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The “Tin Openers” Myth and Reality: Intelligence from U-boat Wrecks During WW1

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Introduction

In producing this paper for the Historical Diving Society the attempt has been made to develop a factual account of the extent of the diving carried out on U-boat wrecks during WW1. It draws on a wide range of sources from the archival through to the author’s investigations of the U-boat wrecks themselves.

The divers who visited the then recently sunken U-boats did so for the sole purpose of intelligence gathering. Intelligence came mainly in the form of charts, codebooks, call signs, technical and personnel data. The intelligence war against the U-boats was secret. Little except hearsay emerged until 1969-70 with the release of much of what is now known as ADM 116 and ADM 137 to the National Archives; within which is a rich source of data.

The information vacuum which lasted for over half a century after WW1 was fertile ground for rumour and hearsay; some of the legacies of which have endured to the present. As a guide to new readers and researchers of this period, the key milestones in the development of the mythology of the “Tin Openers” are described in the postscript.

This paper gives a brief history of the Admiralty Salvage Section and then goes on to show how the process of gathering intelligence from the wrecks was refined throughout the war. Like so much of the history of WW1, the processes required to achieve success in prizing intelligence from U-boat wrecks took time to evolve and perfect and did not reach its apogee until the summer of 1918. The story of this development in process will be highlighted by examples from archival research and ultimately from the wrecks themselves.

Figure 7 and Table 1 provide a full list of all the sites the author has confirmed as having been dived on during WW1, giving brief details of each case. The list is based mainly on the records of the Admiralty Salvage Section, Dover Command and the Intelligence Division, backed up by the UK Hydrographic Office database and the author’s own dives. This list does not include cases where wrecks were searched for by vessels and not found. Unless there is specific evidence that divers were actually dropped in the ocean during the searches, the cases are not listed.

The Admiralty Salvage Section in WW1

The Admiralty Salvage Section, under whose governance much of the U-boat diving took place was formed at the end of 1915 as a branch of DNE (Director of Naval Equipment) to meet the increased requirements of marine salvage in wartime. The U-boats were far from its sole purpose and were largely separate and incidental to its main function.

Commodore Fred Young, RNR became its head and oversaw its development throughout the war. Young, who had been chief salvage officer at the Liverpool Salvage Association, also took command of one of the earliest U-boat cases the Salvage Section were involved in, the recovery whole of *UC5*. In December 1917, the Salvage Section was expanded when it effectively took over all salvage operations, cutting out commercial firms which up that point had also been salvaging wrecks.

By 1918 the Section had grown to operate 15 salvage ships. Its headquarters staff reached 10 officers and 22 civilian support staff. Working on the wrecks were 9 commissioned salvage officers and 19 assistant salvage officers. It is credited with recovering around 450 ships, which were returned to service. The Salvage Section was disbanded in 1919, although one vessel, *Racer* was retained for work on the wreck of HMS *Laurentic*.

Of the vessels operated by the Salvage Section, at least seven are known to have been deployed to U-boat work; the submarine recovery barge *YC-10* (for the lift of *UB110*) and the vessels *Anchorite*, *Ranger*, *Melita*, *Racer*, *Corycia* and *Moonfleet*. The salvage officers who worked on U-boats are known to have been Commanders Young, Davis, McGuffie, Malet, Vine, Wheeler, Kay, George and Damant.

In the summer of 1918, when the number of U-boats being destroyed inshore rose, Damant and *Moonfleet* were deployed specifically to U-boat work. It is at this time that divers succeeded in extracting intelligence from the U-boat wrecks. But before this happened, much had to be learned about the necessary processes needed to successfully seize intelligence from the deep.

1915-16: Beginnings

It is within the records of the Admiralty Salvage Section that much of our current knowledge of the U-boats dived resides. While the Salvage Section made more U-boat dives than any other agency, it is also clear that during 1915-18, Royal Navy and civilian divers searched for U-boat wrecks with mixed results. The first two cases predate the deployment of the Admiralty Salvage Section divers and they are both interesting case studies into the challenges faced at the time.

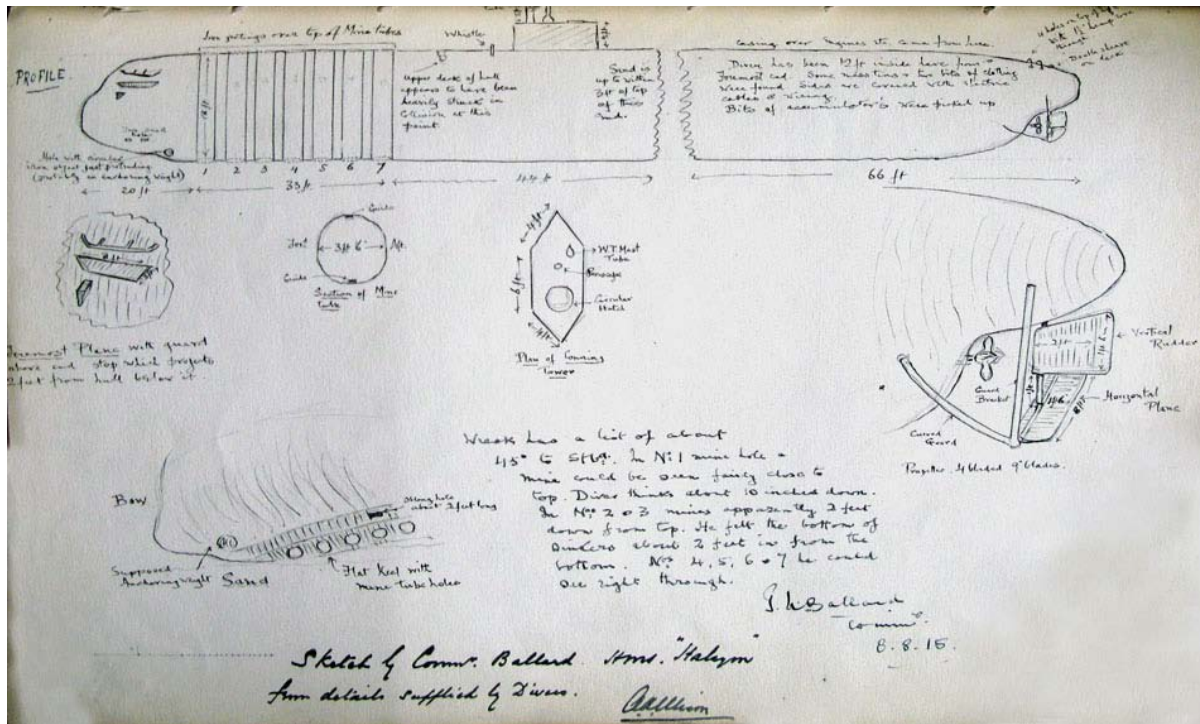


Figure 1. Diagram of the wreck of UC2 as sketched by Cmdr. Ballard of HMS *Halcyon* in August 1915. The details came from two divers, *Severs* & *Bridges* who were commended for their work (National Archives).

suggested the presence of a U-boat and it was duly located by minesweepers. In only 9.5 fathoms, Chatham Dockyard divers were swiftly on the wreck and were able to make a full appraisal of what

was present. The sketch made is the most detailed one from WW1 the author has found and is shown in Figure 1 above.

Clearly the shallow depth assisted the divers in their work, allowing for a detailed survey to take place. Interestingly, although the local commander believed it a simple task to recover the forward portion of the wreck for the purposes of gathering intelligence, Admiral Oliver at the Admiralty ordered the wreck to be blown up. All that was learned of what was there came from the sketches. Clearly at this time the value of what could be retrieved from the wreck was either not recognised or was outweighed by other considerations. Even the U-boat's identity was unknown at the time.

In this instance there was the strong case for a U-boat being present, an accurate position to search, shallow water for the divers to work in and two proficient divers, Leading Seaman Severs and Petty Officer Bridges to do the survey work and latterly the demolition. However circumstances were unusually cooperative in this case and things did not always run as smoothly.

The latter of these two cases, in January 1916, is equally educative, but in the opposite way. The Dover Harbour Master, under orders from Vice Admiral Dover employed a local dockyard diver to locate a supposed sunk U-boat. A summary of the memo to the Admiralty from Vice Admiral Dover reads as:

"The dockyard diver was sent down on 16th January and reported that the obstruction grappled was a submarine. He explained to me that he knew it to be so by it being a round hull...I consider the report of the diver conclusive. In fact, so sure was he that, contrary to custom, he was quite keen to go down again on the submarine."

Besides the natural reaction of the diver to say anything an admiral may want to hear, two things are highlighted by this episode. First, the diver required some guidance and training into what to look for. Second, the grappling for U-boat wrecks after the reported sinking event in most cases did not find a U-boat, because it wasn't there in the first place, (see No U-boat "a" in Figure 7).

