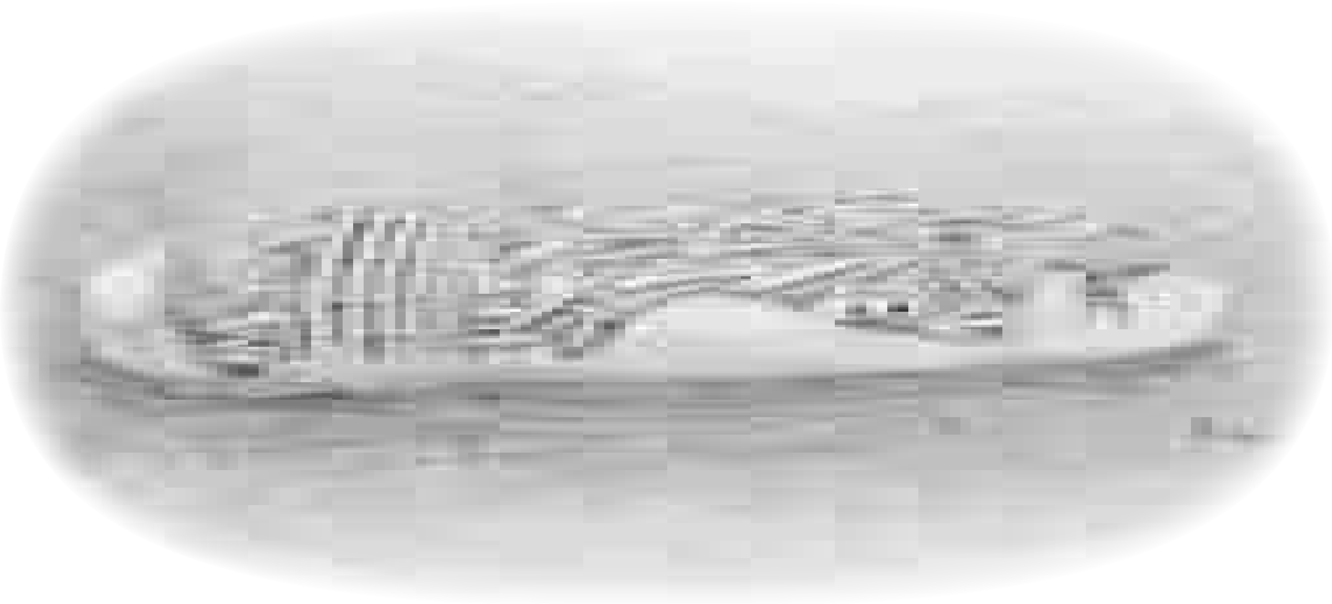
Survey of the Wreck of the *Thor*

Cardiff BSAC 0590

BSAC Expedition BEGS-08-05



October 2008

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I hereby confirm that the expedition did proceed as planned and that the expedition report is a true reflection of the expedition.

Signature of Expedition Leader..Date ....

Signature of Mentor ....Date ....

Expedition Details

Expedition Grant

£500: BEGS-08-05

Expedition Leader

Teresa Darbyshire

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Acknowledgements

Many thanks must go to Cardiff BSAC and its members for supporting the project and allowing us to take over use of the RIB on several occasions for this purpose.

We are very grateful to the British Sub-Aqua Club for awarding us £500 towards the costs of the project and Andy Hunt for his patience in waiting for this report to appear.

Also, to the AA who helped us out on one particular occasion (even if it did take 3 hours to get to us).

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1. Introduction

1.1 Background to the Project

In January 2007, several members of Cardiff BSAC undertook the Introduction to Foreshore and Underwater Archaeology Course run by the Nautical Archaeology Society. The course was very enjoyable and, the opportunity arising nearby, we then decided to take the Part 1 Certificate held in Chepstow a couple of months later in March. Although we have all dived on many wrecks over the years, the courses still added a new aspect to our diving, thinking more about the actual sites we were diving on and the history surrounding them.

In order to expand our experience a bit further, using a local site, the club applied for a BSAC Expedition grant in December 2007 with the purpose of applying our new-found skills to a wreck we had dived before but never really 'looked at' in detail.

1.2 Why the Thor?

The Thor is a small wreck in the Milford Haven waterway, 2 miles from the slipway at Dale (Figure 1.1). Its proximity to the launch site meant that the club RIB could get to the site within 10 minutes, it was easy to see if the site was diveable without expending a lot of effort in getting there only to have to turn back and, if conditions worsened while on site, shelter could be sought very quickly.

The wreck itself is small but still retains a definable structure with a scattered debris field to one side of the deteriorating hull. The wreck can be navigated easily within a single 30 minute dive and, at a depth of 20-25m, decompression is not a factor for up to 40-45 minutes. This allows a reasonable time in which to achieve the various tasks required in mapping the site and also makes it accessible to most grades of diver.

The site has not been a common dive site over the years as the position and transits have not been very accurate. The project also provided an opportunity to remedy this situation, marking the precise GPS position and creating accurate transits for locating the site in the future by anyone who may wish to do so.

1.3 Problems with the Site

The Milford Haven estuary is open to the west and southwest so that any weather from these directions affects diving within the area. Its location on the southwest tip of Wales means that there is no shelter from any Atlantic swell that comes in from the west unimpeded by any other land mass. The position of the Thor site itself is on the north side of the estuary and is exposed to all weather entering the estuary from the west or south. Unfortunately, the prevailing direction of weather in this area is generally west.

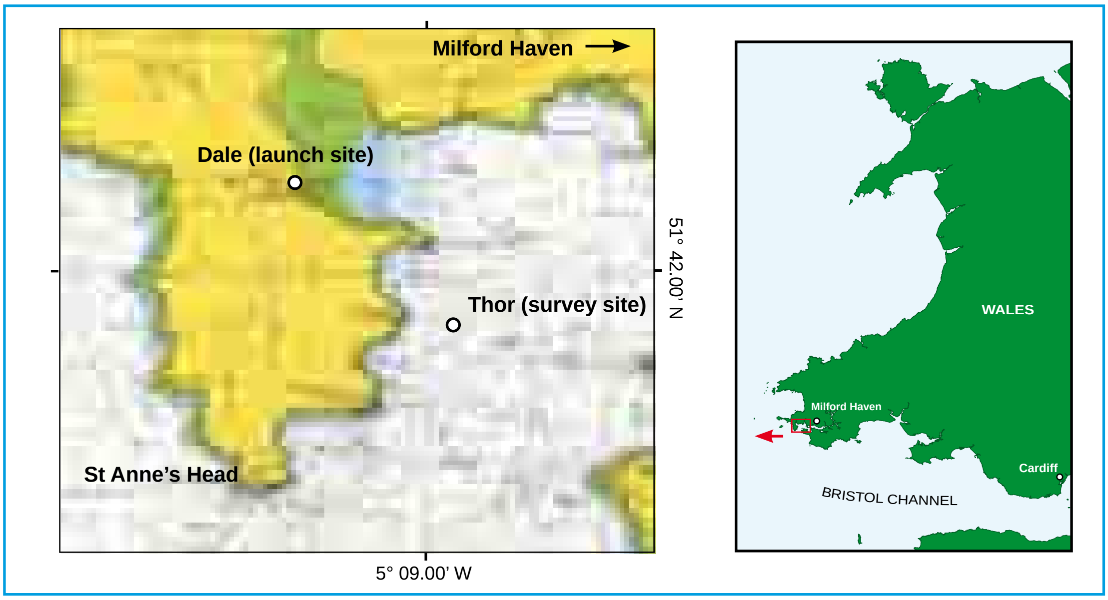


Figure 1.1: Location of the survey site in Wales with a chart extract showing the launch site at Dale and the location of the Thor *in the Milford Haven waterway*

1.4 History of the *Thor*

Position 51° 41.40′ N, 005° 04.11′ W, east of Watwick Point.

The *Thor* currently lies upside down at a depth of around 22-25 m. In recent years the wreck has started to shift and break up revealing some artefacts.

The *Thor* was a 326 ton, coastal coaster built at Foxhol, Holland and launched on 13th May 1937. Records detail that she was 40.7 m long, and 7.4 m across the beam.

The ship had a single propeller, powered by a 74hp four-cylinder diesel engine. Her home port was Rotterdam.

Carrying a cargo of coal, the *Thor* was sank by a following sea, during a southwesterly gale, in the entrance to Milford Haven, on 18th December 1943. A distress signal was sent out, and the Angle lifeboat launched. Seven men from the crew of ten were rescued. The Coxswain of the lifeboat, James Watkins, received a silver medal for the rescue; his mechanic the thanks of the RNLI on Vellum.

On an early dive (February 2008) in the vicinity of the *Thor*, Brian found an object that initially appeared to be a green wine bottle. The base was stamped with the date "1940" and "Brasserie de Leopoldville" with the latter also marked on the shoulder. Further research showed that this was actually a beer bottle. The bottle came from a Belgian built brewery "Brasserie de Leopoldville, located in Leopoldville – now called Kinshasa, in the Democratic Republic of Congo. The brewery was established in October 1923 with Belgian financing and technical support, at the request of the local government as the locally brewed beer at the time was causing health problems for the local population. The successor to that brewery, Bralima, is still producing soft drinks and beer for local consumptiom including Guinness under licence. The company has a website, www.bralima.com.

Photographs of the bottle and the stamped markings are seen in Figures 1.2-1.4.

Figure 1.2: Photograph of bottle with normal size diver's scissors in shot for scale

Figure 1.3: Close-up shot of the shoulder of the bottle showing the name 'Leopoldville'

Figure 1.4: Close-up shot of the base of the bottle showing the date stamp '1940' and words 'Brasserie de Leopoldville'

2. The Survey

2.1 The Survey Plan

Discussions on how to undertake the survey started in February 2008 after an initial foray to the site. The NAS Direct Survey Method was discussed as a possible method for mapping the site. This involves establishing a series of datum points both around the wreck and from a higher position than the wreck. Then measuring from each point to as many of the others as possible and also from each datum point to at least 3 separate points on the wreck itself, thus creating a web of related measurements from which a 3D picture of the wreck can then be formed. Unfortunately, as the *Thor* is sitting on a flat seabed with no large rocks or walls from which to measure down from, the method was deemed unfeasible. Instead, it was decide to lay a series of lines out from and along the wreck in order to accurately measure the external dimensions of the structure and then, using the trilateration technique, measure inward from these lines in order to map the outline of the hull on the seabed (Figure 2.1).

While this worked very well for the starboard side of the wreck which fell to the seabed with a, mostly, well-defined line, the port side was where the wreck spilled out across the seabed with no defined edge. Instead, here it was decided to measure inward to edge of the debris field. Obviously this could be a fairly subjective decision as to where to measure to but it would provide a measure of the actual wreck site itself.

The surface location part of the plan, accurately plotting the position of the site on the seabed, required the surface boat to mark accurate GPS positions for each end of the wreck and draw accurate transits for finding the site in the future.

So, the final survey plan, in order of undertaking, was as follows:

1. Accurately determine the location and lie of the wreck site

• Deploy a shot onto the wreck

a. Divers:

• Move the shot to one end of the wreck

• Swim to the opposite end of the wreck, attach and deploy a DSMB

b. Surface Cover:

• Record the GPS positions of both the shot buoy and DSMB thus defining each end of the wreck

• Take bearings from buoy to buoy to determine the direction the wreck lies in

• Determine and draw accurate transits to locate the dive site.

This part of the survey would have to be completed at slack water in order to ensure that the lines to the surface were as near vertical as possible. To this end, the shot deployed was top-tensioned. This would mean that at slack water the shot would be vertically above the seabed with no slack in the line and, after the dive, the shot could be left in position, able to change depth with the tide without creating slack line.

As there was no place to attach the DSMB at the precise end of the wreck, it would be attached to a piece of wreckage in a short gap created where the stern had broken off from the rest of the hull. A tag would then be attached to a piece of wreck on the seabed directly below where the DSMB was attached and measurements for the length taken from this point.

A bag of equipment would also be dropped down the shotline initially in order to avoid divers having to go in with excess kit clipped to them. All necessary measuring tapes, small weights, slates and spare reels could then be taken in and out of the bag as required.

2. Measure the length of the hull

• Lay a line perpendicular to the hull from the DSMB position (A) and run out enough line to be past the line of the hull.

