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THE EXCAVATION, RECOVERY AND ANALYSIS OF AN EARLY 19TH-CENTURY SHIPWRECK FROM THE SOLENT, HAMPSHIRE

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ABSTRACT

The remains of a 19th-century barge were found in the Solent whilst undertaking pre-construction geophysical survey works as part of the Interconnexion France-Angleterre 2 cable route (IFA2) project. Investigations culminated in the excavation, recording and recovery of the remains of the wreck. Although no documentation or records of its loss have been found at the time of writing, the remains highlight the importance of vernacular shipbuilding techniques that were applied by independent shipbuilders scattered along this stretch of coastline.

INTRODUCTION

The remains of a shipwreck came to light whilst undertaking route clearance works following target identification from geophysical survey works as part of the IFA2: Interconnexion France-Angleterre 2 cable route installation. The remains were situated directly within the proposed High Voltage Alternating Current (HVAC) cable corridor of the IFA2, constituting six subsea HVAC cables between landfall at Monks Hill Beach and landfall at Chilling (Fig. 1). The location of the identified wreck site did not allow for the micrositing of the cables, causing a significant constraint for the effective delivery of the IFA2 project. For the project to continue, it was decided in consultation with Historic England, to excavate and recover/record the wreck material.

The work was carried out under the supervision of the Retained Archaeologist, Wessex Archaeology, following the conditions set out under the Marine Management Organisation Marine licence L/2107/00021/2 and compiled Heritage Method Statements (Wessex Archaeology 2018 & 2019). The initial work included an archaeological pre-disturbance and photogrammetry survey of the site. Following on from this survey an excavation and recovery plan were formulated based on the wreck material present, representing the partial, isolated fragmentary remains of a vessel. The remains were located flush on the seabed, with a fine layer of sedimentation covering the timber elements, with no evidence for extensive buried material.

The shipwreck has been provisionally identified as an early 19th-century barge constructed with oak double frames, oak and conifer hull planking and shows evidence for replaced frames and repairs present in the extant material, possibly indicating a period of extensive use. As a means of dating the timber remains, dendrochronology coupled with isotope analysis provided an indicative primary construction date ranging from 1836 to 1872. No evidence of rigging, fittings or cargo were recovered from the site, other than the remains of an oil lamp and anchor chain found in a concreted mass in the forepart of the vessel.

This article presents the results undertaken as part of the investigations and post-excavation analysis carried out between 2018 and 2020. A glossary of ship and boat terms can be found in Appendix 1.

DISCOVERY AND INITIAL INVESTIGATION

The shipwreck was initially recorded on the seabed approximately 500m from the shore near Hill Head Beach as a magnetic anomaly