In this instance, the event of 11 January 1916 involved the supposed ramming of a U-boat by the yacht *James Fletcher*. History records no U-boats sunk during this period. However the "discovery" of its wreck by the diver led to a £1,000 payout to the crew of the yacht. Later in the war, as will be shown, even experienced divers such as Warrant Shipwright E. C. Miller were to make similar misattributions when assuming a U-boat wreck must be at the bottom of the shot line, when in reality none was sunk at the time.

The first case involving the Admiralty Salvage Section divers was the recovery whole of *UC5* from Shipwash Bank, where it ran aground on 27 April 1916. By 16 May the U-boat had been recovered to the beach near Harwich pier. Some intelligence was recovered although much had been disposed of by the crew before they attempted to scuttle the U-boat. An Intelligence Division translation of the navigator's notebooks was published in June. Since the enemy knew it had run aground it was presumably considered to have fallen into British hands. The Admiralty therefore had nothing to lose and everything to gain by recovering it.

So by the end of 1916, a total of three cases had been investigated by divers, with varying results. It is interesting to observe that in all the cases the intelligence value of what might be gathered from the wrecks appears hardly to have been recognised. During the following year a further seven cases

involving sunken U-boats were investigated and the intelligence potential of what could be extracted from the wrecks became clear.

The year 1917 proved to be the turning point not only in the U-boat war itself but also in the way in which the Salvage Section and the Admiralty came to view what could be achieved by diving on the wrecks. WW1 was very much a war in which the coming to grips with modern technologies proved crucial. Likewise for the divers, 1917 was to be the year of learning, from which the successes of 1918 would emerge.

1917: The Year of Learning

With hindsight the sinking of the liner serving as an auxiliary cruiser, HMS *Laurentic* on 25 January 1917 proved to be a key moment in the Tin Openers tale, although initially this was not recognised. The ship had been carrying 43 tons of gold bullion to pay for the war. Its recovery from the wreck was a strategic necessity. To achieve this from the depth of 22 fathoms, on 1 February the Salvage Section received Lt. Cmdr. G.C.C. Damant RN on secondment. Damant was a leading deep-diving and decompression expert and the retired Navy Inspector of Diving. He had the experience to conduct dives in open water to depths to which most Salvage Section divers did not venture. Just promoted to Warrant Shipwright, Miller followed Damant in July, also on secondment.



Figure 2. The HMS Laurentic salvage team, probably after WW1. Now Commander, Damant is seated third from the left. It is likely that some of the others in this photo were part of the Special Section of 1918, probably to his right is Miller (David Masters).

Dives by naval divers in March off Sunderland recovered items from *UC32*, including a torpedo. Also a Intelligence Division translation of *UC32's* "Machinery History" was published in May 1917. The original could only have come from the wreck, either by divers or as flotsam. Perhaps this further indicated the potential for papers to be found within sunken U-boats. In December Damant, finished with the *Laurentic* salvage (see Figure 2) and in Portsmouth having completed a mining course at

HMS *Vernon*, supervised his first submarine project with the diving on *UB81*, although in this instance the divers were specifically aiding in an abortive attempt to recover the U-boat whole (see Figure 7). The team contained Salvage Officer Davis and the riggers who worked on *UC44*.

In fact it was the recovery whole in September of *UC44* off Dunmore, Ireland by Davis in *Racer*, (using the two divers who worked on *UC5*) which proved for the Salvage Section to be the intelligence coup of 1917 (see Figure 3). Undoubtedly this was a key milestone in the understanding of what intelligence treasure troves sunken U-boats could yield. An Intelligence Division translation of *UC44*'s "Machinery History" was published in January 1918. But equally the fact that the U-boat was beached in view of the public meant enemy discovery could not be discounted. Diving covertly, offered a far more secret way to gather valuable intelligence, if it could be achieved.

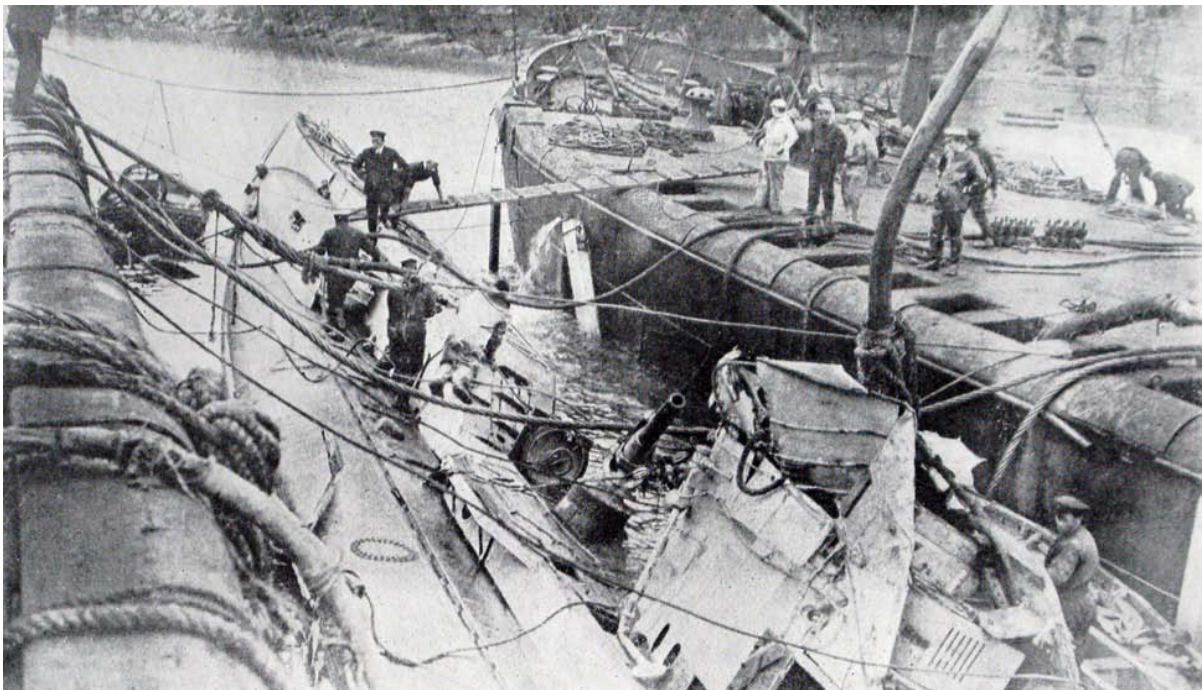


Figure 3. UC44 secured from the sea between two lifting vessels. This was the first great intelligence coup involving the Salvage Section. Salvage Officer Davis is seen standing in the foreground on the lifting vessel (David Masters).

This might also be the reason why the salvage of *UC41* in the Tay estuary being conducted by Salvage Officer McGuffie aboard *Melita* was cancelled in October. In this case the lifting wires were in place and salvage barge *LC3* was ready. Salvage was reported as certainly possible, but the records do not detail why the cancellation took place, except to say it was "not desirable". The record refers to a naval officer, Lt. George returning to London with the confidential books (presumably the Intelligence Division series of publications on U-boat technology) just prior to the cancellation order. This has been misconstrued by previous historians as an episode where intelligence had been recovered. There is no evidence any was found. In fact confidential books had to be kept locked away. It is noted that McGuffie retained one copy of a book, when in fact *Melita* may not have had secure storage (it is known *Corycia* did not until Damant requested it). In May 1918 he was dismissed from the Salvage Section for incompetence and it is possible the retention of confidential books played a part in this.

Three unsuccessful cases (two in 1917 and one in early 1918) were perhaps even more educative than the successful ones in helping formulate policy in the future and they are worthy of some examination. The two unsuccessful cases of 1917 both involved some contribution from the Salvage Section. In the first case, off Penzance in May, a diver from Falmouth dockyard was deployed to find and confirm the destruction of a U-boat. Despite several attempts at the extreme depth of around 29 fathoms, only rocks were found. No U-boat is recorded as having been lost in this area, so consequently none was found (see No U-boat "b" in Figure 7).

In the second case, the Dover Command records reveal that it repeated the *James Fletcher* episode mentioned above, paying out £300 in November to the crew of HMAT *Wren* for the destruction of a U-boat off Dungeness on 4 August (see No U-boat "c" in Figure 7). This entire case contains an element of farce. It is recorded that on 13 September the wreck of a U-boat was identified by divers from Dover, in a search initiated on behalf of *Wren's* claim for prize money by the Captain of the Trawler Patrol. This immediately led to Salvage Officer, Commander Malet with YC *Anchorite* being ordered to Dover to begin salvage operations. The wreck was duly found and inspected on 28 September by salvage diver Self. This led to the somewhat ironic message:

"Commander Malet reports supposed submarine destroyed by Wren is an old wreck"

Clearly infuriated by this turn of events, Captain Trawler Patrol commissioned his own trawler equipped with divers from Inland Water Transport to find the errant submarine. Three wrecks and an anchor were found and Self's inspection was also reconfirmed. Unsurprisingly they did not find the U-boat wreck, because records show it was never there in the first place as no U-boats were lost at that time. Nevertheless such persistence paid off with the £300 reward being granted.