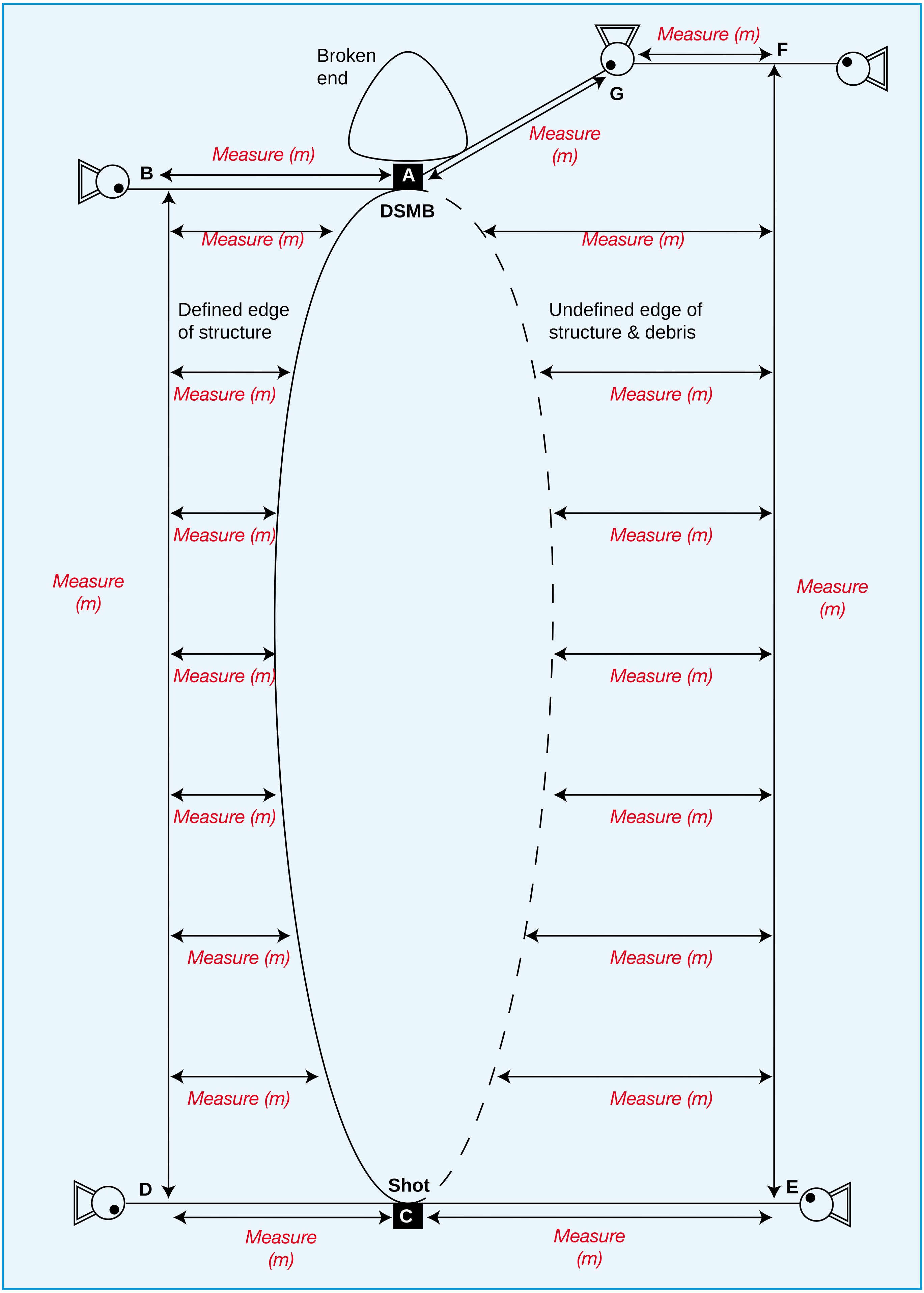


Figure 2.1: Schematic of survey plan with location of measurements to be taken highlighted

• Lay out another line from the shot (C), on the same bearing as the first, for a suitable distance.

• Attach a measuring tape to the first line (B - record the distance on the line from the DSMB where this is) and, on a 90° bearing from this line, swim until meeting the second line (D - from the shot). Record the distance between the 2 lines measured by the tape (B - D). Record the distance from where the length line intersects the line out from the shot (D - C).

3. Create an outline of the hull on the side measured

• With the lines still laid out on the seabed, measure inwards from the length line (at 90° to the line) to the edge of the hull on the seabed.

• Take measurements at 5 m intervals along the length of the hull.

• Using a dive computer, take a depth reading at the edge of the hull where the measurement is taken and at the top of the hull on the same line, thus adding a third dimension to the measurements of the site.

4. Lay the same grid on the opposite side of the wreck

• Extend the end lines on the same bearing out to the other side of the wreck.

• As the wreck debris extends out from the hull on this side the lines will necessarily have to extend further out from the wreck.

• Using the same method as before, measure the distance between the two lines (E - F) and the distance from the source of each end line where the measuring tape crosses (C - E & A - G - F).

Due to the lie of the wreckage, a direct line could not be run out from the position of the DSMB along the seabed. For this reason, the end line was run from a piece of wreckage (G) as close to the end of the wreck as possible. The difference between the length measured on this side and that on the other side should then indicate the remaining distance from the DSMB position to the actual end of the wreck.

5. Measure mast section on seabed.

A mast section was known to be lying along the seabed at an angle to the hull. It was decided to measure this as a recognisable piece of wreckage and then place it accurately on the site plan:

• Measure length and diameter of mast section from exit point on the hull to end point on the seabed

• Take bearing along the line of the mast to determine lie on the seabed

• Measure distance from the length line and the point of intersection on same

6. Create an outline for the other side of the wreck

• Measure inward from the length line to the edge of the wreck debris at 5 m intervals.

As there is no defined edge to the debris field, the measurement would have to rely on the decision of the diver as to where to take it to. Despite not being a measure to the actual hull, the outline created would at least define the edge of the main wreck site itself.

7. Photography & video

Take photographs and video of the wreck site in order to record the actual appearance of the site

8. Illustration

Make drawings of the wreck site and create a site plan for future dives.

9. Marine life survey.

Identify and record the marine life seen on and around the wreck site during the dives and pass on to the Seasearch organisation.

Despite having completed the NAS Part I course, we had no idea of how long or how easy/diffcult this plan might become in practice. However, at least if we were armed with a plan we could go down and have a go and then modify the plan later if necessary.

2.2 The Diving

2.2.1 Sunday 17th February

First sea dive of the season on a fantastically sunny but very cold February day (see Figure 2.2). It was an opportunity to have a look at the dive site to see the layout of the wreck in order to try and formulate a plan for the survey. Visibility was 2-3 m. A single circuit of the wreck took around 20 minutes but it was still not easy initially to visualise how to start the survey.

The cold water took it's toll on one diver though when Rhian's second stage had a major freeflow after inflating her DSMB. Luckily, regular practice with her buddy Andy meant that the pair made a perfectly executed alternate air source ascent to the surface with no problems.

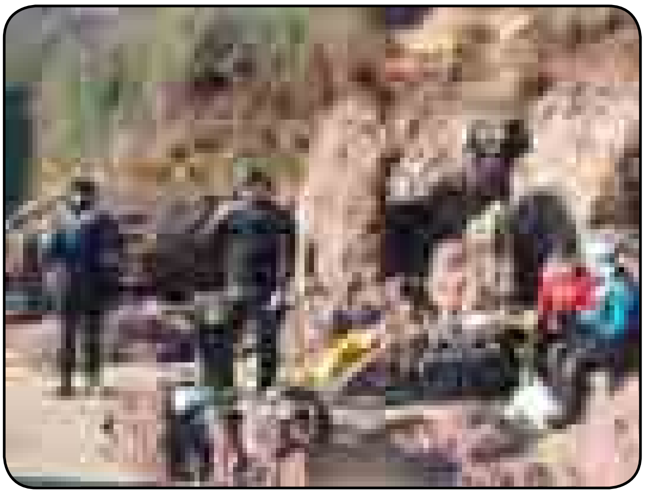


Figure 2.2: Lunch in a sunny bay near the dive site. Note the thick woolly hats and gloves depsite the sun!

2.2.2 Saturday 26th April

First proper attempt to start the survey. Weather reasonable, wind slight but a large 2 m swell over the *Thor* site prevented any diving there. Although diving on a different site was attempted, visibility was found to be near zero and all diving for the day was aborted.

2.2.3 Sunday 27th April

Weather bright with little wind. After launching the RIB in Dale we headed round the headland towards the *Thor* site. Happily, the swell of the previous day had gone and the site was fully diveable. The shot was deployed and Mark and I dropped in. The shot was not on the wreck so, while Mark attached a lifting bag in order to move the shot, I reeled off to search for the wreck. I found the wreck only a few metres away, attached the reel and returned to the shot. As Mark started to move the shot, I returned to the reel and began to reel in the line as Mark moved towards me. We then moved to the end of the wreck as planned to position the shot there. During this time, visibility had dropped to minimal, not surprisingly, due to the movement of the shot. However, even after this was left in its final position and we moved off around the wreck, the visibility was less than 1 m. It was decided to abort the dive as no effective surveying could take place and laying out line in the low visibility would be too great a hazard to all involved.

On the way up the shotline, we passed Rhian and Andy on their descent. Not surprisingly, they then surfaced not long after us having stayed only a few minutes on the bottom before aborting the dive.

Dave and Brian however, undeterred, kitted up to see for themselves what the conditions were like. While they were down, a sea mist began to creep in along the coastline, reducing horizontal visibility although visibility across the dive site was still very good.

Brian's report of the dive:

Sunday started with calmer conditions as we dropped our shot near the Thor*. Mark and Teresa were first down the line to move the shot nearer the wreck, with Rhian and*

Figure 2.3: Brian and Dave surface from their dive, encroaching mist visible in the distance and the milky look of the water apparent around them

Andy next in. The plan was for Mark and Teresa to move the shot to one end of the wreck, and then launch a DSMB from the other end. On the surface, Dave and I would make notes of the length and position of the markers. Another RIB, from Swansea, put a shot on the wreck, then divers into the water too.

Our shot buoy shifted slightly, and then a DSMB appeared a distance away. Dave carefully steered the RIB around the two markers, while I took notes of their relative positions and transits.

After fifteen minutes or so Mark and Teresa were on the surface, with Rhian and Andy appearing a few minutes later. The conditions on the wreck were barely better than the previous day's. Dave was determined to get onto the wreck to look for himself and, after assessing the various comments made by the others, I decided to take a look too. If I didn't like it, I could always come up!

We followed the shot line to the wreck. Below 12 meters things got very dark, very quickly. After reaching the bottom, I pondered the conditions while keeping in touch with Dave by exchanging tugs on the line. All I could make out was the luminous face of my compass, and the three-or-so-inch beam on my torch. Interesting conditions, more akin to my previous experiences of Cosmeston (the local training lake) than my not-so-many saltwater dives. As I got within a metre or so of him, Dave turned on his torch. In this light, visibility was about half a metre or so. It was enough to see the wreck as Dave sketched details of a spindle-like part of the wreck and surrounding plates. The highlight of the dive was seeing a metallic, orange-coloured squid hovering in the beam of Dave's light. From my vantage point I could also see various small (20mm diameter or so) white small anemones, some trimmed with green, some with red, on the rusted steelwork. As well as the squid, Dave also saw a lobster attracted out of its shelter by his light shining on the wreck.

After completing a small tour of the one end of the wreckage, we came back to our starting point to launch a DSMB.

On the surface we found a slight mist was rolling in the distance. After posing for photos, we were quickly back in the boat and on our way to the slipway. One dive in those conditions was enough for the day.

The original purpose of the trip was to start a survey of the Thor. *Despite the good planning, and intents, the conditions did not make this possible. To make the best of the time, we carried out training both on and under the surface.*

2.2.4 Saturday 12th July

Following a week of very poor weather, the neap tides and good forecast meant that we decided to make another attempt at the survey, despite pessimism over the likely visibility. After getting the boat and kit ready in the car park in Dale, we then went through a dry-run of what was intended. This enabled everyone to see exactly what we were going to do and how with the measuring, ask any questions and generally make sure that we knew how we would achieve what we intended. It also confirmed what kit we needed so it could all be made ready in the goody bag to be sent down the shotline.

