction year

The breech block (Figure 33) is marked with the 3-ring Krupp symbol and the following text:



Figure 33: The breech of the Ward Park gun
Image: Maurice Bowens

Nr. 705.L.
FRIED. KRUPP
A.G.
1916
1354 kg

Assuming the breech block is contemporary with the gun, the Ward Park 10.5cm gun appears to be a Friedrich Krupp piece dating to 1916 on a 1915 torpedoboat mount and the aft gun on U-90 would seem to be the same.

Forward Gun

Like the aft gun, the forward gun on U-90 is *in situ* on its mounting and platform, pointing upwards towards the surface. The sighting and adjustment mechanisms are heavily concreted but it is still possible to make out the original form.



Figure 34: Forward gun on wreck of U-90
Image: Martin Davies.

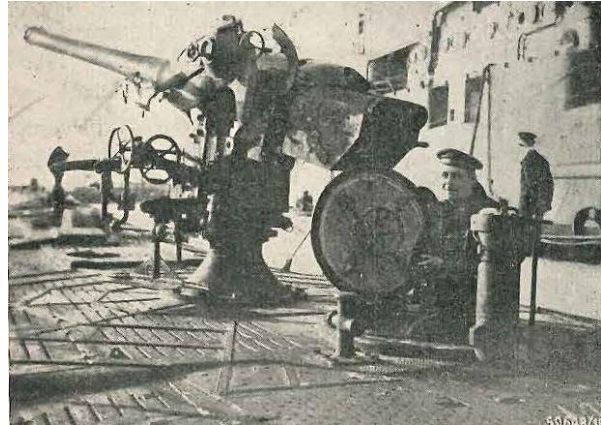


Figure 35: U-90's forward gun (Fischdick 1937: 40)

The forward gun on U-90 (Figure 34) is a good match for that shown in Fischdick's photographs (Figure 35) and the 10.5cm L/45 shown in Techel's technical papers (Figure 36).

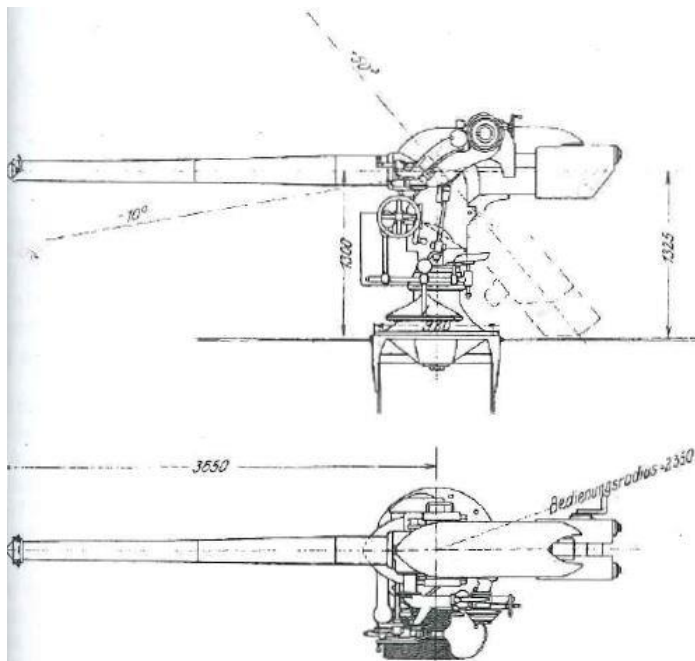
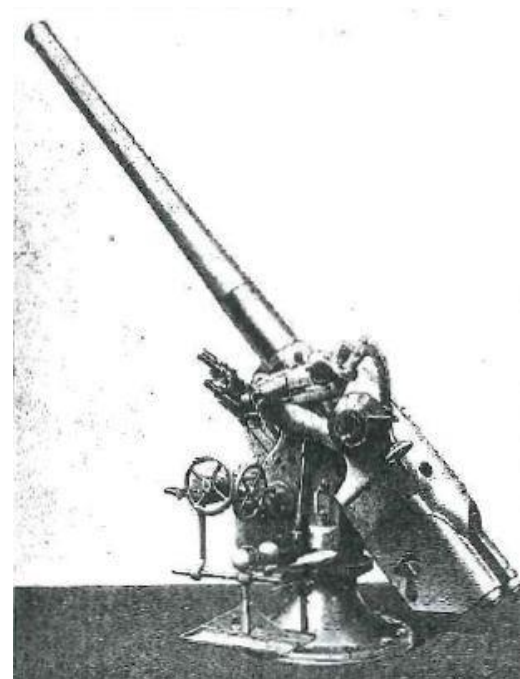