The third case in March to April 1918 describes how divers Miller and Oats were ordered to Falmouth on 24 March 1918. The following day Miller reported diving a U-boat in 21 fathoms off Newquay, which was lying on its port beam and broken amidships (see No U-boat "d" on Figure 7). Miller even drew a sketch (see Figure 4) to show the position of the shotline and the orientation of the wreck. Conditions were reported as being very tough with strong current and tidal surges, making in water decompression impossible. Salvage was not recommended by Miller, but Young noted that its location made it a tempting target. Finally on 24 April after an abortive search in Harwich in which no wreck was found, Damant visited the wreck site in a launch and confirmed conditions were not favourable and the project was abandoned.

What makes this case so interesting is that records show that the only U-boat operating in the area at the time of the reported sinking was *U55* which survived. In fact no U-boats are now known to have been sunk in the area and the supposed wreck has never shown up, despite searches as recent as 2013 on the bearings reported by Miller. Whatever Miller did actually see, it was not a U-boat. From Salvage Section records it appears this was Miller's first dive to examine a U-boat and one has to conclude that a lack of prior experience with U-boats was contributory to this false report. Interestingly, whether the Intelligence Division knew this case was a red herring is an interesting question, mainly because it is one of the only instances of wartime U-boat diving to be published during the period of secrecy after the war, when this episode is described in Newbolt's 1918 book. If false, what was the harm in releasing the details? (see Postscript).

This was not an auspicious start to a year which very shortly thereafter became characterised by success. The lessons of 1917 led to changes in policy in the Salvage Section itself but equally important were the restructuring at the Admiralty at the end of 1917 and similar organisational changes in the Dover Command at the same time, without which little would have changed.

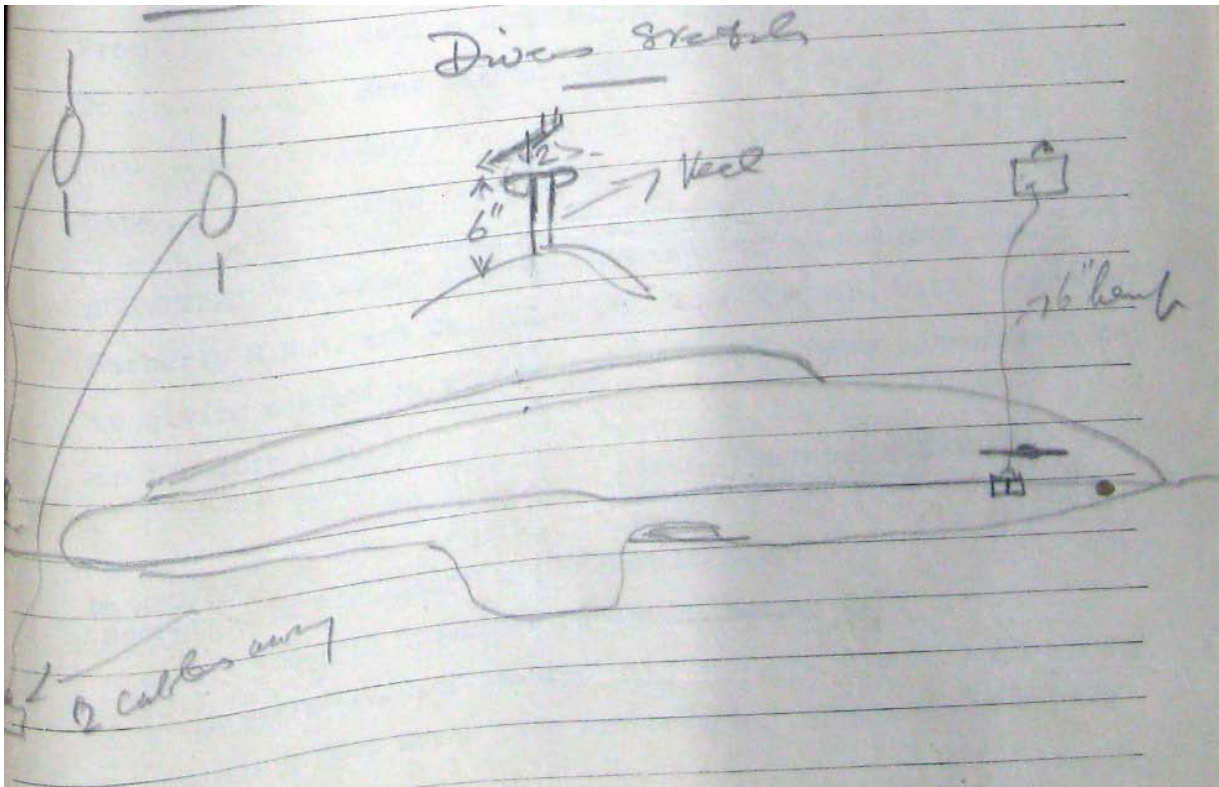


Figure 4. Diagram of the wreck of the submarine (No U-boat "d" on Figure XXX), as sketched by diver EC Miller in March 1918. Miller was commended for his work on this site, but records show no U-boat was sunk and no wreck has been found (National Archives).

In brief, in December 1917 at the Admiralty, failure to get to grips with the U-boat war saw the centralisers, Jellicoe and Oliver moved out and Wemyss moved in as First Sea Lord. This coincided with a significant decentralisation and expansion of the Intelligence Division, which was to significantly benefit the Salvage Section's U-boat efforts. It has been said that this restructuring led to an intelligence organisation more akin to that seen in the Admiralty in WW2.

At Dover, by December 1917, the minefield (which finally shut off the Channel to U-boats in September 1918 and created several relatively easily accessible U-boat wrecks) was being completed. When ordered to, Admiral Bacon of the Dover Command refused to illuminate it, fearing a German raid. When compelled to do so, the same night saw a U-boat (UB56) dive into the minefield to its destruction. This episode, compounded by his association with Jellicoe saw Bacon dismissed. In came the aggressive Keyes who took a keen interest in the activities of the divers.

1918: The Year of Success

The winds of change at the Admiralty were not slow to reach the Salvage Section. The office staff became signatories to the Official Secrets Act in January, enabling them to handle secret information. Importantly on 29 March, a memo from Director Intelligence Division proposed the establishment under two officers and four divers of a Special Section dedicated to salvage work on

U-boats. It was to be trained by intelligence officers in the details of enemy submarines and weapons and was to be on standby for any opportunities. Damant and Miller were ordered to set it up and by May it was operational, with Damant promoted to acting Commander. Moreover, Director DNE was to be given access to reports of sunken U-boats from which to make suggestions as to which cases may lend themselves to salvage work.

It also is interesting to note that during March 1918, the entire staff and structure of the Salvage Section itself was also subject to reorganisation. While probably aimed at dealing with its increased workload, it seems also to have had a number of repercussions regarding U-boat work. The Salvage Section was able to issue a Fleet Order in May directing how sunken submarines were to be correctly buoyed, before requesting divers to examine them. In fact, the Salvage Section made it clear to its local offices that salvage divers would not be made available to check U-boat positions in the future. This was the sole preserve of the Special Section under Damant and they were not to be called upon for "expeditions which have often proved fruitless." Sites were expected to be confirmed U-boat kills, located and properly buoyed before the Special Section would be sent.

The Special Section is forever associated with the tug *Moonfleet*. Built in Millwall in 1917 and destined for Argentina, it was requisitioned in November and converted into a diving vessel. *Moonfleet* was a 100ft steel ship of 145 tons. It proved too small for the decompression chamber allocated to it which was not fitted. Divers were trained on *Moonfleet* specifically for U-boat work and it was accepted in the Salvage Section as a specialised skill. The names of some of the divers who worked on *Moonfleet* are also recorded and notably include Miller, Leading Seaman Edwin Blachford and Able Seaman George Clear, all who had worked on *Laurentic* and had been specially requested by Damant to form the core divers of the Special Section. They were not paid, nor trained as salvage divers, but came to specialise in their own brand of recovery work.

So it was in early May that the Special Section in the newly fitted out *Moonfleet* began work. Its first case proved frustrating. *UB16* had been torpedoed off Harwich and its commander (Olzs. von der Lühe) plucked from the sea but minesweepers failed to locate the main body of the wreck and the divers only found pieces. Now working closely with the Intelligence Division's Cmdr Cooper, this case was abandoned on 19 May and the Special Section headed to Dover.