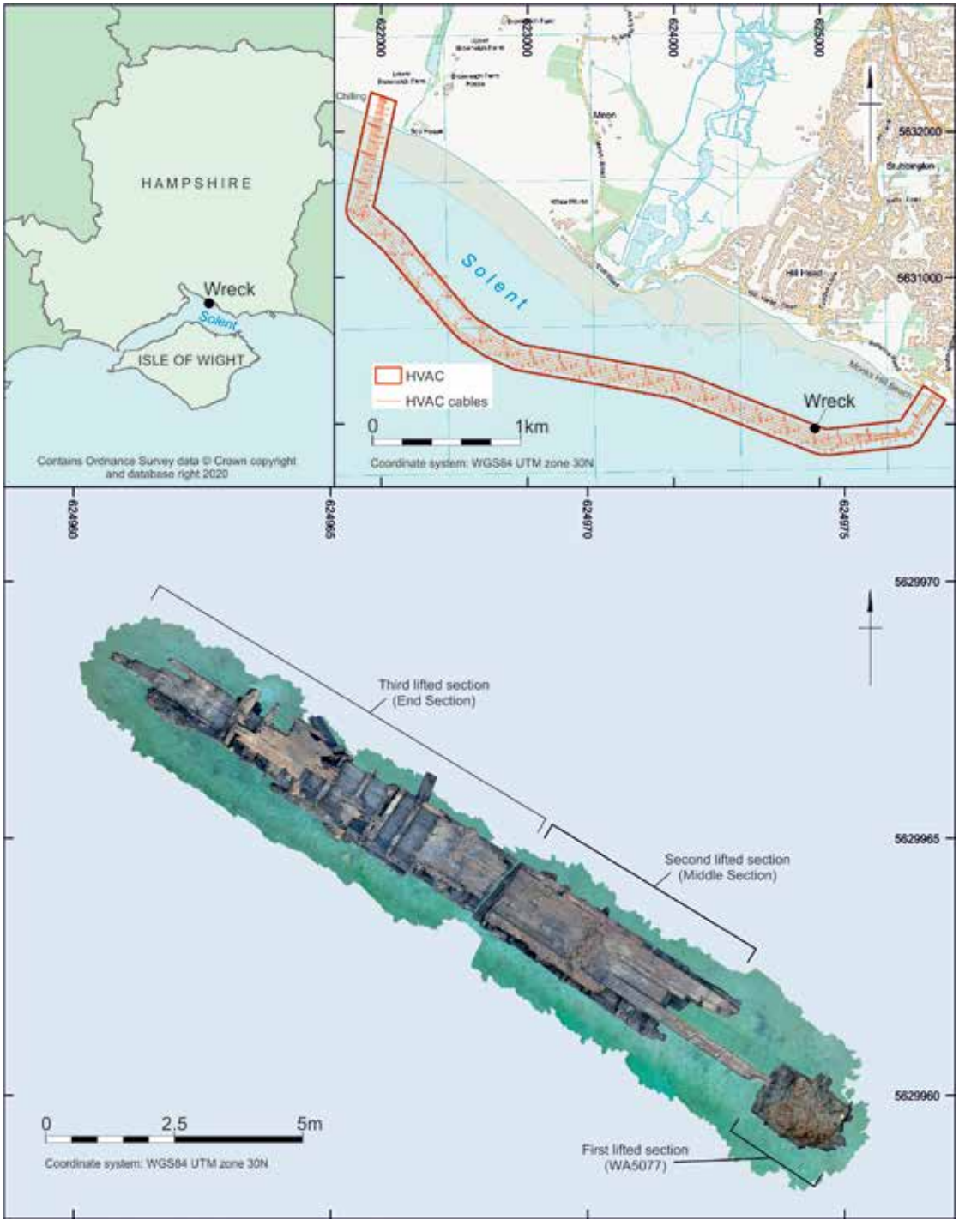

Fig. 1 Cable corridor for the HVAC route showing wreck location and orientation of shipwreck in relation to Hill Head Beach