Figure 36: 10.5cm L45 (Techel 1940: 59)



The Imperial War Museum, Duxford has a 10.5cm U-boat gun (Figure 37) believed to be from U-98. This gun is marked (Figure 38) as a 10.5cm L/45 (Ehrhardt) on a U-boat and Torpedoboat mount. This gun is commonly cited in relation to 10.5cm guns on First World War U-boats but both gun and mount show noticeable differences to the L/45 in Techel's technical papers (Figure 36) and to the forward gun on U-90 (Figure 34 & 35).



Figure 37: 10.5cm U-boat gun (possibly from U-98) at Imperial War Museum, Duxford



Figure 38: plate on the Duxford U-boat gun

Images: Pam Williamson

Michael Lowrey (2018 pers. comm. 15 March) has seen only a few other pictures of such a gun fitted on a First World War U-boat (e.g. U-161) and considers the U-90 to be a “very rare” example of this type of gun, *in situ* on a First World War U-boat. Enquiries via the ‘Fortifications and Artillery’ section of the ‘Axis History Forum’ suggest the forward gun on U-90 is a 10.5cm Uts. U. Tots. Flak L/45 (Krupp) on a 10.5cm Uts. U. Tots. mount (construction year 1916). In addition to U-boats these guns were used on torpedoboats, minesweepers, capital ships and for coastal defence (Joss Vogel, Vladalex and Nuyt 2018, pers.comm., 16 March).

Conning Tower

Between the guns, the conning tower (Figure 39 & 40) is the highest part of the wreck at a depth of around 33m and is relatively intact. The aft hatch of the conning tower is open, inside a ladder can be seen on the starboard side.



Figure 39: Upper conning tower.
Viewed from the starboard side.

Left to right: hatch (open), navigating periscope, attack periscope.

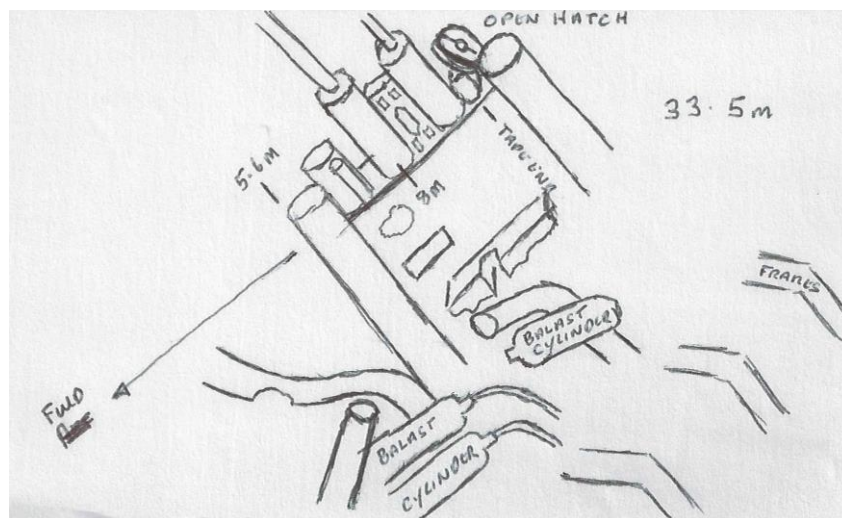


Figure 40: Sketch of upper conning tower from port side (Mark Hobbs)

There are only two periscopes, as expected for U-90 (see Section 3.1). The attack (forward) periscope is the longer of the two, the upper part of the navigating (aft) periscope is at the Shipwreck Centre & Maritime Museum, Isle of Wight (see Section 5).

The front of the conning tower on the wreck thought to be U-90 (Figure 41) is well preserved and an excellent match for that seen in one of the photographs in Fischdick's book (Figure 42).



Figure 41: the front of U-90's conning tower



Figure 42: Two crewmen on the front of U-90's conning tower (Fischdick 1937: 39)

Forward of the conning tower is the forward gun platform (Figure 43).



Figure 43: Forward gun platform.
Hatchway can be seen at the bottom centre of the photo



Figure 44: Forward gun platform with crew member standing in hatchway (Fischdick 1937: 40)

The hatch on the forward gun platform and in the top of the conning tower (see Figure 39) are dished, as expected for U-90 (see Section 3.1). The wooden decking and metal framework of the deck on the wreck of U-90 (Figure 43) match those shown in Fischdick's photographs (e.g. Figure 44).