Two days later work began on *UB33* which had been mined on 11 April. With the wreck found and securely buoyed, the Special Section began work. After surveying the wreck, which was found to have been mined aft, the commander's (Olzs. F Gregor) body was recovered from the conning tower, inspected by Cooper of the Intelligence Division and after several items had been found, it was buried at sea. A largely factually correct account of the diving on this wreck was published by R H Davis in 1935. Davis certainly knew some of the protagonists. He states that the commander was found to have been shot in the stomach and head. It was presumed that this happened to prevent him from opening the conning tower hatch to escape from the sunken U-boat.

On Damant's recommendation, full recovery of the wreck was cancelled and the divers went to work to recover whatever intelligence they could find. Four days later, the divers, experienced with explosive charges from their work on *Laurentic*, blasted off the conning tower with 45lbs of TNT. The following day the bridge helm and compass were recovered and the lower hatch blasted open, allowing the divers inside. It was noticed that the explosion had set one of the torpedoes running and it was found hanging half way out of its tube.

Now on the scent of treasure of a different nature, Miller was noted as working particularly zealously and was rewarded on 29 May with the first great intelligence haul recovered by a diver from a U-boat during the war; which must have contributed greatly to his 1919 DSC awarded for “distinguished services in connection with dangerous and important salvage work”. The same evening a car with the “heavy” precious cargo delivered it to the Admiralty.

Two days later the Special Section was ordered to Immingham, where the usual frustrations returned when the wreck (supposedly *UC75*) could not be located and only the long sunk *UC39* was found and examined. The next case in Harwich brought further success and also a salutary lesson in the use of explosives on sunken U-boats.

ON 26 June *UC11* had been witnessed to sink after striking a mine it had laid on an earlier patrol. Easily located and buoyed, the Special Section were on the wreck two days later. Employing the same method as on *UB33*, this time 100lb of TNT liberated the conning tower on the 30th. The following day another 100lb was used to open up the lower hatch. This caused a sympathetic detonation of the U-boats mines (which had been noted as still being fully on board). Valuable intelligence floated to the surface and the divers found more in the wreck. The following day the Special Section left for Dover, where it remained for three months. Miller was transferred to Davis aboard *Corycia* in June to work on *UB74* off Portland. The two other divers aboard *Moonfleet*, who had come from the *Laurentic* salvage team now come to the fore; Blachford and Clear. The names of other Navy divers who possibly worked on *Moonfleet* during this time are not recorded apart from PO Balson who was aboard until 19 June. During the summer of 1918 Damant continually reported he was short of divers.

Dover, with its well patrolled and extensively buoyed minefield offered the best possibilities to locate sunken U-boats to dive. Work on a number of sites followed, interspersed with the discovery of mined U-boats which were considered too old to yield valuable intelligence. A list of the sites dived is given in Table 1. Until late August, rewards for persistently trying to recover intelligence from the wrecks remained scarce, with only *UB55* yielding “some material”. The use of explosives was reluctantly used on *UC64* to affect entry into the control room, but fell out of favour after an attempt to blow out the forward hatch of *UB55* resulted in the detonation of at least one torpedo.

The Special Section began its final run of successful cases on 29 August when it arrived on top of the wreck of the mined *UB109* just after the last survivors had been rescued. Noting that the use of explosives would not be used, they forced their entry into the control room by entering the wreck through the forward hatch and passing out the bodies and other material recovered through the conning tower. The “inside” divers are mentioned as Blachford and Clear. They were the ones who had to squeeze inside the hatchways and work in unimaginably difficult conditions. A great haul of fresh intelligence emerged. This ended *Moonfleet*’s diving in the Dover area until after the war.



Figure 5. Left: the water stained weather cipher book from the wreck of UC70 (National Archives). Right AB George Clear DSM, one of the divers who recovered intelligence from several U-boats in 1918 (HDS Divers Index).

Moving north, Damant and the Special Section this time aboard *Corycia* worked on the recently discovered wreck of UC70 off Whitby from 4 October. Working as they had on UB109, with one diver inside and one by the hatch, they slowly cleared the wreck, searching for intelligence. The non use of explosives made the work hard going but afforded the divers the opportunity to see a fresh U-boat wreck in detail.

“Inside” divers (Blachford and Clear are mentioned again) noted that some of the crew had probably been alive on the bottom after it sunk. One body at least had its throat cut. Also several locked steel boxes, resembling the type found in UB33 which held the first great intelligence haul were recovered and found to contain nothing more than tinned food and sausages. The locked canvas bag recovered contained potatoes; such was the state of food shortages in Germany. Finally on October 14 they reached the wireless room and “valuable material” was on its way to London (see Figure 5). Both divers received the DSM in July 1919. As with Miller’s DSC it is not explicit whether it was awarded for their work on *Laurentic*, U-boats or both.

An abortive case off the Tees followed before Damant and *Corycia* made their way to Scapa Flow for their last case of the war, UB116. Diving commenced on 1 November and books and papers immediately began to be recovered as the divers edged their way through the usual debris towards the control room. On the day of the Armistice more intelligence was recovered, along with the deck gun. Salvage Section divers arrived and plans were made to lift the U-boat using YC10, recently successful in recovering UB110 (see below) and a sketch of the wreck was made, showing the

damage to it (see Figure 6). However on 14 November, with the war now over, the Intelligence Division cancelled all further work on the wreck and the site was abandoned. This ended the wartime contribution of the Special Section.

Aside from the work of the Special Section, two other important U-boat cases were worked on by the Salvage Section in 1918. First, *UB74* sunk off Portland in May was extensively worked on by Davis aboard *Corycia*, with Miller joining him in June. Explosives were used to widen the forward hatch. Unlike *UB55*, the torpedoes did not detonate. The conning tower was also removed using explosives. In the only case not involving the Special Section under Damant, intelligence material was recovered from this wreck. Conditions, due to its exposed position were difficult and the dives were interspersed by bad weather and the repeated need to re-buoy the site. As a consequence diving continued into September. Miller suffered a period of illness during this case, although its reasons are not stated.

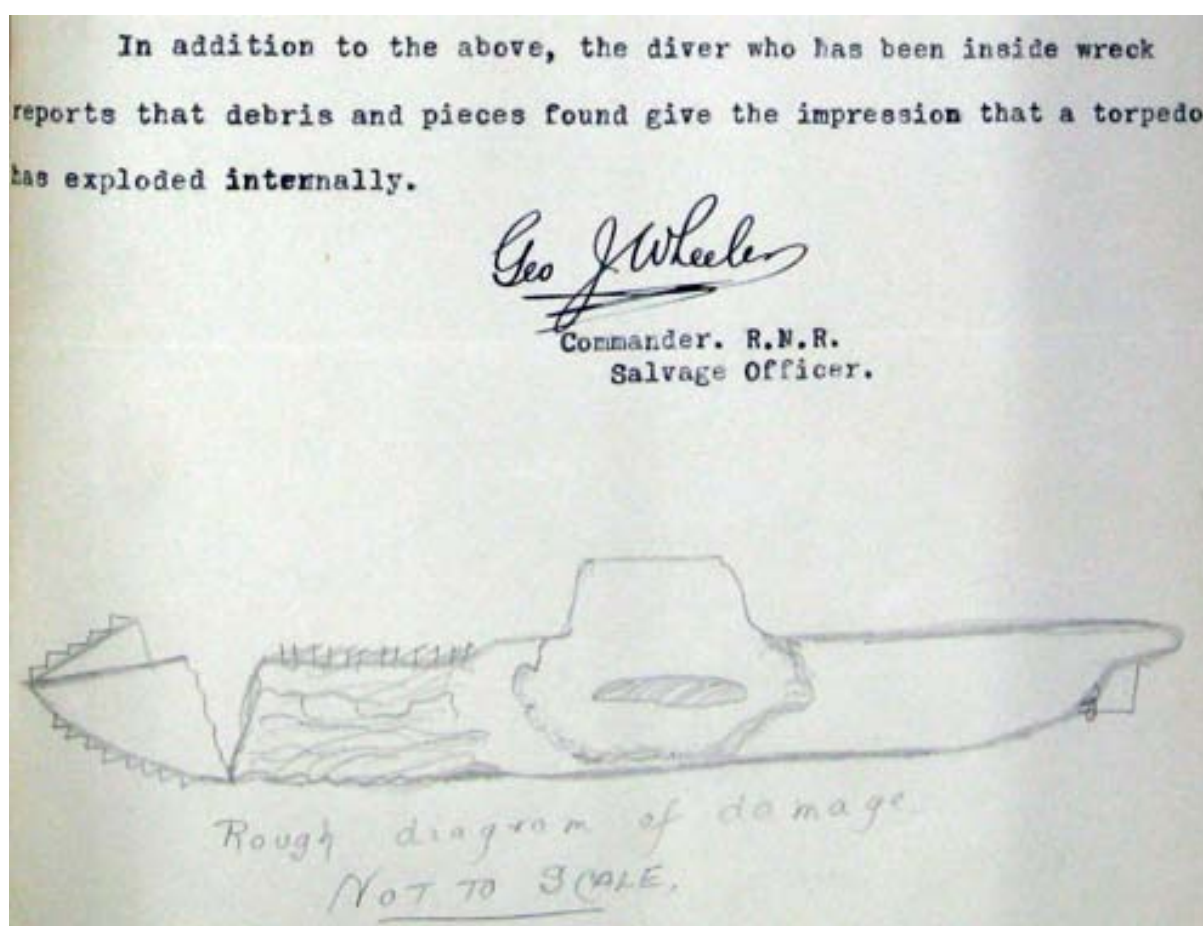


Figure 6. Salvage Section divers sketch of the wreck of *UB116* drawn to assist in the aborted plans to recover the U-boat whole from Scapa Flow (National Archives).

