Ship, Rock, Selsey

A REPORT ON THE WRECKS OF TWO WOODEN SAILING BARGES AND THEIR CARGO OF STONE.

Alison Mayor | Southsea Sub-Aqua Club | May 19

Southsea Sub-Aqua Club

BSAC Dive with us

Contents

Foreword

The waters around Selsey Bill, West Sussex, have long been a hazardous place for sailors and from Roman times to modern day many vessels have been lost in passing this headland. This project looks at two unidentified vessels that were wrecked as they navigated around the bill.

In 2014 as part of the Southsea Sub-Aqua Club's successful Mulberry 70 project, we surveyed a site which was reported in Dive Sussex as 'likely to be associated with the Mulberry Harbour project'. The reality was very different, what appeared to be the wreck of a small wooden vessel carrying either ballast or cargo of rock/stone. Further documentary investigation identified another wreck in the area which may help us understand the wrecks and their cargo.

With the support of a grant from the British Sub-Aqua Jubilee Trust members of SSAC have conducted a number of dives on both sites to learn more about these wooden vessels, their construction and cargo in an attempt to find out more about their voyage and their loss.

Alison Mayor

Southsea Sub-Aqua Club www.southseasubaqua.org.uk

ACKNOWLEDGEMENTS

Our sincere gratitude goes to the many people and organizations who have assisted and supported us in during this challenging project and especially;

- British Sub-Aqua Jubilee Trust
- Wessex Archaeology
- Maritime Archaeology Trust (Dr Sarah Rich),
- Nautical Archaeology Society (Mark Beattie-Edwards),
- Historic England (Serena Cant)
- University of Southampton (Dr Ken Collins Senior Research Fellow Ocean and Earth Science, Faculty of Environmental and Life Sciences, National Oceanography Centre Southampton)
- University of Exeter (Dr. Jens C. Andersen, Director of Research, Camborne School of Mines)
- University of Edinburgh (Professor Brian Upton)
- The Natural History Museum (Dr Epifanio Vaccaro Curator, Petrology, Department of Earth Sciences)
- Mulberry Divers (Steve and Linda Frampton).

Cover photograph – The bow and anchor of a Thames sailing barge. (© Alison Mayor)

Ship, Rock, Selsey

1 Introduction

1.1 BACKGROUND

After a number of successful projects to investigate the remains of WW2 wrecks associated with the WW2 Normandy Campaign (Operation Neptune) Southsea Sub-Aqua Club's investigation of Mulberry Harbour remains in the waters around Selsey/Pagham resulted in the discovery of a wooden sailing vessel with a large mound of rocks. Although little remains of the wooden structure above the seabed the presence of an anchor and copper nail indicated that this wreck was likely to be of pre industrial era.

The natural curiosity of our members led us to investigate this wreck and that of another sailing vessel located nearby which was also carrying stone, albeit this time a cargo of extremely large cut blocks.

1.2 AIMS OF THE PROJECT

The aims of the Ship, Rock, Selsey project were to survey and record two wooden shipwrecks to the east of Selsey Bill in order to understand what these vessels might have looked like, where they may have started their journey and where they may have been voyaging to. By surveying the wrecks we hoped to learn more about these craft, when and how they were constructed and try to learn more about what life on board might have been like for the crew. Finally, we planned to share our findings with the local and wider community.

Both wrecks are believed to have been transporting stone at the time of their loss and we sought to confirm the type of stone/rock and where it may have been quarried from. This would help us establish the point of departure and inform thoughts on where the small sailing ships were heading. We also noted that there is a third shipwreck carrying stone blocks in Portland and if possible we will also examine this wreck to look for similarities to our two wrecks.

The project aims were to;

- Undertake a systematic survey of each wreck and produce a site plan;
- Compose a photogrammetry (3D) image and video recording for each site;
- Record notable features and artefacts for each site;
- Identify the cargo – type of stone and where it may have originated from;
- Consider what the stone cargo may have been used for – possible destination;
- Investigate the wreck structure and the likely size/design of the ship;
- Attempt to date the vessels.
- Compare the two wrecks and their cargo to identify similarities/differences.
- Publicize our findings using a variety of media, such as internet, magazines, video/you tube, talks, news organizations etc.

Being relatively close to shore (<10 miles) we were able to use our well-equipped club boat 'Southsea Explorer' to conduct the survey using photography/photogrammetry, and more traditional sketches/measurements techniques to record each site. We set aside 9 days in July 2016 over a neap tide.

In the many years since Southsea Sub-Aqua Club members first discovered the Tudor Warship 'Mary Rose', we were once again turning our attention to wooden ship wrecks and the project was a great opportunity for our members to learn about the age of sail and the many small vessels that transported vital cargo all around the British Isles and beyond. As with these projects it was also a great opportunity to improve diving skills and enjoy diving with a purpose.

2 The Wreck Sites

2.1 GENERAL LOCATION

Both sites are to the east of Selsey Bill, West Sussex and within the 20m contour line of the UKHO Chart 1652 (Selsey Bill to Beachy Head.

Figure 1 Extract from UKHO Chart 1652 Selsey Bill to North Foreland showing Site 1 and Site 2 plus other wrecks/obstructions in the area. (Source Wrecksite.eu)

Tide and slack water times were calculated using UKHO Total Tide from tidal diamond SN007H. It was observed that slack water based on High Water Portsmouth for each site was generally;

Site 1 : 90 mins before HW and 2 hours before LW

Site 2 : 90 mins before HW and 2 hours before LW.

Tidal conditions were good for this week and even allowed for some two hour slack periods. This allowed for diving in two waves at times and because the sites are relatively small it meant that the site was not too crowded.

2.2 SITE 1

The site is recorded by UKHO as an 'Obstruction' – Wreck Number 20086 as follows;

Wreck Number	20086	State =	LIVE	Classification	Unclassified
Chart Symbol	OB SW 8.7	Status	–		
Date Last Amended	20/01/2003	Reported year	–		
Charting Comments	–				
Obstruction Category	–				
WGS84 Position		50°42,869'N			
WGS84 Origin	Original				
Previous Position	Latitude	50°42,833'N	Longitude	00°41,033'W	
Position Accuracy	13 m				
Horizontal Datum	WGS (1984)				
Position Method	Differential Global Positioning System			Position Quality	Surveyed
Depth	8,7 m	Water Depth	10 m		
Depth Method	Swept by wire-drag			Depth Quality	Least depth known
Height	–	Drying Height	–		
Vertical Datum	Approximate lowest astronomical tide				
Water Level Effect	Always under water/submerged			Bottom Texture	Sand
Sonar Signal Strength	Poor				
Original Sensor	Acoustic Sensor	Last Sensor	Physical Snag		
Conspic Visual	NO	Conspic Radar	NO		
Non-Sub Contact	–	Contact Description	Other		
Name	Obstruction				
Type	WOODEN VESSEL				
Flag	–				
Dimensions (m)	LxBxD = --x--x--				
Tonnage	-- --				
Cargo	STONE				
Date Sunk					
Original Detection Year	1977	Last Detection Year	2002		
Original Source	Survey Vessel	Last Source	Naval Vessel		
Sonar Dimensions	LxWxH = 10x2x1,5				
Orientation	0°				
Magnetic Anomaly	Nil				
Debris Field	--				
Scour Depth	0 m			Scour Length	--
Scour Orientation	--				

Markers	--	
General Comments	ONLY CARGO REMAINS	
Circumstances of Loss	–	
Surveying Details		

** H4822/75 24.3.77 LOCATED 20.7.76 IN 504250N, 004102W [OGB] USING HIFIX [2 LOP]. LEAST E/S DEPTH 7.7 IN GEN DEPTH 9MTRS. NO SCOUR. (FSL WATERWITCH, HI 73/76). INS AS OBSTN 7.7MTRS. BR STD.
** H1310/82/18 12.7.82 OBSTN CONSISTS OF LARGE STONE BLOCKS LYING ON THE SCANT REMAINS OF A VERY OLD WOODEN VESSEL. PROBABLY A CARGO OF MIXON STONE. REQUEST COMMMERCIAL GUARD. (D M DILLINGHAM, 5.7.82).
** HH232/570/02 15.7.92 CONSIDERED TO BE OF ARCHAEOLOGICAL INTEREST. (ENGLISH NATURE, COASTAL ZONE PLAN INFORMATION REVIEW, 1992).
** 27.8.98 COMMERCIAL GUARD REMOVED. MORE THAN FIVE YEARS.
** HH091/003/02 20.1.03 EXAM'D 29.11.02 IN 5042.869N, 0041.142W [WGD] USING DGPS. SWEPT CLEAR 8.7, FOUL 8.9MTRS. LEAST E/S DEPTH 8.7 IN GEN DEPTH 10MTRS. NO SCOUR. LENGTH 10MTRS, WIDTH 2MTRS. DCS3 HT 1.5MTRS. LIES 000/180 DEGS. NO MAGNETIC ANOMALY. (NP 1016, HI 103). AMEND TO OSW 8.7MTRS. BR STD.

Table 1 UKHO Wreck Report 20086 (© UKHO, sourced from Wrecksite.eu).

As can be seen from the report above the wreck was initially recorded in 1977 and in 1992 a commercial guard was placed on the site as it was thought the wreck may be of archaeological interest. This guard was lifted in 1998 as time expired (5 years).

The wreck lies North/South at a general seabed depth of 10m and stands 1.5m proud. The site is a distance of 3.4nm (6.4Km) at a bearing of 120° (ESE) from the launch site at Selsey East Beach Slipway.

Between August 2002 and June 2003 this site was surveyed by Wessex Archaeology as part of a larger project 'Wrecks on the Sea Bed'[1].[2] The project was funded by the Aggregate Levy Sustainability Fund (ALSF), distributed by English Heritage (EH). The comprehensive Wessex Archaeology survey included multibeam and diver survey and concluded;

> *"Results*
> *The archaeological evidence collected during the WA surveys helped to characterise and interpret the wreck site. A final identification of the wreck could not be achieved.*
> *The so called Portland Stone Wreck was a carvel built, single masted sailing vessel, with the mast situated well forward in the front third of the vessel. The ship was approximately 15-16m long and 5.5m wide. It was fairly flat bottomed.*

[1] https://www.wessexarch.co.uk/our-work/alsf-wrecks-seabed and www.wessexarch.co.uk/news/portland-stone-wreck-site-5011

[2] Full Wessex Archaeology report can be found at https://archaeologydataservice.ac.uk/archiveDS/archiveDownload?t=arch-853-1/dissemination/pdf/Wrecks_Ecology_Final_Report_28-05-08.pdf

It probably represents the remains of a sailing barge or barge-like vessel, which sank in the second half of the 19th century with a cargo of Portland stone."

We used this report to assist us in understanding the wreck site and also to note any significant changes from that reported by Wessex Archaeology based on their 2002/3 survey.

The National Monuments Register also records this wreck (NMR Number: SZ 70 SW 14 Unique Identifier: 911222) based principally on UKHO and Wessex Archaeology data.

General Descriptive Text:

Method of Fix: HF (1)

20-JUL-1976: Located in 50 42 50.0N, 000 41 02.0W.

16-AUG-1976: Examined, least echo sounder depth 7.7m in general depth 9m. No scour.

12-JUL-1982: Obstruction consists of large stone blocks lying on the scant remains of a very old wooden vessel. Probably a cargo of Mixon stone. Request commercial guard.

15-JUL-1992: Considered to be of archaeological interest: English Nature, Coastal Zone Information Review, 1992.(1)(3)

27-AUG-1998: Commercial guard removed.

29-NOV-2002: Examined in 50 4.869N 000 41.142W (WGS) using DGPS. Swept clear 8.7m, foul 8.9m. Least Echo sounder depth 8.7m in general depth 10m. No scour. Length 10m, width 2m, DCS3 height 1.5m. Lies 000/180 degrees. No magnetic anomaly. (3)
East Bank, Outer Owers: wreck 4m proud of the seabed carrying Portland stone slabs. (2)
Seen to be located approximately 4.25 miles south of Bognor Regis. (3)
Position given as 3.94 nautical miles almost due east of Selsey Bill lighthouse in an area known as "The Park", position 50 42.874N 000 41.135W (WGS).

A variety of surveys were conducted by Wessex Archaeology. An east-west magnetic anomaly was located over the wreck which might suggest buried ferrous material. According to the sub-bottom profiler survey the wreck lies on gravelly sand with no evidence of scour.
Multibeam survey showed the wreck site to be 15-16m long and 5-6m wide, orientated ENE/WSW.
Diving revealed the wreck to be heavily overgrown with seaweed and an outline of wooden hull structure was observed on either side of the cargo of stone slabs, the port side being better preserved than the starboard side which is more obviously eroded. Two metal chain plates were fitted to port, indicating the original presence of rigging. An iron anchor was observed in the bow section, a cast iron winch, a stove and a iron pump pipe in the stern section. The cargo consists of large stone slabs, presumably of Portland stone, of differing sizes, neatly stacked in the position of the former hold. They are angled to starboard and have buried the hull structure beneath.

Interpreted as a carvel-built, single-masted sailing vessel with the mast originally set well forward. The Admiralty pattern anchor is of a pattern which postdates 1841, and iron pump pipes were used in the 1840s and 1850s. The cast iron stove is datable to the first quarter of the 19th century but remained a common type throughout the century. The best diagnostic

feature appears to be the cast iron winch which suggests a date of building in the second half of the 19th century.

The vessel dimensions, hull structure, position of the mast well forward and a cargo hold as wide as the vessel amidships all suggest a coasting barge or barge-like vessel. (4)

Sources

(1) Hydrographic Office wreck index
(2) Kendall McDonald, 1989: Dive Sussex: a diver guide, Page(s) 36 No 21.
(3) United Kingdom Hydrographic Office (UKHO) wreck report No 20086.
(4) Wrecks on the Seabed: Assessment, Evaluation and Recording: Appendix A: Archaeological Results, Page(s) 28-35"

It was noted that there were a number of inconsistencies within the data held on the NMR, including orientation and height above the sea bed.

One other reference document was identified following the Site 1 survey, namely a report by members of the Nautical Archaeology Society under the NAS Adopt a Wreck scheme[3].