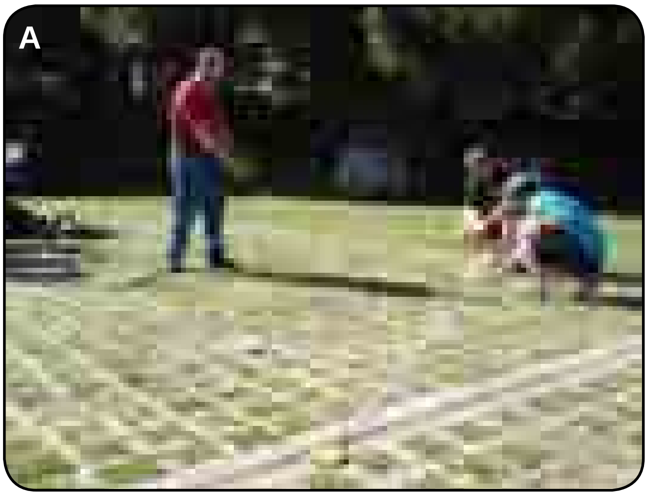


Figure 2.4A&B: Mark, Richard & Brian involved in the dry-run in Dale car park practising laying lines and taking measurements.

On arriving at the site, the shot was assembled. As we wanted to use the shot to mark the position of the wreck beneath accurately, Mark assembled it as a top-tensioned shot in order to keep it vertically over the wreck and enable it to be left in place all day and adjust with the tide. The timing of the morning's diving had been arranged around slack water.

The shot in, a mesh bag containing all the necessary equipment for the surveying, measuring tapes, spare reels and small weights, was dropped down the line ready for the first pair down (Figure 2.5).

Slates had also been prepared in advance with printed sheets of waterproof drafting film attached to the slates for easy removal and replacement after each dive. The sheets were pre-printed with the necessary measurements to be taken so divers did not have to remember what they needed to do. Copies of the data collected, in the format they were taken, can be found in Appendix 5.

Dive 1: Teresa & Brian

Dropping down the shotline I was amazed to find nearly 10 m of visibility and the best view of the wreck I had ever had. The shot was lying next to the wreck close to the bow although initially we were not aware of how close to either end we were. As Brian attached a lifting bag to move the shot I had a look at both ends in order to determine which way the shot needed to move. By preference, we wanted to move it to the stern as at that end the hull sloped into the seabed with no suitable place where a DSMB could be attached as required by

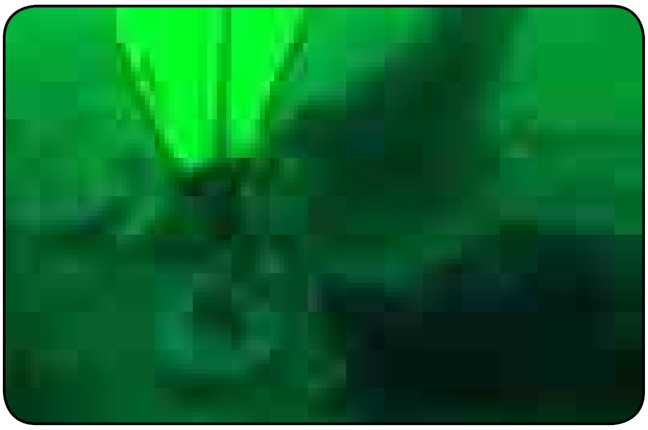


Figure 2.5: Shot weight on the seabed at the bow of the wreck. The lifting bag is still attached after moving the shot and the mesh bag is attached and to the right of the weight.

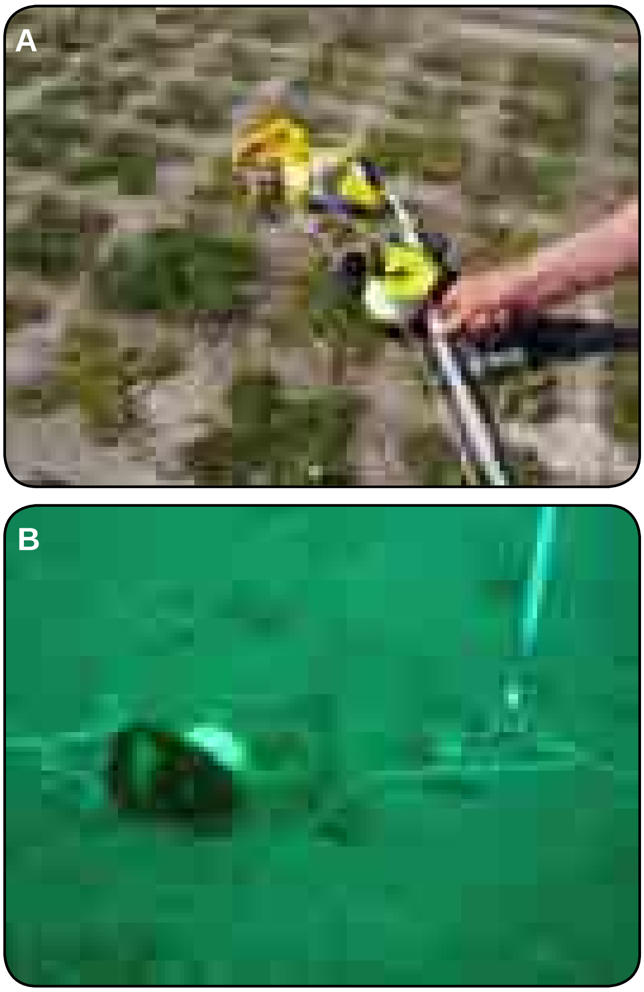


Figure 2.6A&B: Translating the dry-run into practice on the seabed

the plan. The bow, on the other hand, with its broken structure would be easy to attach to. Although the stern turned out to be the greater distance to travel, a slight current running towards the bow meant that it was in fact far easier to move the shot the longer distance than only a few metres the other way. Objective 1a achieved we returned to the bow, attached the DSMB and sent it to the surface so that the boat cover could start their job of recording an accurate position for the site and draw appropriate transits.

Now we needed to start laying the lines for objective 2. The mesh bag containing all the necessary reels, measuring tapes and weights could now be detached from the shot and items taken out as they were needed rather than having to carry everything around separately.

A tag was attached to a piece of wreckage on the seabed directly below where the DSMB had been attached. A separate reel was then attached to the same place as the tag below the DSMB and line run out several metres on a bearing of 270°, which seemed to be approximately 90° to the line of the wreck. The reel was secured with a small weight and a loop in the line (Figure 2.6) created from which the measurement would be taken. The distance measurement from this point back to the DSMB tag was recorded. Returning to the shot, a reel was attached and run out on the same bearing as the first line for a similar distance. Back to the first line again and the large measuring tape was attached to the same small weight anchoring the reel and run out on a 90° bearing along the length of the wreck until the second line was encountered. As this distance obviously took us out of sight of the original line it was important to lay the line steadily and on an accurate bearing. The second diver followed the one laying the tape, running their hand below it to keep it straight and, on occasion, covering it slightly with sand to anchor it in place. The second line had not been quite long enough and so was lengthened in order to meet the tape and the two were secured to another small weight. The length to the second line was recorded and then the distance from this point back to the shot also measured. This completed objective 2 and also signified the end of our dive. It was then a simple matter to ascend the shotline to the surface.

During our dive, the surface cover had completed Objective 1b, recording the positions of the shot and DSMB (Figure 2.7), and taking bearings from one to the other. A set of accurate transits for locating the wreck site had also been drawn up. The transits are figured and described in Chapter 4 later.

Mark's report on making the transits:

"In order to help locate the wreck without the use of a GPS, a set of transits were taken, using the shot buoy on the bow of the *Thor* as the target position.

It was first necessary to ensure the position of the buoy on the surface accurately mirrored the position of the wreck on the seabed and to this end a top-tensioned shot had been used.

Drawings were made of fixed landmarks nearby which aligned with identifiable landmarks on the horizon. The two transits were taken at as near to right angles as possible to help with accurate relocation.

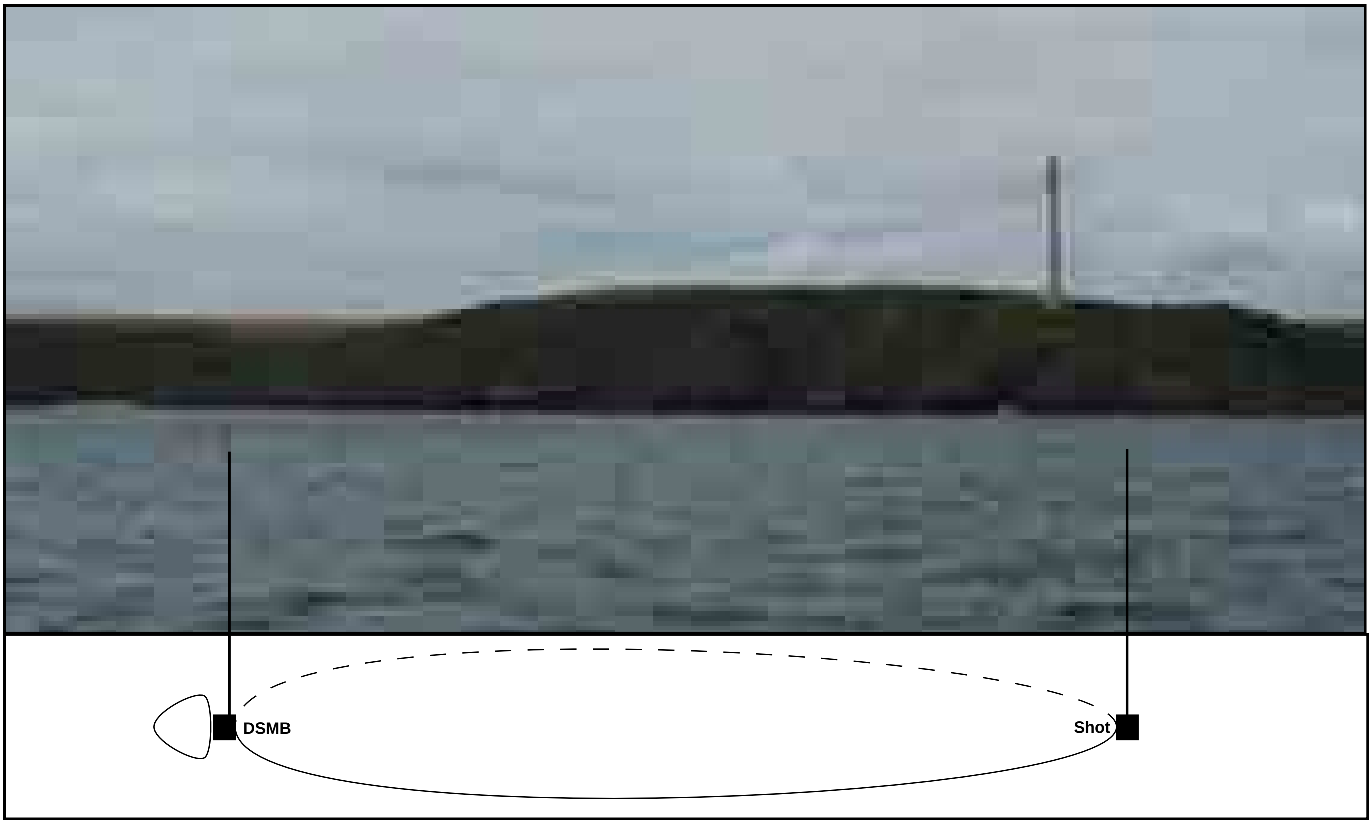


Figure 2.7: DSMB and shot buoy marking each end of the wreck for the surface cover to locate and draw transits from.

A compass bearing was also taken to allow the transit diagrams to be used more easily by someone using them for the first time.

When we returned to the site the next day, we decided to check the accuracy of the diagrams by replacing the shot as close to the previous day's location as possible, just using the transits and without referring to the GPS. When the first divers reached the bottom of the shot, they were pleased to see that it had landed only 3 metres away from the survey tag marking its position the previous day! Definitely an endorsement for the use of transits.

It was found that a number of members involved in the survey had not used transits before, so were happy to have a go at selecting and drawing some for themselves.

We were quite amused later when the window of a so-called building, which aligned perfectly with one of the main shipping channel leading marks, managed to drive away. The lesson there? People who wear prescription lenses in their masks, might think about taking their glasses with them on the rib!"