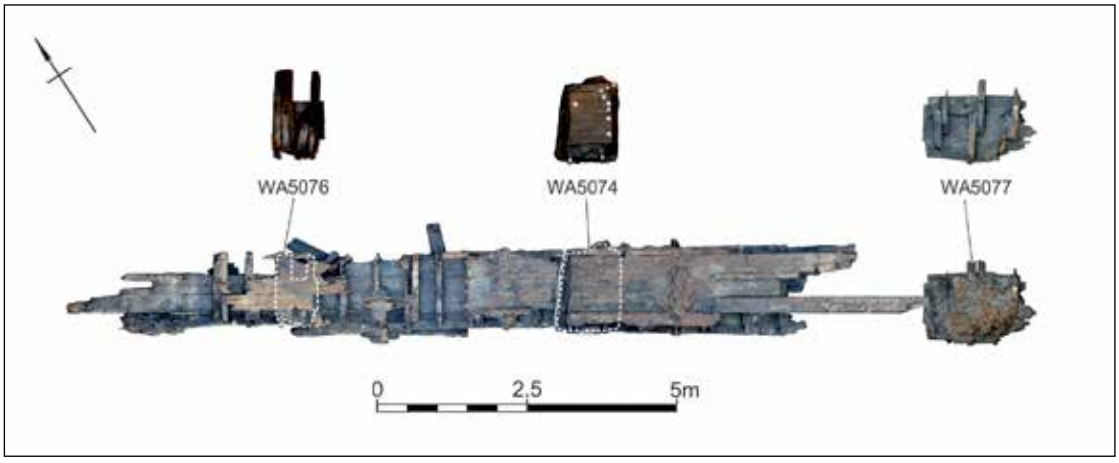

Fig. 2 Plan showing the three sampled sections overlaying the photogrammetric model of the shipwreck

in geophysical survey data acquired by the IFA2 project, and was identified as a pile of chain link measuring 1.2 × 5 × 0.8m by the diving contractor. The dive report indicated that it was possible that the chain was masking further material. During a second stage of pre-construction work, conducted during a boulder clearance campaign undertaken in September 2018, the site was identified as a preserved wooden structure.

Due to the site location, negotiating cables around it was not possible; therefore, an archaeological diving investigation was undertaken by Wessex Archaeology to carry out a pre-disturbance photogrammetry survey. The data obtained during this initial survey assisted in establishing site character, date and importance. This survey confirmed the presence of a wooden wreck covering an area of about 3m by 15m, with the long axis oriented approximately north-west to south-east and lying level with the seabed in less than 10m depth. Flush outer planking, ceiling planking and framing timbers were observed. Fasteners seen *in situ* consisted of treenails, although a small ferrous nail residue was subsequently found on one of the dendrochronological samples. Stratigraphy on site appeared to be very shallow, with limited finds. The single find recovered was a fragment of a conical cuprous object, possibly a washer. Due to the construction characteristics observed, the material appeared to belong to the upper hull of a vessel, with a longitudinal caprail recorded along the top of the vessel's frames (top timbers).

THE EXCAVATION AND RECORDING

In order to record the remains prior to lifting, during the initial diving assessment, where sediments covered the site they were cleared by means of hand fanning and timbers recorded in a single dive, with a subsequent dive carried out to sample, take measurements and use metal detecting around the site. Unfortunately, as is often found in the nearshore Solent, visibility was variable and sub-optimum for photogrammetry. However, video coverage of the whole site was achieved using a GoPro and video lights, with sufficient photographs and video to produce an orthographic model of the site.

The excavation and recovery strategy initially planned to cut the wreck into four sections and lift them aboard a working barge for recording, before re-deposition within the project archaeological exclusion zone (AEZ). Due to various constraints, including the nature of the seabed material leading to slow excavation progression, poor weather

days and the weak structural integrity of the timber elements, the wreck was recovered in three parts, with three sampled timbers being retained for further analysis (Fig. 2), whilst the remaining sections and timbers, following recording, were redeposited within the project AEZ and covered over with sandbags for preservation *in situ* in line with the agreed methodology.

This work was carried out between 9–17 October 2018 by Briggs Marine & Environmental Services aboard their crane barge *Harry McGill*, with a team from Wessex Archaeology present throughout the works. A total of 19 dives were carried out logging a total of 28 hours of diving time.

Recovery was undertaken using an arrangement of lifting strops and bars. The material was stored in a designated area on board the working barge, where they were assessed by two qualified archaeologists. The timbers were recorded by means of photographs, videos, drawings at 1:10 and timber record sheets. The first section (WA5077) to be recovered contained a mass of concreted chain, protecting the remains of an oil lamp and suggesting that the remains were part of the forepart of the vessel. This section was fully retained for further analysis. The second section to be lifted pertained to the middle part of the wreck and measured approximately 4.40m in length. A sample (WA5074) was taken from this section for further analysis. The third part to be lifted pertained to the aft end of the wreck and measured approximately 6.20m in length. Similarly, a sample (WA5076) was extracted for further analysis.