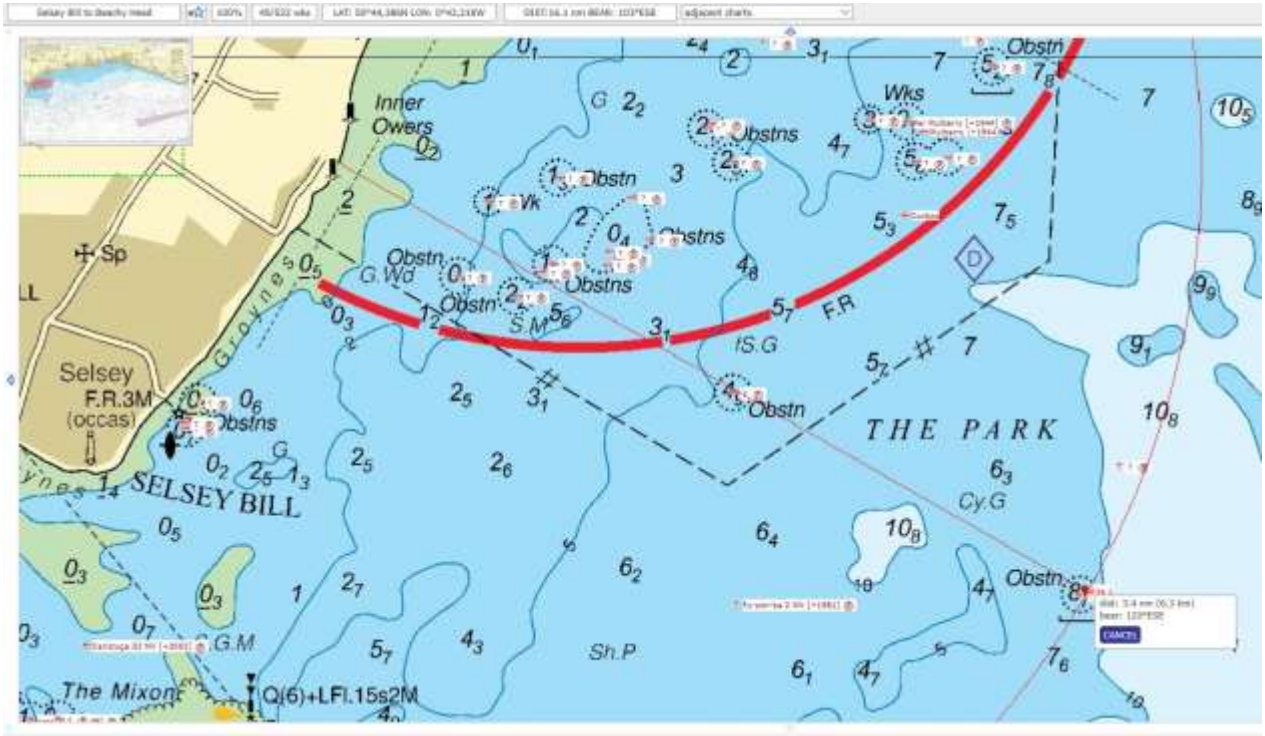


Figure 2 Extract from UKHO chart showing location of site 1 and direction/bearing from Selsey East Beach Slipway. (Sourced from Wrecksite eu)

[3] SELSEY STONE BARGE Nautical Archaeology Society Adopt a Wreck report dated 5 Oct 2005.

2.3 SITE 2

The site is recorded by UKHO as an 'Obstruction' – Wreck Number **20081** as follows;

Wreck Number	**20081**	**State =**	LIVE	**Classification**	Unclassified
Chart Symbol	OB SW 13.5	**Status**	–		
Date Last Amended	19/11/2002	**Reported year**	–		
Charting Comments	–				
Obstruction Category	–				
WGS84 Position		50°42,524'N		00°37,814'W	
WGS84 Origin	Original				
Previous Position	**Latitude**	50°42,517'N	**Longitude**	00°37,7'W	
Position Accuracy	7m				
Horizontal Datum	WGS (1984)				
Position Method	Differential Global Positioning System			**Position Quality**	Surveyed
Depth	8,5 m	**Water Depth**	14 m		
Depth Method	Swept by wire-drag			**Depth Quality**	Least depth known
Height	–	**Drying Height**	–		
Vertical Datum	Approximate lowest astronomical tide				
Water Level Effect	Always under water/submerged			**Bottom Texture**	Sand
Sonar Signal Strength	Moderate				
Original Sensor	Acoustic Sensor	**Last Sensor**	Physical Snag		
Conspic Visual	NO	**Conspic Radar**	NO		
Non-Sub Contact	–	**Contact Description**	Other		
Name	**Obstruction**				
Type	OBSTRUCTION				
Flag	–				
Dimensions (m)	LxBxD = --x--x--				
Tonnage	-- --				
Cargo					
Date Sunk					
Original Detection Year	1976	**Last Detection Year**	2002		
Original Source	Survey Vessel	**Last Source**	Naval Vessel		
Sonar Dimensions	LxWxH = 10x10x1				
Orientation	90°				
Magnetic Anomaly	Nil				
Debris Field	--				
Scour Depth	0 m			**Scour Length**	--
Scour Orientation	--				
Markers	--				

General Comments	–	
Circumstances of Loss	–	
Surveying Details		

** H4822/75 24.3.77 OBSTN EXAM'D 26.8.76 IN 504231N, 003742W [OGB] USING HIFIX [2 LOP]. LEAST E/S DEPTH 13.3 IN GEN DEPTH 14.2MTRS. NO SCOUR. (FSL WATERWITCH, HI 73/76). CHART AS OBSTN 13.3MTRS. BR STD.
** HH091/002/01 19.11.02 EXAM'D 10.9.02 IN 5042.524N, 0037.814W [WGD] USING DGPS. SWEPT CLEAR 13.5, FOUL 13.7MTRS. LEAST E/S DEPTH 13.3 IN GEN DEPTH 14.5MTRS. NO SCOUR. LENGTH 10MTRS, WIDTH 10MTRS. DCS3 HT 1MTR. NO MAGNETIC ANOMALY. (NP 1016, HI 1002). AMEND TO OSW 13.5MTRS. BR STD.

Table 2 UKHO Wreck Report 20081 (© UKHO sourced from Wrecksite.eu).

As can be seen from the UKHO report above the wreck was initially recorded in 1976. The wreck lies East/West at a general seabed depth of 14m and stands 1m proud.

The site is a distance of 5.4nm (11.1Km) at a bearing of 112° (ESE) from the launch site at Selsey East Beach Slipway.

Figure 3 Extract from UKHO chart showing location of site 2 and distance/bearing from Selsey East Beach Slipway. (Source Wrecksite.Eu)

The only other documentation we could find on this site was our own Mulberry 70 project report[4]. This report concluded that the entry in Dive Sussex was incorrect in that the wreck was not associated with the Mulberry Harbour operation but was a wooden sailing vessel with a mound of rocks (ballast or cargo). (Extract at Annex C)

[4] http://www.southseasubaqua.org.uk/images/diving_projects/Mulberry70/20150627%20Mulberry%2070%20report.pdf Site 3 Pages 21 to 25.

3 Project Methodology

3.1 PROJECT AND DIVING MANAGEMENT

All diving was conducted in accordance with BSAC Safe Diving Practices under the direction of SSAC Diving Officer Martin Davies and overseen by his appointed Dive Managers. During the main survey period in July 2016 a total of 76 individual dives were conducted (4,286 minutes) by 26 different divers. Subsequent dives have also taken place on an ad hoc basis as the wrecks are a pleasant dive due to their location, depth and prolific marine life. Divers taking part range from newly qualified Ocean Divers to Advance Diver/Technical grades.

The Dive Team

Alison Bessell	Mark Rayiru
Alison Mayor	Martin Davies
Andy Cooper	Matt Finnie
Bruce Jones	Ollie Meaden
Doug Carter	Pete Dolphin
Edward Rollins	Pippa Hardisty
Iain Jones	Richard Hobson
James Vaughan	Rob Watkins
Jeff Adams	Robyn Peel
Jenny Watkins	Sara Rich
Jim Fuller	Steve Blackburn
John Bohea	Tom Templeton
Malcolm Green	Trevor Perkins

Table 3 Main survey team (Jul 16)

3.2 LOGISTICS

The ability to base ourselves at Selsey for the week by hiring a holiday let greatly improved our ability to undertake the ambitious diving and survey programme. It meant that those diving for the majority of the week did not have to travel the 25+ mile journey each day and therefore we could make the most of a two dive day schedule. The rental house on the seafront between the slipway and the RNLI lifeboat station and thanks to the kindness of Steve Frampton from Mulberry Divers we were able to use his mooring, in sight of the house, to significantly reduce the times we needed to launch and recover our boat.

Diving gas was provided by our portable compressor set up at the holiday let. It also meant we were able to record and discuss survey data between dives and download images etc for viewing.

Figure 4 the holiday rental accommodation, built around former railway carriages. (©Alison Mayor)

3.3 DIVING METHODOLGY

All diving was conducted in accordance with BSAC Safe Diving practices and overseen by Diving Officer Martin Davies. Diving was conducted in buddy pairs, suitably matched for experience and task.

The two sites are of a depth that allows all qualified divers to participate. Where a dedicated boat coxswain was not available dives were conducted in waves to maximise participation. Due to the shallow depth of Site 1 dives on this wreck were conducted on diving gas of air using BSAC 88 Air tables. However site 2, particularly on high water dives meant that there was a benefit from diving on Nitrox 36 using BSAC Nitrox tables to ensure reasonable time to conduct our activities and provide a safety margin for divers.

The SSAC boat 'Southsea Explorer' is fully equipped with navigation, sonar and safety/rescue equipment. Therapeutic Oxygen and first aid kits are always on board and all equipment checked before each dive. The boat is fitted with a DGPS VHF radio which was used to inform Solent Coastguard of all diving activity. It was also reassuring to know that the RNLI station was close by.

Before the project began and prior to each dive a comprehensive briefing was given to all taking part. Relevant information was provided including;

• Diving team composition • Boat details, including safety equipment • Dive times to coincide with slackest possible water • Pre-dive planning using French diving tables to back up computer calculations • Risk assessment including a daily risk assessment • Daily operations plan and weather check.

All boat and diving equipment used were certified as in test/service. Oxygen and first aid equipment, boat radios and navigation equipment were checked each day. Diving operations began each day from

the slipway at East Beach, Selsey. For each site a buoy / shot line was installed for the day to aid location of the site.

3.4 SURVEY METHODOLOGY

Survey methods used in this project included;

- swim-over surveys to get a general impression of the wreck,
- detailed measurements from a control points,
- labelling of stine blocks (site 1);
- use of a metal detector (site 2);
- site recording using photography/photogrammetry and video;
- sample of stone cargo; and
- SeaSeach for marine life recording.

Before each dive a survey strategy was briefed detailing the objectives for each diving pair and each site. Where known the relevant information on the vessel's history and possible orientation/features were included. Other sources were used to expand the details of the vessels, most particularly results of earlier surveys and Wreck Site at www.wrecksite.eu. Some multi-beam data of the sites had also been gained from the Wessex Archaeology report.

Following the dive, log sheets were completed and archived. From the log sheets and reports from the dives it was possible to develop a plan for the following day and future work.

Photogrammetry

Photogrammetry relies on a disciplined and methodical approached to the survey process and is particularly challenging when underwater visibility and light penetration is poor. A degree of overlap and recognizable points assists the photogrammetry software to process multiple points (pixels) in a geometric space. In the underwater environment marine growth, movement and current provide additional challenges to obtaining a series of images that are capable of generating a 2D or 3D image.

The main reason for using photography was to be able to produce 3D images using photogrammetry[5]. Photogrammetry uses methods from many disciplines, including optics and projective geometry. Digital image capturing and photogrammetric processing includes several well defined stages, which allow the generation of 2D Orthographic projections or 3D digital models of the object as an end product. It is becoming the method of choice because of its ability to rapidly record an area and produce good accurate results.

Images were processed using AGISOFT PhotoScan software to produce 3D visualizations that can be converted to a pdf[6] image and viewed using ADOBE pdf reader or viewed in a web browser such as Google Chrome for example. Ultimately the models could be viewed using Virtual Reality (VR) technology for a fully 'immersive' experience.

[5] Photogrammetry has been defined by the American Society for Photogrammetry and Remote Sensing (ASPRS) as the art, science, and technology of obtaining reliable information about physical objects and the environment through processes of recording, measuring and interpreting photographic images and patterns of recorded radiant electromagnetic energy and other phenomena.
[6] A file format for capturing and sending electronic documents in exactly the intended format.

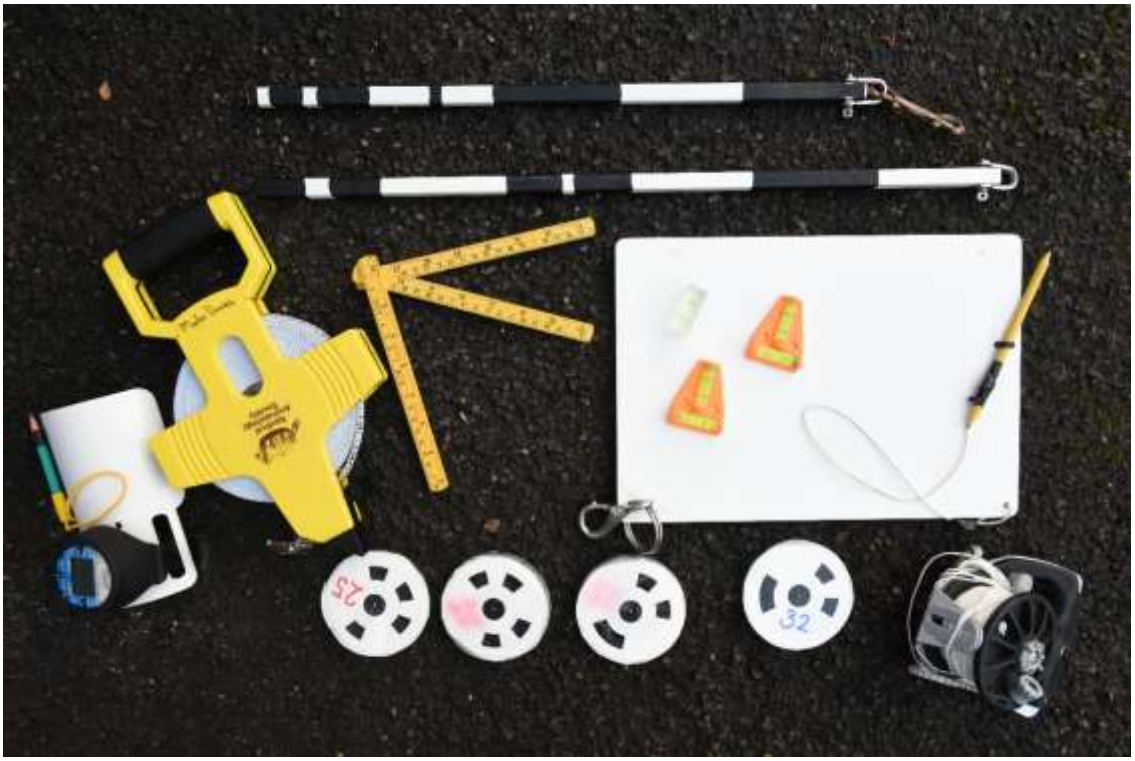


Figure 5 typical survey gear used by the team (© Martin Davies).