Dive 2: Mark, Richard & Anne
With all the lines from Dive 1 still laid out on the seabed, Objective 3 was easily undertaken by the second group. As this side of the hull met the seabed generally unbroken, the measurements were easily taken. The main length line was also only a metre or two away from the edge of the hull so, in the good visibility, the divers were always in sight of each other and it was easy to keep lines taut and straight. As well as the distance measurements, Anne took depth readings at each point measured to on the hull and, on the same line, the highest point on the wreck structure (Figure 2.8). The depth of the shot was also recorded. For the ascent, the DSMB was retrieved from the bow.

As the other side of the wreck would be more difficult to define, it was decided to give the afternoon dives over to illustration, video and photography over the whole site in order to get a better idea of the layout on

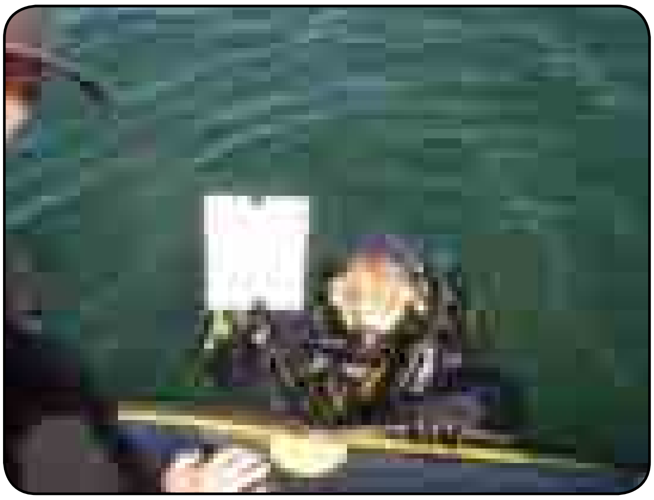


Figure 2.8: Anne returning to the boat with her slate of measurements

that side. A plan could then be formulated overnight on how to tackle the remaining measurements the next day.

Dive 3: Teresa & Brian
Returning down the shotline, we initially swam down the side we had measured from the shot taking some photographs as we went. Although visibility was very good, up to 10 m, there were still a lot of particles in the water meaning that the flash on the camera was useless due to the backscatter created. Unfortunately, while light levels meant that a torch was unnecessary, it was not enough for the camera without the available flash leading to many blurry photographs. Despite this, many of the photos were only slightly blurred and would still be usable for recognising sections of the wreck. Close-up photographs of marine life, using the flash, came out very well and also photographs taken while sitting very still on the seabed.

Having navigated to the end we had a short look around that and on the other side of it and then Brian and I began to retrieve the equipment that had been left on the seabed, unclipping weights, reeling in lines and measuring tapes and replacing them all into the mesh bag. This was done systematically moving back towards the shot again where the bag would be left clipped to the shotline. I took the opportunity to photograph Brian as he undertook some of these tasks as a record of what had been done and the methods employed (Figure 2.9). This completed our dive and we returned once more up the shotline.

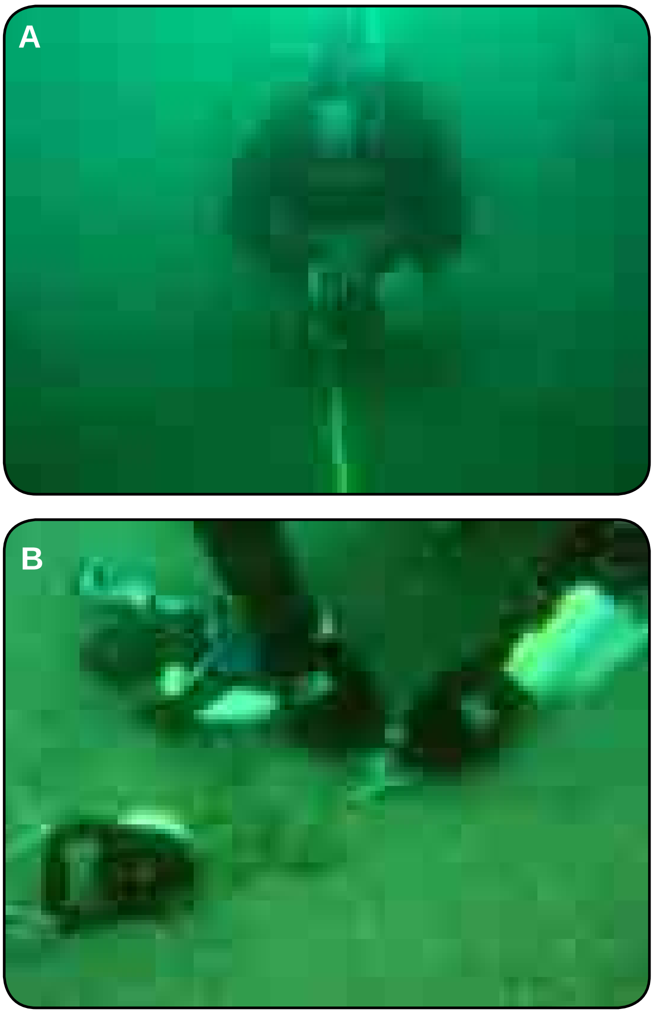


Figure 2.9A&B: Brian reeling in the long measuring tape and detaching the lines after finishing the measurements

As Mark, Richard and Anne kitted up for their second dive we circled the dive site. The steering on the RIB was feeling a little odd and, as we turned towards the shot to drop the divers in, there was a definite snap and all steering was suddenly lost, the wheel moving loosely. Immediately throttling off, the divers had to dekit while the engine and steering were inspected. It was determined that the steering cable had snapped meaning that although the engine was fine, it could not be steered from the console, only by physical manipulation. Luckily, we were not far from the dive site so it was decided to send divers down to retrieve the surveying equipment (still in a bag clipped to the shotline) and the shot in case we couldn't return at all that weekend. This done we set off back to Dale.

As mentioned earlier, one advantage of the site was its proximity to the slipway. This was certainly of benefit now as I controlled the throttle at the helm while Mark manipulated the engine to head us home. This was only possible at a reasonably slow speed but at least it was not far.

The RIB was duly retrieved and then inspected in the car park while a solution was searched for. The day had been so successful up to that point that it was extremely frustrating to now be facing an end to the whole weekend.

Amazingly, our mechanical genius cobbled together a very professional, if phallic (see Figure 2.10A), looking tiller and, less than an hour later, the boat was declared usable for the next day's diving.

2.2.5 Sunday 13th July

Adrian joined us for the sunday creating a third pair which would mean the chance to get more done, particularly as we had lost the last dive of the previous day. The first pair in would start with Objective 4, laying the outer lines for the measurements on the port side of the wreck. The second pair would enter the water while the first divers were still down and follow the laid lines until they met the first pair. The second pair would then take over the measurements from wherever the first pair had reached at that point and continue from there. The first pair would then finish their dive by recording other information on the site. Similarly, the third pair would then take over from the second. In this way, hopefully we would maximise what we could get done in the time. We also did another dry-run to remind everyone of what to do and because Adrian hadn't been with us the day before so it was all new to him.

It took a while to get used to the new method of steering the boat following the attachment of the temporary tiller to the engine thus requiring two people to drive the boat at all times and restricting space for kitting up as the person steering was using the same space as the divers. For anyone unused to ever steering using a tiller, it also took a bit of practice to keep the boat in a straight line, turn in the correct direction and come alongside a shot when forward visibility was restricted from the tiller's position (Figure 2.10).

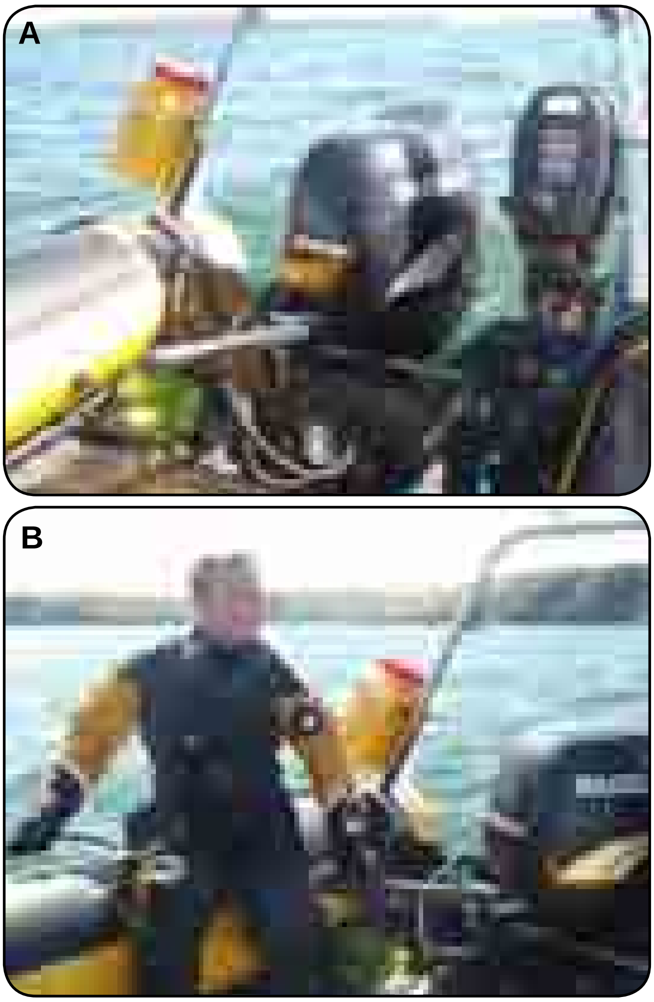


Figure 2.10: The new tiller (A) and Richard demonstrating it's operation

Dive 1: Mark & Brian

A good test of the new transits, the shot had been dropped virtually on the exact spot it was needed and had only to be moved a couple of metres back to the previous day's position on the stern which had been marked with a tag for reference (Figure 2.11). The task then was to start with Objective 4 and hopefully complete Objective 5 also.

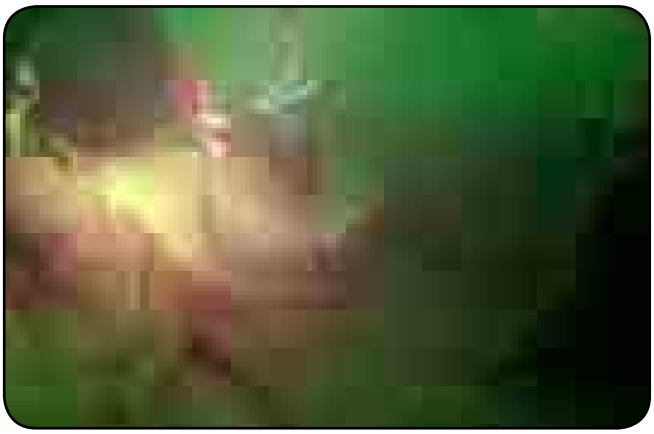


Figure 2.11: The shot, back in position, next to the tag left to mark the right spot

A reel was attached and run out on the opposite bearing to the day before (90°) to start the measurements for the port side. In order to encompass the debris field, this line had to be run out much further than had been necessary on the starboard side. The measuring tape was attached at the 10 m point and both tapes were secured with a weight. The long tape was run out from there with the knowledge of the previous day's length measurement to give a good idea of how far to go. Then, another reel was attached to a piece of wreckage close to the actual end of the wreck and run back to the length line.

At this point, Objective 5 was initiated, with Brian taking measurements of the mast section and following it out along the seabed.

Dive 2: Teresa & Richard

We descended the shotline and found the line attached to the weight. Following this we found the length tape and moved out along that. As the visibility was so good, a short way down the length line I looked over towards the wreck (not visible from here) and spotted Brian taking the measurements at the end of the mast section. Seeing him there I went over and took the distance measurement from the end of the mast back to the length line and also recorded the intersection point thus completing Objective 5. We then carried on along the length line, straightening it slightly as we did and removing two spider crabs (Figure 2.12) that were having a fight over the top of it! At the end we found the last reel attached and followed this back to the wreck, taking a note of the distance. From there we then took a measurement back to the original tagged position of the DSMB from the day before and a bearing of that line, hopefully completing the measurements of the outer grid. Back at the length line we started the measurements inward for Objective 6. A couple of these completed we returned to the shotline shortly before decompression would be entered and started the ascent. On the ascent we met Anne and Adrian on their descent and passed over the slate, indicating how far we had gone so that they could continue.