Another U-boat, *UB110* was recovered whole from the seabed by Wheeler and Kay using the lifting barge *YC10*. *UB110* had been sunk with survivors in July. Salvage operations began in August. On October 5, the salvaged wreck was handed over to the Intelligence Division in the Admiralty dock, Jarrow. The extent of the intelligence recovered was reported as very extensive.

So successful had the Special Section been in the summer of 1918 that by August a diving school for special service and further specialist diving vessels, beginning with *Ceto* were planned. There was to be one in each Salvage Section base. Presumably the end of the war terminated this project. However, 1918 was not a year where the old problems disappeared entirely. Aside from the cases previously mentioned, both at Immingham and Falmouth time was wasted searching for difficult or non-existent cases. Nevertheless the tide had turned and the Salvage Section could be justifiably proud of its achievements. The Special Section had prized intelligence from five sunken U-boats, Davis another and *UB110* added a seventh. Prior to 1918, only *UC44* had yielded her secrets to the Salvage Section, although intelligence had come to the Admiralty from other wrecks and crashed Zeppelins.

Where the Tin Openers are known to have dived

Figure 7 and Table 1 show the locations where it has been verified by archival research that divers were deployed to U-boat wrecks. It does not include the cases where divers were sent for but not used because the wrecks could not be located. Damant commented in a letter to the Salvage Section in 1918 that to have counted these instances would have doubled the number of cases he could list. Also, there are likely to be other cases where divers were deployed to non U-boat wrecks, where there is insufficient information to plot them on a map. For example, during May 1918 Damant's telegrams to the Salvage Section reveal that his divers examined several non-submarine wrecks in the Folkestone area on one tide, and then carried out their U-boat work on the other.

So fast came the discoveries around Dover in 1918, that record keeping could hardly keep up. There was a very noticeable attempt in 1918 to accurately catalogue where the Salvage and Special Sections had been diving on U-boats. Damant was requested to write a list of where the divers had been, which he duly sent in. Perhaps as a result of this episode it is noted in the records that Damant was later furnished with a typewriter and desk whilst on *Corycia*. It is clear from the Dover and Damant records though, that *UB55* somehow got listed as two different wrecks, although it is unclear whether this oversight is simply bureaucratic or that the divers did not recognise they had been on it previously. Equally mysterious is the nonexistent U-boat wreck described as lying next to the wreck of *UB58* and the enigmatic case of (*UC79*), detailed in the author's 2014 UNESCO paper and also in his 2014 book.

Research into this paper has not looked at the records of any of the other Fleet bases besides Dover. It is likely that some diving activity may be found at other commands. For example, there is a known abortive attempt to find a submarine of Ardrossan in the Salvage Section records. Also, a note in Keyes' diary for 16 August 1918 mysteriously points to another diving group looking for a submarine on the Bergues Bank, Belgium. Moreover there are some short gaps in the timelines for Miller and Damant. But nevertheless, the number of actual U-boats found and dived is most probably accurate, as any discovered U-boats will have most likely involved the Salvage Section at some point; especially from 1916 onwards. One absence from this list is *UC47*, where Spindler's reference to it being dived cannot be reconciled with any other source. It seems more likely that if intelligence was found on the site, it was probably recovered floating on the surface.

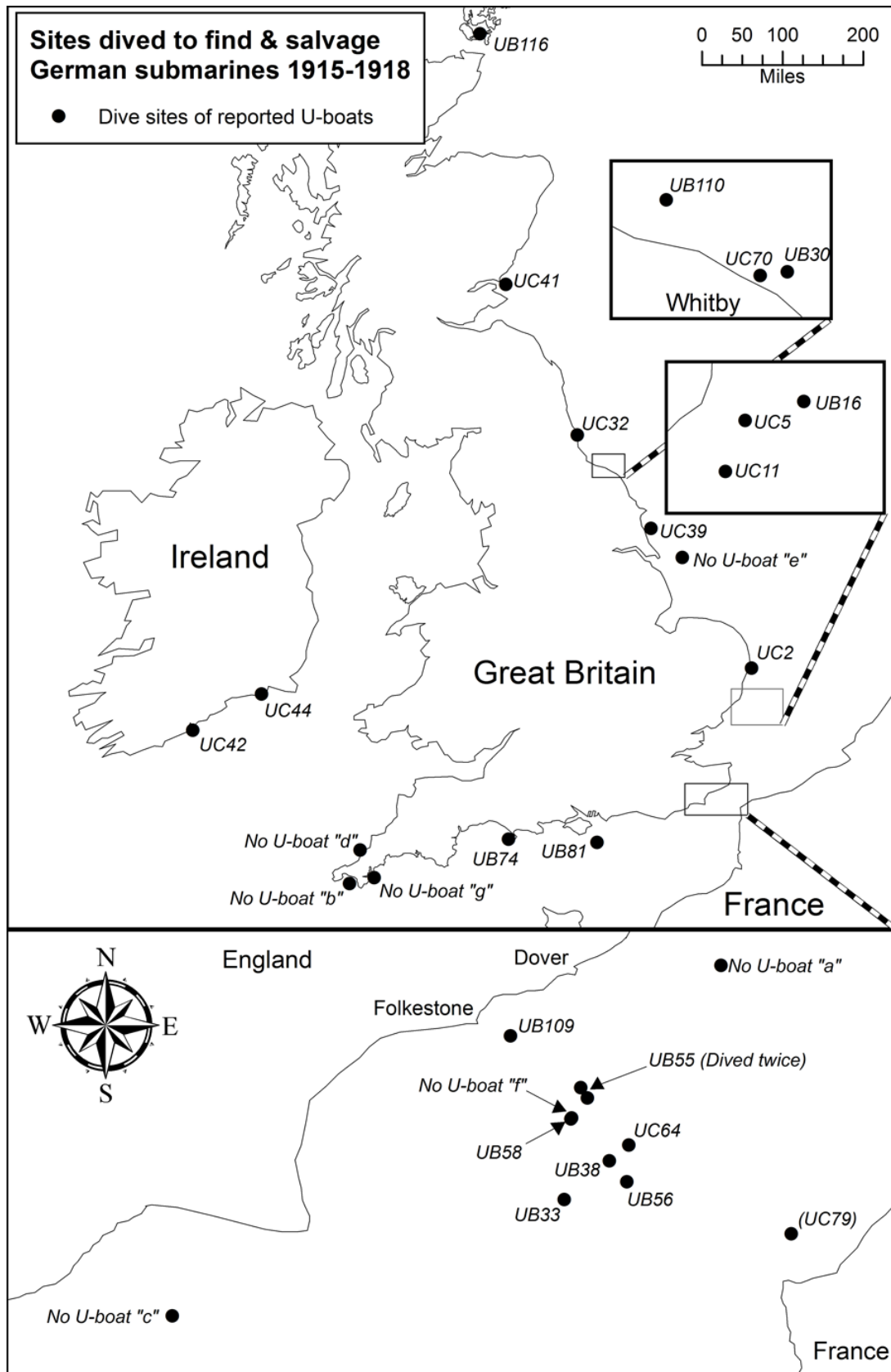


Figure 7. Map showing the locations of all the confirmed sites investigated by divers in WW1. While most are now known U-boat wrecks, others have been found to not exist and other cases were found by divers during the war to be not present or to be shipwrecks. The brackets around (UC79) denote that this is an unconfirmed identification of the wreck itself (Innes McCartney).