When visibility was poor, the collecting of large amounts of imagery was not possible and so more traditional survey methods were used alongside the digital techniques. To assist the digital techniques the use of survey markers would be used if it was felt appropriate, these markers or targets would be placed around an object and then a normal series of images could be taken. The theory is to try to get at least two markers into each image with an overlap, this then allows the software to align the images more accurately.

Figure 6 use of photogrammetry targets and scale (© Martin Davies)

3.5 SKILLS DEVELOPED

Most of the work done was by video and photography. However on some of the dives the low visibility and poor light penetration proved challenging in obtaining photographs that could be used for the photogrammetry process. Numbered individual discs that assist with photograph alignment provided some benefit as did scale bars which also proved useful as a rough measurement guide underwater.

The use of tape measures still being an essential skill to be used underwater along with recording data onto log sheets on boards and this had been practiced and refreshed in a training sessions. At the end of the diving day the most important activity was a debriefing session and log a completing session followed by a discussion of results and this made sure that the record of the day's diving could be used to contribute to the outcomes of the project.

The collaborative feedback was really useful in helping people to understand what they had been recording and resulted in increased understanding of what had been observed and recorded. Images and video were viewed on a large screen monitor to help identify key features of the wrecks, there was much debate over many of the images, which were compared to ships' plans and historic images of similar style of vessels. We also visited Boat House Number 4 in Portsmouth Historic Dockyard[7] where there is an established training facility specializing in the building and repair of boats using traditional construction methods. We took advantage of the time offered as a result of cancelled diving due to high winds to visit Boat House number 4.

Figure 7 Boat House No 4, Portsmouth Historic Dockyard, where traditional boat construction techniques are being taught to students and practiced during vessel restoration projects. (© Alison Mayor)

[7] https://www.historicdockyard.co.uk/site-attractions/attractions/boathouse-4

3.6 POST SURVEY TASKS

There were many tasks to complete after each days diving, most centred around preparing the boat for the following days diving, re-fuelling, checking oil levels and inspecting the boat making sure that everything was as it should be for the following days diving. Other tasks involved refilling the cylinders from the portable compressor this was done at the slipway area to minimize disruption at the property due to the noise of the compressor. Other key logistics were shopping for food, cooking the evening meal and washing equipment down.

The immediate processing of some of the photogrammetry images was vital to give an indication of the underwater conditions and whether there would be a successful model created.

A powerful Dell workstation was used to run the Photoscan software. This machine has a large amount of memory, twin Xeon processors and three graphics cards to give quick results of the alignment process. This information is then used as a base line for the rest of the diving on the chosen site and it is generally included in the briefing for the following dive.

In good conditions, photogrammetry and video allow the detailed capture of an object when time is limited due to depth or tidal conditions. This visual record can then be studied afterwards to identify any key features that may have been missed during the dive. Photogrammetry also provides the opportunity to accurately record to scale, this will require the use of a known scale being placed on the object or wreck and from that the software can then calculate measurements and distances.

4 Survey Findings

4.1 GENERAL OVERVIEW

The surveys confirmed that both sites are the wrecks of small coastal sailing vessels of wooden construction. The wreck of site 2 was much degraded despite being slightly deeper, and therefore potentially less disturbed by wave action. The lack of any visible machinery such as a winch, also indicated that this wreck may be older than that of site 1. Neither wreck had any significant identifiable wooden structures above seabed level.

The transport of stone by sea was relatively common place but because of the nature of the cargo the loss of vessels from cargo shifting in stormy weather would have been a key risk. Whilst the cut stone at site 1 was evidently cargo we were not able to conclude whether the mound of rock at site 2 was cargo or merely ballast.

Some of our findings for site 1 differ from those reported in the Wessex Archaeology report and are more aligned with the Nautical Archaeology Society conclusions in their observations of the wreck site.

4.2 SURVEY FINDINGS SITE 1

The wreck consists of the buried remains of a wooden vessel and a cargo of at least 17 stone blocks of what is believed to be granite (rather than Portland stone). The stone blocks vary in size and shape but are likely to have been specifically cut to be assembled into a specific designed construction. The blocks are sloped at approx. 20 degrees (from the horizontal) with the blocks to the port side mostly buried. On the starboard side stone blocks are visible up to 3 high indicating that the blocks may be three deep and that more blocks are buried on the port side. The position of the blocks also indicates that the cargo may have shifted resulting in a catastrophic loss of the vessel.

The wreck is on a course sand and gravel sea bed orientated ENE/WSW with bow to the ENE. It is dominated by the cargo of large cut stone blocks believed to weigh > 1 tonne each, some much more. The ship itself has eroded away such that no timbers protrude from the seabed and only stone or iron/metal artefacts remain. The stone is well preserved and shows no sign of erosion.

The full dimensions of the wreck are difficult to establish as neither the bow nor the stern are visible above the sea bed. Given the elevation of the stone blocks it was also not possible to accurately measure the width of the vessel though it is estimated that the width is between 5 and 6m. The length is believed to be between 15-18m but this is less certain because of the lack of visible stem/stern posts. In addition to the stone blocks, a number of other artefacts visible include an iron, Admiralty Pattern anchor, iron winch assembly, rigging features, cooking stove, iron knee and small pipe.

4.2.1 Hull structure

The wooden structure of the vessel is also mostly buried though some exposed timbers were visible on both the port and starboard side from the winch area on the port side (bow) to the end of the stone blocks. On the starboard side there were timbers partially exposed on from the first block (from the bow) to mid-way point along the stone blocks. The frames that were visible indicate a carvel type construction with the frames very close together resulting a heavy but strong hull. Frames and planking were joined by treenails with no evidence of copper nails or sheathing.

Figure 8 Timber frames from the port side (© John Bohea)

Figure 9 Treenail visible on port side. (© John Bohea)

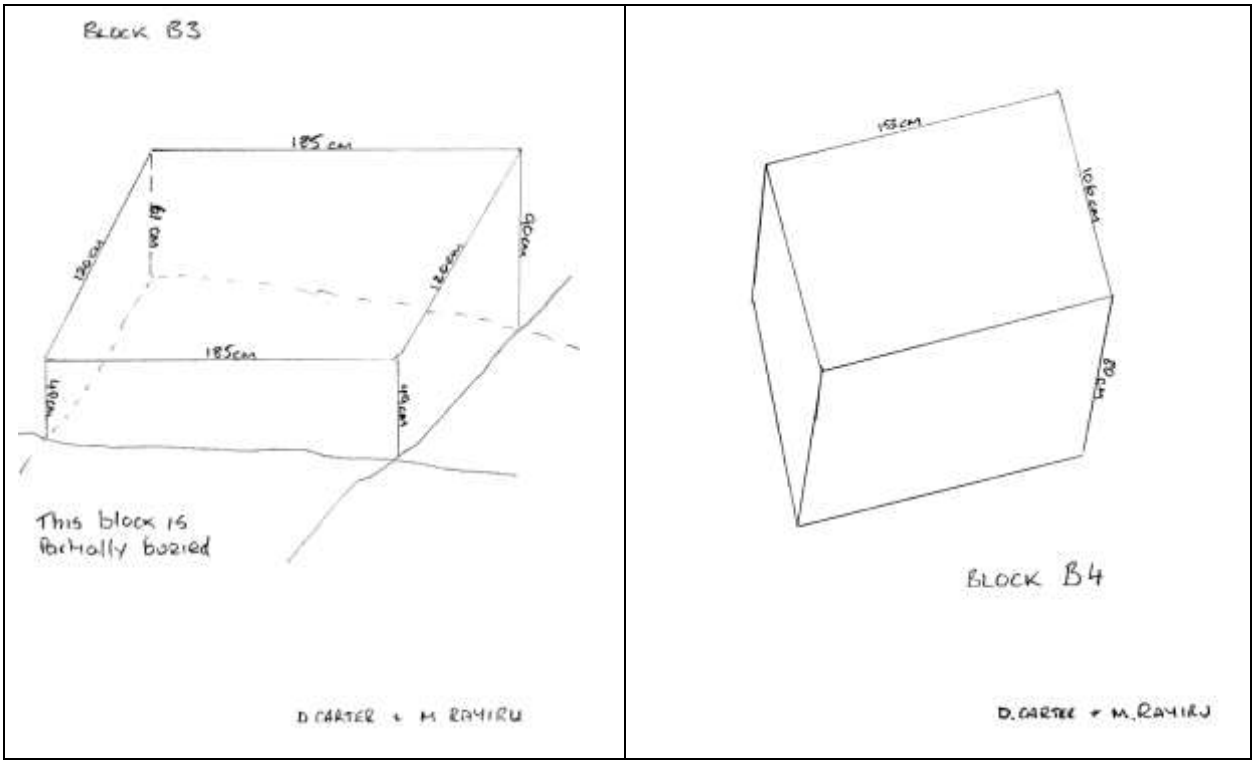
We were delighted to welcome Sarah Rich from the Maritime Archaeology Trust who is an expert archaeologist specialising in timbers. Sarah kindly examined the timbers of site 1 and produced an excellent report on her observations/recordings for which we are very grateful.

Her report is at Annex A and suggests that the majority of timbers used were European deciduous oak (*Quercus* sp). Sarah identified several frames which, if samples could be obtained, may provide sufficient tree rings >50 to enable more accurate dating of the timbers.

4.2.2 Stone Blocks

The 20 blocks that are visible are carefully stacked on top of each other, two abreast and at least two deep. Each stone appears to have been carefully shaped to enable them to be constructed together. At least 3 blocks had a rounded surface, one other appeared to have a tampered shape as if it were a key stone.

The blocks were individually numbered 1 to 20 and measurements were taken. Noting that some blocks were partially buried, sketches produced as follows for each block as follows;



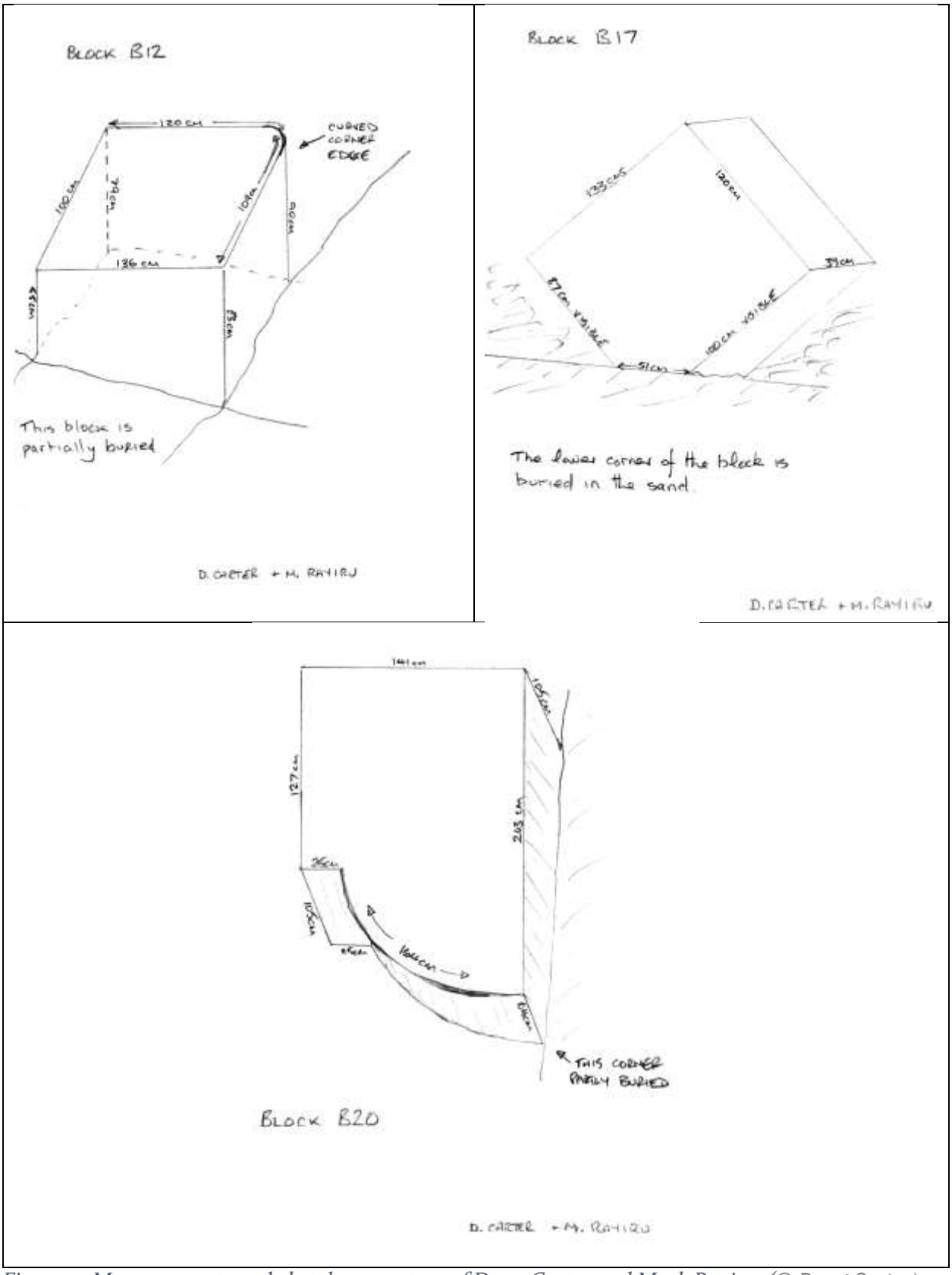


Figure 10 Measurements and sketches courtesy of Doug Carter and Mark Rayiru. (© Doug Carter)

Block 20, above is an unusual shape and at least two other blocks were the same size and shape. A fourth is assumed to be buried. These stones are understood to be 'corbel stones', built into the walls to support the roof beams.[8]

The Wessex Archaeology report presumed that the stone blocks were made of Limestone, and likely to have originated from Portland. Having removed a small patch of marine growth to expose the stone beneath the stone appear to glisten and was incredibly hard. There was no sign of fossil or erosion nor damage from marine organisms. Small samples of the stone were taken for analysis. Firstly they were photographed – see below;

Figure 11 Sample from Block 20. (© Pete Dolphin)

[8] Rodney Alcock, a past curator of Weymouth Museum. NAS Adopt a Wreck report dated 5 October 2005.