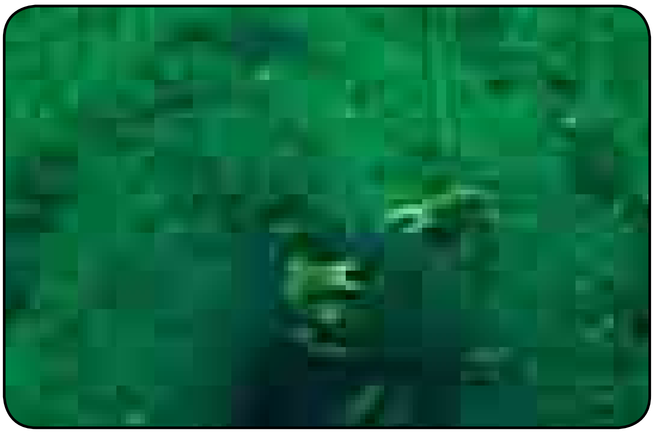


Figure 2.12: Two spider crabs fighting each other over the top of the measuring tape, not improving our chances for accurate measuring

Dive 3: Anne & Adrian

Objectives 4 & 5 complete, Anne and Adrian carried on with Objective 6, taking measurements from the long line back in towards the wreckage. The measurement was taken at what was considered to be the edge of the major debris field rather than just an odd piece of wreckage that may be lying out by itself on the seabed. After completing this list of measurements they returned to the surface.

All the measurements complete, the last dives of the day were now free for more video, photography and attempts at drawing.

Dive 4: Mark & Brian

Mark went in with his video camera with the intention of getting good footage of the general wreck site which could then be used to aid a site sketch, identify further marine life and generally enable people to orientate themselves on the site before diving. The survey equipment was also retrieved from the seabed back to the shot.

Dive 5: Teresa & Richard

More photography, marine life recording and general site orientation. We swam back out along the debris field from the shot looking out over the wreckage that we had not had much chance to see before. One circuit of the area, interspersed with taking photographs filled the whole dive and took us back to the shotline for the ascent.

Dive 6: Adrian & Anne

This dive was filled with photography using a measuring tape to aid scale and some attempt at site sketching, although Anne admitted later that she wasn't the greatest artist!

Adrian's comments on the day:

By the time I started the majority of the hard work had been done. Bow & stern positions had been identified and the method for determining the hull profile had been perfected – oh and the temporary tiller had been designed and installed. Piloting a RIB when stop & go and port & starboard are under the control of two left hands separated by 3 m of boat is a novel experience.

As far as the survey was concerned, by the time I got wet, all that was left to do underwater was measure & map the opposite side & tidy up the transits.

My first dive was relegated to holding the median tape against the longitudinal at 5m intervals whilst Anne swam to & fro, took the measurements & entered the details on the plot sheet. Time enough to converse with the local wildlife that crossed the tape. Second dive all we had left to do was fill the bag on the shot & mooch about looking for something to measure & photograph.

Although viz seemed ok it was not good enough for photos without flash. I recommend using a 0.5m measuring stick with a coloured band at the middle & ends as this would stand out even after Paintshop or Photoshop had done the enhancements.

I have to admit that it's a change to "Dive with a purpose" but, along with good company, it was a great way to spend a sunny Sunday.

An incredibly productive weekend with unlooked-for visibility we may never see again! The only downside had been the loss of a dive due to boat damage. At least an effective temporary repair had enabled the diving to continue.

2.2.6 Monday 25th August

The bank holiday Monday was set aside to continue our recording on the *Thor*. Unfortunately, in typical bank holiday style the weekend was extremely wet and windy. Although diving was achieved on the Saturday and Sunday the *Thor* site could not have been dived either day in the midst of a Force 4-5 westerly with a large swell apparent over the dive site all weekend. In the end, no diving was attempted on the Monday at all.

2.2.7 Friday 28th August

Despite spring tides it was decided to make another attempt to get out on the *Thor* this weekend as the weather forecast, after a dire month, was very good. Unfortunately, without even getting into Pembrokeshire, the van towing the RIB broke down 90 minutes from Cardiff, the radiator fatally bleeding out onto the carriageway. We admitted defeat and called in the AA, eventually arriving back in Penarth at 1am on the back of a tow truck (Figure 2.13).

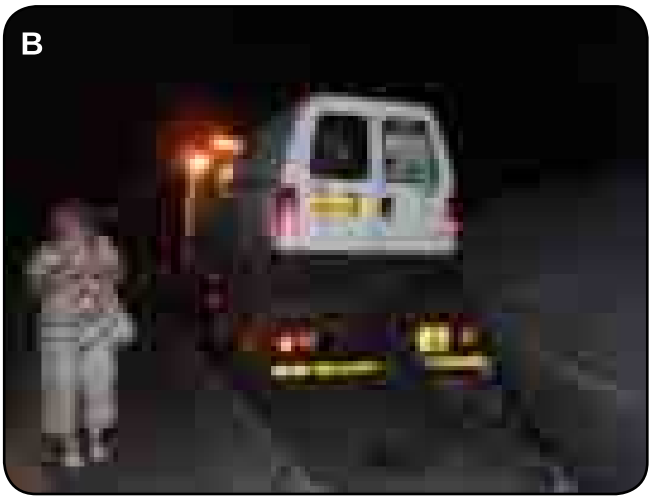


Figure 2.13: The weekend ends before it starts in a layby on the A40 (A). The AA turn up later to take us home again (B)

2.2.8 13th-28th September

Due to various other commitments we were unable to take advantage of these fantastic 2 weeks of weather. Gutting!

2.2.9 3rd & 4th October

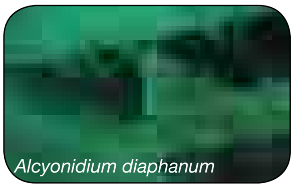
Neap tides, hoping the good weather would hold out, we tentatively made a plan to get back down to Pembrokeshire. A look at the forecast on the prior Monday found a swell forecast of 15ft westerly for Freshwater West, a surfing beach just south of the Haven. The winds were predicted to be 20-25mph. Plans were cancelled.

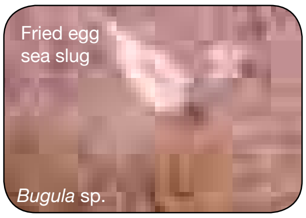
3. Marine Life Survey

The seabed surrounding the wreck is flat and composed of a fine sand sediment. The Haven is a very silty environment and, while the wreck site does experience currents, they only reach 0.5 knots in strength maximum on a neap tide or 1.1 knot on a spring tide, resulting in a lot of sediment deposition on the wreck and a very soft seabed surrounding it which can be easily stirred up.


Sagartia elegans

Although the wreckage was covered thickly with silt there was a lot of life encrusting the structure and living in, on and around the site. The structure itself was encrusted with various hydroids, particularly Oaten Pipe hydroids (*Tubularia indivisa*), and Bryozoa, clumps of Sea Chervil (*Alcyonidium diaphanum*) noticeable along the main hull. Various sea-squirts and sponges were identified on the wreck as well as anemones (jewel and elegant) and Devonshire cup-corals dotted among the encrusting epifauna. A few other small species were also found among these if you looked closely, including the colourful Fried Egg sea slug (*Diaphorodoris luteocincta*). Larger species, such as spider crabs (*Maja squinado*) and a lobster (*Homarus gammarus*) were found wandering along the seabed or hidden inside the wreck and a conger eel was also spotted. On the surrounding seabed there were few starfish or sea urchins due to the soft, uniformly sandy nature of the sediment. Tracks along the seabed were attributed to a number of organisms including small sand brittlestars (*Ophiura* sp.), tower shells (*Turritella communis*) and small hermit crabs, often in *Turritella* shells empty of their previous occupants. Around the area, King Scallops (*Pecten maximus*) were found although it is not an abundant site for them, being a bit too soft. Tubes of the fanworm *Sabella* sp. were seen attached to pieces of the wreck and the fan of an eyelash worm (*Myxicola infundibulum*) was spotted slightly hidden under a piece of wreckage, probably not often identified by people unless they know what they are looking at.


Alcyonidium diaphanum


Fried egg sea slug

Bugula sp.

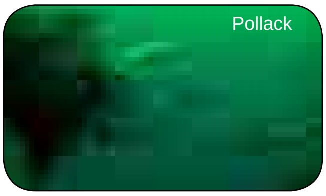

Spider crab


Sabella sp.

Devonshire cup-corals

As with many wrecks, large shoals of Bib (*Trisopterus luscus*) were commonly in residence, supplemented with large Pollack (*Pollachius pollachius*) and a few Poor Cod (*Trisopterus minutus*). On the seabed itself, small dragonets were numerous with occasional dogfish and other seabed-dwelling species (I tentatively include Red Mullet, although the identification is not definite).

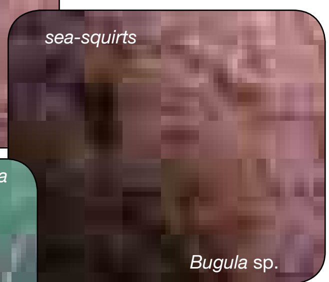

Bib


Pollack

Squid were spotted on one of the early aborted dives, when the site was very dark with poor visibility. They had undoubtedly been attracted by the bright beam of the diver's torch in the darkness.

The following compiled species list was submitted to Seasearch for their records along with the site position and details. Identifications of most of the smaller species was by Teresa Darbyshire, the sponge *Homaxinella subdola* was identified by Rohan Holt from the Countryside Council for Wales.


Xantho pilipes?

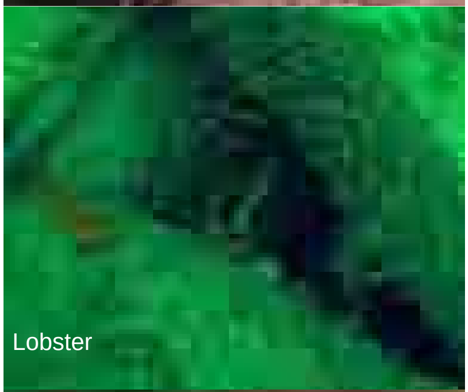

sea-squirts

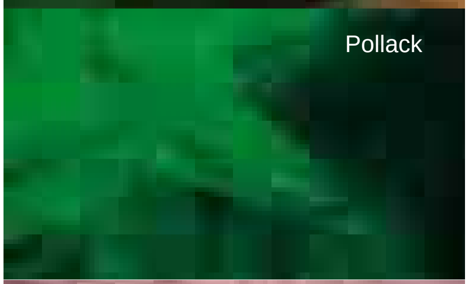
Bugula sp.


Nemertesia ramosa

Suberites sp.

Classification	Common Name
Anthozoa	**Anemones**
Cerianthus lloydii	Burrowing anemone
Sagartia elegans	Elegant anemone
Corynactis viridis	Jewel anemone
Caryophyllia smithii	Devonshire cup-coral
Crustacea	**Crabs & Lobsters**
Homarus gammarus	Lobster
Cancer pagurus	Edible crab
Maja squinado	Spider crab
Pagurus spp.	Hermit crab
Xantho pilipes?	Hairy crab
Mollusca	**Shells**
Turritella communis	Tower shell
Calliostoma zizyphinum	Painted Topshell
Pecten maximus	King scallop
Loligo sp.	Common squid
Diaphorodoris luteocincta	Fried Egg sea slug
Chordata	**Fish**
Scyliorhinus canicula	Lesser spotted catshark (Dogfish)
Trisopterus luscus	Bib
Trisopterus minutus	Poor cod
Pollachius pollachius	Pollack
Callionymus lyra	Dragonet
Mullus surmuletus?	Red Mullet?
Conger conger	Conger eel
Epifauna	**Encrusting Fauna**
Clavelina lepadiformis	Lightbulb Squirt
Aplidium sp.	Club sea squirt
Alcyonidium diaphanum	Sea Chervil
Tubularia indivisa	Oaten Pipe hydroid
Nemertesia ramosa	Branched Antenna hydroid
Suberites sp.	Sponge
Bugula sp.	Spiral bryozoan
Homaxinella subdola	Sponge
Polychaeta	**Worms**
Myxicola infundibulum	Eyelash worm
Sabella sp.	Fanworm
Echinodermata	**Starfish**
Ophiura sp.	Sand brittlestars





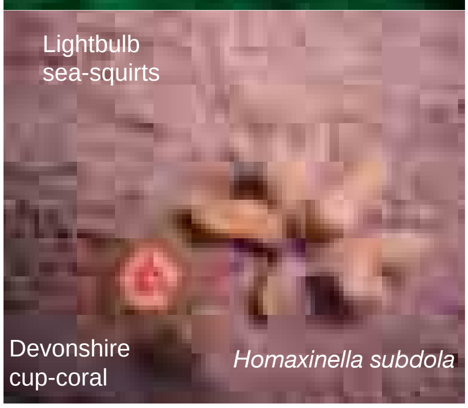


Table 3.1: Marine life identified around the wreck site

4. Survey Outcomes

The choice of the *Thor* as the survey site was based on its proximity to the launch site, suitable depth, a realistic size for surveying and as a wreck with some recognisable structure to it. However, we also knew from the start that the site would be open to prevailing weather conditions although so are the majority of our easily accessible dive sites. Depsite this, much was achieved as detailed below.