Bow

Moving forward from the forward gun platform, a number of rectangular hatchways can be seen in the decking before a forward circular hatch is found on the starboard side (Figure 45).



Figure 45: Forward circular starboard hatch
Image: Hamish Morrison

The outer hull ends at the forward end of the pressure hull, the anchor windless appears to be *in situ* on the deck above (Figure 46).



Figure 46: Forward end of the pressure hull, anchor windless on deck
Image: Hamish Morrison

The four bow torpedo tubes protrude from the front of the pressure hull (Figure 47), along with a pivoting davit/arm (Figure 48) for manoeuvring the anchor. In most First World War U-boats, this mechanism comes out of the top of the pressure hull, the Type U-87 (and Type U-43) submarines were unusual in that the arm/davit came out of the front of the pressure hull.



Figure 47: The 4 bow torpedo tubes
Image: Hamish Morrison



Figure 48: End of pressure hull, with protruding bow torpedo tubes (below) and anchor davit/arm (above)
Image: Hamish Morrison

In July 2014, divers reported seeing the forward hydroplanes lying flat on the seabed on either side of the hull towards the bow. A lot of structure, fixtures and fittings lie on the seabed in a debris field around the bow torpedo tubes (Figure 47).

The starboard anchor pocket, complete with anchor, lies upside down on the seabed next to the front end of the pressure tube and below the anchor davit/arm (Figure 48 & 49).



Figure 49: Starboard anchor pocket (upside down). Anchor ring and top of shank can be seen
Image: Hamish Morrison

In 2014, the port bow anchor was photographed (Figure 50), the stockless anchor, closely resembling a Hall design, with curved flukes and a single crown pin, appears to be *in situ*, stowed in its anchor pocket. Some blue line can be seen tied around one of the flukes.



Figure 50: U-90's port anchor
Image: Martin Davies

5. Recovered Artefacts

There are a number of U-90 artefacts at the Shipwreck Centre, Arreton Barns, Isle of Wight. These were recorded as part of the Forgotten Wrecks project.

Artefacts recovered from U-90



Figure 51: Navigating (aft) periscope upper section

Height: 1400mm
Diameter at base: 150mm
Brass with glass lens
Stamped at base: 562 (crown image) 552



Figure 52: Compass ring

Diameter: 212mm
Thickness: 19mm
Brass
Markings: Compass graduations.
VORN STEIGER 1736 (each side of central hole)



Figure 53: Brass wheel believed to be steering wheel from conning tower

Diameter: 460mm
Brass

These three artefacts (Figure 51 to 53) were recovered in June 1988 from the seabed at the base of the conning tower, on the starboard side, below the periscopes (Martin Woodward 2018, pers. comm., 3 January).



Figure 54: U-90 at sea (Fischdick 1937: 45)

U-90's conning tower steering wheel can be seen *in situ* in one of the photograph in submariner Arnold Fischdick's book (Figure 54).

Another object recovered from U-90 is known to be in a private collection in Chichester. Though it was not possible to record this item, photographs (Figure 55 & 56) were kindly provided:

Propeller cone embossed with: D. 90. B.B.:



Figure 55: Propeller cone recovered from U-90
Image: Martin Woodward



Figure 56: Markings on propeller cone

Propeller Cone Markings

B.B. is for Backboard (German for 'port'). This propeller cone was recovered from the port propeller. The significance of 'D' has been debated, with suggestions including 'Deutschland' and 'Duchemesser' (German for Diameter). A 'D' was used to indicate diameter on the propellers of submarines built by Blohm & Voss, Hamburg but the only U-boats (as opposed to UB or UC) built by Blohm & Voss during the First World War, were Type UE 2 minelayers, and the seabed remains believed to be U-90 do not match those of a Type UE 2 submarine. U-90 was built at the Kaiserliche Werft shipyard in Danzig (KWD). Most of the other yards stamped the yard name on U-boat propellers and though he has not seen another example of a KWD propeller, U-boat historian Michael Lowrey believes the 'D' on this cone is most likely to stand for 'Danzig' and supports the theory that this U-boat is one of only 14 ocean-going U-boats built at Danzig (Lowrey 2015, pers. comm., 2 November).

Though a photograph of the propeller cone was obtained (Figure 55), it was not possible to access the artefact during the project to record dimensions and other details. It is hoped that this can be achieved in the future. No other known examples of propeller cones from U-boats built in Danzig are known of, making it a particularly important example.