Figure 12 sample of Block 20 magnified 0.8 (© Pete Dolphin)

Figure 13 Sample from Block 14 (© Pete Dolphin)

Figure 14 Sample of Block 14 Magnified 0.8 (© Pete Dolphin)

We had hoped to have the sample analysed by the Earth Science Department in Portsmouth University but they were unable to assist us on this occasion. However we do not believe the samples are those from a limestone block. This is consistent with the NAS report (David Carter) which noted that the erosion of the surface by marine worms was not evident as with the Weymouth stone barge which has a cargo of Portland stone which would support the granite theory.

In considering the weight of these blocks it should be noted that granite weighs approximately 2.75 grams per cubic centimetre, which is 2,750 kilograms per cubic meter. On this basis the blocks are estimated to weigh between 3 and 5 metric tons each, based on a minimum of 20 blocks this would mean the total cargo is estimated at 60 to 100 metric tons.

4.2.3 Winch

The iron winch is located on the port side just forward of the hold and granite blocks. In comparison to the images taken in 2005 the winch has deteriorated significantly with the collapse of several of the reel bars.

Figure 15 Elements of the winch has collapsed. (© Martin Davies)

4.2.4 Stove

The small cooking stove at the stern would have provided the crew with both heat and cooking facilities. The stove resembles those traditionally used in Thames barges a modern version of which is still available.

Figure 16 A modern day equivalent, suitable for house boats etc.

Figure 17 the small iron stove. Note the anchor in the background. (© Martin Davies)

4.2.5 Anchor

The anchor is an Admiralty Pattern type and made of iron. It can be found towards the stern on the port side approx. 3m from the last block. The stock is 1.8m across as is the shaft. The stock and lower fluke are exposed.

The location has puzzled us as it does not align with the Wessex Archaeology description of the site. In the publicity leaflet which features a sonar image of the site and photograph (see Annex B). It was observed that this anchor, if the same as that recorded in the Wessex Archaeology report has become more exposed than in was when surveyed 10 years earlier.

It would be highly unusual for the anchor to have moved but we have not found another object in the position indicated by the Wessex publication guide.

Figure 18 the anchor. (© Martin Davies)

Figure 19 diver measuring the anchor. (© Martin Davies)

4.2.6 Photogrammetry

A photogrammetry image was created for this site (see Fig 20 to Fig 23 below) though regrettably this does not feature the anchor. Another (3rd) attempt to create a 3D model of the site to include the anchor will be attempted as soon as practicable and visibility allows.

4.3 SITE 1 CONCLUSIONS

The site has degraded significantly since the Wessex Archaeology survey in 2005 when it was reported that timbers were exposed and much of the iron features were relatively intact. The cargo remains the main element of the wreck and is unlikely to degrade due to the nature of the stone blocks.

It is our belief that the 18 cut stone blocks are not Portland stone or other type of limestone but are probably made of granite. This accords with the Nautical Archaeology Society Adopt a Wreck report dated 5 October 2005.

The NAS research into vessels lost which were carrying granite identified a likely candidate for this wreck;

> *"David Johnston searched Richard Larn's Shipwreck Index of the British Isles for the Sussex area for the period 1750-1900 and came up with 3 possible granite wrecks of which only one was of a similar size, the others were 27.12 m and 32.91 metres long.*
>
> *This sole candidate was the: ''Loftus - 23/3/1866 En route Padstow to Hurst Castle, size: 17.16 x 5.82 x 2.34 m. (Owers, near, - believed to have struck Owers, got off, foundered in force 12 Southerly)".*
>
> *Research by David Carter revealed that in 1866, a new lighthouse, called the Low Light, was built to replace the old Hurst Tower. The new lighthouse consisted of a white circular granite tower with a red lantern atop a wall of Hurst Castle and the structure still survives today. Also extensive additions were made to the castle between 1865 and 1873 known as the Victorian Wings in granite from Cornwall."*

The report of loss at the 'Owers' is consistent with the location of the wreck site.

Figure 20 Extract from UKHO chart showing position of Site 1 wreck and Outer Owers reef. (Source Wrecksite.Eu)

According to the Marine Management Organisation[9] (MMO)

> *"The limestone reef south of Selsey Bill known as the Owers represents a major hazard to shipping especially in bad weather. Groups of rocks and ledges to the south of Selsey Bill are passed through by the Looe Channel. Within the Outer Owers the Shoal of the Lead marks where the sea bed drops steeply from 0 m to 67 m and there are powerful overfalls. There is also the Mixon Hole, a steep cliff of clay capped by limestone which is a Marine SNCI and popular diving spot. It is believed to be a segment of an ancient river gorge swept clear by tidal currents. Tidal currents increase around the headlands, particularly the shallow grounds at Selsey."*

Our conclusion supports that also suggested by NAS members and that the wreck, (Site 1) is wreck is very likely to be that of the 'Loftus' and a visit to Hurst Castle to look at the stone work / architecture is being planned for the summer.

One remaining question is why the wreck is so far to the east of Hurst Castle? It is assumed that the vessel lost steerage in the storm.

9 Https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/321936/1037g.pdf

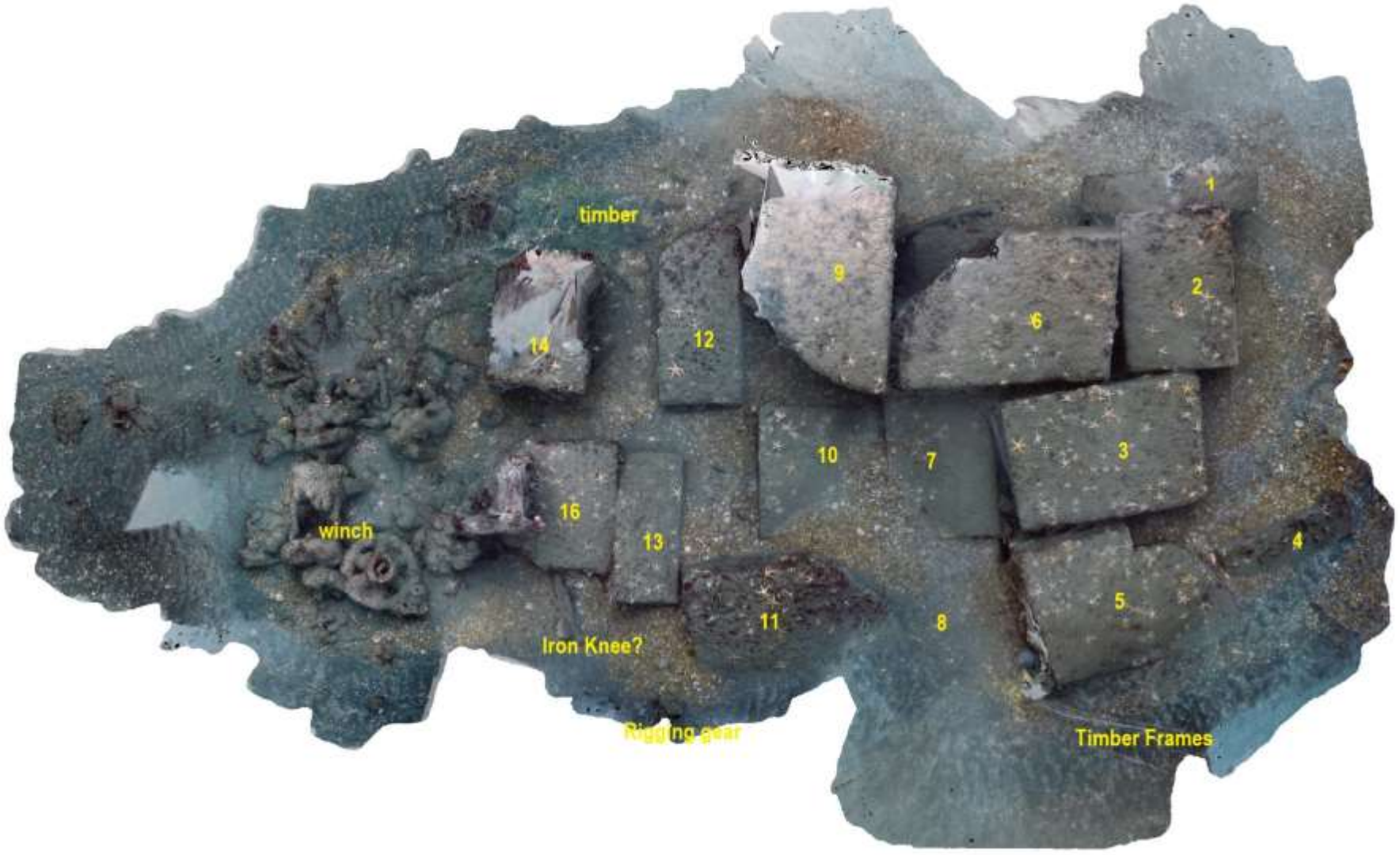


Figure 21 Extract from photogrammetry model - Plan view of site 1 bow to left (© Martin Davies)

Figure 22 Extract from Photogrammetry image - Port side view, bow to left. (© Martin Davies)

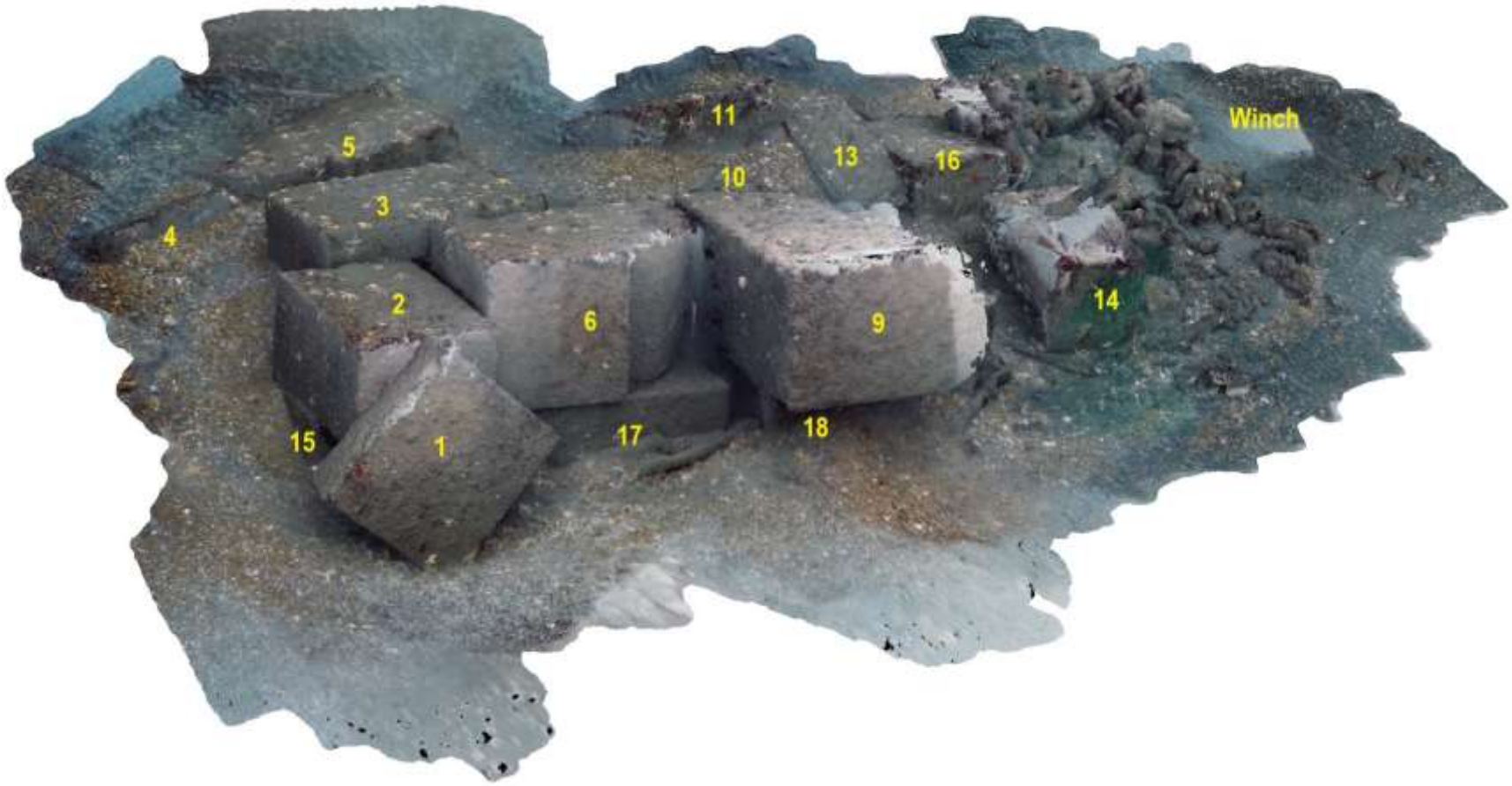


Figure 23 Extract from photogrammetry model - starboard view, bow to right. (© Martin Davies)

4.4 SURVEY FINDINGS SITE 2

This wreck is considerably degraded compared to Site 1 with little of the vessel visible. This is despite the fact that being slightly deeper (17m). The passage of time and the marine environment have all but eroded the vessel above the sea bed level. Unlike the distinctive stone block of site 1, this site has no distinguishing features to indicate this mound of rocks and stone were valuable cargo. It is likely to be a ballast mound though there is a significant volume of stones and it is possible that these could have been used in construction of roads or where a strong foundation was required.

The site comprises of a mound 10m x 7m x 1.5m (L x W x H) on a seabed of soft, fine sand. Also present are an anchor, some heavily concreted items near what is assumed to be the bow and small copper nail embedded into the mound near the stern.

There was no evidence of and mechanical features such as an engine, motor or winches which indicates that this vessel was another sailing ship and likely to be older than that of site 1.