4.1 Success

Although the measurements are incomplete, there were several successful outcomes to the time we did manage on the site.

1. Position of the wreck

• The bow and stern positions of the wreck were recorded and have been plotted on a chart for comparison with the officially plotted position (Figure 4.1).

• Accurate transits have been drawn and tested to locate the dive site (Figure 4.2)

2. Dimensions of the wreck (Figures 4.3 & 4.4)

• The overall length of the wreck has been determined

Approximately 43 m from bow to stern

• The maximum width of the wreckage area has been determined

No more than 17 m across the widest section

• A general area has been defined within which all of the debris can be found

• The height of the wreck off the seabed was determined relative to the defined edge of the hull on the seabed (Figure 4.4)

Up to 3 m off the seabed at the stern

3. Video & Photography

• Good quality video is available to show the wreck site and help orientate divers on what they see. It also illustrates the prolific fish life that may be found around the wreck. The DVD attached to this report contains the video footage which has been colour corrected.

• Photographs illustrate a larger view of the structure, if a little blurred, and also the life that can be seen by looking at little closer at what you are diving on

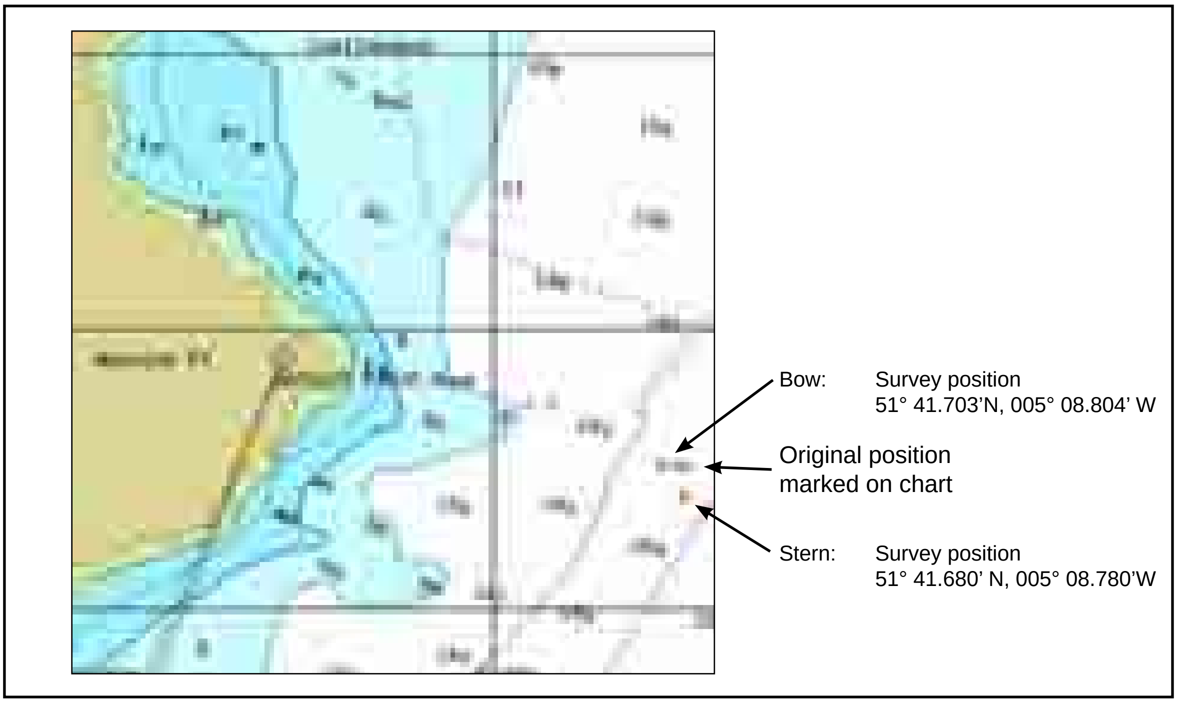
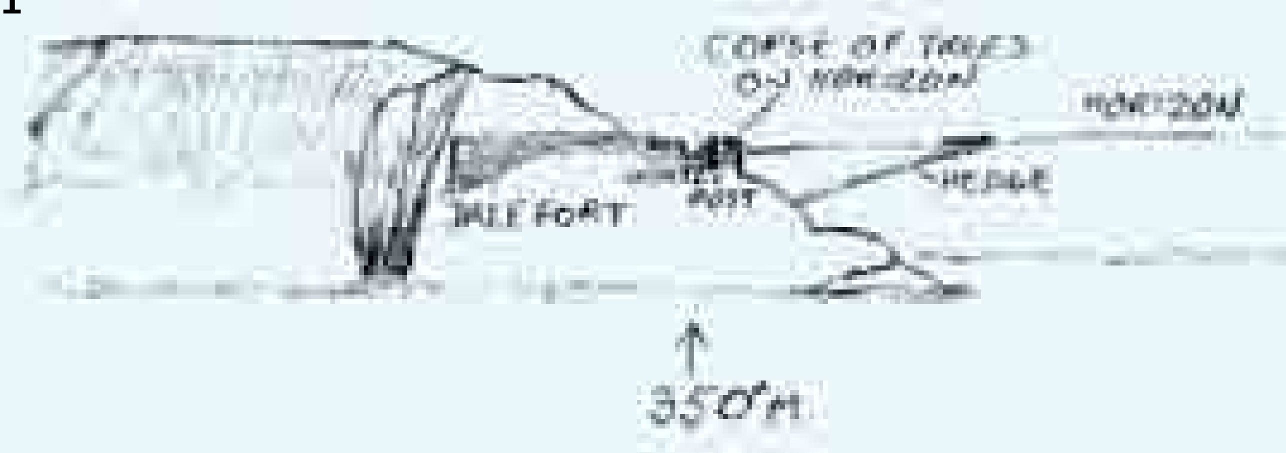


Fig. 4.1: Chart extract showing the charted position of the Thor *and the positions of the bow and stern marked during the survey*

1



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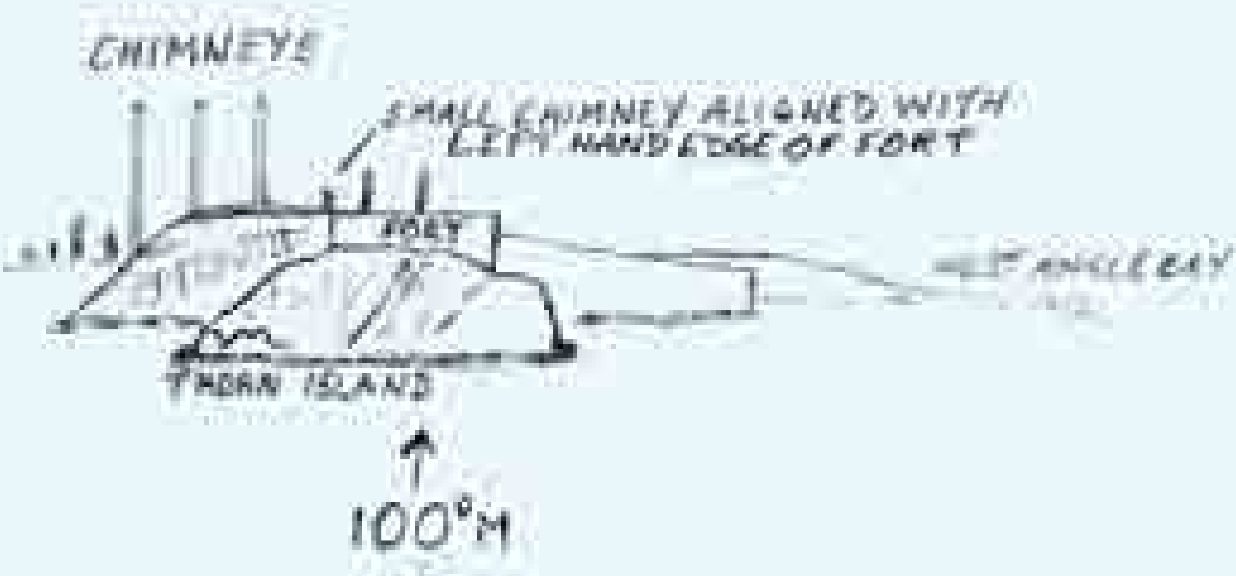