No further artefacts recovered from the wreck of U-90 were identified.

Further study of the four recovered artefacts could provide information on First World War submarine technology, navigation and optical equipment, materials and builders' marking conventions. In addition, comparison of these artefacts with material from other wrecks could help with the identification of currently unidentified U-boat wrecks.

Very few examples of 10.5cm naval guns survive internationally and even fewer in the UK. Though still *in situ* on the wreck, further recording of these rare examples is possible and highly desirable.

6. Site Significance & Potential Further Research

The historical research and archaeological fieldwork undertaken during the MAT's HLF Forgotten Wrecks of the First World War project supports the conclusion that the submarine wreck that lies approximately 3 miles south east of St Catherine's Point, Isle of Wight is U-90.

Historical research suggests it could have been the U-boat referred to in letter from the Head of Naval Section, Paris, to the Secretary of the Admiralty, London, dated 29th November 1919, that was said to have "sunk on the way to Belgium" where it was to have been used for propaganda purposes (see Section 3.2.1).

The following evidence supports the wreck being U-90:

- Length of U-boat wreck: approximately 65m (see 3.1, 4.3);
- Number and arrangement of torpedo tubes: 4 forward, 2 aft (see 3.1, 4.3, Figure 9 & 10);
- The conning tower is located forward of the amidships (see 3.1, 4.3, Figure 9 & 10);
- Externally framed pressure hull (see 3.1, 4.3, Figure 17 & 19);
- Outer hull rounded off over tops of tanks on either side to meet superstructure (see 3.1, 4.3, Figure 18 & 20);
- Evidence of upper vertical rudder (see 3.1, Figure 13);
- Markings on propeller cone and boss (see Section 5, figure 41 & 42);
- Two 10.5cm guns (see 3.1, Figure 3, 4.3, Figure 9, 10, 22, 23, 24, 27);
- Two periscopes (see 3.1, 4.3, Figure 30 & 31);
- Two 3-bladed propellers, approximately 1.3m diameter (see 3.1, 4.3, Figure 12 & 13);
- Dished hatches (see 3.1, Figure 34);
- Characteristics common with Fischdick's photographs (Figure 1, 3, 4, 5, 27/28, 32/33, 34/35);
- Anchor arm/davit protruding from front of pressure hull (see 3.1, Figure 48);
- Recovered artefacts (see Section 5);
- Probable hinged exhaust funnel off port side (see 4.3).

U-90 is significant due to its rarity, being one of only 14 U-boats built at Kaiserliche Werft Danzig that had unique characteristics including: externally framed pressure hull, four forward torpedo tubes and two aft and a conning tower located forward of the midway point, anchor davit/arm protruding from front of pressure hull. Furthermore, U-90 was one of only six Type U-87 U-boats ever built.

The condition of U-90 is very good for a vessel that has survived the natural processes within an area of strong tidal flow for nearly 100 years. The outer hull is beginning to break down and the pressure hull, along with pipes, glands and high pressure cylinders, can be seen inside. The wreck itself, however, is still remarkably recognisable and well preserved. Its state of preservation compares favourably with the wreck of one of the other Type-87 U-boats, U-89, which lies in 60m off Donegal, Ireland, having been rammed and sunk by HMS *Roxburgh* in February 1918. In contrast to U-90, very little of the outer-hull and none of the wooden decking of U-89 remains (<https://www.youtube.com/watch?v=YfyhuPAafro>).

In addition, the service record of U-90 and associated historical sources, make it a particularly interesting case study.

U-90 offers a great deal of research potential. Though diving conditions can be challenging, further visits to record details of construction, layout, fixtures and fittings would add considerably to the knowledge base for this rare class of submarine. More fieldwork and research can further explore the differences between historical sources and the deck layout (see Section 3.1) on the wreck, including detailed study of what appear to be retractable bollards (see 4.3, Figure 21), the pivoting bow anchor davit/arm (Figure 48) and windlass (Figure 46), the anchors (Figure 49 & 50), hydraulic

ram (Figure 23 & 24), rudder (Figure 14 & 16), propellers (Figure 15, 17 & 18) and hydroplanes, upper vertical rudder (Figure 13), torpedo tubes at the bow (Figure 47) and stern (Figure 14) and the U-boats two 10.5cm guns (see 4.3 and Figure 31-36), including the particularly unusual example provided by the forward gun (Figure 30 & 34).