4.4.1 Hull structure

Although a limited amount of timber can be seen near the anchor we have been unable to detect sections of hull without a degree of excavation. There was evidence of treenails but frames were not visible which meant that it was not possible to confirm the construction method of the vessel.

Figure 24 Timber exposed with concreted material (© Martin Davies)

Ideally we would like to take advice on the selection of timbers suitable for samples (as kindly provided by Dr Sara Rich) however to date this has not been possible. Also any excavation would require a MMO

license (and associated fee) though may be considered in the future in order to ascertain the nature of the vessel's construction and obtain timber samples to assist with dating.

Figure 25 Timber exposed with concreted material. (© Martin Davies)

It is assumed though certainly not proven that the anchor is near the bow but as can be observed at Site 1, the position of the anchor does not necessarily align with the bow. There are three significant 'lumps' of heavily concreted material near the anchor which are unrecognisable and would also warrant more detailed examination by an expert.

4.4.2 Stone 'Cargo' or Ballast Mound

The mound comprises of hundreds of irregular sized piece of stone ranging from 1kg to 30kgs. The stone was generally very dark/black and hard. Some surfaces were smooth, as if weathered, though others were rough with some straight edges, as if quarried.

The main questions we sought to answer were;

- Was whether the stone was cargo or simply ballast?
- If cargo, what purpose would the stone have been for?
- Where had the stone originated from? and
- What might its destination have been?

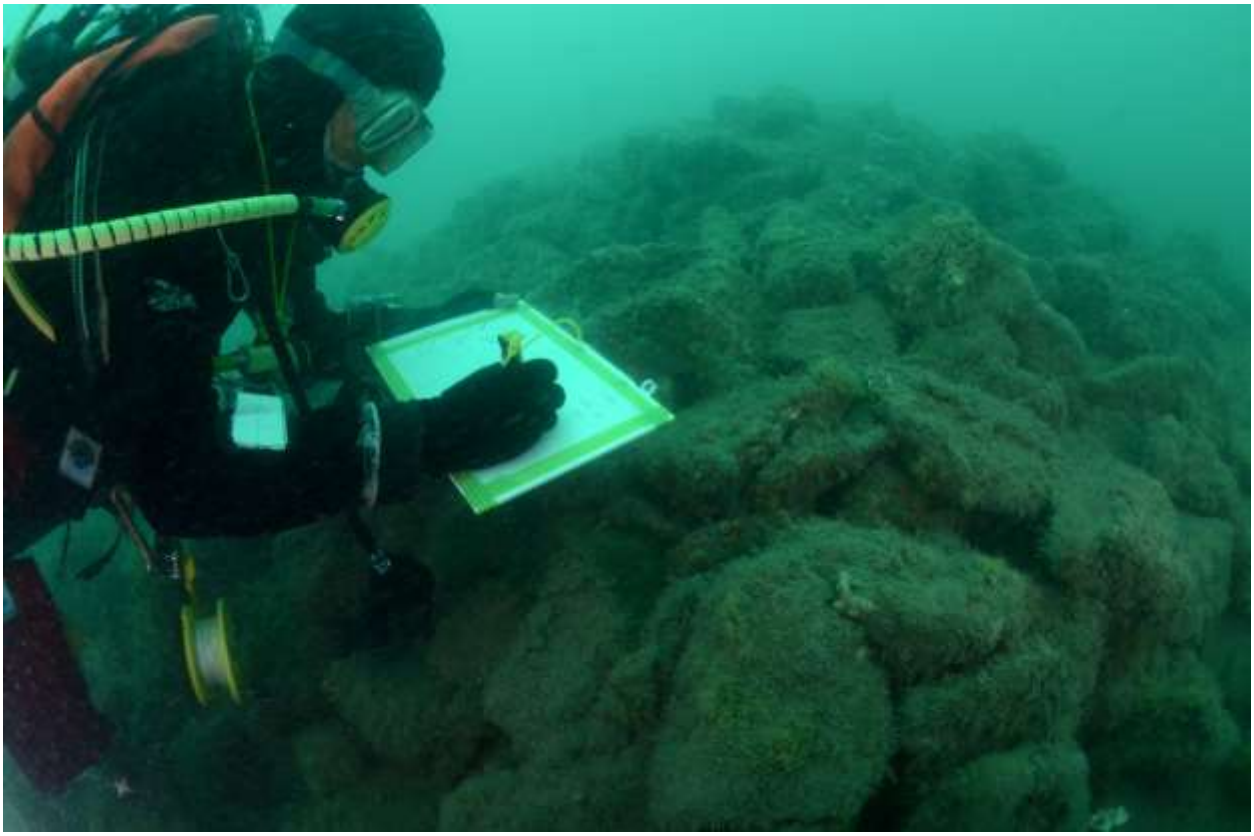


Figure 26 A diver surveying the ballast mound. (© Martin Davies)

Figure 27 Sample of rock from Site 2. Note rough and straight edges. (© Martin Davies)

With the kind assistance of BSA Jubilee Trustee Dr Ken Collins who facilitated a scientific analysis of a sample of the rock, we were only partially able to answer the above questions. The experts at University of Southampton Geology Dept identified the sample as 'Gabbro'.

Gabbro a phaneritic (coarse-grained), mafic intrusive igneous rock formed from the slow cooling of magnesium-rich and iron-rich magma into a holocrystalline mass deep beneath the Earth's surface. Slow-cooling, coarse-grained gabbro is chemically equivalent to rapid-cooling, fine-grained basalt. Much of the Earth's oceanic crust is made of gabbro, formed at mid-ocean ridges. Gabbro is also found as plutons associated with continental volcanism. Due to its variant nature, the term "gabbro" may be applied loosely to a wide range of intrusive rocks, many of which are merely "gabbroic". (Source Wikipedia)

It was also noted that the absence of pink Feldspar meant that the sample was not a granite from Cornwall but would have originated elsewhere. A thin slice of rock sample was examined under a powerful polarizing microscope, then a detailed chemical analysis of the composite minerals and was undertaken.

Dr Jens C Anderson of the Camborne School of Mines[10], reviewed the results of the chemical analysis and commented that;

> "The sample represents an igneous rock. The mineral proportions result in a classification as a '*diorite'*. However, the absence of pyroxene and abundance of biotite and hornblende is unusual for this type of rock, which may help in identifying its potential source."

The combination of rough and smooth surfaces suggested that the stone had been gathered with no specific purpose in mind and also that the source of the material would have been partly weathered by water/sand.

The suggestion was that this was sourced from an area close to the vessel, probably near the shore however it could have also been transported by river, making it more difficult to locate the origin.

Dr Epifanio Vaccaro, Curator, Petrology at the Natural History Museum, advised that:

> *"Diorite is a very common rock with a worldwide distribution, and based on the analyses only it is impossible to pin down the source."*

This conclusion means that we must explore other means of identification, including timber analysis and historical research to narrow down the possibilities for identification. It is therefore a priority to conduct a dendrochronology exercise on the timber assuming that approval to conduct limited intrusive survey to identify and sample suitable timbers. By conducting such an exercise it may be possible to narrow down the region/origin of the vessel and the date of construction.

[10] University of Exeter.

Figure 28 A sample rock from the ballast mound. Note smoothed surfaces. (© Martin Davies)

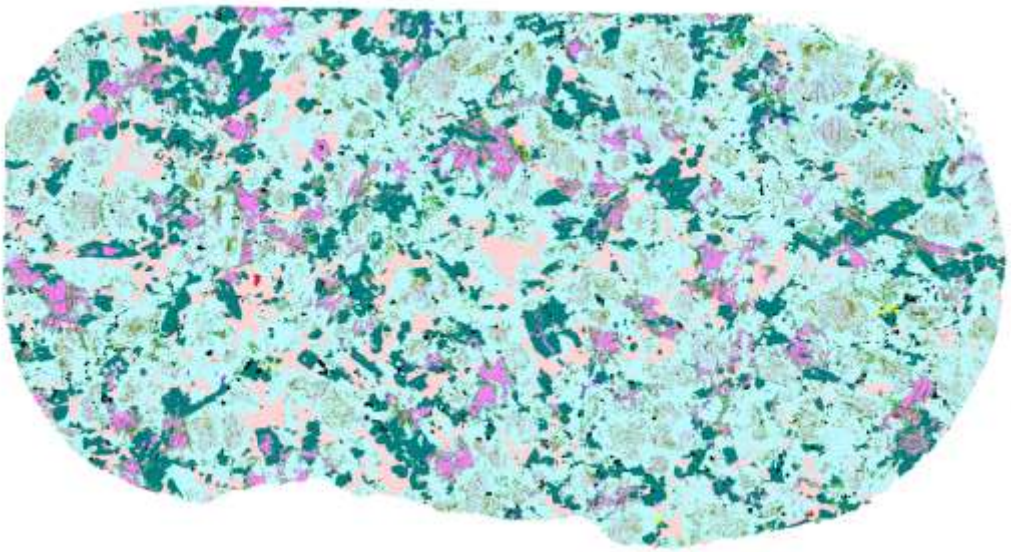


Figure 29 A thin section of the rock sample from Site 2 (© University of Southampton)

4.4.3 Copper Nail

A small copper nail was observed protruding from the ballast mound. A second piece of copper nail (without the head) was also found in the sand in the same area.

Figure 30 the copper nail is embedded in the ballast mound. (© Martin Davies)

The copper nail has a round head and round shaft. Due to it being firmly embedded in-between rocks in the ballast mound it is not possible to determine its length without removing it. However the broken nail, again with a round shaft but without the head was 22cm.

The round head of the nail is approx. 18mm across although it has a slightly irregular shape, indicating that it may have been handmade rather than by machine.

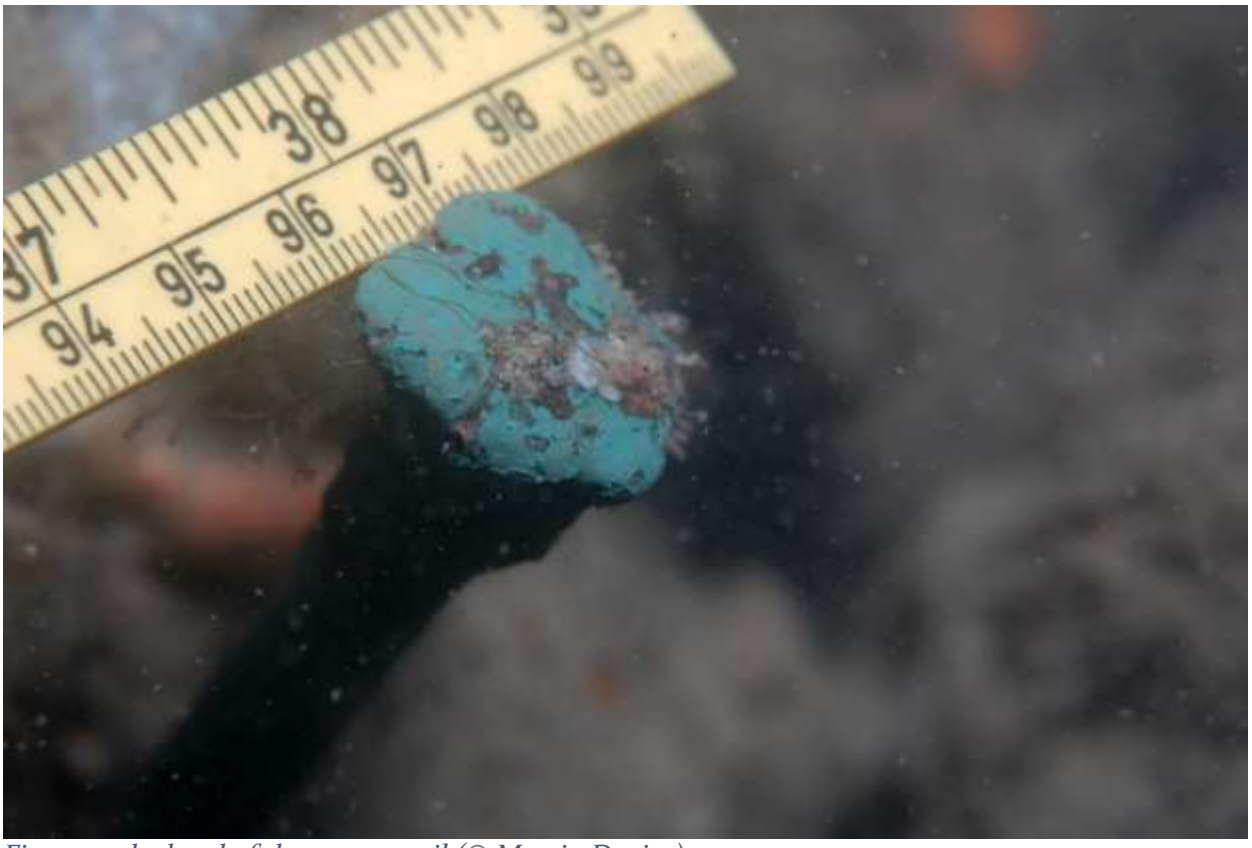


Figure 31 the head of the copper nail (© Martin Davies)

It is believed that this style of nail was used up until the mid-1700s when square shafts and heads were introduced. More regular/uniform nails became available once industrial nail making machinery was introduced.

4.4.4 Anchor

The anchor is an Admiralty style anchor though it is much degraded. It is smaller than the anchor at site 1 and partly buried. Part of the stock is missing and it is difficult to determine whether the anchor has one fluke or two. We assume it has two. Just visible near the fluke are what appear to be a couple of links of chain.

The presence of chain may indicate a more modern vessel as often anchors were secured with rope.

Figure 32 Divers surveying the anchor and fluke (© Martin Davies)

4.4.5 Photogrammetry

A three dimensional photogrammetry model of the site was successfully produced (see figures 34 to 35 below).

4.5 SITE 2 CONCLUSIONS

Disappointingly we have not been able to find out very much about the vessel or conclude how and when she may have sank. The site is much degraded and without the ability to excavate and take wood samples for dendrochronological analysis it is unlikely that we will be able to determine anything further.

We are grateful for the efforts of Dr Ken Collins in seeking help in the identification of the rock sample. Unfortunately although we now know the nature of the rock, it has not been possible to narrow down the area where the rock may have come from.

The site is likely to be that of a relatively small sailing vessel (15-20m long), which was sailing 'in ballast' having either delivered a cargo or on an outward journey to collect her cargo. We believe the possibly pre the industrial era, possibly 18th Century however the presence of chain may indicate a later date ie 19th Century.