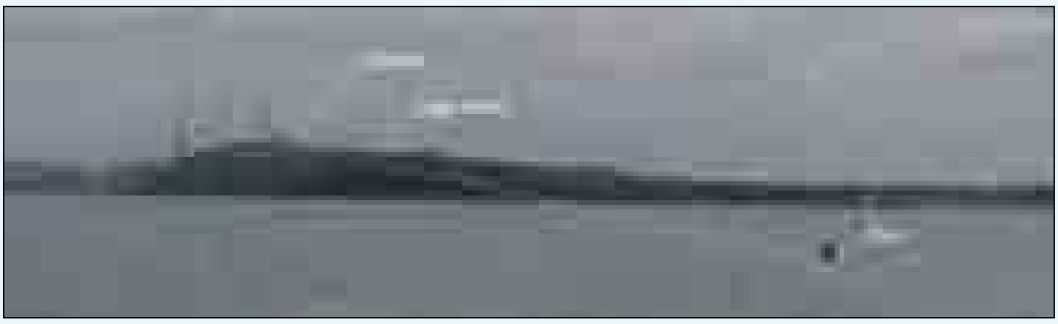


Figure 4.2: Transits drawn on site for location of the Thor *wreck*

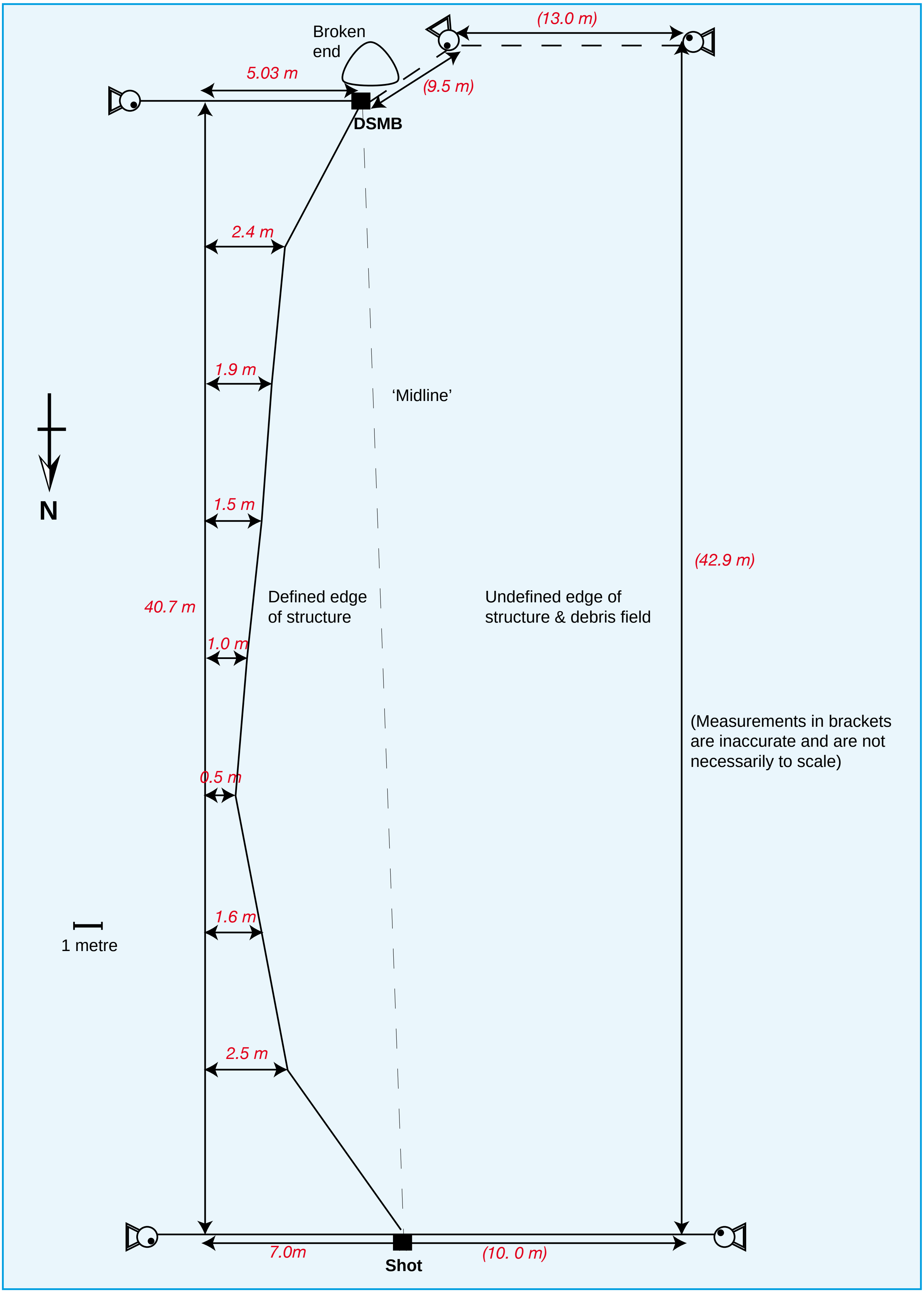


Figure 4.3: Schematic of wreck, drawn to scale from survey results

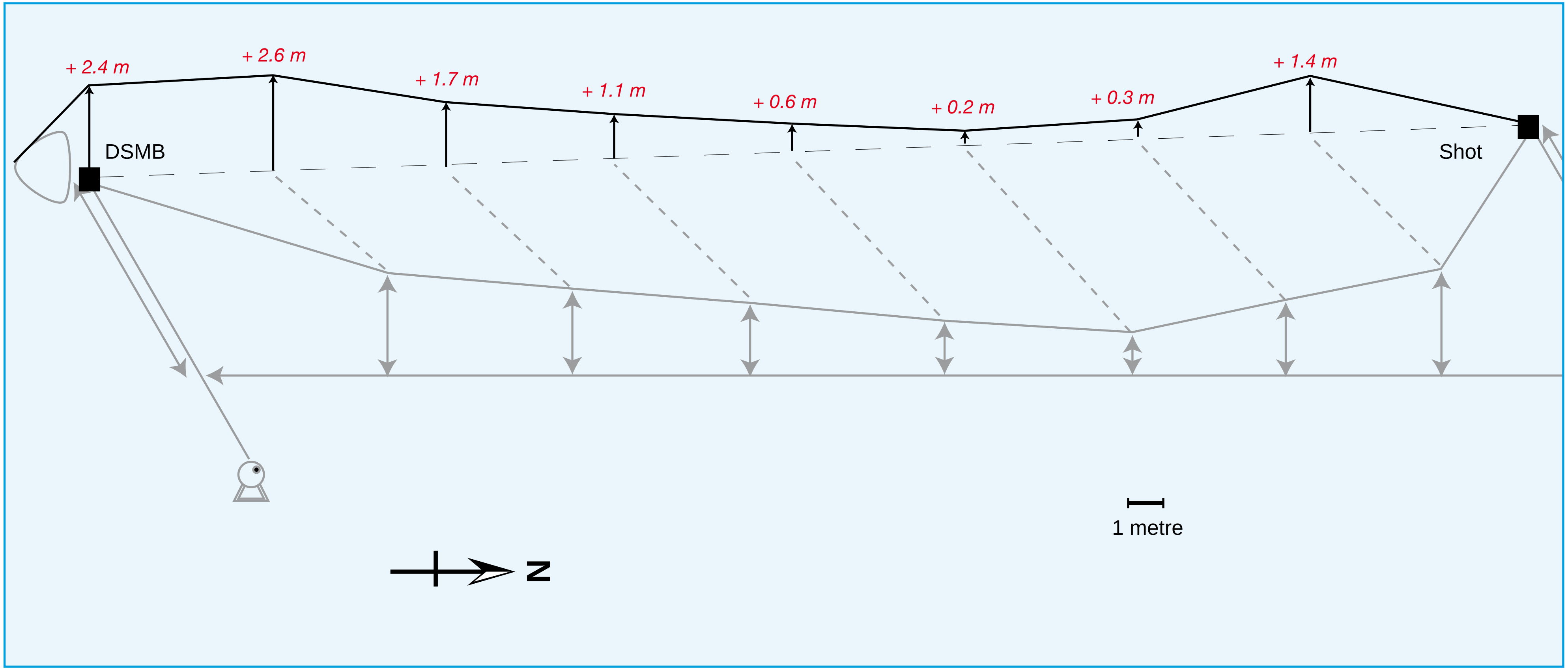
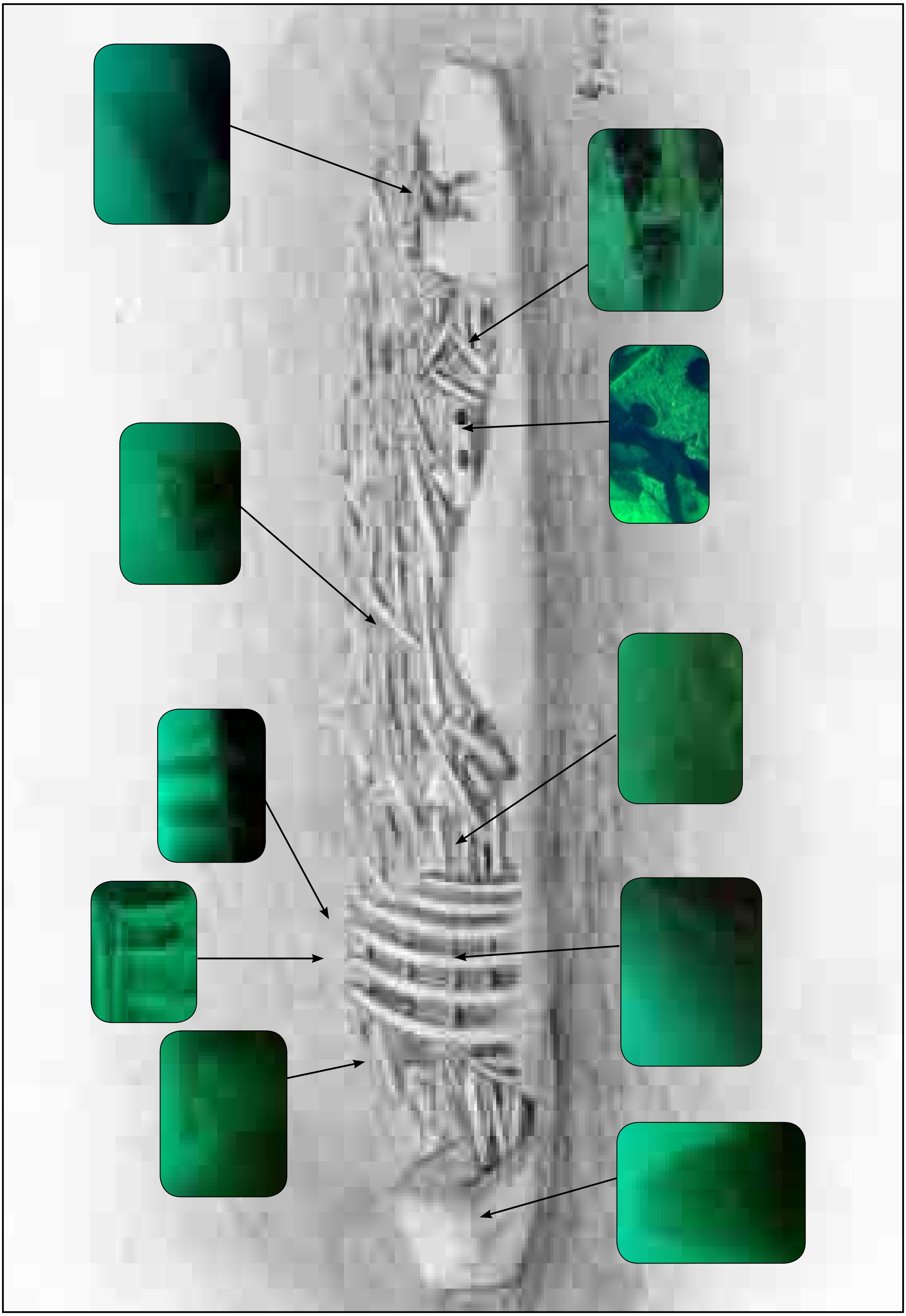


Figure 4.4 (above): Schematic of wreck, drawn to scale from survey results, showing the height contour along the hull relative to the defined edge measured previously

Figure 4.5 (below): Illustration of the wreck with photographs related to various points around the site. Illustration is drawn to the same scale as the schematics in Figures 4.3 & 4.4.



encouraging divers to pay more attention to what they are diving on. The DVD also contains all of the photographs used in this report along with extra photographs not included.

4. Appearance of the Wreck

• An illustration of the general wreck site was made (Figure 4.5)

• A combination of the illustration and digital imagery is shown in Figure 4.5 to give a more realistic view of the appearance of the wreck site

5. Marine Life

• A list of marine life to be found in the area has been drawn up to give divers an idea of what to look out for, both large and small (see Chapter 3 for a description of the fauna identified and related photographs.

All of the video footage and photographs taken (including photographs not used in the ereport) can be found on the DVD attached to this report.

4.2 Setbacks

4.2.1 Site Problems

Diving this year seems to have been particularly plagued by bad weather and poor visibility. The breaking of the steering cable, specifically on our best weekend, was particularly unlucky and the van breaking down unforeseeably frustrating. In the end, out of 10 potential days targeted to the survey, only 4 resulted in actual dives on the site. One was a pre-survey dive to look around, one was aborted due to zero visibility and the last two days were successful but with a dive lost to mechanical failure. Four days were lost to weather and two to van breakdown.

4.2.2 Survey Problems

The initial measurements of the starboard wreckage were very successful. This side has a defined edge to the hull and the closeness of the longitudinal line to the hull meant that most measurements could be taken with both ends of the tape visible at the same time.

The measurements on the port side were less successful. As this side contains the wreck debris scattered over the seabed, the tapes had to be reeled out much further. This led to the longitudinal line being out of view of any of the debris being measured inward to and likely was the source of the errors that crept into the measurements, the line in to the wreckage most likely becoming less than straight or properly at 90° to the longitudinal line which itself was suspected to have been off course.

4.2.3 Future Plans

Plans were made to remeasure the required distances and also to redo the stern measurements. The stern measurements would be taken using a different method to that used originally in order to properly gauge the correct distance from the DSMB tag to the precise end of the wreck. Unfortunately, mostly due to weather, we never got the chance to act on this plan. However, we still intend to complete the survey at a future date.

5. Final Words

Brian

This was the first time that I'd been actively involved in a wreck survey, after poor visibility and conditions thwarted my first visit. It was only after this survey that I've actually started to see wrecks as a total of parts, and not just as debris, rusted metal, or places for fish and creatures to gather. The Thor *was a ship, with a crew, doing a job, that was lost at sea – sunk – with lives lost. Hopefully the information gathered by the survey will be held, and reviewed against future surveys. The rate of deterioration, or exposure, of the wreck can also now be gauged.*

I was one of the lesser qualified divers, if not the least qualified, on the RIB during the survey – and a relative newcomer to the club. It was interesting (sometimes entertaining, but definitely educational) to see and watch how the other divers behaved and interacted both above and below the water

Yes, I am definitely interested in taking a wreck appreciation course, and possibly a NAS course, as well as continuing my dive training and starting down the instructor route.

Mark

Before beginning the survey, I had only dived this wreck once, which didn't give me a good mental picture of its layout. On the weekend it was decided to make a start on the survey, we were unlucky with the visibility, to the extent that it would have been dangerous if not impractical to try and gather any data.

When we finally got a weekend where the weather and visibility were both playing ball, we had already lost more than half the year, so a concentrated effort was being made to gather as much of the basic information such as location, size and some sort of profile. We would consider gathering more detailed information on some of the interesting areas over subsequent dive weekends.

Our plans were nearly scuppered at this already late stage by the steering cable snapping after the first dive of the weekend, necessitating a makeshift tiller being quickly grafted onto the engine to allow the survey to continue.

