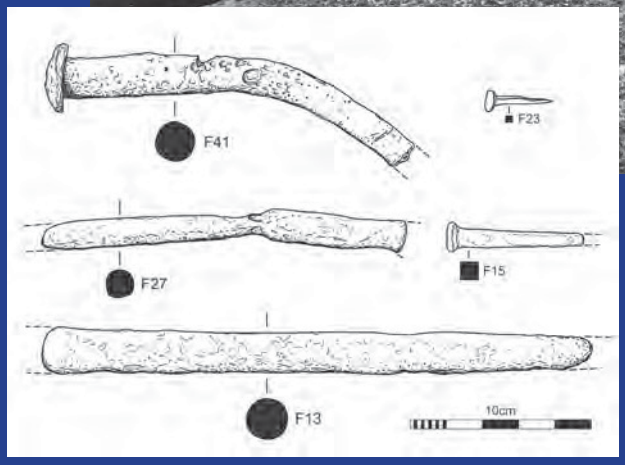
Hampshire & Wight Trust for MARITIME Archaeology

ALSF Mystery Wreck

The Flower of Ugie:
Site Management Report



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This report has been written by Julian Whitewright, Julie Satchell and Virginia Dellino-Musgrave. The ALSF Mystery Wreck Project has been managed by Virginia Dellino-Musgrave and Julie Satchell. This report provides the management recommendations for the site of the *Flower of Ugie*, a full report into the archaeological and historical investigation of the site has also been produced and will be fully published in due course (Whitewright & Satchell Forthcoming). Some elements of this report have been derived, or fully reproduced from, that publication and this is noted accordingly, where applicable.

IV. COPYRIGHT STATEMENT

V. SUMMARY

The *Flower of Ugie* was a sailing barque, built in Sunderland in 1838. The vessel had a successful fourteen year career sailing to destinations in South Asia, the Far East, the Mediterranean, Black Sea, Baltic and North America. The vessel was wrecked on the Horse Tail Sand in the Eastern Solent on 27th December 1852 while en-route between Sunderland and Carthagena, Spain.

Archaeological diving work by HWTMA began on a shipwreck site in the Eastern Solent in 2004 following a report from a fisherman of a net snag on a previously unknown obstruction. Survey between 2004 and 2008 revealed the remains of a wooden shipwreck, lying in two large pieces with an additional area of dispersed remains. At the time, the identification of the vessel remained unknown. Due to the urgent need to establish the date and identity of the vessel to help determine its archaeological significance and develop sustainable long-term monitoring and management of the site, funding from the Aggregates Levy Sustainability Fund (ALSF), distributed by English Heritage, was awarded to the project. A program of investigation into the material characteristics of the vessel (dendrochronology, timber species analysis, metal analysis, ship structure, small finds) was undertaken and indicated an early/mid-19th century date. Historical research and correlation with the recorded shipwreck losses for a 10 km area around the site revealed that that shipwreck represented the remains of the *Flower of Ugie*.

The archaeological and historical research into the vessel will result in the publication of a monograph in 2011. However, approaches to the management and future monitoring of the site are still being developed (this volume). The shipwreck lies within an area licensed for aggregate extraction (Aggregate Area 122/2-UMD) although the area is currently inactive with no current plans for future extraction, a voluntary exclusion zone has been established around the site by the developer. The first stage of the ALSF project reviewed all available data and artefacts recovered from the site and put them in context through desk based research on the historic shipwrecks of the area. The assessment and analysis of geophysical data, kindly facilitated by UMD, provided information on the site and surrounding seabed. Further context for the site, was obtained through research on the environment of the area and interpretation of other available datasets which helped determine the principal environmental impacts on the site. Geophysical data has indicated a general tendency toward sediment loss in the area over the last ten to twelve years.

During the 2009 season of fieldwork, a series of monitoring points were installed around the site. These are intended to allow the specific monitoring of sediment loss/accumulation at specific areas of

the site. Observation of the site since 2004 has indicated that the exposure of timber due to sediment loss is usually followed by subsequent degradation as a result of biological and physical processes. Similarly the site is at risk from damage resulting from further fishing net-snags and the removal of metal items by casual diving.

The *Flower of Ugie* is a virtually unique set of shipwreck remains within English and UK waters. Although other 19th century vessels exist and are protected, no merchant vessels with the global history and significance of the *Flower of Ugie* are currently designated. Investigation and study of the vessel have highlighted its significance and its current vulnerability. The future potential of the vessel to add further to our knowledge of mid-19th century shipbuilding, trade, colonial and maritime society is also noted. Finally, this report details recommendations for the future monitoring, management and protection of this important piece of the UK's underwater cultural heritage. These recommendations can be summarised as follows;

- Continued monitoring of the site at a micro-scale and also at a macro-scale to continue to observe the sediment regime across the site and to catalogue any changes to the visible seabed structure.
- Designation of the site as a Protected Historic Shipwreck under the Protection of Wrecks Act (1973). Designation would mitigate the potentially harmful effects of future aggregate extraction, fishing activity and interference from divers.
- Consideration of the application of pro-active measures to stabilise the sediment regime on the site, if monitoring of the site indicates sediment loss, leading to a subsequent increase in the degradation of the site.

1. Introduction

1.1 PROJECT OVERVIEW

The 'Mystery Wreck' comprises the remains of a wooden vessel that was first located in 2003 when a fisherman snagged his nets on an obstruction. The Hampshire and Wight Trust for Maritime Archaeology (HWTMA) were invited to investigate the site and discovered the substantial remains of a wooden shipwreck lying exposed just off the south eastern edge of Horsetail Sands. This site was given a working name of the 'Unidentified Wreck' and hence the site code of UNID. However, it has become most commonly referred to as the 'Mystery Wreck' during fieldwork seasons. Archaeological and historical research has identified the site as the remains of the sailing barque *Flower of Ugie* (1838-1852).

Over subsequent years, the HWTMA have been working to establish a pre-disturbance survey of the site. This work has been limited due to available funds and the sheer size of the site. Although the remains are relatively flat to the seabed they include two sections of wooden hull measuring up to 20m in length, 23m apart. Between the two pieces of structure lie a range of ships fittings. Diving investigation undertaken to date has involved a mixture of a professional dive team working alongside a student and volunteer dive team. This fulfils educational and learning objectives in terms of enabling hands-on involvement with underwater sites and developing capacity, knowledge and appreciation of the marine environment and survey skills.

After initial investigation in 2004, contact with United Marine Dredging (UMD), a division of Tarmac Ltd, was established as the site lies within a licensed dredging area (122/2) that was licenced by the Crown Estate prior to any requirements for an EIA (therefore, the site did not have a full archaeological assessment). An exclusion zone was established around the site to prevent any damage. Through this preliminary work, HWTMA recognised the potential of this site to contribute significantly to the Aggregate Levy Sustainability Fund (ALSF) research priorities related to both cultural heritage and the marine environment within aggregate dredging licence areas.

Following application, funding for further work on the site was received from the ALSF in the second half of 2008. This project was split into four stages of work which are summarised as follows:

- **Stage One**: Desk based assessment and artefact analysis, the full results of which are included within 'The Mystery Wreck (Aggregate Area 122/2 UMD), Eastern Solent: Stage One report' (see HWTMA 2009).
- **Stage Two**: Recording – involved diving fieldwork to enhance understanding of the site based on the findings from stage one and installed monitoring points around the wreck to be used for long term management of the site. There was also public awareness raising events and opportunities for volunteer diver skill development within this stage. Results of this stage are included within 'The 'Mystery Wreck', (Aggregate Area 122/2 - UMD), Eastern Solent. Stage Two: Fieldwork Report and Updated Research Design' (see HWTMA 2010).
- **Stage Three**: Analysis – involved a variety of specialist analysis of the data gathered as part of Stage Two. This includes ship structure, copper fastenings, iron components, timber and pottery, and further historical research based on the new findings, resulting in the submission of a draft publication on the site (see Whitewright & Satchell Forthcoming). Results were used to develop a significance assessment of the site and put forward recommendations for future management and monitoring (this report).
- **Stage Four**: Publication and archiving – Final preparation and submission to publishers of the draft publication. Preparation and submission of archive for deposition. There will also be dissemination through presentation of the project to relevant conferences and at public events and through HWTMA Education and Outreach activities.

1.2 ALSF Mystery Wreck Project: Aims & Objectives

This section re-states the original ALSF Project Aims and Objectives. The methodology that was developed and which guided the successfully completed research, both field and desk-based is contained in the Stage One and Two project reports (HWTMA 2009; 2010).[1]

1.2.1 Aim:

To undertake archaeological investigation of the 'Mystery Wreck', lying within aggregate licence area 122/2, off Horsetail Sands, to inform future management and monitoring approaches

1.2.2 Scientific and Research Objectives

These objectives relate to all project stages.

1. To undertake an archaeological desk-based assessment (DBA) to inform site survey approaches, assess historical wrecking information and review prevailing environmental conditions on the site.
2. To assess any currently available geophysical survey data to inform archaeological assessment, monitoring and management approaches (data to be supplied by UMD, a division of Tarmac Ltd).
3. To assess currently available survey data, timber and artefact samples to investigate the age and identity of the site and inform recording strategies for diving fieldwork in stage two.
4. To undertake diver recording of the wreck to develop survey of the seabed archive and establish seabed monitoring mechanisms, this will assist with the significance assessment of the site to inform future monitoring and management. It will help develop best practice in relation to the management of historic sites within marine aggregate license areas.
5. To assess the diving and recording methodology employed as a cost effective approach to historic wreck assessment.
6. To undertake specialist analysis of the ship structure and artefact assemblage to inform understanding of the ship to focus further detailed vessel research.
7. To develop informed management and monitoring recommendations and approaches for the site based on the principle of sustainability.
8. To use the site as a case study example for the development of approaches to marine sites within the framework proposed in the draft Heritage Protection Bill.
9. To disseminate the results to the scientific community.

1.2.3 Education, Training and Outreach Objectives:

1. To raise public awareness of issues associated with aggregate dredging and the marine environment utilising the 'Mystery Wreck' as a case study
2. To feed the results into any wider ALSF education and outreach projects that may be on-going during this EH and MEPF funding round
3. To provide an opportunity for students to dive alongside professional divers to help training, raising capacity and career development of future marine archaeologists

[1] Stage 1 and Stage 2 reports can be downloaded from; http://www.hwtma.org.uk/flowerreports

2. The *Flower of Ugie*: Site Context

2.1 Site Location

The *Flower of Ugie* is located within the Eastern Solent (Figure 1) and lies on the southern side of the Horse Tail Sand, towards the eastern end of this sandbank (Figure 2). The site lies in twelve metres of water and comprises an area of some 1,424 m^2. Additionally, the site is located within an active aggregate extraction area; Zone 122/2 (Figure 1 & Figure 3). The license for this area is held by Tarmac Marine Dredging (formerly United Marine Dredging).

2.2 Environmental Overview

2.2.1 Geology and Sediments

The Solent and Spithead region contains extensive Holocene deposits of shingle and sand with most marine shingle lying below sea level at the borders of the deep channel (West 1980: 12). Much of the surface sediment in the Eastern Solent is characterised by mud or sand which extends down the channel between Horse Sand and No-Mans-Land into St Helen's Road (Dyer 1980: 22). The underlying bedrock in the area is argillaceous rock, a sedimentary rock formed of clay deposits (SeaZone Hydrospatial). The seabed sediments of Horse and Dean sand show as sandy gravel, the Horse Tail as gravely sand while the area in which the *Flower* lies as slightly gravely sand. The bathymetry of the area shows a depth contour of 5 m delineating the area of the Horse Tail with isolated areas reaching 10 to 15 m in depth.

In general, sediments become progressively coarser in an eastwards direction with sandy gravels, gravely sands and, finally, gravels successively taking over dominance as the outer Solent approaches become co-adjacent with English Channel sediments (SCOPAC 2004: 4). This general pattern is, however, complicated by large patches of coarse gravels associated with former terraces of the former Solent River and the fine to medium sands, or sandy gravels that constitute major stable banks (SCOPAC 2004: 4).

2.2.2 Hydrology and Sediment Movement

The Eastern Solent is a dynamic environment which is affected by tides, wave action and storm events. The Solent tides are among the most complex in the world with a double high water and the flood is longer than the ebb with a notable flood stand (Tubbs 1999: 14-17). Net tidal flux is from the east to west Solent at approximately 38km^3 per tidal cycle (SCOPAC 2004: 2).

The strength of the tides across the wreck site mean that archaeological work is timed around slack water on neap tides. Information available from the UKHO chart for the Eastern Solent demonstrates that a tidal speed of 0.9 knots should be expected at the peak of flow on neap tides. However, the surface currents change during each tidal cycle. The tidal range experienced on the site on neap tides is around 1.8 m (minimum), and on Spring tides 3.6 m (maximum).

The seabed deposits in the Eastern Solent are highly mobile. There is a complicated regime with a combination of wave action and time-asymmetry of tidal currents causing a westerly net sediment transport under low energy conditions and an easterly direction when high energy waves operate (SCOPAC 2004: 8). However, across the study area around Horse Tail Sands the net bedload transport appears to be seawards. Where cobbles and gravel are exposed on the seabed the evidence suggests that they are 'swept' clean of sand and finer grade sediments by tidal streams or by a combination of tides and waves. Moreover, surveys of wreck structure (Section 4.2) demonstrate newly exposed timbers from one season to the next, again indicating fairly high mobility of sediments.

The position of the site just off the south east edge of Horse Tail Sands means that the burial environment is impacted by this significant topographic feature. Since deposition of the wreck in the mid-19th century the size and shape of Horse Tail Sands has changed. Geo-referenced cartographic data spanning the period from 1848 to 1974 (Figure 4) illustrates the movement of the eastern arm of

the sandbank, relative to the current location of the wreck-site. In the period 1848-1869 the current wreck position was 172 m south of the three fathom line, this reduces to 75 m based on the 1894 soundings and 16 m in 1935. The Horse Tail Sand then moves to the north in the following period and in 1974 is 47 m to the north of the current wreck position. It can be assumed that this northward trend has continued, leading to the subsequent exposure and discovery of the site. This conclusion regarding the recent exposure of the site is reinforced by the analysis, through difference plots, of collected bathymetric data (Supplied by United Marine Dredging). This data indicates that between 1993 and 2005 there has been a broad loss of sediment on the area of the Horse Tail Sand adjacent to the wreck of up to 2 m and in the area of the site of up to 1 m (Figure 3). It seems likely that this has been caused by sediment draw-down into the inactive historic dredge footprint c. 350m to the southwest of the site which has witnessed an accretion of sediment by up to 3 m. Historic dredging to the north of the Horse Tail Sand has not experienced comparable sediment accumulation.

2.2.3 Ecology

Further information on the ecology of the site has been provided by marine biologists from the Hampshire and Isle of Wight Wildlife Trust through diving on the site. The water temperature recorded on the site during the 2008 survey was 16°C. This appears to correlate with available literature on eastern Solent temperatures as ranging from 7.8°C in February to March to a peak of about 16.7°C in August (Clark & Gurnell, 1987: 10). The results of the ecological survey indicate the general habitat of the wreck and surrounding sediments as classed as 'mixed seaweeds on wreckage, animal turf on wreckage, sandy sediment with life apparent'. The site is dominated by algae and animal turf, surrounded by coarse sand and gravel with burrowing and mobile fauna. A short snouted seahorse was recorded on the sand between the two sections of the wreck. The site is bio-diverse with species making use of the variety of microhabitats presented by the wooden wreck. Lesser spotted catshark, tompot blenny, cuttlefish, squid, common whelk, netted dogwhelk and necklace shells all use the area for breeding as evidenced by the presence of their eggs on the site.