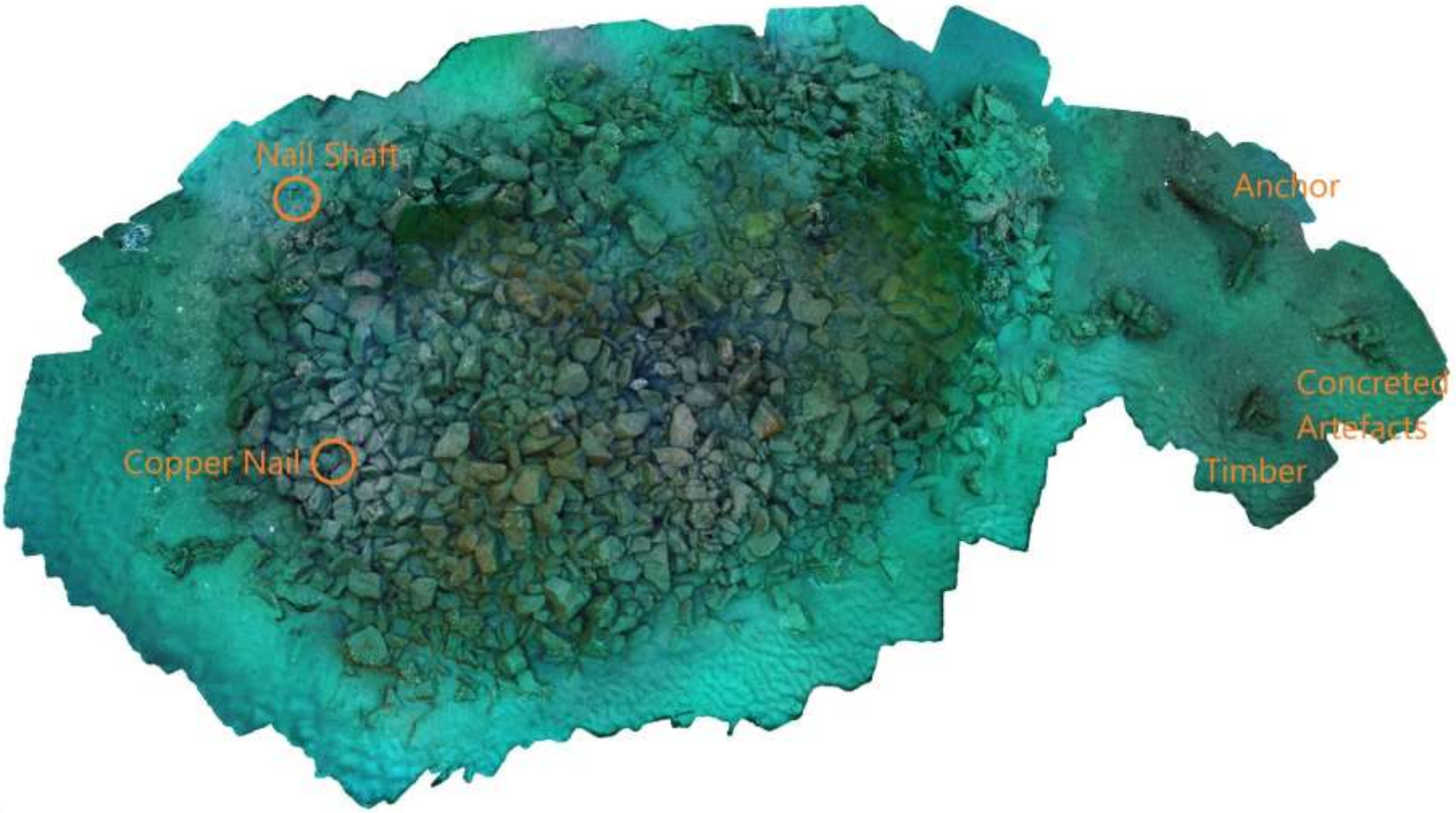


Figure 33 Extract from photogrammetry model of Site 2 - Plan view 1, Bow to the right. (© Martin Davies)

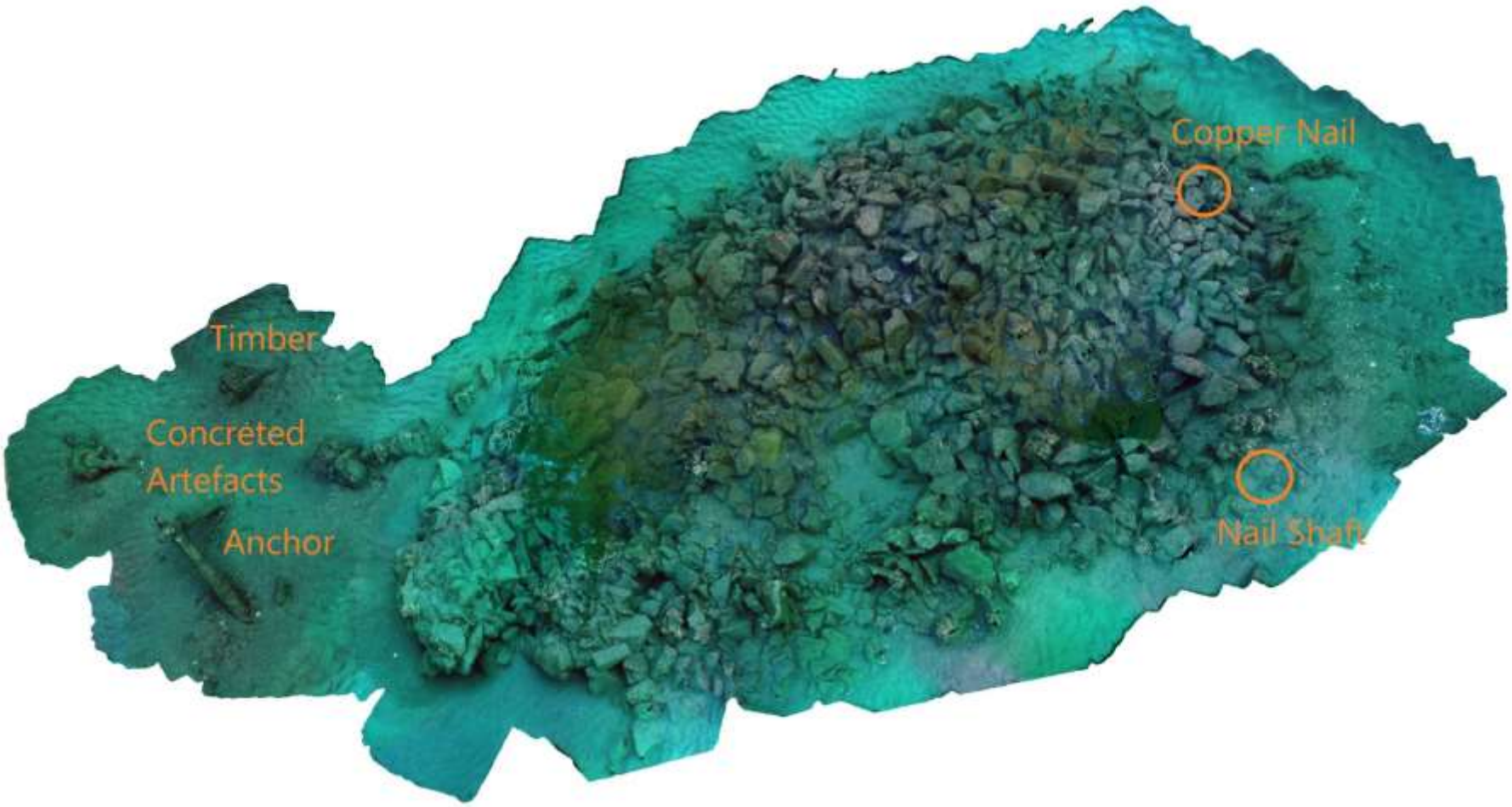


Figure 34 Extract from photogrammetry model of Site 2 – Plan view 2 – bow to the left. (© Martin Davies)

5 Ship, Rock, Selsey – Project Outcome and Summary

5.1 CONCLUSIONS

This project is the first time in recent years that SSAC members have investigated wooden wreck sites. We have learnt a lot about how sailing vessels were constructed and also how quickly they can degrade. We have also learnt about geology and the way that stone was transported by sea.

Site 1 is likely to be the sailing vessel 'Loftus' which was reported lost on the Owers on and this conclusion aligns with previous work by members of the Nautical Archaeology Society.

*''Loftus - **23/3/1866** En route Padstow to Hurst Castle, size: 17.16 x 5.82 x 2.34 m. (Owers, near, - believed to have struck Owers, got off, foundered in force 12 Southerly)".*

The large cut granite blocks (not Portland Stone as previously reported) are believed to be for part of the construction work being undertaken at Hurst Castle.

Further work on this site could be undertaken; dendrochronology and visit to Hurst Castle to view construction.

Site 2 has proven to be much more of a challenge as much of the site has degraded and the remains of the vessel are believed to be buried. Analysis of the stones/rocks have not been able to provide an indication of location of departure though have pointed towards confirmation that the rocks are likely to be ballast rather than cargo. The wreck is likely to be that of a sailing vessel, possibly mid-18th Century to mid-19th Century.

Further work on this site could be undertaken; dendrochronology and site excavation however this would require permission/License from the MMO.

5.2 SUMMARY

These wrecks are typical of the many thousands of coastal sailing barges operating around our shores. Their loss will have been only briefly recorded, if at all. In particular the events leading to Site 2's sinking and the fate of those aboard at the time may never be established.

Southsea Sub-Aqua Club members have enjoyed taking part in another successful wreck project and have increased their knowledge and understanding of the construction of wooden sailing vessels and their use in transporting goods in British waters and beyond.

This report and a short video showing the two sites will be made available on the SSAC website (www.southseasubaqua.or.uk) and SSAC You Tube channel. The photogrammetry models are available on Sketchfab website which will allow full 3D interaction and viewing of the sites.

Our sincere thanks to all who have participated and supported this project.

Annex A – MAT Report on Site 1 Timbers

Maritime Archaeology Trust

Room W1/95
National Oceanographic Centre
Southampton
SO14 3ZH
(+44) 02380 593290
www.maritimearchaeologytrust.org
info@maritimearchaeologytrust.org

In situ timber sampling and wood identification report for the Selsey Stone Barge Wreck

Dr. Sara Rich

sara.rich@maritimearchaeology.co.uk

Tel. office: 02380 237300

On 13 June 2016 seven timber samples were removed *in situ* from an unidentified shipwreck off the coast of Selsey, England, which was carrying a cargo of large pre-formed architectural blocks of granite. The barge is thought to have been in use during the mid- to late-19th century. The wood samples were removed from exposed structural timbers on what is believed to be the port side of the shipwreck (opposite of the orientation posited in the Wessex Archaeology report). The sample area is located directly between stone block B2 and fixed point CP8 (Figure 1). It is an area of exposed hull planking (inner and outer) and ends (transverse sections) of frames, with several treenails visible. From CP8, this exposed timber area extends eastward 2m and westward 5m. Because the frames' transverse sections are exposed, the majority were clearly identified as oak, but two of the frames (VII and XII) assumed a paler hue and were suspected to be of a different material. Likewise, most of the hull planks appeared black as waterlogged oak does, but one of them seemed a lighter colour and was suspected to be of coniferous wood (Table 1). Samples of planks were taken from fragile eroded ends in order to restrict damage to the shipwreck assemblage (Figure 1).

It should be noted that while not sampled, Frame VIII features very narrow growth rings and was most probably cut from a rather slow-grown oak. This frame would make an ideal sample for dendrochronology if one could be taken without too much disturbance between the planking. The absence of an exposed frame to the west could make this task more feasible (Figure 1). Other possible candidates for dendrochronological sampling are noted below (Table 1).

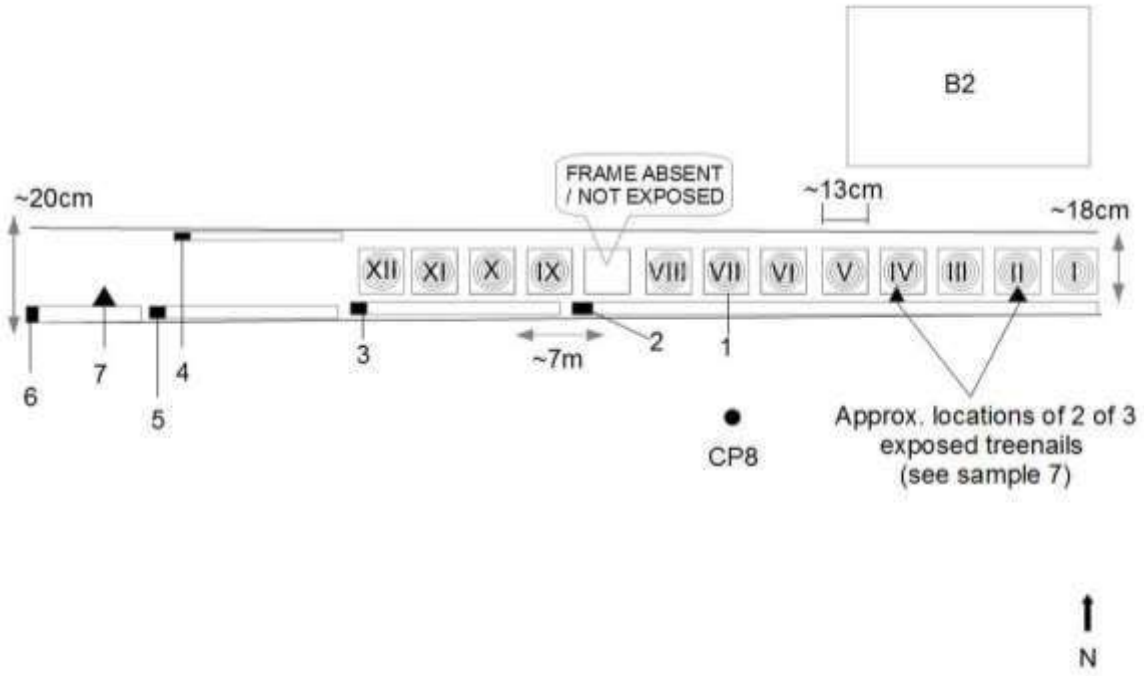


Figure 1. Schematic plan of the sample area of the Selsey Stone Barge Wreck. Plan is not to scale and sample locations (noted in Arabic numerals) are approximate.