Name	Dates (Approx)	Base	Supervisor & Vessel	Depth	Notes
<i>UC2</i>	02/07/1915 to 24/08/1915	Lowestoft	Ballard <i>HMS Halcyon</i>	8 fathoms	Wreck investigated and then blown up. Divers Severs (RN) & Bridges (Chatham). Not Salvage Section.
<i>No U-boat "a"</i>	16/01/1916 to 16/01/1916	Dover	King's Harbour Master not known	not stated	Dockyard diver finds "U-boat" wreck. Payout <i>James Fletcher</i> crew followed. Not Salvage Section.
<i>UC5</i>	01/05/1916 to 16/05/1916	Lowestoft	Young Ranger	8 feet	U-boat salvaged whole. Limited intelligence recovered. One diver is listed as PO Gohm. the other was probably PO FP Eaglestone.
<i>UC32</i>	24/02/1917 to 30/03/1917	Sunderland	SNO Tyne 2 x MLs, 2 x Drifters, 1 x Lighter, HMS Bonetta	6 fathoms	Torpedo & director recovered. Divers mentioned Lt Collier of HMS <i>C13</i> & PO E W Crafter CSC.J.5351 of HMS <i>Bonaventure</i> .
<i>No U-boat "b"</i>	30/05/1917 to 09/06/1917	Penzance	Young Local Trawler	28.5 fathoms	Diver from Falmouth dockyard
<i>UC44</i>	08/08/1917 to 10/12/1917	Dunmore	Davis <i>Racer</i>	14 fathoms	Stripped under cliffs in view of public. Taken into 30ft of water and dumped 21/11/1917. Important intelligence recovered. Divers were Gohm. & Eaglestone, the latter awarded the DSM.
<i>UC41</i>	23/08/1917 to 08/10/1917	Dundee	McGuffie <i>Melita</i>	11 fathoms	Salvage cancelled 2/10/17, presumably because <i>UC44</i> successful. No intelligence recovered.
<i>UC42</i>	02/11/1917 to 11/12/1917	Queenstown	not known	15 fathoms	Diver from Queenstown dockyard. U-boat identified by brass plate. No intelligence recovered. Not Salvage Section.
<i>No U-boat "c"</i>	26/09/1917 to	Dover	Malet <i>Anchorite</i>	not stated	"submarine destroyed by Wren is an old wreck" Diver recorded as Self
<i>UB81</i>	30/12/1917 to 18/02/1918	Portsmouth	Damant Dockyard vessel	15 fathoms	Lift abandoned in winter 1917 after a long spate of poor weather.
<i>No U-boat "d"</i>	24/03/1918 to 28/04/1918	Newquay	Vine Local Drifter	21 fathoms	Recommended by Damant as too difficult to lift. No U-boat wreck known in area. Diver Miller.
<i>UB16</i>	03/05/1918 to 20/05/1918	Harwich	Damant <i>Moonfleet</i>	14 fathoms	Could only find fragments of wreck, even though U-boat captain survived sinking
<i>UB33</i>	21/05/1918 to 30/05/1918	Dover	Damant <i>Moonfleet</i>	14 fathoms	Lifting cancelled and explosives used. Miller & Clear recorded in report.
<i>UC39</i>	31/05/1918 to 13/06/1918	Immingham	Damant <i>Moonfleet</i>	17 fathoms	Looking for <i>UC75</i> - not found. But found the older <i>UC39</i>
<i>UB74</i>	01/06/1918 to 03/09/1918	Portland	Davis <i>Corycia</i>	21 fathoms	Gelignite used. Gun removed. Miller present on site from June also Balson mentioned.
<i>UC11</i>	28/06/1918 to 02/07/1918	Harwich	Damant <i>Moonfleet</i>	not stated	TNT used twice - 2nd occasion ignited mines. Important intelligence recovered.
<i>UC64</i>	04/07/1918 to 02/08/1918	Dover	Damant <i>Moonfleet</i>	22 fathoms	Explosives used to blow away tower and widen lower hatch. Little intelligence found.
<i>UB110</i>	02/07/1918 In dry dock on 5/10/1918	Redcar	Wheeler & Kay <i>YC10</i>	not stated	U-boat salvaged whole. Important intelligence recovered. Divers: Hommet & Morris (RN) & Oates (dockyard).
<i>UB55a</i>	15/07/1918	Dover	Damant <i>Moonfleet</i>	not stated	The site dived was probably <i>UB55</i> (first time)
<i>UB38</i>	16/07/1918	Dover	Damant <i>Moonfleet</i>	not stated	Located small U-boat sunk for some moths.
<i>No U-boat "e"</i>	18/07/1918 to 28/07/1918	Immingham	Wheeler	12 fathoms	Large steamer located. Previously stated by Navy divers to be a large U-boat.
<i>(UC79)</i>	07/08/1918	Dover	Damant <i>Moonfleet</i>	18 fathoms	UC damaged fwd with much marine growth
<i>No U-boat "f"</i>	09/08/1918	Dover	Damant <i>Moonfleet</i>	not stated	"blown to pieces - very old" No wreck known at position
<i>UB58</i>	10/08/1918 to	Dover	Damant	not stated	Bows blown off - down several months.

	12/08/1918		<i>Moonfleet</i>		105mm gun removed.
UB56	12/08/1918	Dover	Damant <i>Moonfleet</i>	not stated	Found old U-boat - stern blown in and full of sand
UB30	13/08/1918 to 15/08/1918	Whitby	Wheeler Not known	27.5 fathoms	Some items recovered steering & compass. Abandoned to concentrate on <i>UB110</i>
UB55b	14/08/1918 to 22/08/1918	Dover	Damant <i>Moonfleet</i>	not stated	88m gun removed. Explosives used which blew up bow torpedoes. "Found" on 14/8/18 but probably first dived on in July. "Some material" recovered.
No U-boat "g"	Report of 15/8/1918	Falmouth	George Not known	not stated	Obstruction found to be rocks
UB109	29/08/1918 to 25/09/1918	Dover	Damant <i>Moonfleet</i>	12 fathoms	Notebook recovered from coat pocket. Important intelligence recovered. Divers Blachford & Clear
UC70	06/09/1918 to 29/10/1918	Whitby	Damant <i>Corycia</i>	14 fathoms	Wreck found on 6/9/18 but waited until Damant arrived. Body in conning tower. Important intelligence recovered. Divers Blachford & Clear
UB116	29/10/1918 to 14/11/1918	Scapa Flow	Damant <i>Corycia</i>	80 feet	Gun raised. Intelligence recovered.

Table 1. A list of all of the known U-boat sites to have been inspected by divers during WW1. All these cases are confirmed by archival research and the results of the dives are given. Figure 7 is a map showing their locations (Innes McCartney).

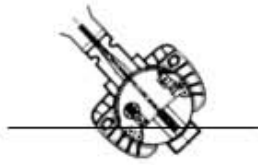
The Tin Opener's Archaeological Footprint

The author has dived and recorded a number of the sites worked on by the Salvage Section. No discernible evidence of their presence was seen on *UB81* and *UB38*. In 2014 the sites of *UB33* and *UB56* were found to be buried under sand and not currently worth attempting to dive. Several wrecks do however manifest obvious archaeological evidence of the presence of the Salvage Section divers and the specific details of *UB55*, *UB58*, (*UC79*), *UB109*, and *UB74* are described in the author's 2014 book.

A case which is typical of the archaeological footprint left by the Tin Openers is the case of *UC64*. The U-boat was mined outbound on 20 June 1918 in the Dover barrage. The Special Section first dived the site on 5 July. The wreck was found to have been sunk by a mine detonation underneath the control room, which forced the underside ten feet upwards into the hull, compressing everything inside. In order to ease the very difficult work of getting into the control room, explosives were used to remove the conning tower and widen the lower hatch (as in the cases of *UB33* and *UC11*). This time no sympathetic explosion occurred. The divers were able to enter the control room, but it was much crushed and only personal items from the dead were recovered, although it seems these were enough to identify the wreck.

A survey on 2 August 2014 revealed that wreck resembles the contemporary description well. The details in Figure 8 are described as: Images A) The deck gun has fallen onto the seabed, where the submarine has broken in half in front of where the conning would have been. This forward break is possibly unrelated to the 1918 dives; being caused by stresses in the decomposing wreckage. B) The Herz horn of a mine is clearly visible in this photo. All the chutes are full, as was described in 1918. C) The major blast damage from the mine explosion under the control room still dominates the visible areas of damage on the wreck. D) The external torpedo tubes are present, although the extra torpedoes (without warheads) reported stowed on deck are not present. E&G) The conning tower was found on the seabed on the port side of the wreck, with the periscope still running through it.