During archaeological survey the presence of the calcareous tubes left by shipworm (*Teredo navalis*) was noted. These ran with the grain along the timber elements and were particularly evident on the western section. Figure 5 shows a dense concentration of shipworm tubes visible on the surface of the timber. The age of these tubes, and hence the activity is unclear. However, it is interesting to note that shipworm was recorded during the ecological survey indicating recent activity. Shipworm was noted within newly uncovered timbers in 2005, although the extent to which the surface of the timber had been 'pitted' by gribble worm (*Limnoria*) suggests these timbers may have been uncovered previously, but had just not been visible during the initial season of diving in 2004. Inevitably the wood that is exposed is also being attacked by gribble. This is visible on most exposed timber, although timber previously buried has yet to be affected. Figure 6 demonstrates the significant impact of gribble, with the newly exposed area of planking still showing clear detail of wood grain while the adjacent area has been degraded with the associated loss of all surface detail.

2.3 SITE HISTORY

In 2003 the HWTMA received a report that a fisherman had snagged his nets on a previously unidentified obstruction lying just off the Horse Tail Sands. This report led to the location of the net-snag being the focus of the 2004 eastern element of the HWTMA Solent Marine Archaeological Project (SolMAP). This investigation resulted in the identification of a substantial area of wooden wreckage, lying in twelve metres of water. This seabed structure (Section 2.3) represented the remains of an unidentified vessel and the site became known as the 'Mystery Wreck'. Diving on the site was inhibited by poor weather in 2005 but survey and recording of the site continued in 2006, the 2007 season was completely abandoned due to poor weather conditions in the area. Diving investigation continued in 2008 and by the end of that season outline plans and recording of the seabed remains had been completed.

Funding was received from the ALSF and work related to this commenced in late 2008 when a Desk Based Assessment of the site was undertaken. This gathered a wide range of historic and environmental data relating to the site and the surrounding area. Further fieldwork was conducted in 2009 that aimed to complete the characterisation of the wreck remains through sampling of timber and metal remains. The 2009 season also saw the establishment of a series of monitoring points across the site (Section 3.1). During 2010, desk-based work continued to process the findings of specialist material analysis and to correlate this with the historical research that resulted from the identification of the site (Section 2.3). Diving was also undertaken to complete the first year of formal monitoring and to identify any change to the structure of the site during this period (Section 3.2).

2.4 SEABED REMAINS OF THE *FLOWER OF UGIE*[2]

2.3.1 Overview

The disposition of the seabed remains also requires some further explanation at this point. The remains of the wreck (Figure 7) can be divided into three areas of coherent remains;

- A western section of hull remains, 20 m in length and 5 m wide, lying in a WSW/ENE orientation. This section comprises fifty-five frames overlying surviving outer planking (Figure 8), there is very limited survival of ceiling planking in this area. Analysis of this section of remains in conjunction with the survey report into the building of the vessel suggests that they represent the floor of the vessel, either side of the keel. A single carronade is located on the northern side of this section of remains and a small signal gun to the west of it.
- An eastern section of hull remains, some 23 m to the east, c. 16 m in length and 5 m wide, lying in a SSW/NNE orientation. This section comprises thirty-seven frames over-lying surviving outer planking, additionally there is good survival of *in-situ* ceiling planking in this area.
- A central area of scattered remains, mainly concreted iron elements and some wooden remains, covering an area roughly 15 m east-west and 13 m north-south (c. 195 m2). These remains primarily represent the iron elements that provided reinforcement to the wooden structure of the vessel. These comprise hanging/lodging knees and staple knees. There are some wooden elements, one of which has been identified as a hold beam.

The relative location of these three areas is shown in Figure 7. Diving and recording on the wreck has taken place over six seasons (Figure 8). During this time there has been continual degradation of the site in addition to on-going exposure of new timbers (Section 3.2). As a consequence of this, there is no single definitive site-plan that represents a fixed moment in time. Figure 7 illustrates the site as it has been recorded over all seasons of fieldwork, in effect the maximum extent of the remains. The on-going degradation of the site on a year-by-year basis (Section 3.2) has hampered survey in some areas with elements of the hull being too degraded for complete measurements to be taken.

The vessel can be categorised as a frame-first built, carvel-planked vessel, reinforced with iron knees. At the time of sinking the vessel was fastened with a mixture of treenails, copper bolts and yellow-metal (brass) bolts (Figure 9). The vessel was sheathed in yellow-metal. Analysis of these materials indicated that the copper bolts were manufactured between 1820 and the late 1840s and that the yellow-metal could have been manufactured from the late 1840s onwards. This dating evidence played an important part in the identification of the vessel and subsequent historical research. Apart from a single carronade and a small signal cannon, there is no armament visible on the site of the wreck. There are a number of contemporary archaeological sites or shipwreck remains, both in UK waters and abroad Table 1. This corpus of vessels and the research that has been conducted into them provided valuable comparative evidence when analysing the remains of the *Flower of Ugie*.

[2] The disposition, dimensions and materials of the seabed remains of the *Flower of Ugie* are fully discussed in Whitewright & Satchell (Forthcoming: ch. 3), analysis of the correlation of these remains with the historical documentation associated with the vessel are discussed in section 5.3.4 of the same volume.

None of this group of vessels located in UK waters are directly comparable to the *Flower of Ugie* in terms of size, function, date and materials.

Vessel	Built	Lost	Reference
Earl of Abergavenny East Indiaman	1796 Kent	1805 Weymouth, UK	Cumming & Carter 1990
Water Nymph Brig	1840 Newcastle	1875 Ahrenshoop, Germany.	Auer & Belasus 2008
Unknown, 2-masted	19th century	19th century Seaton Carew, UK	Green & Pritchard 2007
SL4	c. 1838 poss. Sunderland	c. 1840s Slufter, Rotterdam	Adams *et al.* 1990
Snow Squall Clipper	1851 Maine, USA	1864 Falklands	Carlson *et al.* 2010
Petrel Barque	1847 Tasmania	1852	Carlson *et al.* 2010
Eglinton Barque	1848 Quebec, Canada	1852 Western Australia	McCarthy & Stanbury 2003 Carlson *et al.* 2010
Jhelum East Indiaman	1849 Liverpool	1870 Port Stanley (hulked), Falklands	Bound 1990 Stammers & Baker 1994

Table 1. Merchant vessels contemporary with the Flower of Ugie*.*

2.3.2 Material Characterisation

An extensive program of specialist analysis of the material remains of the wreck was conducted from 2008 onwards in order to characterise the vessel as accurately as possible. This encompassed dendro-chronological and species analysis of the wooden remains, metallographic and microscopic analysis of metal remains, EDXRF analysis of material thought to be the remains of the vessel's cargo and specialist analysis of the small corpus of ceramic artefacts. The combined results of all of these analyses, where significant, are summarised in Table 2. Dendro-chronological analysis did not produce a date for the wooden elements of the vessel remains.

Structural Element	Material
Floor timber (western section)	Oak and Larch/Spruce
Futtock (eastern section)	Oak
Outer planking (western section)	Elm and some Ebony
Outer planking (eastern section)	Ebony
Ceiling planking (eastern section)	Ebony
Hull sheathing	Yellow-metal (Brass)
Fastening bolt, type 1	Copper and Yellow-metal (Brass)
Fastening bolt, type 2	Yellow-metal (Brass)
Possible cargo material 1	Coal
Possible cargo material 2	Flowed slag

Table 2. Summary of materials identified during analysis of the wreck remains.

2.3.3 Identification

The detailed characterisation of the wreck remains resulting from the archaeological survey and specialist analysis allowed a general set of characteristics of the wreck to drawn up;

- The vessel is built of wood, reinforced with iron framing elements.
- The absence of mechanical propulsion elements or any significant armament indicate that the vessel was a sailing merchant ship.
- The hull is fastened using treenails as well as copper and brass bolts.
- The copper bolts are likely to have been manufactured within the UK between the mid-1820's and before 1850.
- The brass bolts are likely to have been produced during, or after, the late 1840's.

- The outside of the hull is sheathed in Muntz Metal, this can only have been applied to the hull after 1832, when this material was first patented. Analysis of recovered sheathing suggests that it dates to the late 1840's, or later.
- The vessel was probably at least 30m in length.

These characteristics were then compared with shipwreck losses recorded by the NMR, Hampshire Sites and Monuments Record, Isle of Wight Sites and Monuments Record, UK Hydrographic Office (via Seazone Hydrospatial) and the Receiver of Wreck within 10km of the wreck site (Figure 10). These comprised;

- 303 losses that do not have a known seabed location, only a named location (NLO).
- 77 losses that do have a known seabed location.
- Six seabed obstructions were noted within 1km of the site.

This comparison allowed the majority of the losses to be disregarded because they did not fit with the observed characteristics of the wreck. This left five vessels that required more detailed analysis of their date of use, size, material composition and sinking location (Whitewright & Satchell Forthcoming: Ch. 4.1). Following consideration of these factors for each of the vessels it became clear that the remains visible on the wreck site correlated closely with the *Flower of Ugie*,[3] a barque, built in Sunderland, in 1852. Subsequent additional historical research into this vessel further confirmed this conclusion.

2.3.4 History of the *Flower of Ugie*

Identification of the shipwreck remains as the *Flower of Ugie* allowed further historical research to be undertaken in order to establish an outline biography of the vessel. This included the vessel's construction, use, sailing routes and wrecking process. This information is briefly summarised below.[4]

Building

The keel of the *Flower of Ugie* was laid in August 1837 by the Sunderland shipbuilder Luke Crown. The vessel was launched in July 1838 and surveyed by Lloyds Surveyor John Brunton, listed dimensions were 102'6" (31.25 m) in length, 27' (8.23 m) extreme breadth, depth in hold of 19' (5.8 m) and a registered tonnage of 350 old tons (402 new). The vessel was rigged as a barque. In his survey of the vessel, Brunton noted that the vessel was well built and that in some areas (such as the planking and fastening) the vessel is as good as it is possible to make. The vessel received a Lloyds classification of 10 A1; the '10' indicating that it did not need to be re-surveyed for ten years, 'A' categorising the hull as carrying the highest rating and '1' categorising the vessel's rigging and stores as the highest rating.

Sailing Career

The sailing career of the *Flower of Ugie* is recorded through a combination of the Lloyds Register, the Lloyds List and a wide range of UK national and local newspapers that carried regular updates on the shipping movement of the day. A summary of the destinations visited by the vessel during the course of its life is provided in Table 3 and this reveals three distinct phases of use. The first phase saw the vessel engaged in trade between the UK and destinations in the Indian Ocean and the Far-East, between 1838 and 1846. This included a continuous period of 3½ years without returning to Britain when the vessel sailed mainly between India and Mauritius. The second phase of use began in 1847 and correlates with a change in ownership of the vessel. In this period the vessel remained in the northern hemisphere and visited destinations in the Mediterranean, Black Sea, Baltic and North America. A third phase of use occurs at the end of the vessel's life, during 1851 and 1852 and is quite

[3] Previous reports have referred to the vessel as the *Flowers of Ugie*, on the basis of information contained in the NMR. Research into the original survey report of the vessel indicates that it should be referred to as *Flower of Ugie*, this name has been used throughout the present report and the associated draft publication.

[4] An in-depth description of the biography of the *Flower of Ugie* and the analysis and interpretation resulting from this is provided in Whitewright & Satchell (Forthcoming: ch. 4.2 and ch. 5).

mixed. This again sees the *Flower* sailing to destinations in South Asia, as well as returning to North America. The final intended voyage of the vessel was from Sunderland to Carthagena.

Year of Arrival	Destination Port
1838	Cape of Good Hope
1839, also 1840, 1841, 1846	Calcutta
1839	Penang
1839, also 1840, 1844, 1845	Liverpool (via St Helena)
1841, also 1843, 1844, 1845	Mauritius
1842, also 1843, 1844	Madras
1842	Singapore
1842	'China'
1846	London (via St Helena)
1847	Odessa
1847	Livorno
1847, also 1848	Falmouth
1847, also 1848	Gloucester
1848	Cardiff
1848	Malta
1848	Alexandria
1849, also 1850 and 1852	Quebec
1849, also 1850 and 1852	Sunderland
1849	St Petersburg
1850	Hamburg
1850	Bremen
1850	New York
1851	Galle, Sri Lanka
1851	Moulmein, Burma
1852	Carthagena (intended)

Table 3. Destinations of the Flower of Ugie*, 1838-1852.*

Maintenance and Repair

The record of the vessel contained within the Lloyds Register and the initial survey report allows the material composition of the vessel at the time of building to be accounted for (Whitewright and Satchell Forthcoming: Section 4.2.2). Further information regarding the ongoing maintenance and repair to the vessel is documented in the Lloyds Register entries for the ship. This records the replacement of the original copper sheathing in 1841 and 1844, as well as the re-sheathing in yellow-metal instead of copper in 1847 and 1851. Repairs to the hull of the vessel are recorded in 1847, 1849 and 1850, the latter being repairs to damage sustained while at sea. Material analysis of the archaeological remains also documents this maintenance and repair most notably through the presence of yellow-metal sheathing, applied in 1847 and 1851 to replace the original copper sheathing. Analysis of wood species used in the hull is also of interest and demonstrates the use of Ebony for re-planking work during the repairs of the late 1840s. The import of wood to England for shipbuilding and maintenance during the 19th century is well documented (Clarke 1997: 50-54) and the use of Ebony on the *Flower of Ugie* provides archaeological evidence for this trade.

Wrecking

The *Flower of Ugie* departed Sunderland on 7th December 1852, bound for Carthagena with a cargo of coal, passing Deal on the 22nd December. On the 26th December the vessel encountered a severe storm in the English Channel and was thrown on its beam-ends off Portland. The main-mast and mizzen-mast were cut away in order to save the ship and the damaged vessel arrived in the relative shelter of the eastern Solent in the early hours of the 27th December. It is reported as having thirteen feet of water in the hold. The *Flower of Ugie* became stranded on the Horse Tail Sand and the foremast was cut away in order to try to stabilise the vessel. The crew were forced to give up their attempts to save the vessel and they abandoned ship, reaching safety in an attendant pilot boat.

Observers report that the vessel broke up rapidly and sank during the afternoon of Monday 27th December.

2.3.5 Interpretation

The *Flower of Ugie* was built on the banks of the River Wear in 1838, fourteen years later the vessel was wrecked in the Eastern Solent. Between these two events the *Flower* spent the vast majority of its life at sea, sailing thousands of miles between a range of ports in South Asia, Southern Africa, Europe and North America. In this sense the vessel epitomised the age of global seafaring and developing capitalisation that was in full-swing by the mid-19th century.

Although unclear, it seems likely that the vessel was commissioned for use in the trade with British colonies in Southern Africa and South Asia; the Cape of Good Hope, Mauritius, Madras and Calcutta being primary destinations over a number of years. With this in mind, it may be possible to classify the *Flower of Ugie* as a late form of British East Indiaman, albeit one with no connection to the British East India Company itself. A similar status has been ascribed to the *Jhelum* (Bound 1990: 43), contemporary with the *Flower* and now hulked on the Falkland Islands. Ascribing such a status to the *Flower of Ugie* is perhaps over-simplistic, the vessel was very much the continuation of a tradition of British merchant shipbuilding that could be traced back to the beginning of the 19th century. If Luke Crown had been engaged in the building of a similar sized vessel, but with a destination of Quebec, rather than Calcutta, it is likely that he would have built the same design of vessel with the same materials and carrying the same rig. The flexibility of the ships resulting from the building tradition in which the *Flower* was constructed is illustrated by the range of destinations and variance in passage distance that the vessel was capable of being employed on. The vessel was equally suited to trade with the Baltic or Mediterranean as to the conveyance of cargoes to the East Indies.

In the light of later developments to materials and hull-form, in particular iron and steel and the clipper-style hull-form, it is easy to view the *Flower of Ugie* as being at the end of a particular branch of shipbuilding evolution. While this may be true in part, this should not mean that the vessel is viewed as backwards looking, low-tech or less advanced. Consideration of why the *Flower of Ugie* was constructed in such a way, using such materials provides a clue to the motives of the builder and owner and offers another interpretation of the vessel. The *Flower* was built to a tried and tested design formula that offered the capacious, steady conveyance of cargo over potentially long-distances in an economic fashion. Further indication of the latter is given by the rig of the vessel, selected for economic performance, rather than out-and-out speed. The building materials tell the same story through the building and repair of the vessel during its career; materials selected because they represent the most cost-effective way of achieving a specific technological aim.