Table 1. Results of timber samples.

Sample ID	Structural type	Genus ID	Growth	Dendrochronology
1	Frame	Deciduous oak (*Quercus* sp.)	Fast-grown	Low priority
2	Outer hull plank	Pine (*Pinus* sp.)	Moderately slow-grown	High priority
3	Outer hull plank	Deciduous oak (*Quercus* sp.)	Very fast-grown	Low priority
4	Inner hull plank	Deciduous oak (*Quercus* sp.)	Very fast-grown	Low priority
5	Outer hull plank	Deciduous oak (*Quercus* sp.)	Moderately slow-grown	Medium priority
6	Outer hull plank	Deciduous oak (*Quercus* sp.)	Slow-grown	High priority
7	Treenail	Deciduous oak (*Quercus* sp.)	Slow-grown	Low priority

Not surprisingly, the majority of timbers sampled were converted from deciduous oak (*Quercus* sp.). Unfortunately though, European deciduous oaks cannot yet be determined with wood anatomy beyond the genus level, but given the archaeological context, the species is likely to be *Q. robur* or *Q. petraea*, both of which are native to the UK. It is unknown why sample 1 (from Frame VII) appears so much lighter in colour than others surrounding it; Frame 12 looks identical to Frame VII so was not sampled, but it is presumed to also be oak. This visual difference could be due to those two timbers having been replacement frames, perhaps having been treated with a different coating or sealant of before being placed on the vessel, which could then alter the chemical reactions that occur in waterlogged wood over time. Similarly, the area's lone coniferous plank was also likely a replacement for an original oak timber that was rotten or otherwise damaged (Table 1, sample 2).

Given the density of European oak and pine dendrochronologies, three timbers in particular have been noted that would make good candidates for future sampling for dendrochronological investigations, which could provide the date of construction (oak) and the date of a possible repair (pine), the latter date providing a closer estimate of the ship's wrecking. Besides the pine plank, oak frame number VIII and the outer hull plank that provided sample 6 would be ideal for these purposes due to the apparent slow growth of the parent trees and the likelihood of >50 growth rings in the timber. The treenail that provided sample 7 was also of slow-grown oak, but due to its relatively small size, there would likely be an insufficient number of rings (<50) to provide a statistically sound date.

Annex B – Wessex Archaeology Leaflet about Site 1

Portland Stone Wreck

Where can You find it?
The Portland Stone Wreck lies in 7.7 m (CD) deep water, 3.94 nm almost due east of Selsey Bill Lighthouse, in an area called "The Park". The wreck position is 50 42.874'N, 00 41.135'W (WGS 84) or 492748 E, 91515 N (OSGB36).

How was it found?
The UKHO located the wreck site in 1976 at a least depth of 7.7 m in a general depth of 9 m. It was charted as an obstruction. In 1982 the wreck was dived on by the UKHO and described as the remains of a 'very old wooden vessel' carrying a cargo of mixon stone. Commercial guard for the wreck site was requested and granted. In 1998 the commercial guard ran out as it was in place for more than five years. In 2002 Wessex Archaeology conducted a sidescan sonar survey, a magnetometer survey as well as a short diver assessment on the wreck site. In 2003 the wreck was revisited by Wessex Archaeology. A number of geophysical surveys, including a multibeam sonar survey were carried out. In addition the site was dived and recorded.

What is left on the Seabed?

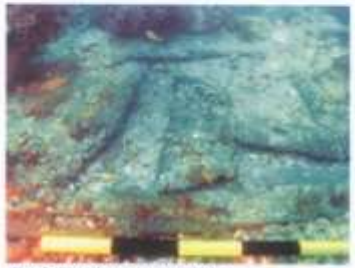
The Hull:
The outline of wooden hull structure could be observed on both sides of the cargo of stone slabs. The wreck lies buried in the seabed at an approximate angle of 17°. The bow was in the east north east, as indicated by the anchor and winch. Bow and stern structure are no longer visible. Due to the angle of the hull to the seabed, the portside of the vessel is better preserved. Frames with outer planking and ceiling planking run from a point about 2.5 m from the presumed bow to a point 3 m aft of the stone cargo. Frames, ceiling planking and outer planking are clearly visible. Frames are 15 cm18 cm sided and 15 cm moulded. Ceiling planks are 3.5 cm thick and outer planks are 5 cm thick. Length and width of these planks could not be measured. All planks are fastened by treenails of 3.5 cm diameter.


Port side hull timbers

The starboard side is eroded to a much higher degree. Hull structure was observed from a point approx. 3 m aft of the bow to directly beneath the stone slab cargo.

In the bow area the ship's sides are missing, so that floor timbers or first futtocks are visible. They are 15.5 cm wide and 15 cm deep, lying with 10 cm 15 cm spacing.

Their eroded ends are angled upwards, being only 5 cm deep. Outer planks and ceiling planks were observed with a thickness of 5 cm and 3.5 cm respectively and a width of 22 cm. Each frame is fastened to the planks with two 3.5 cm diameter treenails, approximately 7 cm apart. One of the floor timber futtocks observed consisted of two pieces. An unfastened filling piece is inserted between two frame timbers close to that position. The angle of the floor or futtock ends indicates that the chine area of the vessel must have been in or very close to the visible hull structure. The wrecked vessel was thus fairly flat-bottomed.


Starboard bow hull timbers

Rigging:
The only indication of rigging are two metal chain plates fitted to the portside. They were located about 5m from the presumed bow, 1m aft of the winch. The chain plates consist of a concreted inner and outer iron plate, fitted to ceiling and outer planking respectively. The inner plate had a width of 22 cm, but was heavily concreted. The outer plate was around 10 cm wide. The plates were fitted to frames and planking with 3.5 cm diameter iron bolts. No further chain plates were observed. Thus the vessel in question was probably single masted. The mast would have been forward of the chain plates, perhaps just aft of the winch.


Chain plate port side

Fittings:
The fittings observed on the site include an iron anchor in the bow section, a winch, a stove in the stern section and a metal pipe in the stern, possibly the remains of a pump assembly. The iron anchor is a fairly modern, small admiralty type anchor. The stock is not visible. The flukes are 34 cm long and 25 cm wide, the visible shaft length is 1.2 m and the shaft diameter is 13 cm. The lower fluke is buried in the seabed so that the fluke to fluke distance could not be measured.

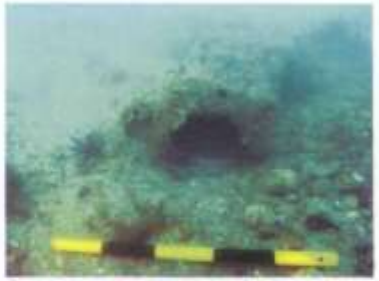
Iron winch casing

The winch is situated on the portside, about 3m from the presumed bow. It consists of a 0.98 m long iron winch casing, which is 0.57 m high. Iron bars (0.52 m long) with a diameter of 6 cm are fitted between a 29 cm and a 19 cm wide ledge on either side. The whole structure was heavily concreted. A winch drum inside the casing could not be seen. A large concreted and eroded iron feature behind the winch casing could not be identified or interpreted.

Aft of the cargo, the end of a hollow pipe was observed, sticking out of the seabed sediment. The visible length is 1.65 m. The pipe has a diameter of 25 cm, widening to 35 cm towards the end. The inner diameter is 9.5 cm.

Pump pipe

This could be a pump pipe, although the pipe wall seems to be very thick. In the far stern of the vessel, approx. 3 m from the stone cargo, a small cast iron stove was found and recorded. The 0.5 m high, 29 cm wide and 25 cm deep cast iron stove is lying on the side, attached to a broken iron baseplate. The main opening in the top has a diameter of 14.5 cm. The flue hole in a base at the back of the stove is 10 cm in diameter. The stove has an 11 cm base at the bottom, to which 5cm feet are attached. At the top, a 6 cm rim runs around the stove.



Stove

Cargo:

The cargo consists of large stone slabs, presumably of Portland stone. All slabs have different sizes, One example was measured as being 1.2 m long, 1.3 m high and 40 cm deep. The stones are neatly stacked in the position of the former hold. They are angled towards the starboard side and have buried the hull structure beneath.

What is the Portland Stone Wreck?

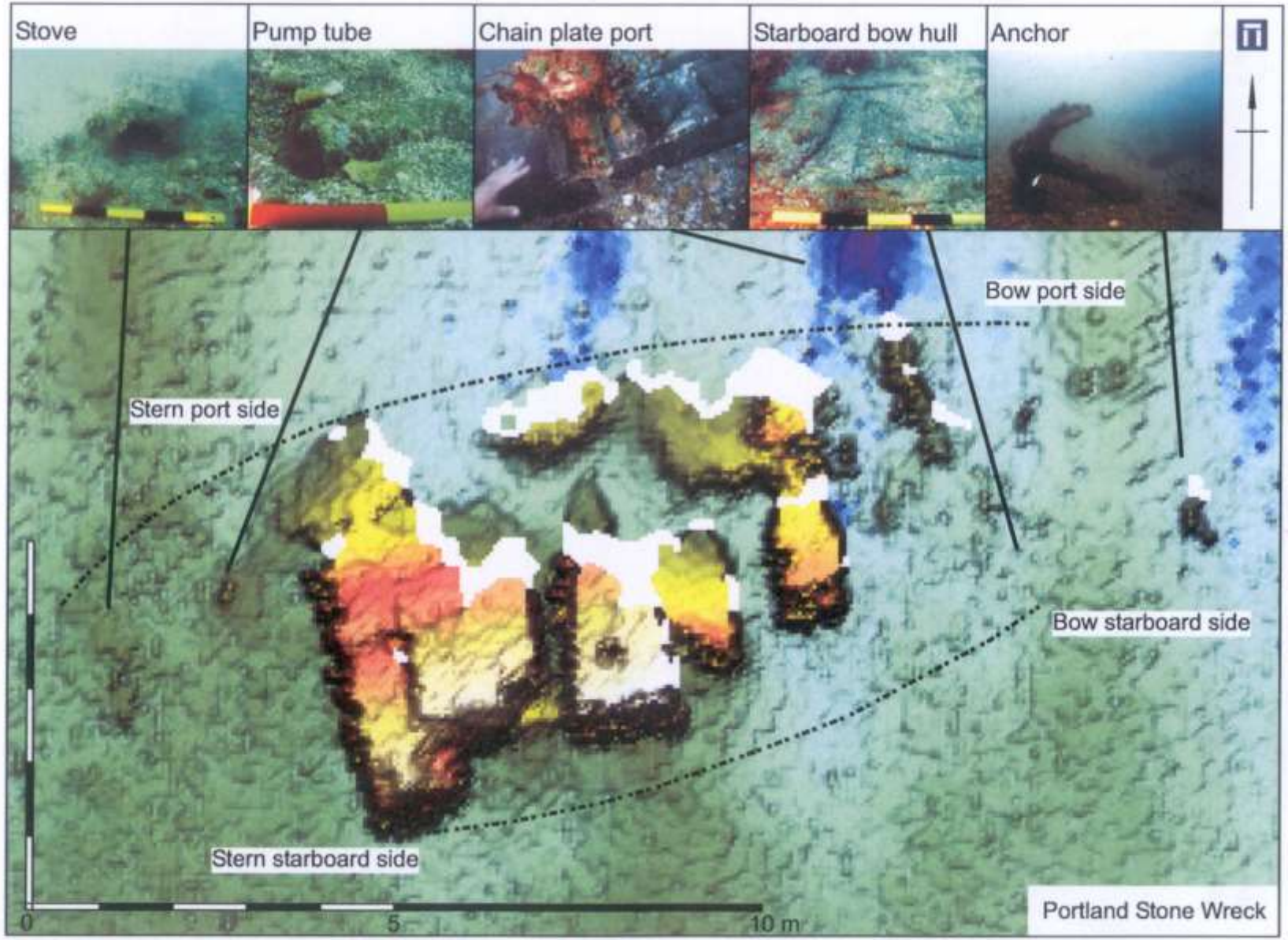
Our wreck probably was a carvel built, single masted sailing vessel, with the mast situated well forward in the front third of the vessel. The approximate length was 15 m-16 m, the greatest breadth was 5.5 m. The vessel had a fairly flat bottom. It was equipped with at least one winch for sailhandling in an iron casing and had a small admiralty type anchor. Although a windlass would also be expected on a vessel of this size, no traces of this were found. The cargo hold amidships was approx. 5 m long and extended well toward to the sides of the vessel, probably leaving only narrow side decks. Aft of the cargo hold, the cabin was equipped with a cast iron stove. The ship probably had a pump with cast-iron pipe. Frames were fastened to planks with treenails, but the metal chainplates were fastened with iron bolts.

Diagnostic artefacts include the anchor, winch and pump pipe. Admiralty anchors were the most popular anchor types throughout the 18th and early 19th century. This modern variation came into use in 1841. Anchors had however a very long lifespan, especially in merchant ships, so that the anchor cannot reliably be used for dating. Iron pump pipes came in use in the 1840s and 50s. The cast iron stove dates to the first quarter of the 19th century, but the general small stove design did not change much during the century. The best indication is probably the iron winch casing. Such cast iron winches came into use in the latter years of the 19th century on barges. Boats built from the 1870s very often had iron winches.

Multibeam image of th wreck site

It is highly likely that the ship was built during the second half of the 19th century. Portland limestone has been quarried throughout the 19th century. Before the existence of railway lines the stone was usually transported by sea. A number of simple piers were built, so that the stone slabs could be loaded onto sailing barges or ships for easier transport. A breakwater for Portland Harbour was only constructed in 1843. Many buildings in London and other cities are built from Portland stone.

Altogether the Portland Stone Wreck can be described as a single masted barge or barge like vessel, 15 m 16 m long and 5.6 m wide, dating to the second half of the 19th century. The exact type cannot be established.


Stove
Pump tube
Chain plate port
Starboard bow hull
Anchor
Bow port side
Stern port side
Bow starboard side
Stern starboard side
0
5
10 m
Portland Stone Wreck

Annex C - Extract from SSAC Mulberry 70 Report (2015) Site 2

3 Obstruction - Unidentified ("likely to be part of Mulberry")

UKHO Site reference 20081 - Dive Sussex site 96. Position 50° 42'.523N 000° 37'.794W

Maximum Depth 17m average depth 15.3m, water temperature 18C.

This was our first major surprise of the survey. A little further out than The Park area the wreck was picked up relatively easily by the sonar equipment. Slightly over 10m in length and rising 1.7m from the flat sea bed we placed our shot about 5m from the wreck.