At the request of Historic England the post-recovery recording followed level two survey guidelines recommended by the Chartered Institute for Archaeologists (CIfA) (2014, updated 2020), with the aim of recording the three separate sections (as recovered) during the process of disassembly and then subsequently each individual timber. A decision was also agreed with Historic England and the Receiver of Wreck to discard the timbers once all necessary data had been obtained and reported on, with a sample to be retained for future training.

THE HULL REMAINS

The wreck lay on its port side, with the bow facing south-east (Fig. 1), as suggested by the mass of concreted chain (potentially correlating to the chain locker). None of the lower hull section or the starboard side were preserved. No evidence of its port of origin or destination was identified during the recovery operation, nor was any evidence of cargo or ballast identified.

The condition of the wooden structural elements varied significantly. Some were heavily deteriorated due to physical processes and biological agents (marine borers), whilst others, which were covered and protected by sediment deposits, were in a very good state of preservation. During the post-excavation recording process some elements were identified as repairs or replacement timbers, reflecting the vessel's potentially long lifespan.

The most preserved section of the ship consist mainly of framing and planking on the port side, pertaining to the upper half of the vessel up to the caprail down toward the area of the chine. Two separate layers of outer planking, consisting of an inner layer jointed by rebates (overlapping edge) and an outer layer jointed by butt joints were recorded. Ceiling planking was also well preserved in places. None of the lower half of the hull was preserved.

Forward section WA5077

The forward end of the wreck (WA5077) preserved the remains of six framing elements (probably futtocks), six inner planks and four outer planks, all preserved *in situ* (Fig. 3). WA5077 had a width of 1.00m and a length of 1.45m. This section was covered over by the concreted chain, which was removed to expose the frames. No ceiling planking was preserved, and no evidence to suggest any existed within this section, with all visible treenails sitting flush on the frames. Treenails with an average diameter of 28mm were noted fastening outer planking onto framing elements. Square shafted iron nail holes were observed along rebates of the inner planking, measuring 100 × 50mm, and along the upper and lower edges of

Fig. 3 Photogrammetric model of extant inboard and outboard forepart (WA5077) of shipwreck