Taking all of this into consideration, it is possible to view the *Flower of Ugie* as representing a state of the art approach to the procurement, use and deployment of materials in a manner in which economics was the primary driving force. Viewed in this way, the *Flower of Ugie* does not lie at the end of a technological line of development for large wooden shipbuilding, waiting to be displaced by bigger, faster iron and steel vessels. Although the fact that vessels such as the *Flower of Ugie* would cease to be built within a generation of its launch is beyond question. But Luke Crown could not foresee this in 1838, he was simply building within the accepted tradition of the day. Instead, the *Flower of Ugie* may be seen as representative of the pinnacle of British wooden merchant shipbuilding, developed over several centuries and epitomised in the approach of shipbuilders in the north-east of England and in Sunderland in particular.

At a wider-scale, the *Flower of Ugie* also symbolises much more than simply a technological snap-shot of British shipbuilding in the mid-19th century. The role played by the vessel throughout its life places it at the heart of the globally developing trading systems that were an on-going feature of the 19th century. Many of these routes and the goods, people and ideas that travelled along them, lay at the heart of British commercial activity at this time. This activity itself was linked irrevocably with the

development of overseas colonies and the maintenance and expansion of the British Empire during the 19th century. In this sense, the *Flower of Ugie* is itself the result of this activity as well as a facilitator of its continuation. The technological features of the ship are simply the tangible manifestation of 19th century commercialisation, colonialism and economisation.

2.5 GAPS IN EXISTING KNOWLEDGE

The archaeological and historical investigation into the *Flower of Ugie* undertaken through the aegis of ALSF funding attempted to be as complete as possible. It is however inevitable that time constraints imposed by a finite level of funding have left gaps in the current knowledge relating to the site. These gaps in existing knowledge and possible solutions to them are now discussed.

2.5.1 Total potential extent of site

The extent of the currently identified site is well known and has been established over six seasons of archaeological survey. However, it can be strongly argued that a significant quantity of the vessel remains have yet to be discovered. The rapid and violent breakup of the vessel is witnessed in the disposition of the currently known ship structure, the potential for other similar pieces to be surviving *in-situ* must therefore remain high. The exposure of the present site, the noted sediment loss across this area and the seeming northward progression of the Horse Tail Sand all make the exposure of further elements of the vessel a likely scenario. A high resolution swath-bathymetry survey of the wider Horse Tail Sand around the present site may serve to identify any such elements and allow the subsequent investigation of identified anomalies by archaeological divers.

2.5.2 Correlation of archaeological remains with historical documentation

Despite the archaeological work undertaken thus far, there is still scope for further productive work to be undertaken on site. Principally, this involves increasing the level of material characterisation of the shipwreck, with a probable resultant increase in its correlation with the identified historical documentation. Further expansion of the existing program of wood-species analysis would allow additional interpretation of the timber sources utilised in the building of the ship, over and above that already undertaken. This is particularly valuable given the presence of further Lloyds Survey Reports relating to the vessel, other than the 1838 survey. These have not been accessed so far because of on-going archive refurbishment at the National Maritime Museum. The marriage of full analysis of the timber remains of the vessel with the Survey Reports documenting the repair and refit undergone by the vessel has the opportunity to create an extremely complete record of this aspect of mid-19th century shipbuilding. On a wider scale it would allow more substantial comment on the extent to which British shipyards became increasingly reliant on imported timber, the sources of such imports and the areas of vessels in which they were utilised.

2.5.3 Expansion of historical resource

Following identification of the wreck remains, historical investigation proved extremely fruitful in outlining the basic career and use of the vessel. Likewise, a certain basic amount of information relating to the ownership and command of the vessel is also known. However, little is currently known about the specific cargoes carried by the vessel, with the exception of two return voyages from Calcutta and Mauritius. Outbound cargoes remain unknown, as do the majority of inbound cargoes from a wide range of ports. Such information is likely to be available through surviving port books or customs entries, both for outbound and inbound voyages in the UK and abroad. This element of the vessel's activity has huge potential for informing on the wider trends and routes of 19th century maritime trade, through the focused case-study of a single vessel.

An area of particular interest in this regard may be the period that the vessel spent engaged in trade between Calcutta, Madras and Mauritius between 1841 and 1844. This period, in particular the 1843/44 element corresponds directly with the resumption of the transport of indentured Indian labour from Calcutta and Madras to Mauritius to work on the sugar plantations of the island (Allen 1999: 56). The circumstantial evidence suggests that the *Flower of Ugie* was possibly part of this early phase of

transportation and it should be seem as strongly desirable to establish the extent of the vessel's involvement in this activity. Further historical investigation should serve to achieve this.

Finally, little is currently known about the owners, master and crew of the *Flower of Ugie*, other than the name of the owners and master recorded in the Lloyds Register/List and newspaper reports. While such a knowledge gap is likely to be much harder to fill, its potential to add significant social depth to our understanding of the vessel and its wider context means that it should be considered a worthwhile exercise, at least as far as scoping the likely available historical resource.

2.5.4 England's Maritime Research Framework

Within the forthcoming Maritime Research Framework for England (Ransley *et al.* Forthcoming), chapter 8, covering the early-modern period (Dellino-Musgrave and Ransley Forthcoming: 279-313), can be identified as being of relevance to the *Flower of Ugie*. Both Section 2.5.2 and Section 2.5.3 (above) address areas of continuing study that have been identified as being of importance. With regard to these the statement that 'most studies are technologically-focused and descriptive and still need to be understood within the economic, political and social transformations of the period' (Dellino-Musgrave and Ransley Forthcoming: 297) can be highlighted with the Maritime Research Framework. Archaeological and historical study of the *Flower of Ugie* thus far has attempted to chart a holistic approach to understanding the vessel, not just from a technical perspective, but also with regard to its wider economic, political and social context. However, there is still potential to develop our knowledge of these elements of the vessel and its relationship to wider concerns, specifically the areas of Seafaring (Theme 3 (Dellino-Musgrave and Ransley Forthcoming: 291-300)) and Maritime Networks (Theme 4 (Dellino-Musgrave and Ransley Forthcoming: 301-309)).

2.6 OWNERSHIP, MANAGEMENT AND CURRENT USE

All material raised from the *Flower of Ugie* was declared to the Receiver of Wreck (RoW), in accordance with the Merchant Shipping Act. Ownership of this material has now been handed over to HWTMA, by the RoW, due to the absence of any legal owner of the vessel. While analysis and publication is ongoing the site archive is held by HWTMA, during this period some objects are being used as part of a handling collection for Education and Outreach activities with school groups. On completion of publication the site archive will be deposited with Hampshire Museums Service.

3. Threats & Vulnerability

3.1 Site Monitoring Strategy

A feature of the survey of the *Flower of Ugie* has been the observation of the on-going site formation processes since the initial diving inspection in 2004. The following section highlights and discusses the primary visible changes to the structure of the shipwreck since archaeological investigation began in 2004. Survey of the site was still on-going during the fieldwork seasons between 2004 and 2008, with completion of the overall plan of the site in 2008. Consequently, observation of comparable, year-on-year changes across the *whole* site were not possible during this period. In 2009, funding through the ALSF included provision for the monitoring of any changes to sediment or structural remains across the site. From the 2009 season onwards it has therefore been possible to empirically monitor and observe changes across the entire site when compared to the measured survey of the site, completed in 2008.

Changes to the site have been monitored in two ways, these allow for the monitoring of changes to the surviving structure of the vessel and also to observe changes to the sediment levels across the site;

1. Through diver observation of the extant structural remains, in comparison to those observed in previous seasons. This allows the production of an updated site plan for the shipwreck in its current state. Structural elements that have become uncovered due to sediment loss are noted, in addition to those that are no longer visible or have degraded away.
2. Via the installation of a series of monitoring points around the structure of the wreck in 2009. Measurements were taken between these points and the seabed following installation and the measurements were retaken during 2010. Comparison over time should provide a picture of the relative accumulation/depreciation of sediment around the site. A similar system of monitoring points has been successfully operated on the wreck of the *Colossus* in the Isles of Scilly (Camidge 2009: 180-1).

3.2 Condition of Physical Remains

The structural remains of the *Flower of Ugie* that are visible on the seabed comprise a western and eastern section of coherent wooden hull remains, with a central area of concreted remains and dispersed wooden material (Figure 7). The western section is oriented WSW/ENE and the eastern section SSW/NNE. The processes visible in each of these areas are now described in turn.

3.2.1 Observation of Structural Remains

Western Section

The western section of the *Flower of Ugie* is characterised by the large number of framing elements that are visible on the seafloor. To the north of these lies a carronade, orientated roughly north/south. At the eastern end of the western section, some outer hull planking is visible protruding from underneath the frames. A small amount of ceiling planking is visible in the centre of the western section. The observed, progressive changes to the western section of hull remains are detailed in Figure 11. This illustrates the total structure surveyed between 2004 and 2008 (Figure 11a). The wooden hull structure subsequently observed in 2009 and 2010 is then shown in Figure 11b and 11c respectively.

Changes: 2004-2008 to 2009

The survey of the western section of the site conducted in 2009 was able to inform on changes to the structure of the site, when compared to the overall plan completed in 2008;

- Further outer hull planking had become uncovered in the north-east area of the section.
- The main ceiling plank visible in the centre of the section had partially degraded away.
- An area of the outer planking that comprises the southern edge of the section had degraded away.
- The orientation of the carronade had remained unchanged.

Changes: 2009 to 2010
Further inspection of the site was conducted in 2010 and the following observations can be made, based on comparison between the 2009 and 2010 plans of the western section;

- Outer hull planking had become exposed at the western extremity of the section.
- Additional outer planking had become exposed underneath the frames along the south-eastern edge of the section.
- The most easterly frame element of the section had disappeared.
- The orientation of the carronade had remained unchanged.

Eastern Section
The eastern section of coherent hull structure is characterised by a large number of visible framing elements, in addition to significant survival of both outer and ceiling planking. The presence of concreted iron knees may indicate that this section come from a higher area of the vessel than the western section. The observed, progressive changes to the eastern section of the wreck site are detailed in Figure 12. This illustrates the total structure surveyed between 2004 and 2008 (Figure 12a). The wooden hull structure subsequently observed in 2009 and 2010 is then shown in Figure 12b and 12c respectively.

Changes: 2004-2008 to 2009
The survey of the eastern section of the site conducted in 2009 was able to inform upon a number of observations on changes to the structure of the site, when compared to the overall plan completed in 2008;

- A large quantity of outer planking had become displaced at the south-western end of the section and was no longer part of the coherent hull section. This hull structure was originally lying proud of the seabed when initially observed.
- Framing elements at the south-western end of the main section of hull framing had become increasingly degraded.
- Additional outer planking had become exposed on the north-eastern edge of the section.

Changes: 2009 to 2010
Further inspection of the site was conducted in 2010 and the following observations can be made, based on comparison between the 2009 and 2010 plans of the eastern section;

- Outer planking at the south-western end of the section had continued to degrade.
- An additional outer plank had become visible along the western/north-western edge of the section.
- Frame ends along the eastern edge of the section had degraded slightly.

3.2.2 Observation of Monitoring Points
In 2009 a series of fixed monitoring points were attached to the western and eastern areas of hull structure (Figure 11b and 12b). The height of these points above the seabed was then recorded. The aim of the monitoring points was that future survey would be able to continue to record the relative height of the seafloor on an annual basis at a range of positions around the site. It was hoped that this would inform on any patterns of sediment loss/accumulation across the site. Monitoring points and recorded measurements at both sections are summarised in Table 4.

Western Section
Eight monitoring points were installed on the western section of the site. One of these (M290) was subsequently sacrificed to the dendrochronology/timber sampling program and no further measurements were taken at this point. In 2009 no measurements were taken at M293 and M296, but measurements were taken in 2010 to allow future comparison. No measurement was taken at M200 in 2010. Measurements of monitoring points on the western section from both seasons (2009 and 2010) are summarised in Table 4 and Figure 13. The observed change of the level of the seafloor is

also included in Figure 11c and Figure 13. In all cases a negative number indicates a reduction in the height of the seafloor and corresponding loss of sediment. A positive number is indicative of sediment gain in the area. At the time of measurement in 2010, there had been a slight sediment loss around most of the western section. This was greatest in the vicinity of M291, on the north-western edge of the section where a difference of -110mm was observed between 2009 and 2010.

Eastern Section

Nine monitoring points were installed around the eastern section of the site. M208 was not measured in 2009 but was measured in 2010 to allow future comparison at this point. Two monitoring points, M203 and 207, were missing when the site was visited in 2010. Measurements of monitoring points on the eastern section from both seasons (2009 and 2010) are summarised in Table 4 and Figure 14. The observed change of the level of the seafloor is also included in Figure 12c and Figure 14. In all cases a negative number indicates a reduction in the height of the seafloor and corresponding loss of sediment. A positive number is indicative of sediment gain in the area. The overall picture of sediment change at the eastern section of the site is very mixed, with no overall trend appearing. Sediment gain was noted at three locations and sediment loss noted at the remaining three monitoring points.

Monitoring Point	2009	2010	Change
Western Section (all measurements are in mm)			
M200	18	N/A	N/A
M209	20	60	-40
M291	10	120	-110
M292	5	30	-25
M293	N/A	5	N/A
M294	90	100	+10
M295	25	35	-10
M296	N/A	60	N/A
Eastern Section (all measurements are in mm)			
M200	260	210	+50
M201	310	300	+10
M202	150	210	-60
M203	22	Missing	N/A
M204	380	430	-50
M205	220	245	-25
M206	210	100	+110
M207	17	Missing	N/A
M208	N/A	2	N/A

Table 4. Summary of monitoring point measurements taken in 2009 and 2010 and the relative change in seabed height.

3.2.3 Discussion

The process of observation, survey and recording that has been implemented since the completion of the initial survey of the extant remains of the *Flower of Ugie* in 2008 has highlighted two processes. This relates to changes to the physical arrangement of the hull structure and to the accumulation/loss of sediment in different areas of the site. The two factors are to an extent inter-related, as the exposure of new material due to a loss of sediment can lead to the subsequent degradation of the exposed material as a result of biological and physical processes. The reasons for any change to the sediment regime across the site are unclear. However, it should be noted that the Horse and Dean Sands, where the wreck-site is located is an extremely dynamic environment. The overall position of the sandbank is itself not static, as witnessed by the initial appearance of the wreck in 2002 (Figure 4).

Changes to the disposition of wooden hull remains on the seafloor are still clearly on-going in both areas of the site. In the western section this is mainly related to loss of sediment leading to the exposure of new timbers. There has also been some degradation of the exposed timbers, presumably

as a result of biological and physical processes acting on the site. There is no indication of any non-natural processes impacting upon the western section of the site.

In contrast to this, the eastern section of the site is different. There is no identifiable overall pattern of either sediment gain or loss. Rather, changes to the sediment levels are localised in specific areas of the site. As a result of this there has been new material exposed, usually in the form of outer planking, at the northern end of the eastern section. There has also been some degradation of the exposed timbers, presumably as a result of biological and physical processes acting on the site. Additionally, changes to the disposition of hull structure at the southern end of the eastern section are strongly suggestive of interference by non-natural processes. The large quantity of outer planking displaced in this area, in a relatively confined area is suggestive of human interference, probably a fishing net snag.

3.3 THREATS: NATURAL AND CULTURAL

The site of the *Flower of Ugie* is subject to threats and impacts from a range of factors both due to natural process and human agency. This section considers the threats to the site, based on evidence from survey and observation. The scale of the threat and impacts are also reviewed.