The wreck site was a mass of irregular shaped rocks, each approx 25-30cm in size. The rocks were in an oval shape mound which was clearly defined around the edge. Near one end we found a copper nail extending out about 15cm from the rocks. It had a round head and shaft and was green in colour as is normal for copper. At the other end of the site there were some irregular shaped objects which appeared to be concreted metal. What resembled the stock of an anchor could be seen with part of the fluke just visible. Wooden timbers were also sighted just below the surface of the sand, occasional protruding from the sea bed.

We hope to investigate this wreck further, very early research on copper nails in ship building would indicate that round head with round shaft usually older pre 18th Century then square head square shaft from mid-18th Century through modern times. We are keen to learn whether the rocks were cargo or ballast and if more can be established from the anchor and other artefacts.

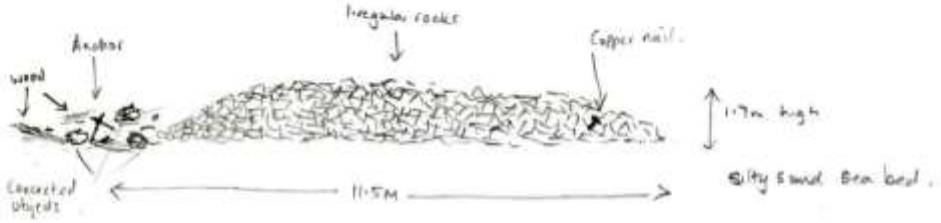
One thing that we are confident of is that the wreck site is very unlikely to be connected with Mulberry harbours.

3. Unidentified obstruction

NCHO 2008 Dive Sussex site No(17). Unidentified obstruction - likely to be part of Mulberry operations

Depth 17m

50 42.523 N
00 37.791 W



Comment

Remains of a wooden vessel Rocks cargo or ballast? Anchor and other metal objects (or bow?)
Copper nail round head + shaft extends 16cm from rocks.

Figure 1. Not the remains of a Mulberry but an old wooden **shipwreck.** (© Alison Mayor)

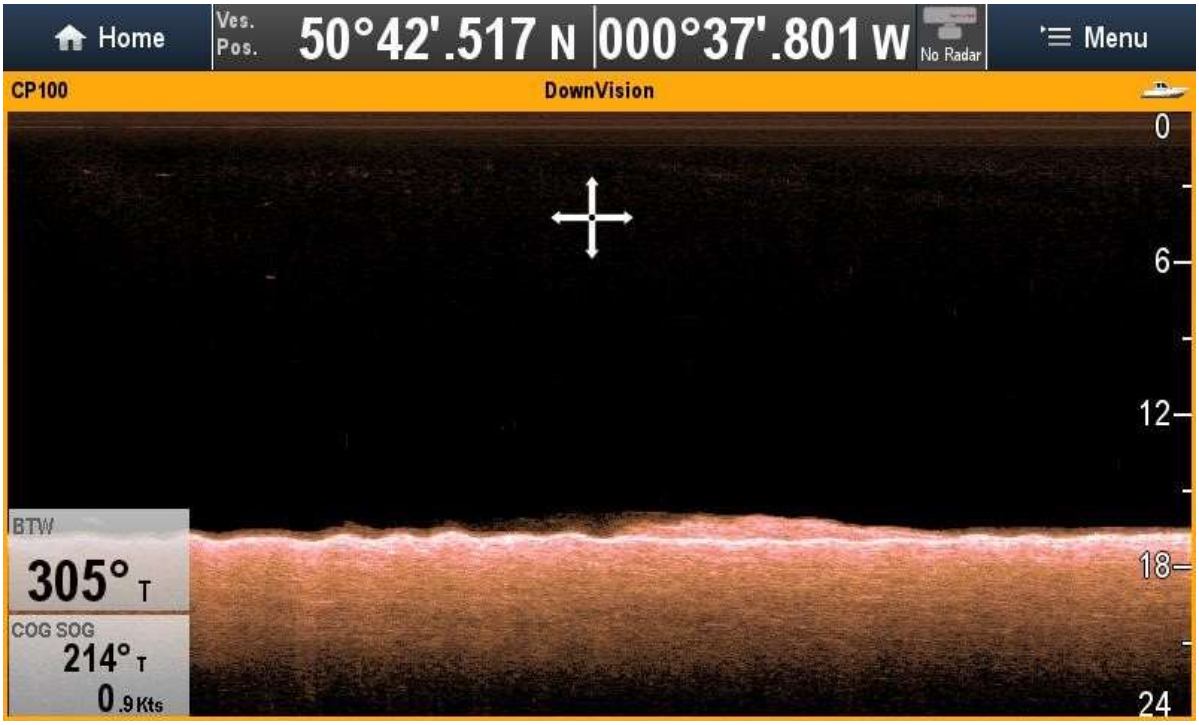


Figure 2 Sonar image of the mound of rocks.

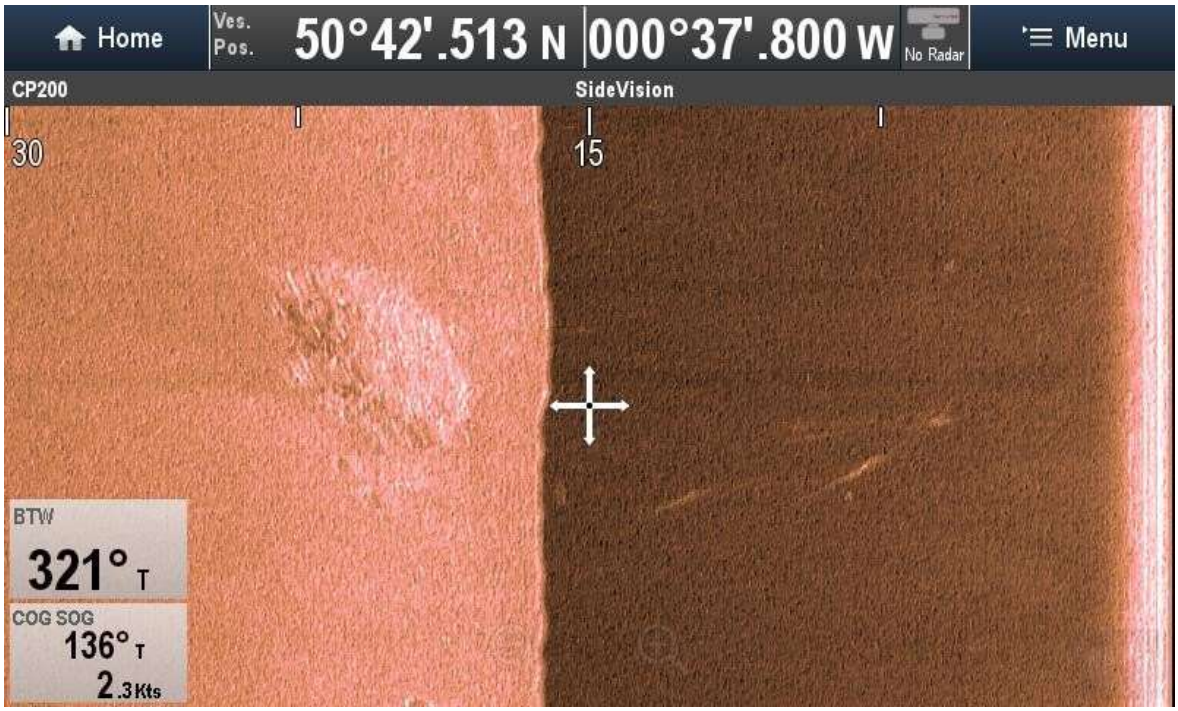


Figure 3 Side scan image of the wreck site showing the oval rock mound.

Figure 4. The anchor rests on the sandy sea bed. (© Martin Davies)

Figure 5 Diver measuring the anchor. (© Martin Davies)

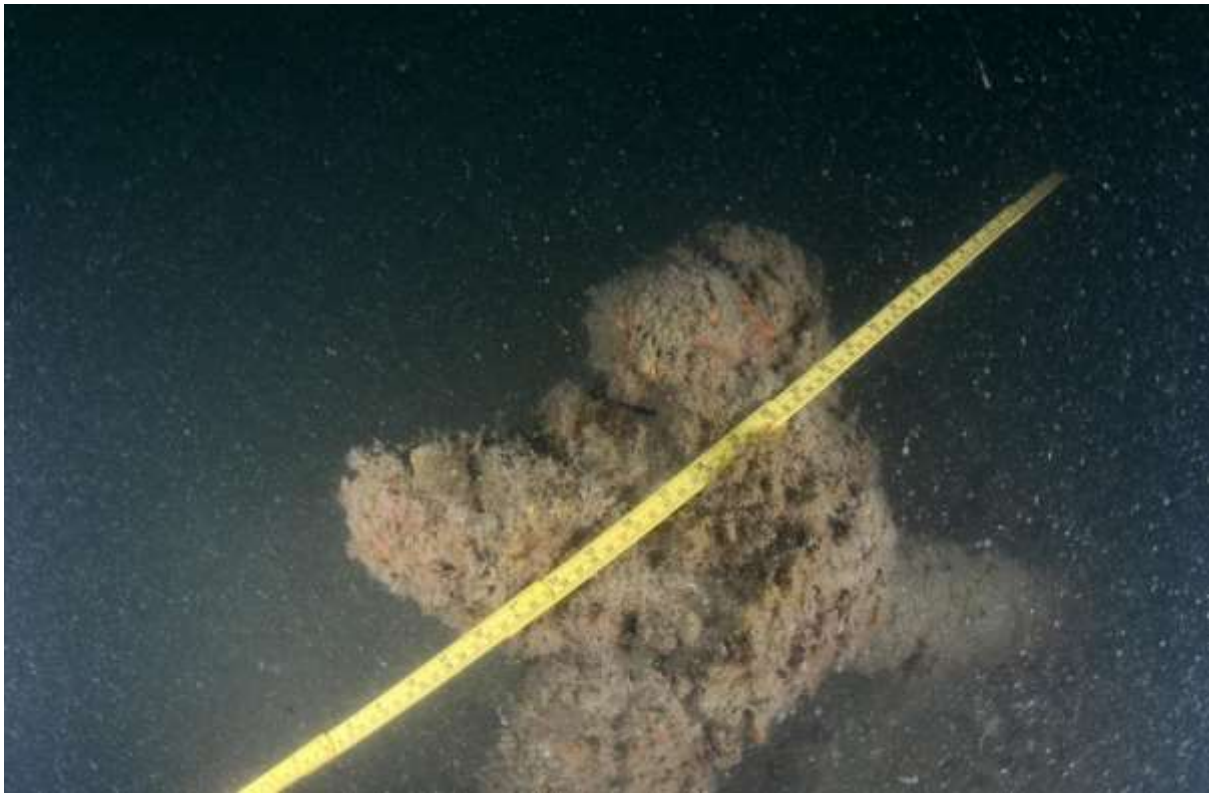


Figure 6 the top of the anchor. (© Martin Davies)

Figure 7 Exposed timbers and concreted objects. (© Martin Davies)

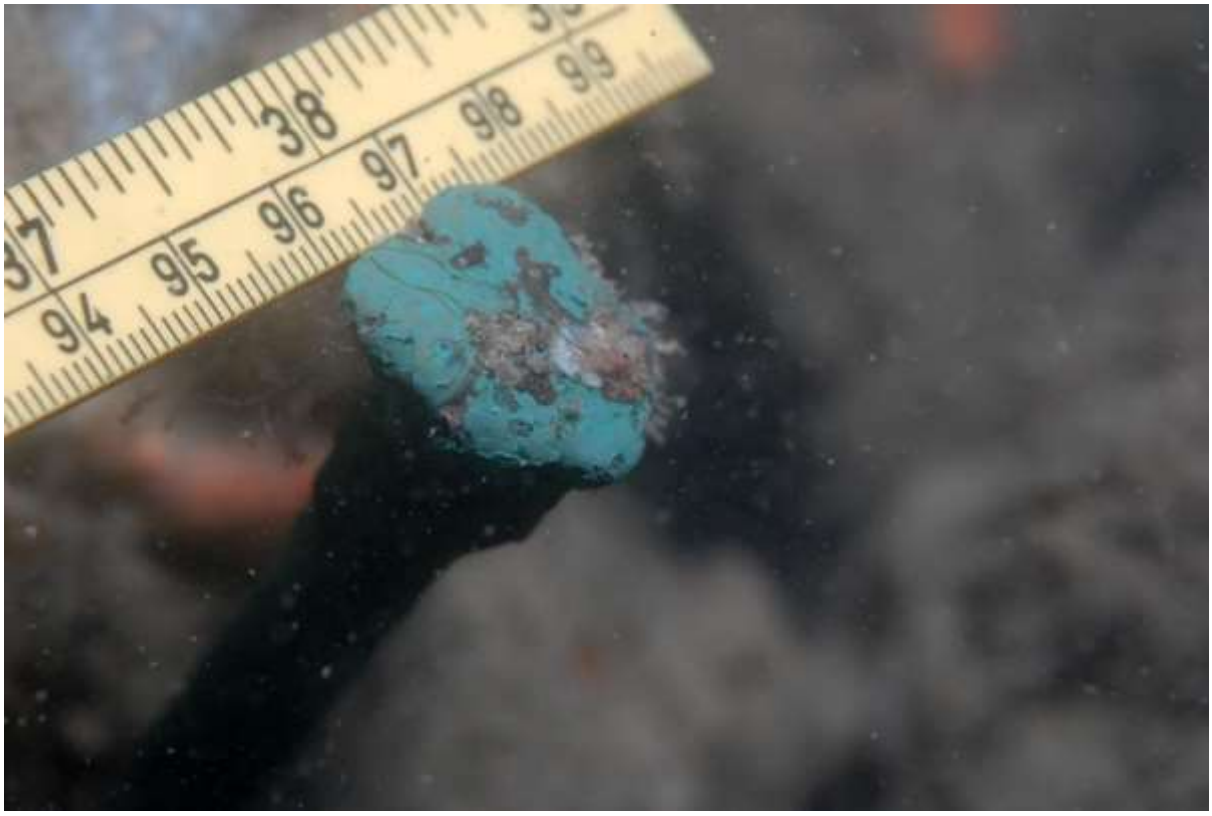


Figure 8 the copper nail protrudes from the rocks. (© Martin Davies)

Figure 9 A diver measures the copper nail. (© Martin Davies)