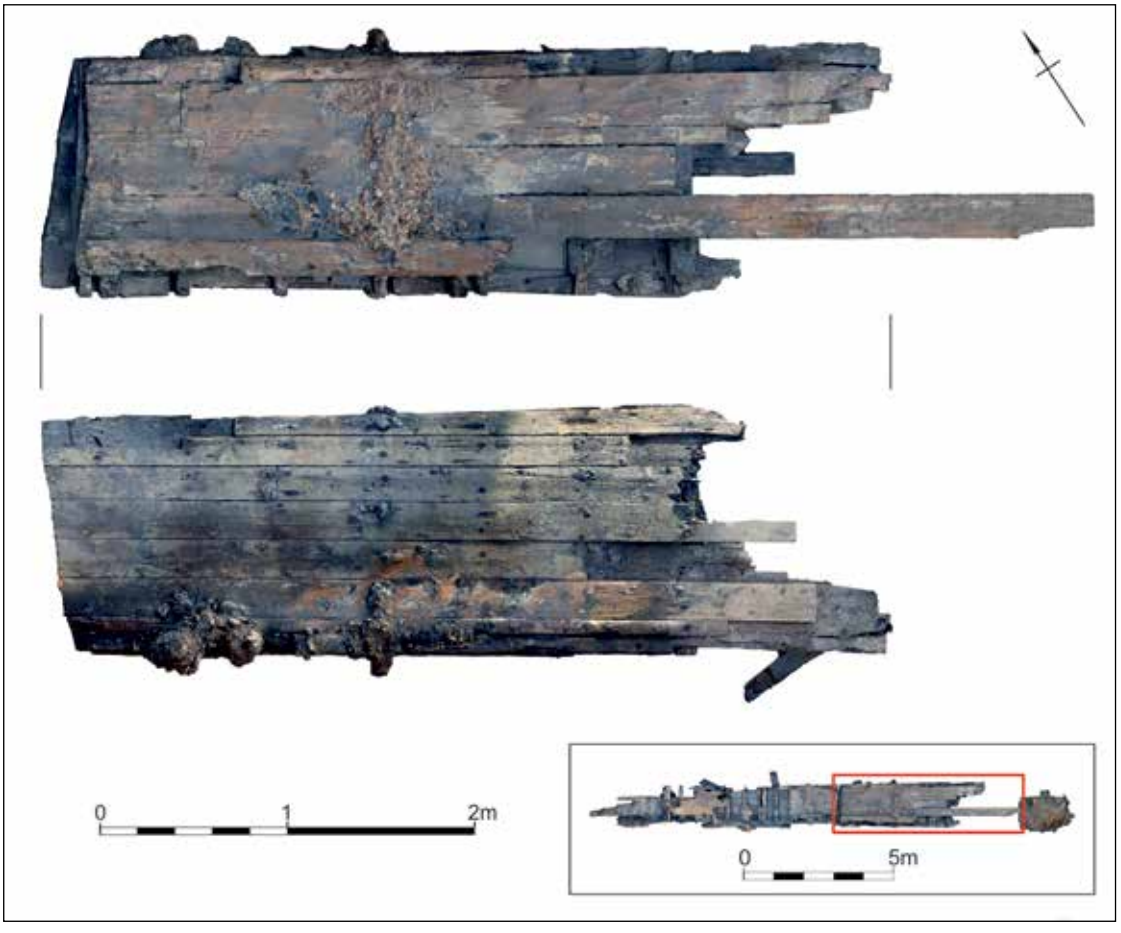

Fig. 4 Photogrammetric model of extant inboard and outboard middle section of shipwreck

outer planks, in line with the framing elements, measuring 100 × 100mm.

Middle section – sample WA5074

The middle section of the wreck had a width of 1.30m and a length of 4.40m (Fig. 4). The forward end of this section was attached to the concreted chain section WA5077, whilst the aft end was sawn off to accommodate the lifting process and was attached to the end section. Sample WA5074, measuring 1.00m wide and 1.45m long, was removed from the aft end of this section for further analysis (Fig. 2). This section preserved six partially preserved ceiling planks, nine framing elements, outer planking and a wale which ran along the upper edge of this section. Six small wooden patches have been observed on the outer planks fastened with square shafted iron nails, as observed by the nail holes. These measure approximately 100mm by 60mm. The overall lack of timber knots within the outer planking suggests that these patches were probably inserted to replace existing knots in the planks. Top timbers retained a lap joint on the inboard timber head where the caprail would have fitted on, whilst a bridle scarf (similar to that of a dovetail joint) is present on the timber heel. Two supporting chocks were preserved *in situ*, measuring

Fig. 5 Detail of wedged treenails and square shafted iron nail holes

approximately 300mm long and 150mm thick, filling out the spaces between double and single frames. As with Section WA5077, treenails, measuring 28mm in diameter were utilised to fasten framing elements to inner planks and to attach outer planks to inner planks onto frames. Wedged treenails (with x mark's) were often observed aligned with the framing elements, however, no specific pattern was noted (Fig. 5). Square shafted iron nail holes have been observed along rebates of inner planking and along the upper and lower edges of outer planks (Fig. 5).