3.3.1 Aggregate dredging and physical processes

As outlined in Section 2.2 the physical processes on-going in the eastern Solent make it a dynamic environment. The tidal and wave action combined with storms affect the sedimentary regime, including the shape and size of the Horse Tail Sand bank. The historic migration of the Sands (Figure 4) demonstrates a movement-trend from north to south, with a reversal of this trend in the course of at least the last fifty years. When this is combined with the evidence from the difference plots produced by UMD based on swath bathymetric geophysical survey, which indicate a net loss of sediment around the wreck of between 1-1.5m, this indicates the site is becoming more exposed. The cause of the net sediment loss is likely to be due to both natural processes (such as the northward movement of the Horse Tail Sand) and the effect of draw-down of sediments into the areas which have been dredged lying to the south west of the site.

3.3.2 Fishing activity

The wreck site was first discovered due to a fisherman snagging nets on the structure. There is a continued threat of further entanglement of nets and potential damage, particularly to elements of the structure which are raised above the seabed, which is the case for some of the timbers of the eastern Section. The loss of some elements of timber during the course of survey could have been caused due to fishing nets snagging on the site, but this is conjecture as this loss could also have been due to entanglement of large quantities of seaweed around timbers which caused stress and eventual loss.

3.3.3 Diving

At present the *Flower* site is not well known within the sport diving community. The precise position of the site has not been made widely available while archaeological survey and assessment has been on-going. During the initial diving season in 2004 there was potential evidence of diving activity noted through a rope which appeared to have been deliberately secured on the site rather than something that had drifted in due to tidal movement. There has been no other visible evidence of the site having been affected by sport divers during the period of archaeological work. However, should sport diving become frequent on the site there may be potential for impacts due to the presence of guns on the site (which are popular trophy artefacts for lifting) and also due to the portable nature of the copper and copper alloy fastenings which can become loose on the site.

3.3.4 Marine organisms

One of the most significant causes of loss of archaeological integrity of the site is the damage caused by burrowing micro and macro fauna. Section 2.2 outlined the presence of both gribble (*Limnoria*) and

shipworm (*Teredo Navalis*) on the site. The burrows created by individual gribble are only around 1-2mm in diameter, however, as they target any exposed wood their impact is significant. The effect of gribble attack is the degradation of the whole surface of any exposed organic materials. Even a fine covering of sand over timbers appears to impede infestation.

The damage caused by shipworm (a bivalve mollusc) involves boring into and living in submerged wood. It forms calcareous tubes for protection within the burrows which are around 10mm in diameter and can be between 0.6 – 1m in length. While the loss of surface detail of timber may not initially be as great as that caused by gribble, the presence of many shipworm burrows within individual timbers can quickly cause loss of physical structure, this is evidenced in Figure 15.

These boring organisms are not the only fauna impacting the site, there are also a small number of crabs species which have been noted in the biological survey (Section 2.2.3), and lobsters have been seen by divers during archaeological work. Although smaller crabs burrow under the wooden structure, the sandy nature of the seabed means burrows can only be excavated to a certain size as the sediments fall back into the holes created. At present the macro fauna does not appear to be causing as much damage as the micro fauna.

3.4 SITE STABILITY

The preceding discussion (Section 3.2 and 3.3) of the visible processes impacting the wreck site illustrates the main future threats to the integrity and stability of the site. These threats come from both natural and human processes, occasionally these processes are inter-related in their impact upon the wreck. Both forms of threat are discussed in the following section which discusses the likely future stability of the site.

3.4.1 Erosion and Exposure

The most obvious naturally occurring threat to the stability of the wreck-site is the continuing exposure of new elements of the vessels wooden structural remains. Fresh remains have been exposed on an annual basis since the wreck was first investigated in 2004. Damage to the vessel remains comes not from the exposure itself, but from the subsequent degradation that occurs to the exposed elements. This can be caused by the eroding effect of sediment movement across the site, caused for example by sediment suspended in the water column during the tidal cycle. Additionally, exposed timber is likely to be the target of marine organisms such as shipworm (*Teredo navalis)* that burrows into and consumes the wood, both destroying it and further increasing its susceptibility to erosion (above). This combined process can be seen in Figure 15, where shipworm is visible protruding from the exposed timber. Behind this, the potential for degradation from sediment erosion is demonstrated by the column of wood that represents the remains of a framing element, clinging to the metal fastening inside it.

Continuing changes to the sediment regime of the wreck-site are to be expected, particularly due to the dynamic environment of the Horse and Dean Sands that the shipwreck remains lie within. The changing shape and position of these sands was outlined in Section 2.2.2 and the very appearance of the wreck, due to sediment movement, first noted by fishermen in 2002 is itself evidence of this. It can therefore be postulated that future changes to the sediment regime of the site, either accumulation or loss, are to be expected. The latter trend is likely to lead to the further exposure of timber remains, resulting in their eventual destruction. Significant sediment gain across the whole site may serve to offer some level of protection against both marine organisms and erosion, thereby increasing the stability of the structural elements of the site. Systematic monitoring of the sediment regime undertaken thus far has indicated further sediment loss, as well as sediment gain in different areas of the site. In this regard the stability of the site on a micro-scale level is still unclear.

The position of the site within a licensed marine aggregate extraction area must be considered as potentially detrimental to the future stability of the site. This threat takes two forms, firstly from direct interference with the site during aggregate extraction and secondly through indirect interference resulting from sediment loss caused by aggregate extraction in the vicinity. The first of these threats has been totally mitigated through the establishment of an exclusion zone around the site where dredging is prohibited. It is hoped that the size of the exclusion zone will also successfully mitigate the second, indirect threat. It should also be noted that dredging in the vicinity of the site may result in sediment accumulation across the site, leading to an increase in its protection. In reality, the relationship between aggregate extraction and the sediment regime on the site is unknown. The exclusion zone around the site should be considered to have mitigated the primary threat to the site posed by aggregate extraction.

3.4.2 Future Stability

On the balance of the evidence presented in the preceding sections and taking into consideration the range of likely threats, the site of the *Flower of Ugie* may be considered as unstable in the long-term. The primary reasons for this are the likely continued exposure of sediments leading to their subsequent degradation and eventual destruction. This pattern has been observed throughout the period during which the site has been under close observation and there is no reason to think that it will be reversed in the near future. The steady degradation of the site is also witnessed by the loosening of copper/copper alloy fastenings, following the destruction of the wood that encases them (Figure 15). The archaeological significance of the *Flower of Ugie* is outlined below (Section 4). Unfortunately, the environmental location of the site in conjunction with the dispersed and fragile nature of the remains dictates that the long-term stability of the site is likely to be poor.

3.5 SITE RISK ASSESSMENT

This risk assessment has been completed according to the guidelines set out by English Heritage (Dunkley 2008).

Wreck/Site Name	***SI Number***
Flower of Ugie (Mystery Wreck)	

NMR / UKHO No.	***EH Region***	***Restricted Area***	***Principal Land Use***
NMR898886 (NLO only)	South East		Coastland 1

Latitude (WGS84)	50°43.99'N
Longitude	1°1.22'W

Class Listing	***Period***	***Status***
Wooden Sailing Barque	Victorian	Non-Designated Wreck Site

Licensee	***Nominated Archaeologist***	***Principal Ownership Category***
		E: No Known Owner

Seabed Owner	***Navigational Administrative Responsibility***
The Crown Estate	Nil
Environmental Designations	
G: None	
Seabed Sediment	***Energy***
Sand and Gravel	Medium

Survival
Poor

Overall Condition	***Condition Trend***	***Principal Vulnerability***
B: Generally satisfactory but with minor localised issues	C: Stable	FISH/TRAWL, BIO, S_ERO, NAT, DIVE, LICE

Amenity Value: visibility
A: Substantial above bed structural remains that are highly visible.

Amenity Value: physical accessibility	***Amenity Value: intellectual accessibility***
A: Full	C: None

Management Action	D: Legal protection should be sought to preserve integrity of site													
Management Prescription	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**
									X					
Notes	The shipwreck is broken into two substantial areas of hull remains, with a scattered area of structural remains between them. Remains lie generally flat to the seafloor with limited upstanding structure. One area of hull represents the floor of the vessel while the other is likely to represent the side of the vessel, either side of the hold beam level. Structural remains in the central area comprise concreted iron reinforcement and occasional timbers including one hold beam. Degradation is on-going at a rate that may be considered 'natural'. Increase/decrease in this rate is largely dependent on the site sediment regime. Loss of sediment, leading to exposure of remains, will lead to an increased amount of degradation. Accumulation of sediment is likely to impede further degradation. Overall sediment regime is at present unclear but is thought to trend toward sediment loss across the site as a whole. The site has been damaged in the past by fishing activity and this has the potential to happen again. The site also lies within an area of licensed aggregate extraction, although this is mitigated by the voluntary implementation of an exclusion zone around the site by the license holder. Risk should be considered as MEDIUM													

4. Assessment of Significance

4.1 CRITERIA

The following section details an assessment of the significance of the *Flower of Ugie* against the non-statutory criteria set out by DCMS for assessing the importance of wrecks or the sites of wrecks. In each case, the criteria is defined before an assessment of the *Flower* against this criteria is made.

4.2 STATEMENT OF SIGNIFICANCE

4.2.1 Period

The historic interest of all types of wreck which characterise a category or period should be considered, and the selection of sites for protection should include wrecks which illustrate important aspects of social, political, economic, cultural, military, maritime, and technological history. In identifying sites to be protected, regard will be had to the currency of any particular wreck type (the length of time over which any particular vessel type was constructed and used or any cargo type transported) and its representativeness (whether the vessel or cargo type was one of few or many types representative of that period).

The *Flower of Ugie* was built in Sunderland in 1838 and wrecked in the Eastern Solent in December 1852. The wreck can be considered to fall in the Victorian Period (1837-1901). This period, in conjunction with the two decades before, was one of dramatic technological development and change in the building and use of Naval and merchant ships in Britain and overseas. Iron and materials such as copper and copper-alloys began to play an increasingly important role in the construction of sailing ships, while steam began to be more widely adopted in lieu of a reliance on wind powered sailing vessels. In addition to this, there were fundamental changes to the way in which large merchant ships were conceived and subsequently built, most famously manifested in the class of vessel we know as a clipper. Such vessels had a much higher length:beam ratio than their immediate predecessors and this trend can be seen in most large sailing ships built at this time. *Flower of Ugie* was built and used in the central phase of this period of change and represents an example of the old type of shorter, deeper hull-form at a time when longer, narrower vessels were becoming widespread. As a wooden sailing vessel the *Flower of Ugie* should therefore be considered of high significance as a physical indication of the adoption and trajectory of such developments within British shipbuilding.

The mid-19th century also witnessed the on-going development of trade on a global scale. The abolition of the British East India Company's monopoly on trade to the Indian Ocean opened up huge opportunities for British merchants. The *Flower of Ugie* was built to service this opportunity, fulfilling a continuous sailing schedule between Britain and the Indian Ocean. The increase in trade also led to a corresponding increase in shipbuilding activity within Britain. A feature of this was the huge increase in the tonnage of ships launched from shipyards outside London, in particular the north-east of England. This was coupled with the boom in the coal carrying trade form the coal-fields of north-east England to the south of England and Europe. As a Sunderland built East Indiaman, that became a collier bound for Carthagena, the *Flower of Ugie* epitomises all of these developments and influences on British maritime activity during the period.
Overall Period significance should be considered HIGH.

4.2.2 Rarity

There are some wreck categories which, in certain periods, are so scarce that all surviving examples that still retain some archaeological potential should be preserved. The age of a vessel is often closely linked to its rarity. The older a vessel is, for example, the fewer comparable vessels are likely to survive either in use or as wrecks, and the more likely it is to have historic interest. The loss of one example of a rare type of site is more significant than the loss of one example of a very numerous class of site. In general, however, a selection for protection must be made which portrays the typical and commonplace, as well as the rare. This process should take account of all aspects of the situation and distribution of a particular type of wreck in a regional, national or international context.

There is a large corpus of material concerning the historical sources that relate to the design, building and use of British merchant ships in the mid-19th century (eg. MacGregor 1980; 1984a; 1884b; 1988. However, archaeologically documented examples of such vessels are relatively rare. Even more so if the high overall number of ships in use is considered against the small number that have been investigated and published. The *Flower of Ugie* was a barque-rigged sailing vessel, built for the trade with the Indian Ocean. Of the contemporary archaeological examples, only the *Jhelum* (1849-1870), currently hulked in the Falkland Islands, represents a comparable vessel intended for similar trade routes. Other vessels, such as the *Water Nymph* or SL4 remains, located in Germany and Rotterdam respectively, were probably built within the same tradition as the *Flower of Ugie* in the north-east of England. However, they seem to have been intended for a regional, rather than global trade. The location of all of these vessel remains outside the UK further enhances the Rarity of the remains of the *Flower of Ugie*.

A search of the National Monuments Record (NMR) indicates that 982 vessels listed as 'Barques' were lost in UK waters between 1800 and 1899, while 153 vessels listed as 'Full-Rigged Ship' were lost during the same period. Only two mid-19th century sailing vessels are represented in the current list of UK Designated Wreck Sites (ACHWS 2010: 34-44). Of these, the Seaton Carew vessel has been identified as a brig, probably engaged in the coal trade, while the positive identification of the *Diamond* is now considered as doubtful. There is only one barque listed in the National Register of Historic Ships; the *Glenlee*. Built in 1898, of 1613 tons and 75 m long, this vessel has little in common with the *Flower of Ugie*, other than a shared rig type. In summary, the *Flower of Ugie* is a rare archaeological example of a vessel type common during the mid-19th century.
Overall Rarity significance should be considered HIGH.

4.2.3 Documentation
The significance of a wreck may be enhanced by close historic association with documented important historical events or people, or by the supporting evidence of contemporary records or representations. Historical records are generally only relevant to monuments of recent date, although it is important to recognise that some types of recent vessel may not be served by any historical records. The range of contemporary records that might be expected for a particular type of vessel needs to be considered so that the value of any known records which relate to it can be assessed. The importance of a wreck may also be enhanced by the existence of records of previous archaeological recording or survey work.

The *Flower of Ugie* dates to a period when documentary sources offer an increasingly large and important resource for conducting historical research that enhances the archaeological record. This is witnessed in the present volume by the use of the Lloyds List and Register, both of which contain considerable information regarding the *Flower of Ugie*. In addition to this, further documentary evidence exists in the form of the initial Lloyds Survey Report that was conducted on the vessel during its building. This allows further comparison to be carried out with the archaeological record and provides an interesting means to validate the accuracy of such historical records. Finally, a corpus of documentation exists in the form of newspaper reports and company records that provides further depth to our analysis of the archaeological remains of the *Flower of Ugie*. The *Flower of Ugie* is therefore associated with a wide range of documentation that serves to complement and enhance our understanding and analysis of the archaeological remains of the vessel. Additionally, this historical documentation serves to enhance our interpretation of the vessel within its local, regional, national and international context, increasing its significance still further.
Overall Documentation significance should be considered VERY HIGH.

4.2.4 Group Value
The value of a single wreck may be greatly enhanced by its co-location with other similar vessels (for example at the site of a battle) or by its association with other contemporary features such as port facilities or defensive sites. Association with vessels of other periods (for example on long-standing navigation hazards) may also enhance the value of a site. In some cases it is preferable to protect the complete group of archaeological remains, rather than to protect isolated features within the group.

The remains of the *Flower of Ugie* cannot be immediately located with any other vessel type. In broader terms, the *Flower of Ugie* is representative of what was a relatively common type of vessel (sailing barque) within mid-19th century British maritime activity. Vessels of this type, from this period are not currently represented within the UK's list of designated shipwrecks. The *Flower of Ugie* provides an opportunity for this class of vessel to be represented with the UK's protected shipwrecks.
Overall Group Value significance should be considered MEDIUM.

4.2.5 Survival/ Condition
The degree of survival of a wreck is a particularly important consideration. In general, early wrecks are less likely to survive well than later examples, and in assessing the survival of any site, it is important to consider the likely normal degree of survival of vessels of that date or type. Assessments of survival should consider the degree of intactness of a wreck, the likelihood of the preservation of constructional and technological detail and the current condition of the remains.