Name: UC64 Posn: 50 58.533;001 23.212E Depth: 40m
Date of Loss: 20 June 1918 How Sunk: Mined
Date of Survey: 2 August 2014



Wreck leans 40 deg to port

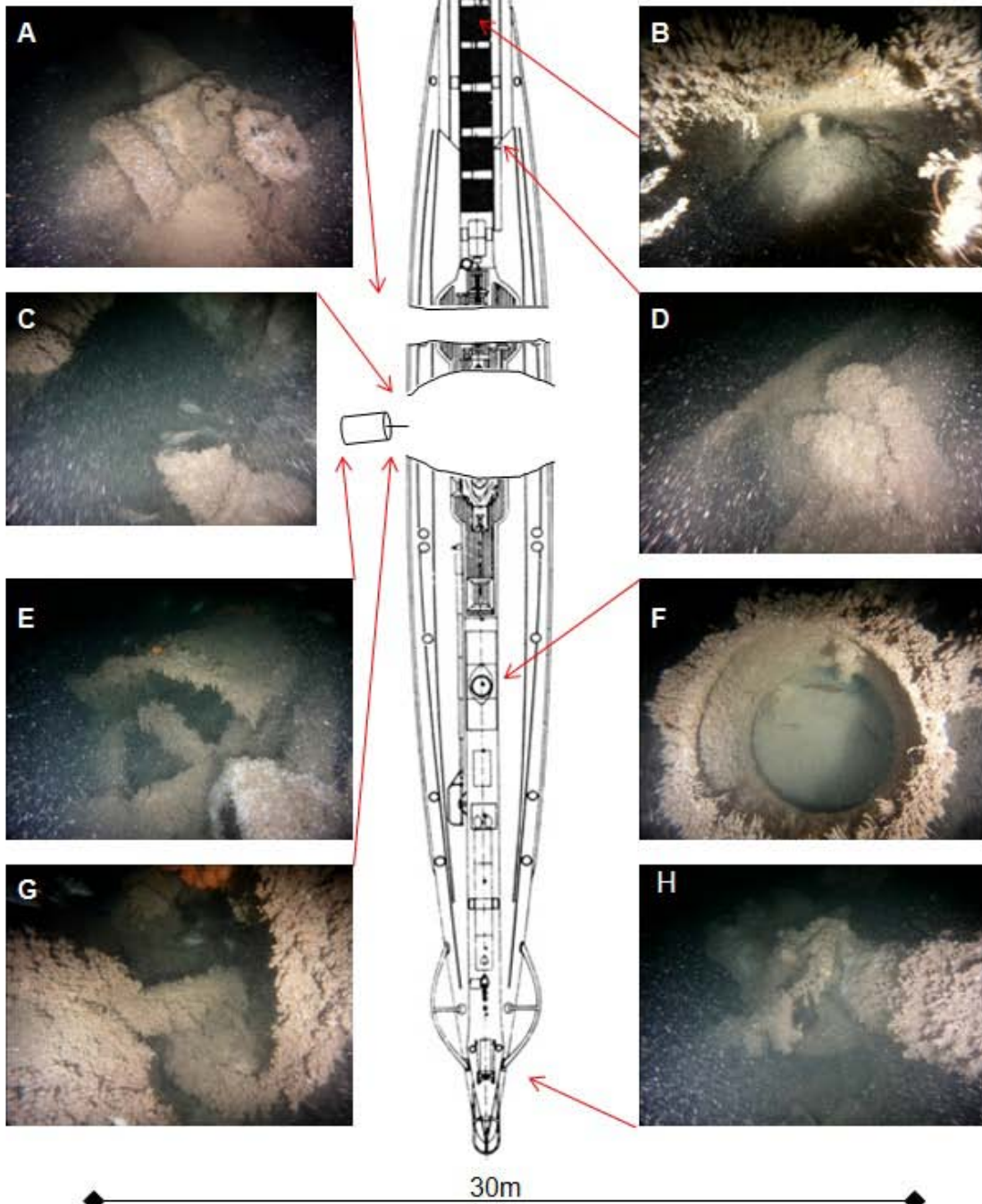


Figure 8. Diagram of UC64 as seen in 2014. The impact of the Special Section divers can be seen by the blasted remains of the conning tower. The rest of the wreck fits their descriptions (Innes McCartney).

The top portion has been ripped open, presumably by the charge which removed it. F) The engine room hatch is open. It is not known whether the 1918 divers opened it. G) The stern torpedo tube marks the aft part of the wreck.

In this instance the footprint of the Special Section is clear to see in the evidence of the removal of the conning tower and their overall description of the wreck. It was a memorable survey dive, because apart from the need to record the technical features of the wreck, the evidence for the 1918 dives was just as important to record. The wreck of *UC64* is made all the more special as a dive because of its association with the Tin Openers.

Conclusions

This paper has aimed to accurately depict the diving on U-boats in WW1, based on what can be verified by archival research and diving. Although far from comprehensive, a timeline of events has emerged, alongside the key achievements of the divers themselves. One of the main findings during the research was the extent to which the years 1915-17 were marked by much trial and error which later paid off in 1918. The Tin Openers' task was never an easy one and such descriptions that it was ring of the triumphant, such as the Director of Naval Intelligence Admiral Hall's note that the divers were instructed to:

"open torpedo-hatch, open five watertight doors, turn sharp right and retrieve top drawer in which were all papers"

With a century now passed since the Special Section carried out its dives, it is easy to forget the challenges they faced. The foremost of which was actually finding the wrecks in the first place. In navigational terms, only dead reckoning existed. So a certain degree of chance was involved in relocating the supposed sunken U-boat. It is no surprise therefore that in nearly every case of the 22 U-boats known to have been dived, the U-boat was witnessed to sink or survivors were picked up. Immediate buoying of the sites helped, as did the navigation scheme surrounding the Dover minefield.

The sharp upswing in sites dived in 1918 is of course due to the success (albeit late in the war) of the Dover minefield. Eight cases off Dover were successfully surveyed by the divers in that year, although only two yielded significant intelligence hauls. In Dover in particular, both Bacon and especially Keyes were keen to show the successes being achieved. The Dover Command records augment the Salvage Section files and provide a quite detailed history of the diving off Dover in 1918 with its successes and frustrations.

It should also be borne in mind the more limited depth the divers could reach and work in than today and the far greater risks taken with decompression issues. Working inside the remains of freshly destroyed U-boats took the sort of courage it is difficult to comprehend. The readers of this paper have not been spared some of the grim depictions of the work of Blachford and Clear in particular, who had to clear out U-boats with their bare hands while looking for precious intelligence papers. In the Dover area there was also the risk of diving in a minefield which Damant later recalled in a letter:

"..these men were diving almost daily in the active minefield between Dover and Grisnez. It was well known to them that the explosion of a mine within a mile of the

operations would be fatal to the diver. No steps could be taken to avoid the mines, the men had to dive right amongst them and in fact sighted them under water at a distance of 10ft or less on more than one occasion. They also entered and placed charges within damaged Enemy Submarines (sic) having active mines and torpedoes in the tubes.

On several days the divers were severely shaken by the explosion of Depth Charges during attacks on enemy submarines within a short distance. On one occasion the shock was so great as to bang down the hatch on top of a diver who was working inside a submarine. He had great difficulty in forcing it up again to get out.

They never hesitated to go down and never even has a man left the bottom without orders during a Depth Charge attack.”

The initial motivation to research this subject was to learn what might be seen of the Tin Openers activities when the sites were surveyed by diving. The wrecks themselves, often also the graves of German submariners, represent perhaps the greatest memorial to the pioneering and dangerous work of the diver and the submariner during WW1. While research continues, it is felt that the anniversary of the war marked an appropriate opportunity to present the results as they are currently known.

This paper is dedicated to the memory of Robert M. Grant 1917-2014; a scholar and colleague who more than many shed light into the murky recesses of WW1 U-boat history.

I am greatly indebted to both Dr. John Bevan and Gary Wallace-Potter of the Historical Diving Society for generously guiding me to valuable sources of information and to Michael Lowrey for reading drafts of this paper and making suggestions. All errors are my own.

Dr I McCartney

November 2014

Postscript: Separating Fact from Fiction - the “Tin Openers” through history

Files available today in the National Archives, coupled with a detailed hydrographic record and an increasingly accurate list of U-boats destroyed makes it possible to research a focused list of U-boat wrecks visited by divers during WW1. However, for much of the last 100 years this has not been the case and the literature on this subject has naturally reflected the shallower depth of historical knowledge that existed at different periods in the past. This section attempts to show how the literature has developed since 1918 and how some semi-fictionalised accounts endured to the present day.

In the immediate post-war years there was naturally a reticence by the Admiralty to release any information relating to its ways and means of gathering intelligence on the enemy. The first books to be published on Admiralty intelligence (sometimes referred to as Room 40, the cryptographic office) by individuals who either worked there or knew a little of it were therefore published without

Admiralty consent and its authors were not allowed to consult Admiralty files, but had to work from memory e.g. Hoy, 1932 and James, 1955.

The earliest published source identified by the author that specifically mentions diver inspections of sunken U-boats is Newbolt (1918). He later became the official historian of the Royal Navy in WW1 and certainly had access to key documents. Nevertheless the details are deliberately vague because Newbolt, perhaps more than anyone else had to work under naval censorship. The reader will note above, that since the main case he mentioned was a false one, there would have been little harm in divulging it.

Hunger clearly existed for information on the intelligence war and into the vacuum created by Admiralty silence poured numerous publications which contained tales whose provenance was difficult to substantiate. Within these came some of the first details of diving on and the full salvage of U-boat wrecks and the impact of this work on the path of the war. Notable examples of this genre include Bywater 1932 and Chatterton 1936.