End section – sample WA5076

The end section of the wreck had a width of 1.30m and a length of 6.20m (Fig. 6). The forward end of this section was attached to the middle section, whilst the aft end demarcated the extent limits of the wreck. Sample WA5076 was extracted from this section for further analysis (Fig. 2). Five ceiling strakes would have enclosed this section of the wreck, however, at the time of recovery ceiling planks were partially preserved as ten timbers, showing clear biological deterioration. Eighteen framing elements (top timbers) were identified, a majority persevering a lap joint on the inboard timber head and a bridle scarf on the timber heel. Frames were fastened to inner planks by means of treenails, again with an average diameter of 28mm. Outer planking was preserved in the form of inner oak planks and an outer layer of softwood, fastened together by means of treenails, some preserving a

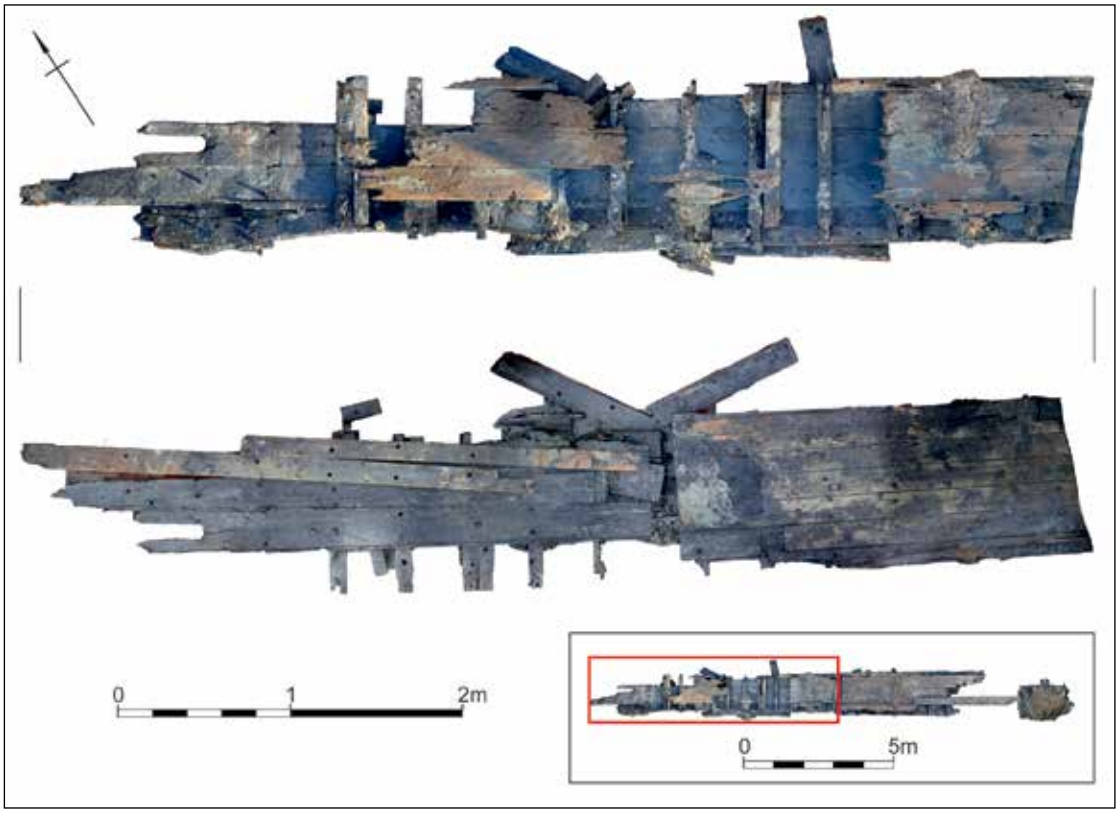

Fig. 6 Photogrammetric model of extant inboard and outboard End Section of shipwreck

wedge (with x mark's). A wale was also present running along the upper edge of this section. Square shafted iron nail holes, measuring 100 × 50mm were located along upper and lower ends of planks, as means of fastening outer and inner planks together. Nail holes located along the centreline of the planks functioned as fasteners to frames, often measuring 100 × 100mm. Circular impressions have also been observed around some of the nail holes of the latter fasteners.