The remains of the *Flower of Ugie* currently lie in a dispersed state on a relatively flat seafloor. As a result of this it is not possible to distinguish the original form of the vessel, despite its relatively recent date. Although the vessel remains are divided into three distinct areas, within these areas the remains have retained a certain degree of coherence. While identification of the specific areas of hull that are present on the site is difficult, it is possible to distinguish the various constructional elements of the vessel that are present on the site; planks, frames, fastenings, sheathing, etc. Such constructional elements that are present on the site are in good condition and this has allowed a significant amount of analysis of the ship to be conducted, including the identification of the vessel and associated increase in significance. These elements also have a high potential for further comparative study with other contemporary shipwrecks and to inform on the interpretation of those vessels. The cargo, rigging and shipboard items that were originally on board the vessel have largely been dispersed by the wrecking/deposition process and do not represent a significant corpus of remains.
Overall Survival/Condition significance of the Flower of Ugie should be considered MEDIUM/ HIGH.

4.2.6 Fragility/ Vulnerability
Highly important archaeological evidence from some wrecks can be destroyed by the selective or uncontrolled removal of material, by unsympathetic treatment, by works or development or by natural processes. Some vessel types are likely to be more fragile than others and the presence of commercially valuable objects within a wreck may make it particularly vulnerable. Vulnerable sites of this type would particularly benefit from protective designation.

The observation of the site of the *Flower of Ugie* over the course of the project, in conjunction with analysis of the available geophysical and historical map data allows comment to be made on the Fragility/Vulnerability of the site (Section 3). This suggests that the site is currently in a relatively stable environmental condition. However, it is evident that natural degradation will occur to any wooden elements of the vessel that become exposed and that this degradation will lead to the loss of such exposed elements, over time. Structural elements that are currently exposed are therefore both fragile and vulnerable to decay/loss. New timbers have been exposed in every year that the site has been investigated as part of the present project.

The future stability of the site is therefore reliant on the sediment regime across the site either remaining static or witnessing an accumulation in sediment. The latter would probably lead to a decrease in the number of exposed timbers and a consequent reduction in the rate of degradation and loss. The overall sediment regime in the area suggests that there is likely to be a gradual loss of sediment across the site as a result of sediment accumulation in the historic dredging areas to the south of the site. Likewise, analysis of historical mapping of the Horse Tail Sand suggests that the sandbank is currently undergoing northward mobility, also likely to lead to sediment loss on the site in the long-term. Thus far, this longer-term view of the expected dynamics of the site has not been witnessed in the monitoring of sediment on the site itself. This indicates localised sediment loss and

gain in different areas of the site at different rates. However, it must be stated that this systematic monitoring has only been in place for two years.

In addition to threats from on-going natural processes it should be highlighted that there are two very visible guns present on the site – a carronade and a signal gun. Additionally a range of highly portable metal fastenings are present. Should the precise position of the *Flower* become widely available it is likely to increase diver activity, placing high value (guns) or trophy (metal fastening) artefacts at immediate and significant threat of loss. Such activity would cause attrition of the seabed archive, impacting this historic asset.
Overall Fragility/Vulnerability significance should be considered MEDIUM/HIGH.

4.2.7 Diversity
The importance of wrecked vessels can reflect the interest in their architectural design, decoration and craftsmanship, or their technological innovation or virtuosity, as well as their representativity. Consideration should be given both to the diversity of forms in which a particular vessel type may survive and to the diversity of surviving features. Some vessels types may be represented in the surviving record by a wide variety of building types and techniques which may be chronologically, regionally, or culturally conditioned. The sample of protected sites should reflect this wide variety of forms. In addition, some wrecks may be identified as being of importance because they possess a combination of high quality surviving features or, occasionally, because they preserve a single important attribute.

The remains of the *Flower of Ugie* is representative of the final expression of British wooden shipbuilding intended for the long-distance carriage of bulk cargo. Although the structure of the vessel is dispersed, a range of constructional features are preserved that are indicative of the technological processes that were being undertaken by British shipbuilders during the mid-19th century and in particular those from the north-east of England. These included: the provision of iron reinforcement; fastening with yellow-metal (brass), rather than copper or iron; and sheathing in yellow-metal.

British built vessels of this date, of a type comparable, in either form or function, to the *Flower of Ugie* are currently not present in the UK's list of protected shipwrecks. At the time of the building and operation of the vessel, Sunderland was amongst the biggest wooden shipbuilding centres in the world (see Clark 1997: 76, 81-3). This building tradition, responsible for the construction of many of the vessels that underpinned Britain's expanding global maritime trade in the mid-19th century is currently only tentatively represented in the country's protected shipwrecks by the remains located at Seaton Carew. It is notable that these remains are very different in their material composition than those of the *Flower of Ugie*. The remains of the latter vessel therefore have the potential to greatly increase the overall diversity of the UK's protected historic shipwrecks.
Overall Diversity significance should be considered HIGH.

4.2.8 Potential
On occasion, the nature of archaeological remains cannot be specified precisely but it still may be possible to document reasons anticipating their existence and importance and so to demonstrate the justification for identifying a site for protection. For example, each type of site may provide a slightly different range of contexts for the preservation of archaeological and palaeoenvironmental evidence, and the environment of a site may provide strong indications of its likely level of survival. Sites may also be significant in terms of their potential to provide information on site formation and decay processes and the examination of physical, chemical and biological processes on cultural remains or through its potential for public education.

The investigation of the *Mystery Wreck* has established the identification of the remains as the *Flower of Ugie* (Whitewright & Satchell Forthcoming). The project has also undertaken the characterisation of the site through material analysis of its remains. Both of these have allowed a biography of the use-life of the vessel, from construction, to sinking, to re-discovery to be constructed. In addition, provision for the on-going monitoring of the site remains and the site formation processes impacting upon the site have been put in place.

There is some future potential for further material characterisation of the site, based on the seabed remains alone. This may be reliant on any unusual or significant archaeological feature being uncovered as a result of future sediment loss on the site. The future potential of the historical resource associated with the site is much greater. As well as the opportunity to correlate additional historical documentation (eg. survey reports) with the material remains, there is clear potential for further investigation into cargo manifests and crew composition, likely to be contained within historical records in the UK. These have the potential to shed further light on the wider context of the vessel and the activity of seafaring and maritime trade within mid-19th century British and colonial society. Additionally, further comparison with contemporary vessels and also those from the wider 19th century will allow a more comprehensive understanding of the national and international significance of the site. This holds true when viewed *across* the mid-19th century and also *along* the entire trajectory of shipbuilding development at this time. Finally, the investigation undertaken into the environmental context of the site, in conjunction with the provision for the on-going monitoring of the site has potential for providing an account of the site-formation processes likely to be witnessed on a site of this type.
Overall Potential significance should be considered HIGH.

4.3 Gaps in Understanding Significance

The account of the Archaeological Significance of the *Flower of Ugie* presented above is based on the criteria associated with current designation practice under the Protection of Wrecks Act (1973). The extension of authority granted to English Heritage under the National Heritage Act (2002) and revision of Planning Policy relating to cultural heritage (PPS5) means that an alternative route to establishing the significance of a shipwreck can be taken. This has the potential advantage of addressing significance against the wider context of all of the nation's cultural heritage, rather than just the existing corpus of designated shipwrecks. Similarily, the soon to be published, National Heritage Protection Plan is also likely to have an effect on the way in which heritage is thought about and subsequently protected in the future.[5]

Within the revised PPS relating to the historic environment, the concept of significance has remained a key term. Paragraph 14 of the Practice Guide associated with PPS5 states (DCMS 2010: 8) that;

> 14. The basic criterion for listing a building is that it must hold special historic or architectural interest. For a monument to be scheduled it must be nationally important by reason of its historic, architectural, artistic, traditional or archaeological interest. Parks and gardens and battlefields may be registered if they are of special historic interest. Conservation areas will be designated if they are of special historic or architectural interest, the character and appearance of which it is desirable to preserve or enhance. All of these criteria have two components: the nature of the interest or significance that defines the designation and the relative importance of that interest or significance. Significance, as defined in the PPS, encompasses all of the different interests that might be grounds for designating a heritage asset. The principles of selection for both listed buildings and scheduled monuments are published by DCMS.

It is the intention of English Heritage to publish 'Principles of Selection' for marine historic assets.[6] Until these are published it is impossible to say with certainty if the significance of the *Flower of Ugie* as assessed above will be the same under the 'Principles of Selection' for PPS5.

Paragraph 14 highlights the twin components of these criteria; 'the nature of the interest or significance that defines the designation and the relative importance of that interest or significance.' It is clear that the *Flower of Ugie* carries a high level of *archaeological* and *historic* significance when addressing shipbuilding technology, maritime trade and potentially also for addressing the nature shipboard societies at this time. These themes can be addressed at a site, local, national and

[5] See http://www.english-heritage.org.uk/professional/protection/national-heritage-protection-plan/all-about-NHPP/
[6] see http://www.english-heritage.org.uk/caring/listing/criteria-for-protection/selection-guidelines/

international scale. Such themes are of perennial and recurring interest and importance for maritime archaeology, yet it is not clear if the period (the mid-19th century) and interest themes represented by the *Flower of Ugie* will carry any significance in the assessment of a marine historic asset.

5. Monitoring & Protection

The following section outlines the future monitoring options that can be undertaken on the site. Such monitoring options can serve to assess its physical condition, potential changes to its vulnerability and any developing trends in the stability of the site. Following this, a range of protection requirements are discussed that are intended to mitigate against the threats to the site, identified in Section 3.3.

5.1 Monitoring Options

5.1.1 Structural remains

Processes for monitoring the remains of the *Flower of Ugie* are in place on a micro-scale level. Alterations to the structure and disposition of the site can be monitored through the continued diving on the site on a regular basis. Comparisons over time between the observed seabed remains and those previously surveyed and recorded allow a narrative of any changes to the seabed remains to be developed. A nascent form of this is illustrated in Section 3.2.

5.1.2 Site sediment monitoring

Similarly, the monitoring points installed during the 2009 season should allow the on-going assessment of the extent to which sediment levels are changing across the site. Measurement of these points can be taken at the same time as observations of the extent of structural changes to the wreck (above) are conducted. Continuation of this scheme of monitoring, as initiated in 2010, should allow observations to be made on any changes to sediment levels within specific areas of the site. The detrimental effect on the integrity of wooden elements, resulting from their exposure was highlighted in Section 3.3. Knowledge of the patterns of these processes, either increasing/decreasing structural exposure are therefore paramount.

5.1.3 Area sediment monitoring

Understanding changes to the sediment regime on the site cannot be fully achieved through on-site monitoring alone. The complexity of the area in which the *Flower of Ugie* is located, in terms of its geomorphology, was summarised in Section 2.2. A benchmark level of data relating to sediment levels across entire area surrounding the site exists through the geophysical survey of Aggregate Area 122/2 UMD (Figure 3). Future, comparable surveys can inform on the over-riding trends of sediment levels across the area. This has obvious implications for our understanding of the site dynamics relating to the *Flower of Ugie* and its relationship to the areas of historic and working dredging zones in the vicinity.

5.2 Protection Requirements

5.2.1 Aggregate extraction

The location of the site within a licensed aggregate area (Figure 1 and 2) dictates that it must be considered potentially at threat from associated aggregate extraction activities. This threat is currently mitigated by the voluntary establishment of an exclusion zone for such activities around the site within the aggregate extraction area in which the site is located. It should be noted that although an unlikely scenario, the voluntary nature of this zone does mean that it can be revoked at any time, should the license holder wish to do so. The establishment of a permanent, formal exclusion zone around the site that prohibits such activity is therefore desirable.

5.2.2 Fishing

The initial discovery of the site illustrates the potential for further net fastenings on the seabed structure of the *Flower of Ugie*. The dispersal of wooden structure from the eastern section of wreck remains between 2004 and 2009 was probably the result of a similar fastening event. This highlights both the ease with which such an episode could occur and also the extent of the damage that it could cause to the seabed remains. It should be noted that such damage extends to the decontextualisation of such remains relative to the other structural elements that they were originally associated with. If

the apparent trend for sediment loss on the site continues to be realised, structural remains will become increasingly proud of the seabed and correspondingly more likely to snag a net.

Currently, the only protection offered against such inadvertent but destructive damage is that as an increasingly 'known' seabed obstruction, fishing vessels will avoid the site, rather than risk damaging their nets. It seems unwise to place the structural integrity of the site in the hands of serendipitous non-intervention. The site would be better served through the provision of a formal fishing exclusion zone around the site.

5.2.3 Diving

Casual diving activity on the site is currently low, although it should be noted that HWTMA have kept the precise site position confidential since archaeological investigation began. However, sport diving is likely to increase as the site becomes better known and more widely published and publicised; the shallow nature of the site in combination with the relatively extensive, exposed structural remains, suggests the potential for the site to become popular in the future. It is unlikely that the majority of casual divers would intentionally damage the vessel's structure. However, there is an abundance of easily mobile 'souvenirs' in the form of copper and brass metal fastenings that could be easily removed from the site by unscrupulous divers. Meanwhile, the carronade and signal gun could form potential targets for more ambitious salver's. A recent episode of loss from the *Holland 5* submarine site, itself a Protected Wreck, illustrates the potential for this kind of intentional damage (http://www.bbc.co.uk/news/uk-england-11154558).

Exclusion of the public from any heritage asset is always a problematic and divisive subject, especially if the purpose of public exclusion is to protect the heritage *for* the public benefit. If unregulated public access to the site increases, the on-going monitoring of the seabed remains will become increasingly important. While it is not desirable to exclude divers from the site, this recourse may become necessary if evidence of damage to the site resulting from their activity becomes apparent. Formal protection of the site through the Protection of Wrecks Act would provide a more effective tool to manage access as diving is permissible through the granting of visitor licences. There are currently only a small number of protected shipwreck sites in UK waters, when taken as a proportion of the overall potential shipwreck resource. The unique, known, nature of the *Flower of Ugie* would provide a valuable addition to this corpus of shipwrecks.

5.2.4 Structural degradation

On-going degradation of the exposed elements of the site is unavoidable. Physical and biological processes will act on the remains of a wooden shipwreck, lying on the seabed in an area of mobile sediment and in which micro-fauna such as shipworm (*Teredo navalis*) and gribble (*Limnoria*) are present. Decrease in the level of sediment across the site is likely to lead to a larger area of remains being exposed to such processes. Conversely, an increase in the level of sediment and gradual burial of seabed remains may serve to slow down such processes. It would certainly preserve structural components that have not been exposed thus far.

Possible mitigation for this form of degradation could be the installation of artificial measures to increase the levels of sediment accumulation across the site. Experimental work has been conducted on the wreck of the *Colossus*, Isles of Scilly, to test the application of synthetic materials aimed at increasing the stability of an eroding wooden shipwreck site (Camidge 2009). While initial results seem favourable, the assessment of longer term trends is still ongoing (Camidge 2009: 182). However, if successful and if deemed cost-effective, similar measures could be deployed on the *Flower of Ugie* if the on-going monitoring of the site indicates that structural degradation is worsening.

5.2.5 Ecological Protection

Biological survey recorded the presence of Short-Snouted Seahorse (*Hippocampus hippocampus)* on the site. This animal is listed on Schedule Five of the Wildlife and Countryside Act (1981) as a

protected species. In accordance with this legislation (Section 9, 4a & b) it is an offence if any person intentionally or recklessly 'damages or destroys, or obstructs access to, any structure or place which any wild animal included in Schedule 5 uses for shelter or protection.' It is also an offence if a person 'disturbs any such animal while it is occupying a structure of place which it uses for that purpose.' Accordingly, the presence of Short-Snouted Seahorse on the site means that any disturbance or destruction of the site via or resulting for any of the human threats noted above may potentially constitute an offence under this legislation. It should also be noted that prior to any further archaeological work on the site the extent of seahorse activity across the site would need to be established and monitored in order to avoid committing any of the above offences. Future monitoring of the site should therefore consider including marine biological expertise in order to attempt to establish the extent and distribution of the seahorse population across the site.