In fact the salvage whole of U-boats from the sea was difficult to hide in wartime and in consequence difficult to deny thereafter. This is especially so considering that *UC5* became a public exhibit, *UC44* was landed and stripped on a beach in view of passers-by and *UB110* was brought into dry dock on the Tyne. These are cases which became known to the public during the 1920's and 30's through books such as Masters 1924, 1932 and 1938.

However, outside of complete salvage from the seabed, the intelligence story of dives to U-boat wrecks remained silent, kept its mystique and the vacuum remained; with one notable exception. The earliest and doubtless the most influential semi-fictionalised account of these dives appeared in the *Saturday Evening Post* (a general interest magazine published in the US) in 1926. Entitled "A War Secret" and penned by unnamed hand (possibly the journalist Richard Rowan), it claimed to be an interview with the diver Miller and to have had official Admiralty sanction. This highly embellished tale of diving on a number of U-boat wrecks contained some grains of truth which was interwoven with tales of dangerous sea creatures and wrecks full of officers etc. One of its more outlandish claims was that Miller had dived on 60 U-boat wrecks during the war. Far more factual accounts of diving on *UB33* (Davis 1935) and *UB74* (The Seagoer 1937) seem to have passed generally unnoticed.

Nevertheless in the post-war world where the secret work of Naval Intelligence was not being made public, the *Saturday Evening Post* article in particular endured. In the absence of much more it was cited in a number of notable historical works, e.g. Kahn 1968 and Andrew 1987. But it was in the diving community where this paper had its greatest and longest lasting impact. This is because it was the key source used by the journalist and author Kendall McDonald in his 1998 articles in *DIVER* magazine and his 2003 book, *The Tin Openers*; (a name by which it seems the divers are now commonly referred). Only four cases out of 11 mentioned in McDonald's book have any basis in fact.

In reality the release of the Dover Command files in 1969 and the release of the Admiralty Salvage Section records 1970-1975 brought the truth to light. The first in depth research carried out on these records and their impact on our current understanding of the intelligence war was carried out by Robert M Grant, assisted by Capt. A. B. Sainsbury, although their manuscript did not find a publisher until 2003. All that remained to finally reveal the full historical picture was an accurate record of where the U-boats wrecks actually lay.

The discovery by amateur divers of so many U-boat wrecks in recent years has finally enabled a truer picture of the actual dispersal of the U-boat wrecks themselves to be understood. Against this list, the archival evidence could be empirically benchmarked and the final piece of the jigsaw could be put in place. The results of this fusion of archival sources and hydrographic data are the basis of this paper.

References

Andrew, C., 1987. *Her Majesty's Secret Service: The Making of the British Intelligence Community*. London: Penguin.

Anonymous, 1926. A War Secret. *Saturday Evening Post*, Oct 23 1926.

Anonymous, 1937, Submarine Episodes. *The Seagoer*. Vol V. No. 1, 1937, 86-97

Babbs, E., A., 1936. The Sinking of U.B.109. *The RUSI Journal*. 1936, p185.

Beesly, P., 1982. *Room 40: British Naval Intelligence 1914-18*. London: Hamish Hamilton.

Booth, T., 2007. *Admiralty Salvage in Peace and War 1906-2006: "Grove Grub & Tremble"*. Barnsley: Pen & Sword.

Bywater, H., C., 1932. *Their Secret Purposes: Dramas and Mysteries of the Naval War*. London: Constable.

Chatterton, E., K., 1936. *Valiant Sailormen*. Hurst & Blackett Ltd: London

Davis, R., H., 1935. *Deep Diving and Submarine Operations: A Manual for Deep Sea Divers and Compressed Air Workers*. London: St Catherine's Press.

Gibson, R. H., and Prendergast, M., 1931. *The German Submarine War 1914-1918*. London: John Constable Ltd.

Grant, R. M., 1964. *U-Boats Destroyed*. London: Putnam.

Grant, R. M., 1969. *U-Boat Intelligence*. London: Putnam.

Grant, R. M., 2003. *U-Boat Hunters*. Penzance: Periscope.

Hoy, H., C., 1932. *40 O.B. How the War was Won*. Hutchinson: London.

James, Admiral Sir W., 1955. *The Code Breakers of Room 40*. St Martin's Press: New York

Kahn, D., 1968. *The Codebreakers: The History of Secret Writing*. New York: Macmillan.

Keyes, Admiral of the Fleet Sir R., 1935. *The Naval Memoirs, Volume 2*. London: Thornton Butterworth.

Masters, D., 1924. *The Wonders of Salvage*. London: The Bodley Head.

Masters, D., 1932. *When Ships go Down*. London: Eyre & Spottiswoode.

Masters, D., 1938. *Divers in Deep Seas*. London: Eyre & Spottiswoode.

McCartney, I., 2014. *The Maritime Archaeology of a Modern Conflict: Comparing the Archaeology of German Submarine Wrecks to the Historical Text*. Routledge, New York.

McCartney, I., 2014. The Historical Archaeology of WW1 U-boat Wrecks and the Compilation of Admiralty History: The Case of (UC79). *Proceedings of the UNESCO Conference on Underwater Cultural Heritage, Bruges 2014*.

McDonald, K., 1998a. Dusty Miller's Secret War. *Diver Magazine*, August 1998.

McDonald, K., 1998b. Gold, Mutiny and Mystery. *Diver Magazine*, September 1998.

McDonald, K., 2003. *The Tin Openers: The secret war against the U-boats 1914-1818*. Storrington: Historic Military Press.

Messimer, D., 2002. *Verschollen: World War One U-boat Losses*. Annapolis: Naval Institute Press.

National Archives (various dates). *Salvage Record No. 3. ADM 116/1504*. London.

National Archives (various dates). *Salvage Record No. 10. ADM 116/1589*. London.

National Archives (various dates). *Salvage Record No. 16. ADM 116/1595*. London.

National Archives (various dates). *Salvage Record No. 20. ADM 116/1632*. London.

National Archives (various dates). *Salvage Record No. 21. ADM 116/1634*. London.

National Archives (various dates). *Salvage Record No. 37. ADM 116/1642*. London.

National Archives (various dates). *Salvage Record No. 39. ADM 116/1643*. London.

National Archives (various dates). *Laurentic Salvage. ADM 116/1740*. London.

National Archives (various dates). *Salvage Record No. 22. ADM 116/1851*. London.

National Archives (various dates). *Salvage Record No. 23. ADM 116/1853*. London.

National Archives (various dates). *Salvage Record No. 23. ADM 116/1853*. London.

National Archives (various dates). *Lowestoft: Minesweeping, etc, Area X, July - December 1915. ADM 137/1114*. London.

National Archives (various dates). *Dover Area: German Submarines, January-April 1918. ADM 137/1560*. London.

National Archives (various dates). *Dover Area: German Submarines, May-November 1918. ADM 137/1561*. London.

National Archives (various dates). *Dover Patrol Operations Packs, Volume 3, pack 46/3. ADM 137/2096*. London.

National Archives (various dates). *Dover Patrol Operations Packs, Volume 4, pack 46/3 continued. ADM 137/2097*. London.

National Archives (various dates). *Dover Patrol Operations Packs, Volume 7, packs 46/10, 46/12-46/14. ADM 137/2100.* London.

National Archives (various dates). *Dover Patrol Operations Packs, Volume 10, packs 46/24-46/26. ADM 137/2103.* London.

National Archives (various dates). *Dover Patrol Operations Packs, Volume 22, charts. ADM 137/2115.* London.

National Archives (various dates). *Interrogations of survivors of captured and sunk German submarines, etc. 1917-1918. ADM 137/3060.* London.

National Archives (various dates). *Name Miller, Ernest Charles Date of Birth: 31 August 1888. ADM 196/157/756.* London.

National Archives (various dates). *Name Damant, Guybon Chesney Castell Date of Birth: 25 July 1881. ADM 196/142/507.* London.

National Archives (various dates). *Name Blachford, Edwin Henry Date of Birth: 27 Aug 1887. ADM 188/403/228024.* London.

National Archives (various dates). *Name Clear, George Date of Birth: 1 Sep 1881. ADM 188/328/191844.* London.

National Archives (various dates). *Weather code and key "Wetterschlüssel" of UC70. ADM 137/4268.* London

National Archives (various dates). *German Call Sign list Book 2 of UC70. ADM 137/4269.* London

National Archives (various dates). *Reported destruction of submarines Aug. 1914 to Jan. 1919. ADM 239/26.* London.

Newbolt, H., 1918. *Submarine and Antisubmarine.* London: Longmans

Rössler , E., 1997. *Die Unterseeboote der Kaiserlichen Marine.* Bonn: Bernard & Graefe

Spindler, A.,1941 *Der Handelskrieg mit U-Booten, Vierter Band: Februar bis Dezember 1917.* Berlin: Verlag von E.S. Mittler & Sohn. Berlin.