While the present condition of U-90 is good, concern has been raised following the publication of the wreck's position in a diving magazine in December 2014. Damage to the site, sustained between 2015 and 2017 has been observed (see Figure 24 & 25).

The "considerable strategic importance" of "the role played by submarines in both World Wars" has been highlighted by English Heritage (EH 2012: 6) and U-90 falls directly within an EH NHPP Designation priority for 2014 – 2015 'Unknown Marine Assets and Landscapes'.

The site has already been identified through research funded by English Heritage as requiring protection. The report 'Strategic Assessment of Submarines in English waters' (Walker & Webster 2014) states that in relation to First World War Boats "The most significant is the privately owned U-90, one of only six in its class (U87 Class), and with a war service record. The wreck is fairly intact and a dive site" (page 38). Section 6 of the report considers candidates for protection, particularly "significant wrecks, in reasonable condition, where identity is secure. Examples to be considered are:.....U-90 is privately owned, but is a rare later cruiser" (page 40).

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8. Appendices

8.1 Diver survey forms



ARCHAEOLOGICAL RECORD SHEET

MARITIME ARCHAEOLOGY

Name <i>ALLY LAWRENCE</i>		Date <i>11-7-14</i>	Number <i>1</i>
Site <i>U-90</i>		area	Continued from
Survey files		Page of	
Uw drawing ref	Photo ref	Video ref:	

Dive duration <i>68</i>	Depth	UW vis	UW tide
Diving Equipment			
Tools/ Equipment			

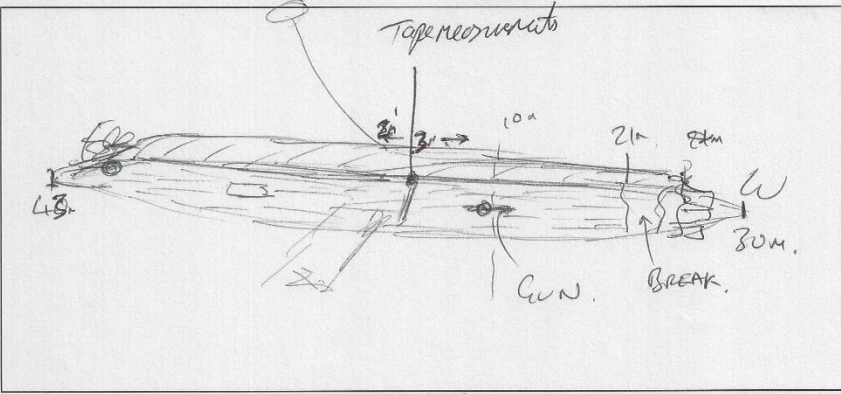
Other constraints

Cold Tide swell access low light other

Task/ objectives <i>LAY BASELINE ALONG WRECK AND MEASURE SIGNIFICANT PIECES/ITEMS.</i>
--

Outcome/ procedures
<i>Tape measure laid to bow and stern. Patient features recorded. Submarine in the order of 69-70m long.</i>

Sketch (additional sheets available)





MARITIME ARCHAEOLOGY

ARCHAEOLOGICAL RECORD SHEET

Name <i>Mark Hobbs</i>	Date <i>11th July 14</i>	Number <i>3</i>
Site <i>U 90</i>	area	Continued from
Survey files		Page of
Uw drawing ref	Photo ref	Video ref:

Dive duration <i>41 min</i>	Depth <i>32 m</i>	UW vis	UW tide
Diving Equipment			
Tools/ Equipment			