5.3 Monitoring & Protection: Recommendations

The future monitoring and protection of the site of the *Flower of Ugie* are clearly inter-linked. While threats to the site and the means to mitigate against them are reasonably clear. The success of, and potential need for, further protection are dependent on a coherent and successful monitoring strategy, both at a micro and macro scale, across and around the site.

This report would therefore recommend that existing monitoring plans across the site be continued. This provides a means to understand on-going changes to the shipwreck remains and the levels of sediment on the site itself. It would also be beneficial if larger-scale bathymetric surveys of Area 122/2 were repeated in order to understand the wider processes of sediment movement at work in the area around the site and in which it is situated.

With the exception of the natural physical degradation of the site, future protection would be achieved by the Designation of the site as a Protected Wreck, under the terms of the 1973 Act. The associated exclusion zone would serve to mitigate the potentially harmful effects of direct aggregate extraction, fishing and casual diving. However, consideration must be given to whether exclusion of the public from the site is in the wider interests of public interaction with their heritage resource. Accordingly, the potential granting of visitor licenses to allow managed public access to the site, following any designation, should be borne in mind.

As stated above, natural degradation of the site is probably unavoidable. However, if the monitoring of the site indicates that such degradation is moving beyond a sustainable level, the experimental assessment work carried out on the *Colossus* wreck may provide a means to mitigate against even this traditionally unavoidable problem.

6. Conclusion

The site of the *Flower of Ugie* represents the remains of a mid-19th century merchant sailing barque. Extensive analysis and interpretation of the vessel has been carried out as a result of six years of archaeological and historical investigation by the HWTMA. Funding was provided through the Aggregate Levy Sustainability Fund for the latter stages of this process. This will include the publication in 2011 of a monograph recounting the current understanding of the site.

This report has focused on the on-going management of the site of the *Flower of Ugie*. Central to this process is the development of an understanding of the significance of the site. This assessment (Section 3) has been made against the current criteria for significance assessment that is related to the Protection of Wrecks Act (1973). This concludes that the current archaeological significance of the *Flower of Ugie* is high. Furthermore, the vessel has a high potential to inform, to a significant level, on a wide range of aspects relating to 19th century maritime activity, both within the UK and internationally. A vessel of this type and carrying this level of significance for the period in question is not currently represented within the corpus of historic shipwrecks protected under UK legislation.

A program of monitoring across the site has been initiated to observe the nature and extent of any changes to the vessel structure and the seabed sediment upon which and in which it lies. The latter is of particular importance as sediment loss is likely to increase the extent of degradation impacting upon the wooden structural remains. Strongly associated with the monitoring of the site has been an assessment of the range of risks/threats to which the site is, or could become, exposed. In each case, recommendations have been made for measures to mitigate against these threats. At the heart of these recommendations lies the process of formal designation under the Protection of Wrecks Act (1973).

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8. Figures

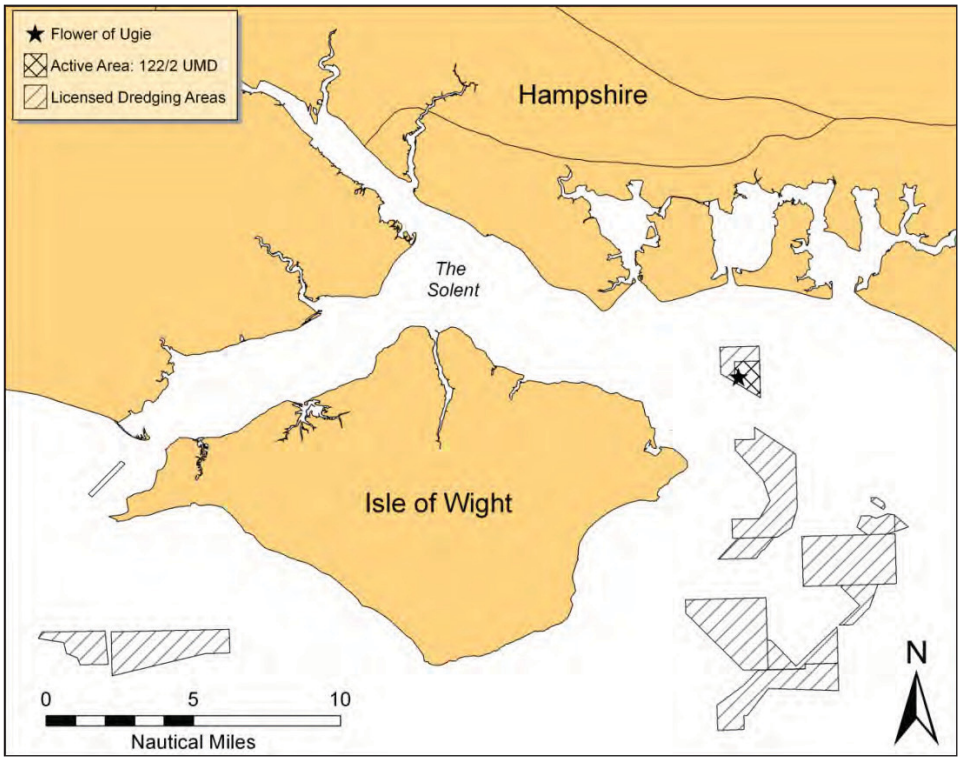

Figure 1. Location of the Flower of Ugie *within the Eastern Solent and its relationship to licensed aggregate extraction areas.*

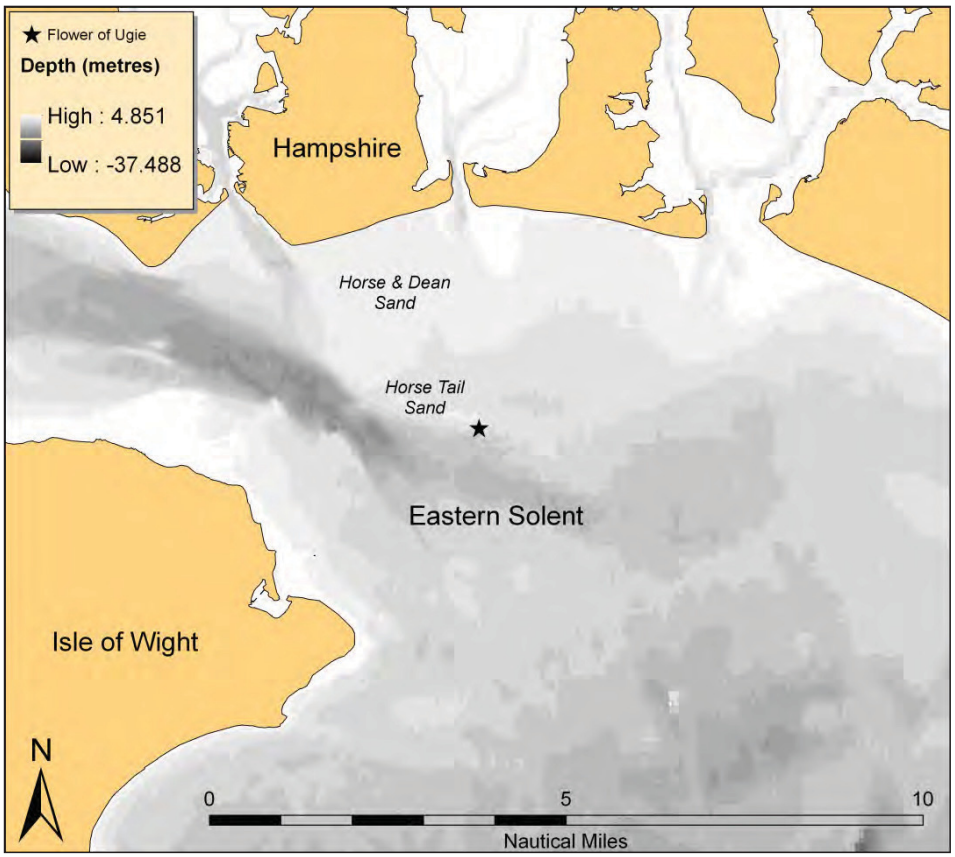

Figure 2. Location of the Horse and Dean Sand and the Horse Tail Sand.

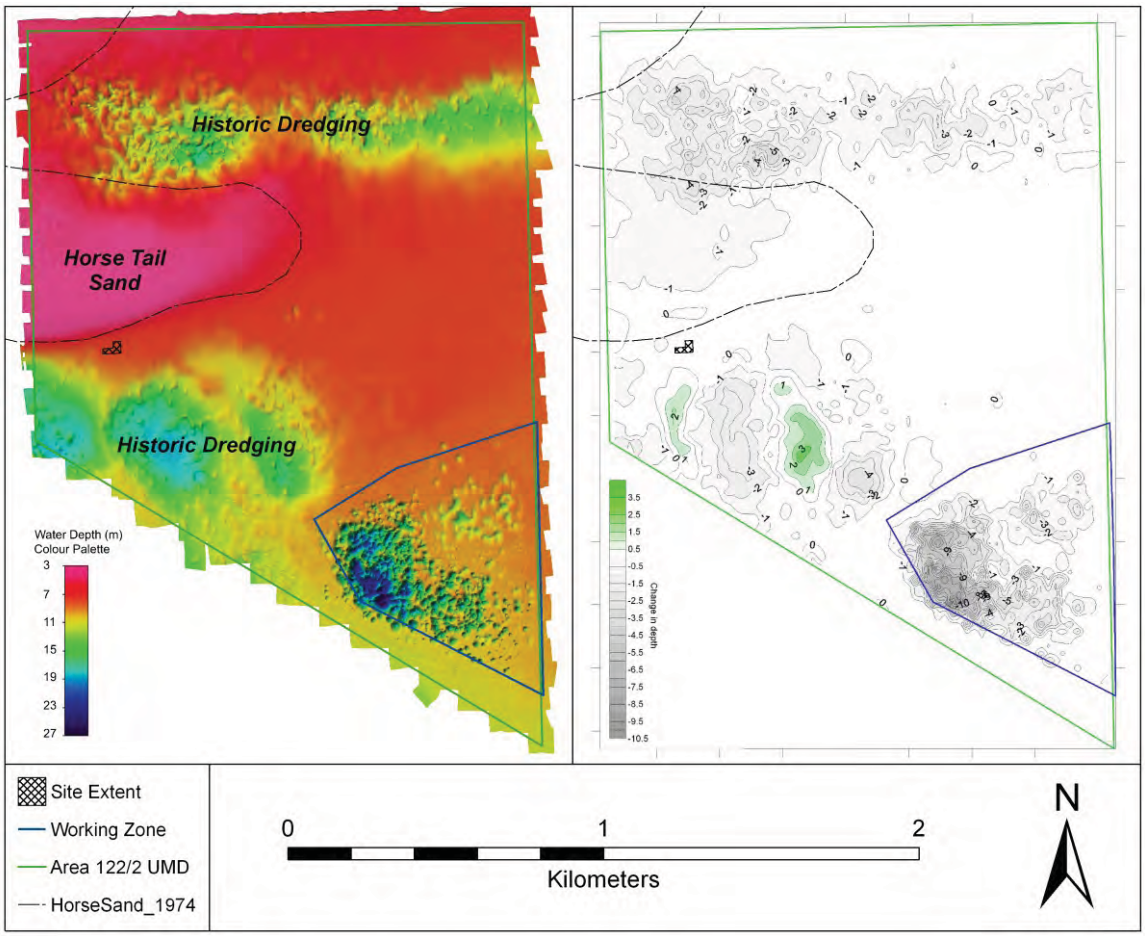

Figure 3. Detail of Aggregate Area 122/2. Left: Overview showing the relationship between the Horse Tail Sand, wreck site, historic dredging and working dredging zones. Right: Difference plot showing overall change in sediment distribution in the area between 1993 and 2005. In both cases, the dashed line references the 1974 Admiralty delineation of the Horse Tail Sand along the three fathom/five metre line (see Figure 4). Swath Bathymetry and difference plot data courtesy of United Marine Dredging.

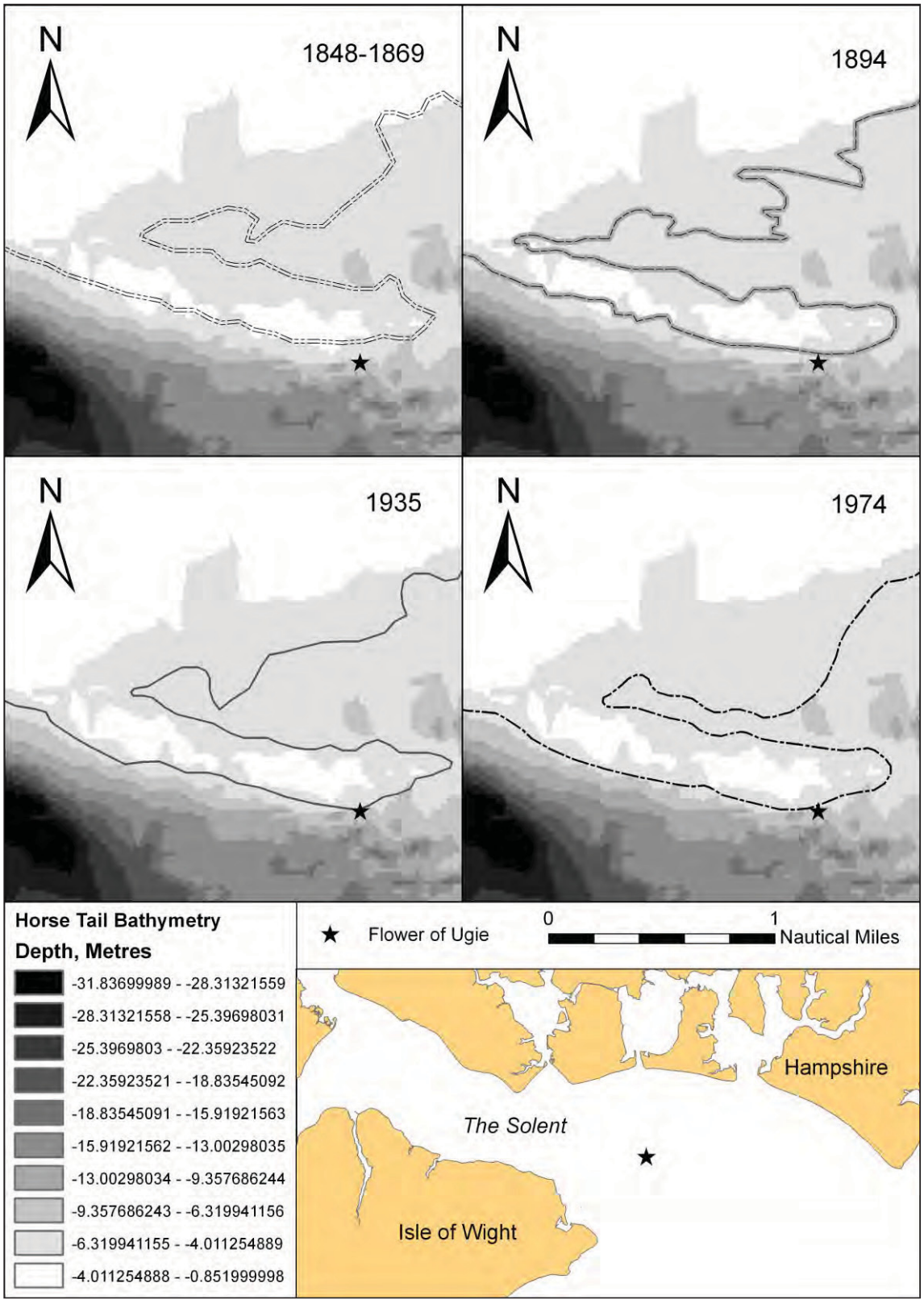

Figure 4. Historic chart progression of the Horse Tail Sand, 1848-1974. In each case the Bathymetry is modern and the position of the wreck is shown as a current reference location.

Figure 5. Severe infestation of Teredo, visible on the western section of the wreck site during 2005 (Photo: Dave Johnston).

Figure 6. Gribble infestation on a frame timber on the western section of the wreck. The exposed end of the timber is visible on the right of the picture and some of the surviving wood grain in the centre. The surface damaged by gribble is on the right hand-side.