I think the initial idea of us doing the survey was not too ambitious, had we been able to get on the wreck on the occasions that were planned. It quickly became a more difficult task as the weekends passed, making it necessary to adapt the original plan.

The information we have gathered so far has certainly given me a much better mental picture of the wreck, and has definitely made it easier to find even without a GPS. I still hope to do some more diving on it even after the survey is over.

Teresa

To say this has been a bit of a trial I think most would agree is fair. However, that is not to say it wasn't fun and extremely enjoyable, even when things were going wrong.

I enjoyed putting the plans together and trying to think of the best way to survey a site like this as it really put the NAS courses into context and gave me a new aspect to my diving. The only frustrating part has been not being able to get as much done as we wanted. The more we achieved the more I wanted to do and, despite the setbacks, I am really proud of what we have managed to achieve in the time we did get on site.

I've never been 'into' wrecks as a diver except as places that are abundant with marine life and offer bits to look around and in. However, diving the Thor *and really looking at the pieces of wreckage have given me a new appreciation of what I am really diving on.*

I can't thank everyone in the club and particular those involved with the survey enough for putting up with me and my mad plan to do this. I think everyone enjoyed it as much as I did and hopefully have also forgiven me for puttin them through it!

Appendix 1

Accounts

Expenditure During Survey

Equipment	£50
Measuring tapes	
Rulers	
Drafting Film	
Paint stick marker	
Propelling pencils	
Gas Fills	£200
Nitrox fills	
Air fills	
Travel Costs	£250
Boat & Tow fuel	
Towing Fee	
Car parks	
TOTAL	£500
BSAC Grant	**£500**

Appendix 2

Qualification Details of Divers Involved in the Survey

Name	Diving Grade	Membership Number	Instructor Grade	Other Position Held
Rhian Lewis James	First Class	A312481	Advanced	Expedition Mentor
Teresa Darbyshire	Advanced	A643310	Advanced	Expedition Leader
David Brown	Dive Leader	A757648	Open Water	Area Coach (Cardiff), Club Training Officer
Adrian Davies	Advanced	A298226	—	—
Mark Gosling	Advanced	A745154	Advanced	Club Chairman
Anne Hudson	Advanced	A750754	Open Water	Club Secretary
Andy James	Advanced	A613636	—	—
Richard O'Donnell	Sports Diver	A778896	—	—
Brian Pentland	Sports Diver	A785591	—	—

(Qualification Details as at July 2008)

Appendix 3

Risk Assessments

Hazard	Who	Frequency	Severity	Risk Evaluation	Controls	Immediate measures to deal with consequences if risk- does occur
Heart Attack	All divers	Rare	Fatal	Medium	Medical self-declaration form completed. All divers trained in basic life support.	CPR Contact Coastguard for casualty evacuation.
Contact with Propeller	All divers	Rare	Fatal	Medium	Only qualified Dive Cox'ns to control the boat.	Recover casualty into boat and administer appropriate first aid. First Aid kit onboard. Contact Coastguard for casualty evacuation.
Injury from other boats	All divers	Rare	Fatal	Medium	Monitor surface before surfacing for approaching vessels. Surface cover to fly A-flag and to patrol site and warn other users of diver presence.	First Aid kit onboard. Coastguard to be contacted for casualty evacuation.
Nitrogen Narcosis	All divers	Frequent	Fatal	High	All participants to have built up depth experience prior to survey.	Assistance from buddy & ascent.
Decompression Illness	All divers	Occasional	Major injury	Medium	All diving carried out according to dive computers carried and using the most conservative requirement.	Oxygen kit carried on board, all divers trained in its use. Coastguard to be contacted for evacuation.
Out of Air	All divers	Occasional	Fatal	High	All divers to carry contents gauges and monitor regularly. Ascent to be initiated at a minuimum agreed pressure.	All divers to carry AAS

Hazard	Who	Frequency	Severity	Risk Evaluation	Controls	Immediate measures to deal with consequences if riskdoes occur
Reduced visibility	All divers	Frequent	Major injury	High	All lines to be attached to part of the wreck before laying out. Ensure divers are confident in techniques to be used before diving.	Dive to be aborted in case of severely reduced visibility. Divers to exit and inform dive manager of conditions. Dive manager to abort diving.
Diver separation	All divers	Frequent	Fatal	High	Divers to remain on one end of the measuring tape/reel at all times. Ensure all divers are aware of survey methods before diving	Divers to surface immediately & re-establish contact. Contact Coastguard if divers become overdue.
Separation from boat	All divers	Frequent	Fatal	Medium	Divers to surface immediately if wreck is lost or on leaving the site. All divers to ascend shotline or using a DSMB.	Surface boat to maintain constant monitoring around dive site. Contact Coastguard if divers become overdue.
Entanglement in nets/ lines	All divers	Rare	Fatal	Medium	All divers to carry appropriate cutting tools. Ensure all divers aware of proper methods of laying lines before diving.	Assistance from buddy
Slips/Trips/Tumbles	All divers	Occasional	Minor injury	Low	Boat to be kept tidy during diving. Kit loading to be supervised and managed properly.	Remove casualty from danger and apply appropriate first aid. Evacuate if necessary. Fist aid kit onboard.

Hazard	Who	Frequency	Severity	Risk Evaluation	Controls	Immediate measures to deal with consequences if riskdoes occur
Boat breakdown	All divers	Rare	Fatal	Medium	Maintain boat regualarly and check condition before launching. Anchor, VHF radio and flares to be onboard and in working condition. Spare boat engine to be onboard and in working condition. Should be tested on each dive.	Anchor boat if necessary while assessing situation. Abort diving and return to launch site if possible. Contact Coastguard for assistance if not.
Weather deterioration	All divers	Rare	Fatal	Medium	Latest weather forecast to be checked before launching and monitored during the day.	Diving cancelled if necessary. Diving in progress terminated using diver recall mechanism if possible.

Appendix 4

Diving Log Sheets

A	*17th February*
B	*27th April*
C	*12th July*
D	*13th July*

Dive Site:	Thor	Date:	17th February 2008
Weather:	Bright, sunny, calm, cold		

Name	Cyl. Size	O_2 %	Air In	Air Out	Time In	Time Out	Stops	Dive Time	Max. Depth	Notes
Teresa	15	21	220	140	1030	1108	1@6	38	22.3	
Mark	2x10	21	220	130	1030	1108	1@6	38	22.5	
Rhian	12	21	210	0	1050	1121	—	31	21.0	Freeflow during DSMB deployment. Surfaced on buddy's air supply
Andy	15	21	210	50	1050	1121	—	31	21.3	
Brian	15	21	215	90	1132	1204	3@6	32	22.1	
Anne	2x 10	21	220	80	1132	1204	3@6	32	22.0	

Dive Site:	Thor	Date:	27th April 2008
Weather:	Overcast, misty, calm		

Name	Cyl. Size	O_2 %	Air In	Air Out	Time In	Time Out	Stops	Dive Time	Max. Depth	Notes
Teresa	15 + 3	32	210	150	1010	1031	1@6	21	23.0	
Mark	2x 10	32	190	140	1010	1031	1@6	21	23.2	
Rhian	12 + 3	21	220	200	1025	1033	—	8	22.6	
Andy	12 + 3	21	220	190	1025	1033	—	8	22.5	
Brian	15	21	220	80	1052	1122	1@6	30	22.3	
Dave	2x 12	32	220	125	1052	1122	1@6	30	22.5	

Dive Site:	Thor	Date:	12th July 2008
Weather:	Bright, sunny, calm, warm		

Name	Cyl. Size	O_2 %	Air In	Air Out	Time In	Time Out	Stops	Dive Time	Max. Depth	Notes
Teresa	15+3	32	200	80	1047	1132	3@6	44	22.2	
Brian	15	21	230	60	1047	1132	3@6	44	21.9	
Mark	2x10	21	210	110	1202	1243	3@6	41	22.6	
Richard	15	21	210	50	1202	1243	3@6	41	22.2	
Anne	15	21	200	70	1202	1243	3@6	41	22.4	
Teresa	15+3	21	210	120	1428	1458	2@6	30	23.4	
Brian	15	21	220	100	1428	1458	2@6	30	23.2	
Mark	Diving aborted due to steering cable break. Shot retrieved.									
Richard										
Anne										

Dive Site:	Thor	Date:	13th July 2008
Weather:	Bright, sunny, calm, hot		

Name	Cyl. Size	O_2 %	Air In	Air Out	Time In	Time Out	Stops	Dive Time	Max. Depth	Notes
Mark	2x10	21	220	110	1043	1123	1@6	40	21.0	
Brian	15	21	200	50	1043	1123	1@6	40	21.0	
Teresa	15+3	33	210	100	1101	1144	3@6	43	21.5	
Richard	12	21	285	50	1101	1144	3@6	43	21.0	
Anne	15	21	190	50	1140	1218	3@6	38	21.8	
Adrian	12	21	210	95	1140	1218	3@6	38	21.7	
Mark	2x10	21	120	50	1422	1459	3@6	37	23.3	
Brian	15	21	216	59	1422	1459	3@6	37	23.0	
Teresa	15+3	21	190	120	1435	1505	3@6	30	23.4	
Richard	15	21	200	50	1435	1505	3@6	30	22.2	
Anne	12	21	210	50	1520	1558	3@6	38	23.0	
Adrian	12	21	200	60	1520	1558	3@6	38	23.0	

Appendix 5

Data Collected

Site:	Thor	Date:	12 July 2008
Divers:	Teresa, Brian		
Time In:		Time Out:	
Task:	Measure length of wreck		

Length Measurements (m)		
From	**To**	
SHOT	**midline**	7.0
DSMB	**midline**	5.03
Bearing ° of lines	270° (from wreck)	
SHOT	DSMB	40.7
DEPTHS (m)		
SHOT (1050)	21.0 (T)	20.8 (B)
DSMB (1125)	19.8 (T)	22.2 (T)
	(edge)	(top)
5 m		
10 m		
15 m		
20 m		
25 m		
30 m		
35 m		

Defined Side	
From	**To Wreck**
5 m	
10 m	
15 m	
20 m	
25 m	
30 m	
35 m	

Debris Side	
From	**To Wreck**
5 m	
10 m	
15 m	
20 m	
25 m	
30 m	
35 m	
40 m	

Site:	Thor	Date:	12 July 2008
Divers:	Mark, Richard, Anne		
Time In:		Time Out:	
Task:	Measure distances into wreck		

Length Measurements (m)		
From	**To**	
SHOT	**midline**	
DSMB	**midline**	
Bearing ° of lines		
SHOT	DSMB	40.7
DEPTHS (m)		
SHOT (1205)	21.5 (A) 21.4 (R)	21.8 (M)
DSMB		
	(edge)	(top)
5 m	22.1	19.7
10 m	21.0	20.7
15 m	21.9	21.7
20 m	21.8	21.2
25 m	22.0	20.9
30 m	22.0	20.3
35 m	21.7	19.1
(Depths taken from 1210-1230)		

Defined Side	
From	**To Wreck**
5 m	2.5
10 m	1.6
15 m	0.5
20 m	1.0
25 m	1.5
30 m	1.9
35 m	2.4

Debris Side	
From	**To Wreck**
5 m	7.4
10 m	10.11
15 m	13.22
20 m	15.53
25 m	14.08
30 m	13.46
35 m	10.68
40 m	11.25

Site:	Thor	**Date:**	13 July 2008
Divers:	Mark & Brian, Teresa & Richard, Anne & Adrian		
Time In:		**Time Out:**	
Task:	Measure length & distances into wreck (debris side)		

Length Measurements (m)		
From	**To**	
SHOT	**midline**	10.0
DSMB	**midline**	13.0&9.5
Bearing ° of lines	90° (from wreck)	
SHOT	DSMB	42.9
DEPTHS (m)		
SHOT		
DSMB		
	(edge)	(top)
5 m		
10 m	19.7	
15 m	19.8	
20 m	19.7	
25 m	18.5	
30 m	21.5	
35 m	21.6	
40 m	21.8	

Defined Side	
From	**To Wreck**
5 m	
10 m	
15 m	
20 m	
25 m	
30 m	
35 m	
Mast section:	
Length	9.42
Direction	N-S
End - Length Tape	
	6.45
Intersect on Tape	
	17.4
Diameter	0.37

Debris Side	
From	**To Wreck**
5 m	7.4
10 m	10.11
15 m	13.22
20 m	15.53
25 m	14.08
30 m	13.46
35 m	10.68
40 m	11.25