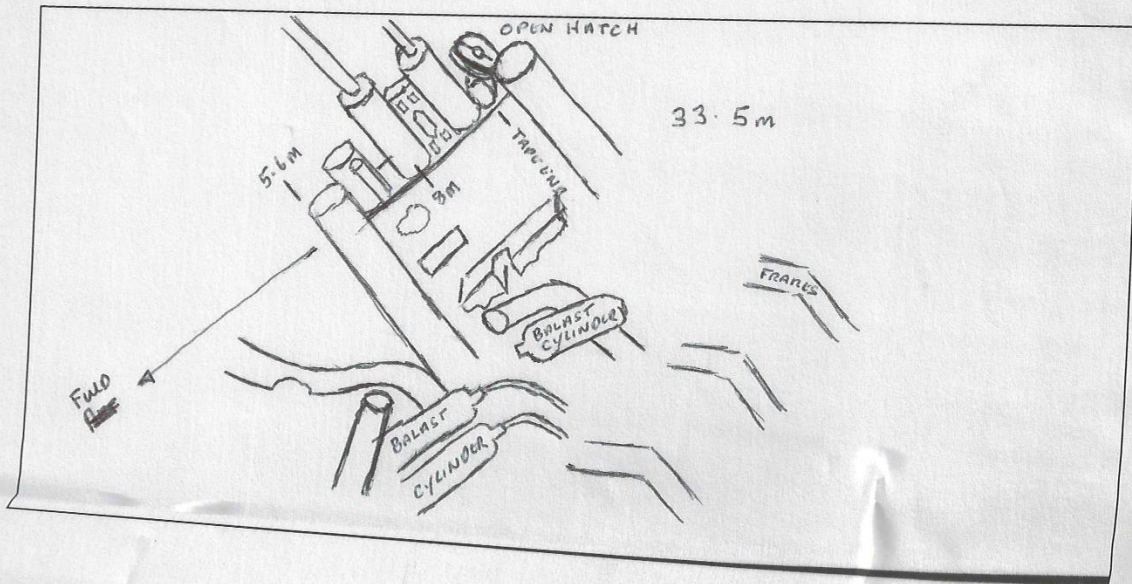
Other constraints

Cold Tide swell access low light other *too many 'helpful' divers*

Task/ objectives <i>Dive on U 90 to look at conning tower</i>

Outcome/ procedures
<i>lots of structure visible eg sky periscope, normal periscope, radio mast. Structure of surrounding missing but frames visible. 3 hp gas cylinders visible - has 45° angled side bows east.</i>

Sketch (additional sheets available)



23-09-14

Name ANDY + ROLAND	Date U90	Number U90 8
Site U-90	area	Continued from
Survey files		Page of
Uw drawing ref	Photo ref	Video ref:

Dive duration	Depth 38	UW vis	UW tide
Diving Equipment			
Tools/ Equipment			

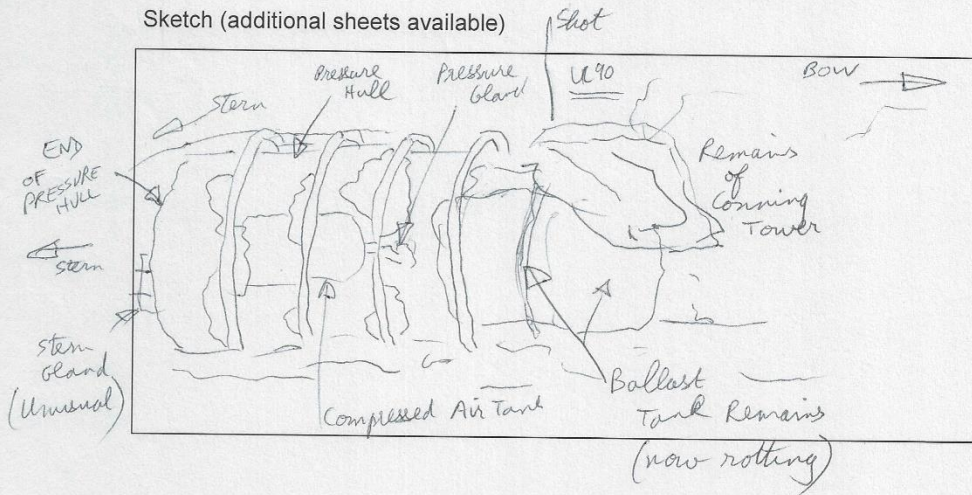
Other constraints

Cold Tide swell access low light other

Task/ objectives	SURVEY TOWARDS STERN (WEST)

Outcome/ procedures
Reached the stern. Mark and Tare on the prop and so returned on Starboard side
Some interesting (early) technology such as glands, penetrations of the pressure hull) and the propeller stern gland

Sketch (additional sheets available)



8.2 U-90's attack record

The following information relating to the career of U-90 was researched and collated by MAT volunteer Roger Burns:

Kptlt. Walter Remy attacked the following:

- *Union Republicaine*, a French fishing vessel (dundee)
- *Deux Jeannes*, a French fishing vessel
- *Liberte*, a French fishing vessel
- *Peuples Freres*, a French fishing vessel (dundee)
- *Drake*, a British steamer
- *Heron*, a British steamer, with 22 casualties
(See [https://livesofthefirstworldwar.org/search#Category=lifestories&FreeSearch=SS Heron&PageIndex=1&PageSize=20](https://livesofthefirstworldwar.org/search#Category=lifestories&FreeSearch=SS+Heron&PageIndex=1&PageSize=20))
- *Neuilly*, a French sailing vessel
- *Jeannette*, a French fishing vessel
- *Robert Morris*, a British sailing vessel
- *Aros Castle*, a British steamer
- *Corton*, a British steamer, damaged not sunk, with three casualties
- *Victor De Chavarri*, a Spanish steamer
- *Charles*, a British sailing vessel, with one casualty
- *Normandy*, a British steamer, with 27 casualties
- *Union*, a French steamer
- *Lindeskov*, a Danish steamer
- *Martin Gust*, a Russian sailing vessel
- *Arrino*, a British steamer
- *Oilfield*, a British tanker
- *City of Winchester*, a British sailing vessel
- *Superb*, a Norwegian sailing vessel
- *Begum*, a British steamer, with 15 casualties
- *Carlton*, a British steamer
- *President Lincoln*, an American six-masted passenger steamer, with 26 casualties

Oblt. Helmut Patzig attacked the following:

- *Montanan*, an American steamer, with five casualties
- *J. M. J.*, a French fishing vessel
- *West Bridge*, an American steamer, with four casualties. This vessel was very seriously damaged; abandoned by crew but later towed into Brest by the Royal Naval tugs *Epic* and *Woonda*, escorted by USS *Smith (DD-17)*
- *Escrick*, a British steamer, with one casualty
- *Joseph Cudahy*, an American tanker, with one casualty
- *Graciosa*, a Portuguese sailing vessel – shelling of this vessel was assisted by U-67.

Kptlt. Heinrich Jeß attacked the following:

- *Dundalk*, a British steamer, with 21 casualties
- *Pentwyn*, a British steamer, with one casualty

8.3 Online video relating to U-90

Publishing date:	30 th April 2008	Publisher:	Southsea Sub-Aqua Club
URL:	https://youtu.be/25-XlvtpLM		
Last accessed:	13 th March 2018	License:	Standard YouTube License
Length:	7:29 mins	Description:	Dive footage
Notes: club dive on U-90, underwater footage starts at aft side of conning tower with open hatch in foreground, 45 degree angle of submarine can be clearly seen. Low resolution, hard to make out detail.			

Publishing date:	4 th March 2007	Publisher:	p1lse
URL:	https://www.youtube.com/watch?v=NiwlWl4t47g		
Last accessed:	13 th March 2018	License:	Standard YouTube License
Length:	5:39 mins	Description:	Dive footage
Notes: dive footage from July 2006. Diver starts at conning tower and moves aft down submarine, ending at the propellers.			
0:30	Closed, dished hatch in pressure hull (aft of conning tower)		
0:57	Breach of aft gun – can be seen pointing to surface		
1:13	Probable retractable mooring bollards & surviving wooden decking		
1:13-1:20	Looking through the deck into the hull below – aft of aft gun platform		
2:04	Moving aft down the pressure hull		
3:52	Aft deck fittings		
4:08	Frame of upper vertical rudder (can be seen in Figure 13)		
4:24	Possible aft hydroplane guard		

Publishing date:	31 st July 2015	Publisher:	Hamish Morrison
URL:	https://vimeo.com/135090036		
Last accessed:	13 th March 2018	License:	
Length:	39:14	Description:	Dive footage
00:47	Diver/video camera reaches bottom of shot line. HP cylinders can be seen		
1:24	Travelling down port side, past conning tower, many pipes and tubing		
3:10	Aft gun (viewed from behind the conning tower)		
4:09	Aft gun deck		
4:26	Travelling aft down the starboard (lower) side		
4:33	Outer hull joining deck		
4:40	HP cylinders between outer and pressure hull		
5:41	Pressure hull, external framing, possible hydraulic ram for rudder/hydroplanes		
6:07	Outer hull frame		
6:39	Aft deck mooring bollards		
6:58	Framework of upper vertical rudder		
7:15	Starboard propeller (with cone) – from starboard side. Aft starboard hydroplane immediately behind propeller.		
7:23	Starboard propeller (with cone) and shaft from starboard side		
7:56-8:25	Swimming around stern of U-boat at seabed level		
8:35	Bottom of rudder		
8:39	Where rudder attaches to underside of hull (to right of frame), upstanding aft port hydroplane (centre), note recess in rudder so it clears aft hydroplanes		