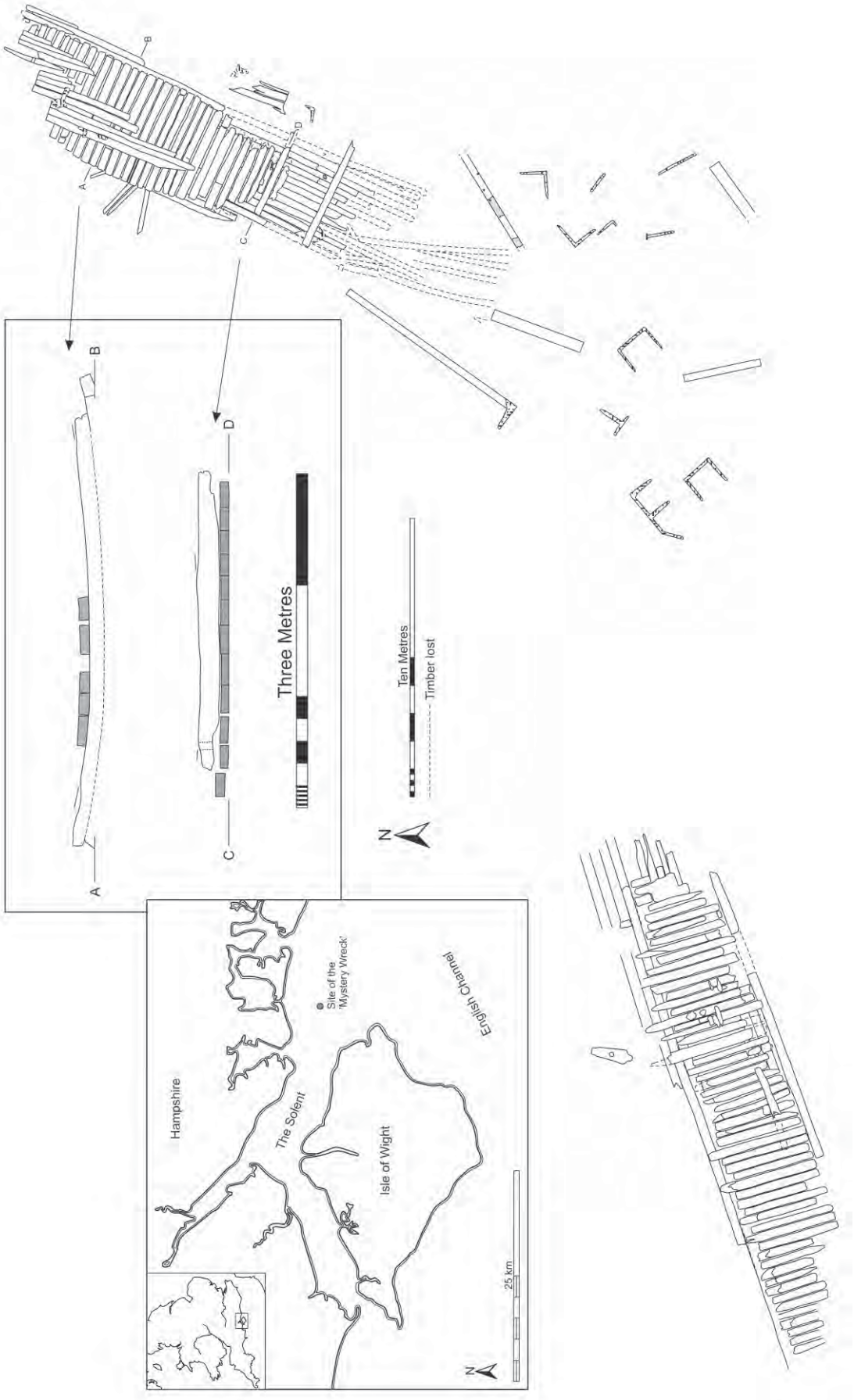

Figure 7. Overall site plan of the wreck remains as recorded across six seasons of survey, 2004-2010.

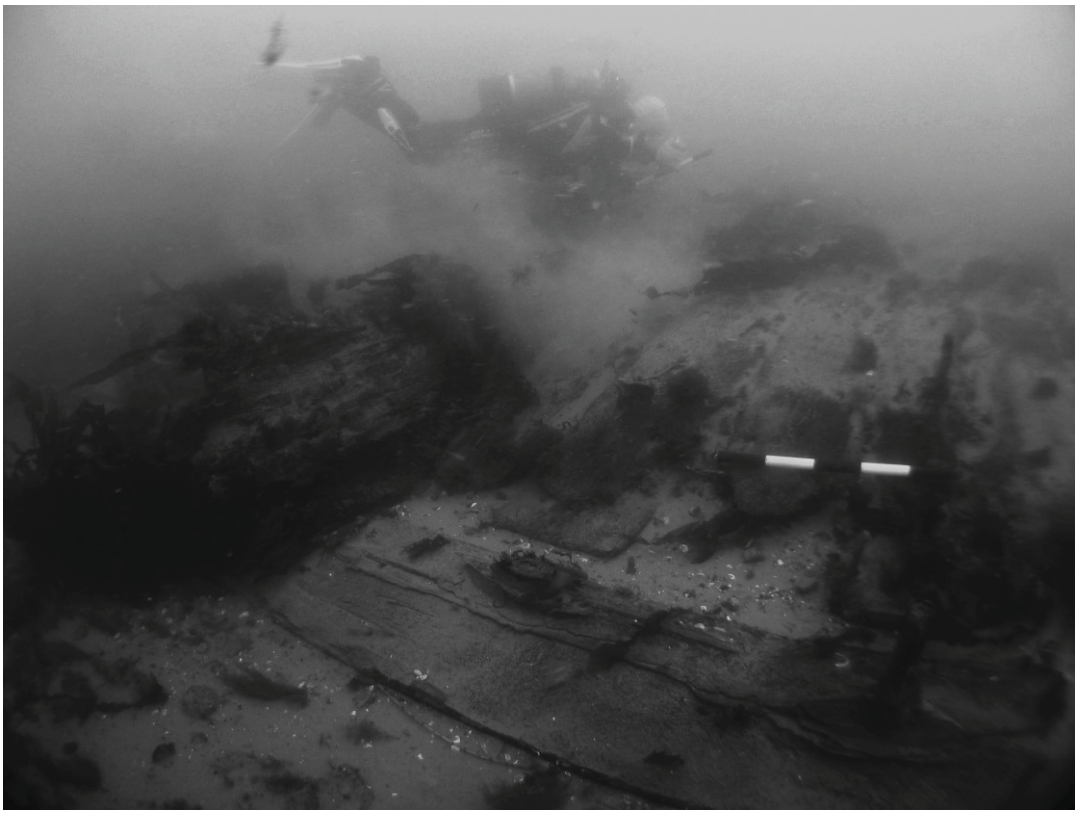

Figure 8. Example of framing elements from the north side of the western section of the wreck (Photo: Doug McElvogue).

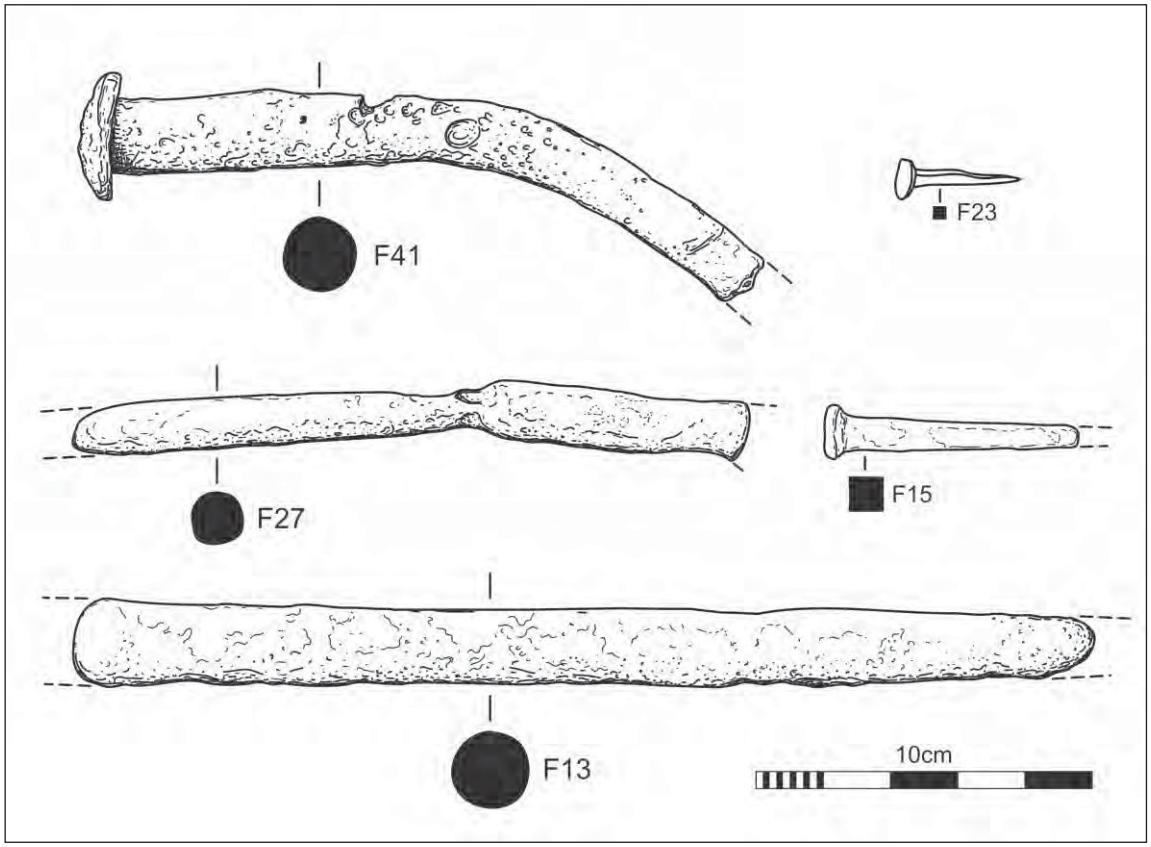

Figure 9. Sample of metal fastenings recovered and analysed. F13= brass, F15= gunmetal, F27= copper, F41= brass (J. Whitewright).

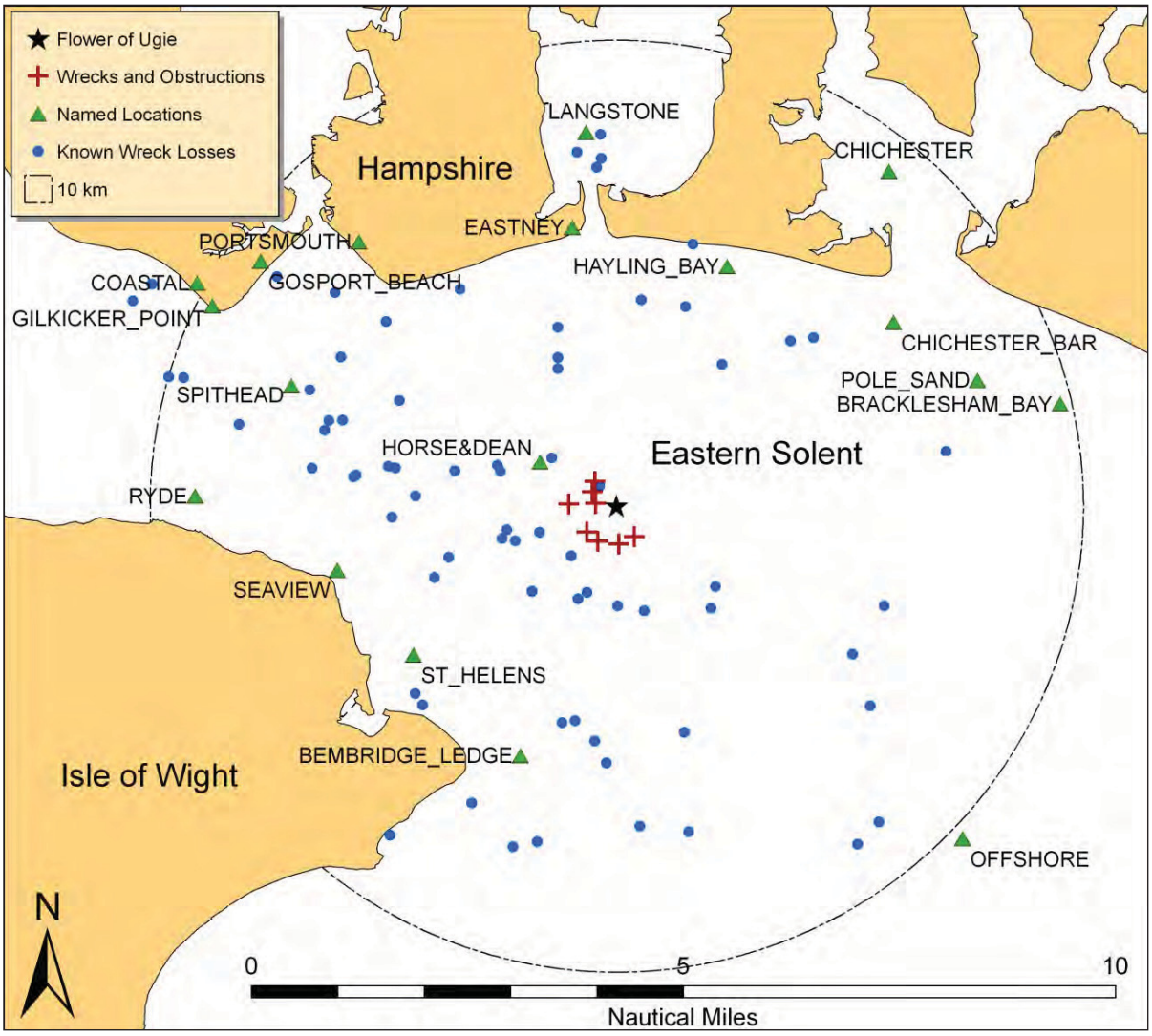

Figure 10. Known shipwreck losses, Named locations and Known Wrecks/Obstructions located within a 10km study area of the wreck site, the latter were restricted to a 1km study area around the wreck site..

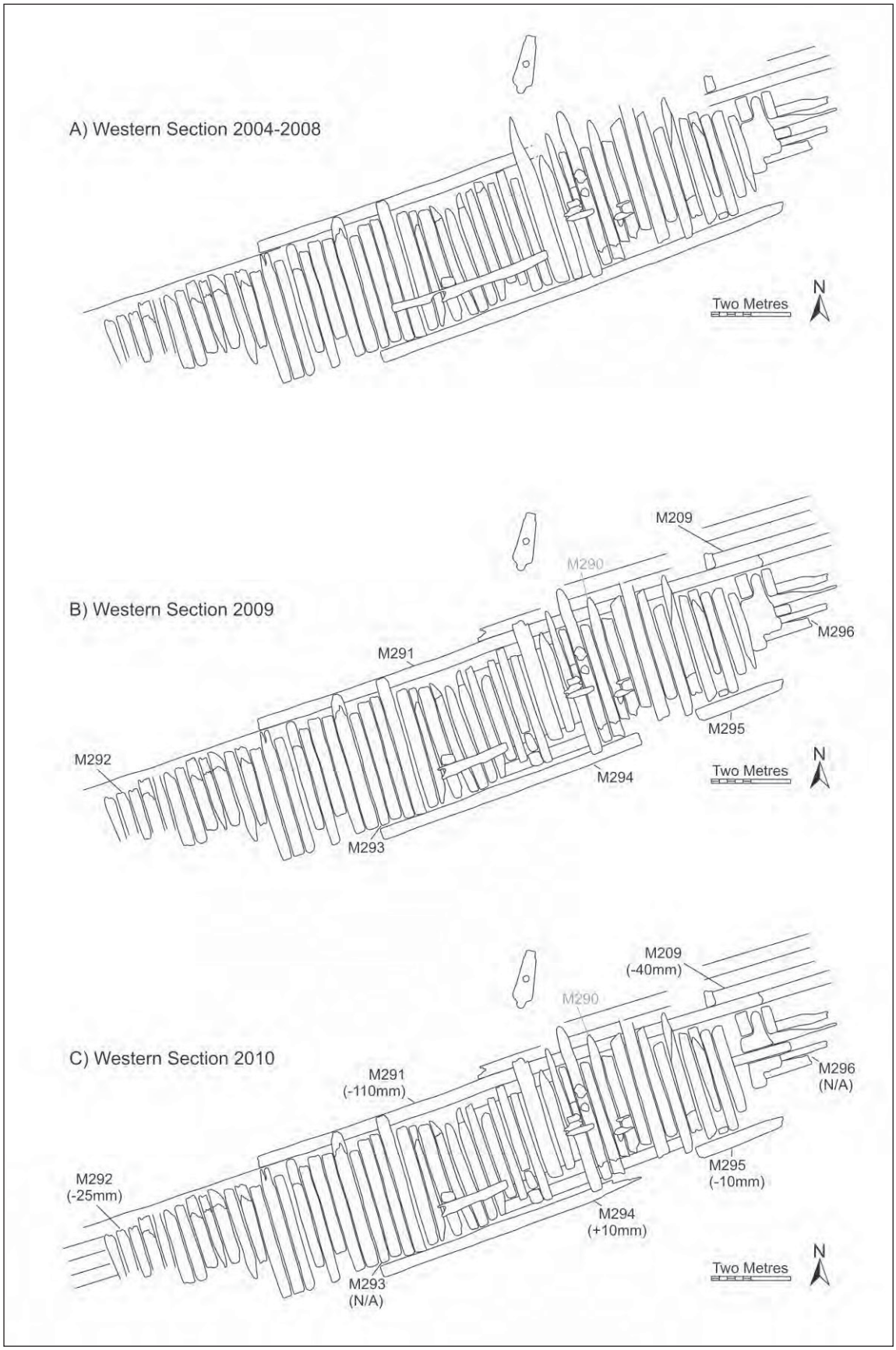

Figure 11. Observed progression of changes to hull structure on the western section of the Flower of Ugie*. Monitoring points installed in 2009 are shown in B) and the changes in sediment level, relative to these points as observed in 2010, in C).*

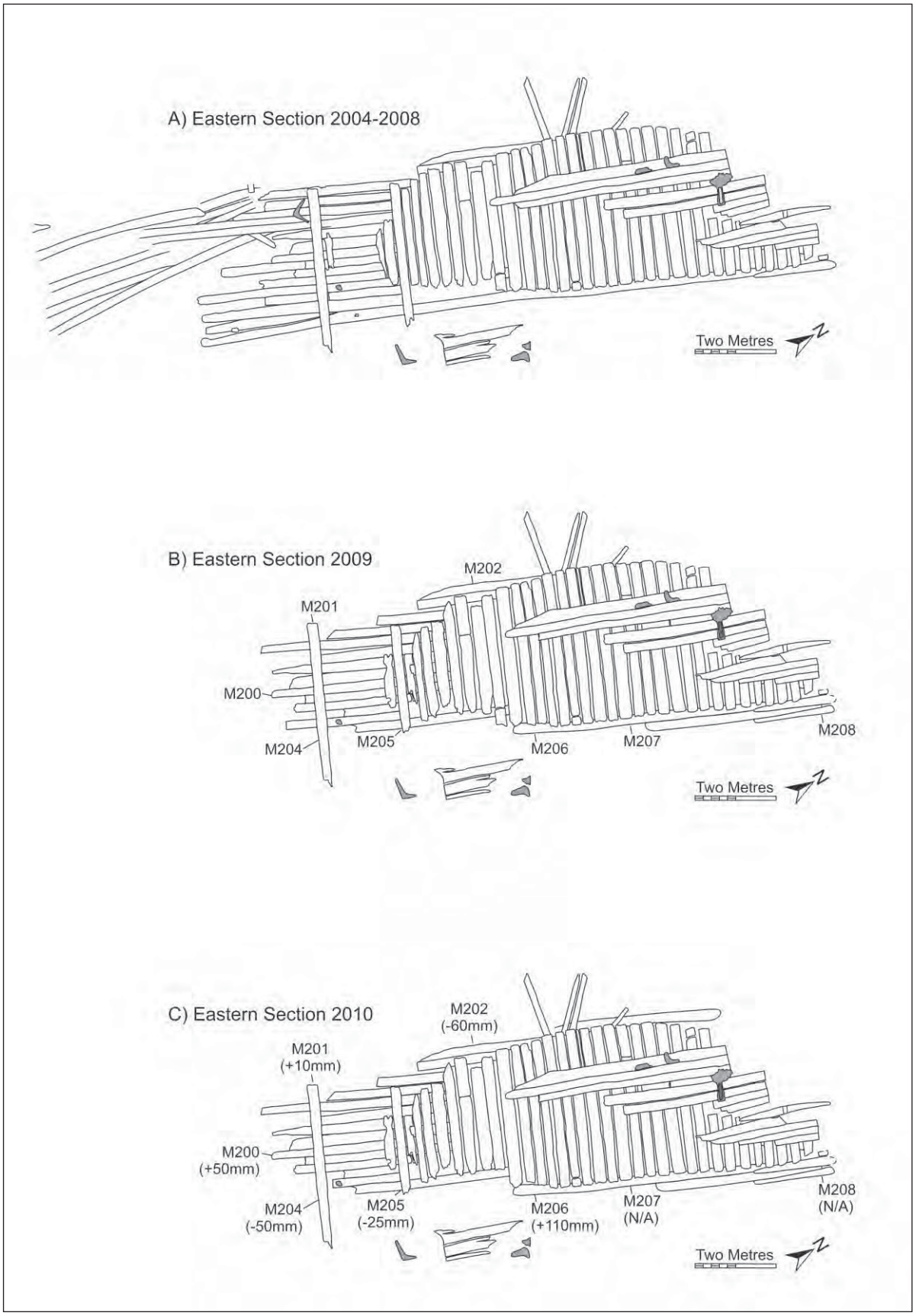

Figure 12. Observed progression of changes to hull structure on the eastern section of the Flower of Ugie*. Monitoring points installed in 2009 are shown in B) and the changes in sediment level, relative to these points as observed in 2010, in C).*

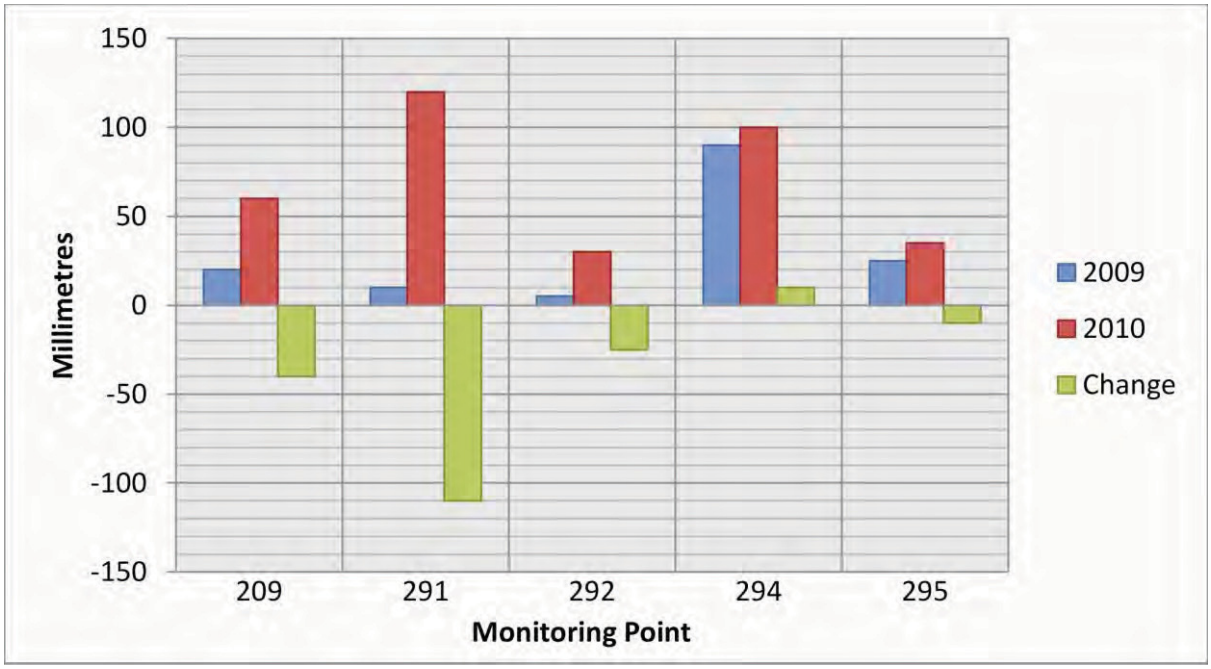

Figure 13. Relative monitoring point measurements (height above seafloor) taken in 2009 and 2010 and the relative change in seabed height at the western section of hull remains.

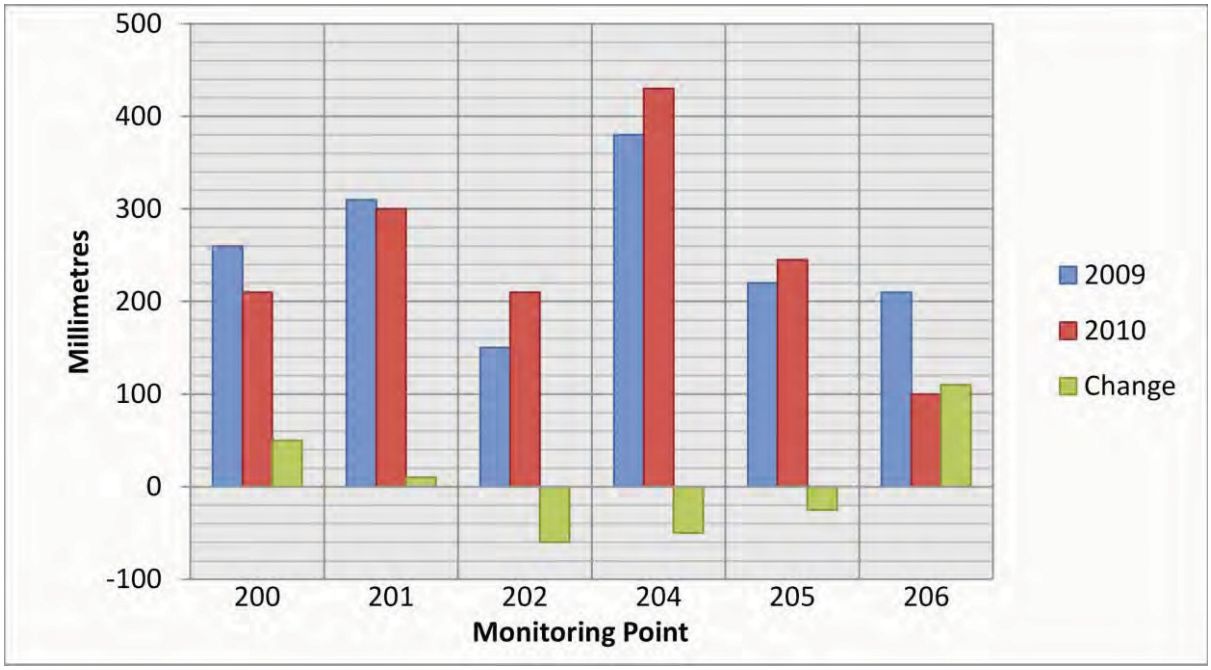

Figure 14. Relative monitoring point measurements (height above seafloor) taken in 2009 and 2010 and the relative change in seabed height at the eastern section of hull remains.

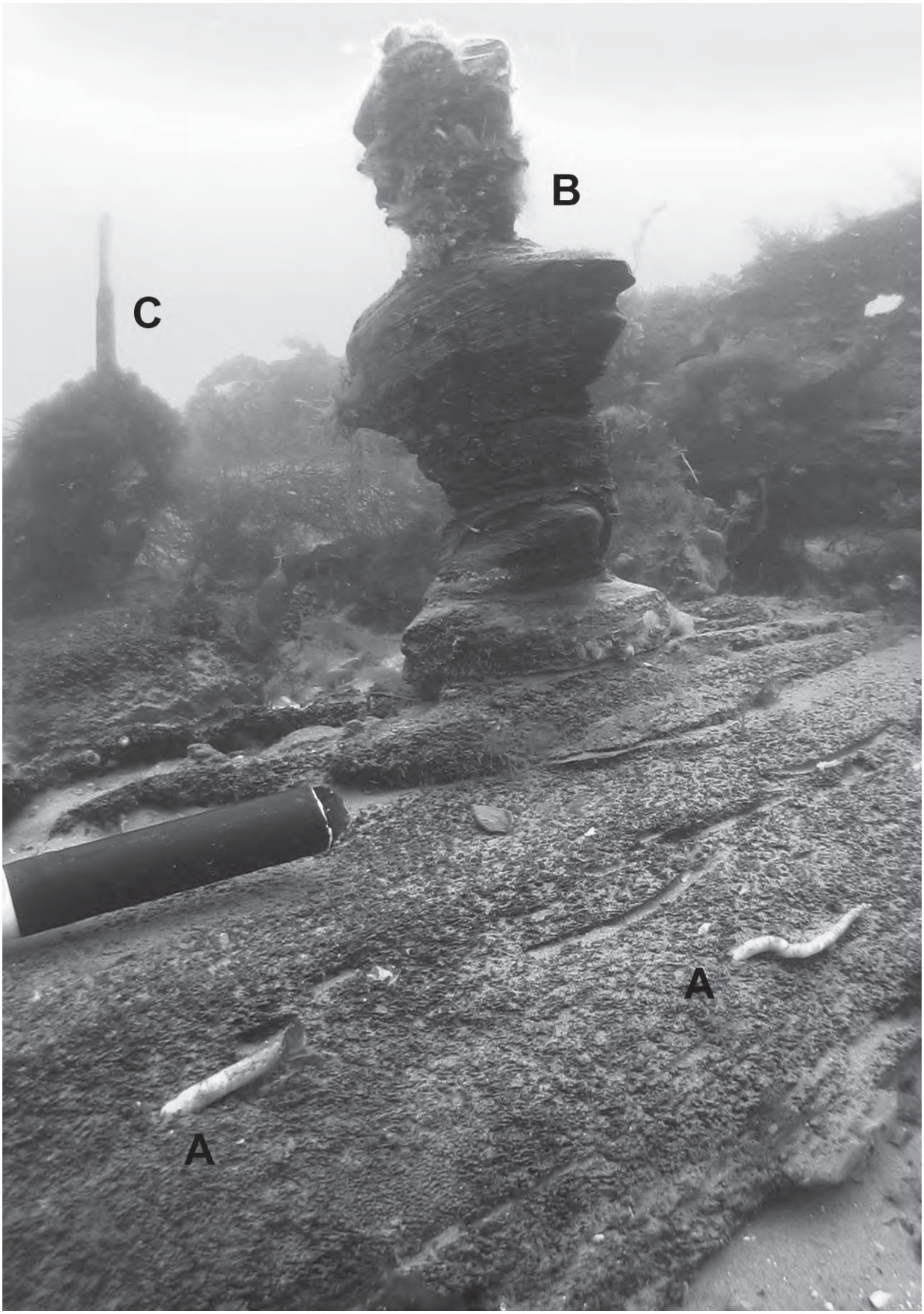

Figure 15. Natural processes degrading the timber remains visible on the wreck-site. Shipworm is visible in the foreground, protruding from the exposed face of a plank (A). Beyond this, the column-like object is a metal fastening surrounded by wood (B), the only remains of the frame that previously occupied this position. A similar metal fastening, with the surrounding wood completely lost is visible in the far left background of the picture (C). Scale increment = 10 cm (Photo: Doug McElvogue).