8:52	Port aft hydroplane (to right), middle/centre = lower leading edge of rudder
8:58	Port propeller (no cone), with hydroplane immediately aft of propeller
9:07	Propeller (no cone)
9:12	Starboard propeller (with cone) – from port side, starboard hydroplane immediately aft
9:34	Port propeller (no cone) and hydroplane
9:42	Port propeller shaft
10:12	Port aft hydroplane
10:46	Aft edge of rudder
11:00	Aft port torpedo tube
11:38	Starboard/lower side near stern – moving forward
12:34	Outer hull (starboard) broken away, frames revealed
12:47	Hydraulic ram inside outer hull
13:41	HP cylinders <i>in situ</i> above pressure hull starboard side
13:44	Cylinder on seabed
14:03	Aft gun platform, starboard side, moving forward
14:09	Aft gun
14:33	Starboard (lower) side at seabed level, moving forward towards the conning tower
14:37	Well preserved outer hull, starboard side
14:56	Conning tower from starboard/below
15:46	Pressure hull beneath the forward part of the conning tower
16:01	Starboard deck hatch, just aft of forward gun platform (can be seen in Fischdick 1937: 122)
15:49	Ventilation pipe aft of forward gun (can be seen in Fischdick 1937: 40)
16:08	Forward gun
16:37	Conning tower from starboard side
16:45	Periscopes (forward/attack periscope – longer of the two)
17:32	Starboard side of forward gun deck
18:06	Section of well-preserved wooden deck, forward of forward gun platform
18:42	Circular hatch towards starboard bow
19:00	Starboard forward hydroplane
19:14	Bow section, outer-hull missing, 4 torpedo tubes
20:18	Debris field around forward end of bow torpedo tubes
19:21	Starboard anchor pocket, upside-down on seabed – shackle can be seen at end of anchor
20:57	From bow, looking aft, conning tower centre frame
21:06	Starboard anchor pocket hawser end, with anchor shackle
21:35	Returning aft down starboard side
22:36	Section just forward of forward gun platform, starboard side, where outer hull is missing
22:55	Looking aft at forward gun
23:31	Looking aft at conning tower
23:52	Forward base of conning tower
24:37	Port side of conning tower
24:43	Periscopes viewed from port side
24:58	Conning tower hatch (open)
25:42	Looking down conning tower hatch (ladder can be seen inside, starboard side)
25:53	Hatch closing mechanism – inside dished conning tower hatch
25:59	Looking down conning tower hatch (ladder can be seen inside, starboard side)

26:50	Aft gun viewed from aft of conning tower
27:05	Passing around breech of aft gun
28:01	Moving aft from aft gun, possible retractable mooring bollards
28:24	Pressure hull aft of aft gun, no deck
28:46	Forward end of hydraulic ram
29:22	Aft end of hydraulic ram
31:27	Starboard propeller and hydroplane
32:07	Underneath hull, starboard side, at stern
32:54	Rudder trailing edge
33:28	Skeg
33:56	Port propeller & hydroplane
34:25	Rudder trailing edge
34:33	Starboard aft hydroplane
36:20	Moving forward along aft deck

Publishing date:	2 nd January 2015	Publisher:	Norman Woods
URL:	https://youtu.be/YfyhuPAafro		
Last accessed:	16 th March 2018	License:	Standard YouTube License
Length:	10:30 mins	Description:	Dive footage
Notes: Dive on the wreck of U-89, off Donegal (depth 60m) in July 2014. Amazing visibility. Many similar features to U-90 including bow/stern torpedo tubes, upper vertical rudder frame (from 4:18)			

8.4 Primary Archive generated by the HLF Forgotten Wrecks project

Record Type	Sub type		
Digital	Underwater images & site plan		
Archive Filename prefix: FWFWW_659_14072017_			
End of archive file name	Figure number in this report	No.	Notes
SITEIMAGE_01.tif	Figure 8	1	Underwater image
SITEIMAGE_02.tif	Figure 10	1	Site Sketch
SITEIMAGE_03.tif to SITEIMAGE_18.tif	Figs 11, 21, 22, 23, 24, 26, 27, 28a, 28b, 29, 30, 31, 39a, 39b, 41, 43.	16	Underwater images
ARTEFACTIMAGE_19.tif to ARTEFACTIMAGE_21.tif	Figure 51 – 53	3	Artefact images
Total images:		21	
FWFWW_659_11072014_ DiveLog.pdf	Appendix 8.1	3	Dive Record Sheets