Other finds

Sample WA5077 had a mass of concreated chain overlaying it with hemp rope fragments, a heavily corroded iron shackle and the remains of what is believed to be a metal container, an oil lamp (Fig. 7), and its saponified oil, buried within the concretion (Fig. 8). Also recovered from this area were the remains of what appears to be a metal rowlock and bar. Two stones laying within the wreck were also recovered by the divers as potential ballast stones. No further metallurgical analysis was recommended on the sampled chain, as these were associated with chain cable generally found on 19th-century vessels.

DENDROCHRONOLOGY AND ENVIRONMENTAL EVIDENCE

Spot dating was carried out on a total of seventeen samples from an initial two batches of samples. Further analysis was undertaken on a third batch of samples, totalling to fourteen (Table 1), comprising ring-width dendro-

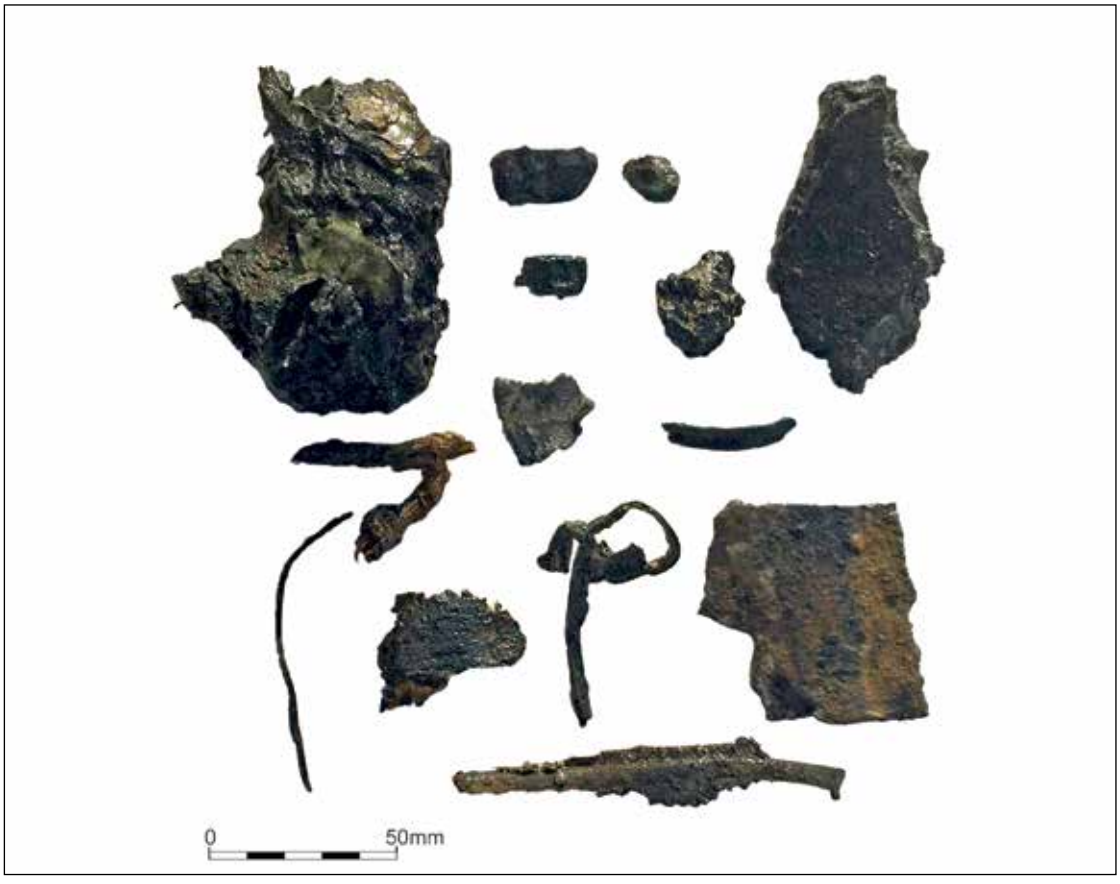

Fig. 7 Possible oil lamp

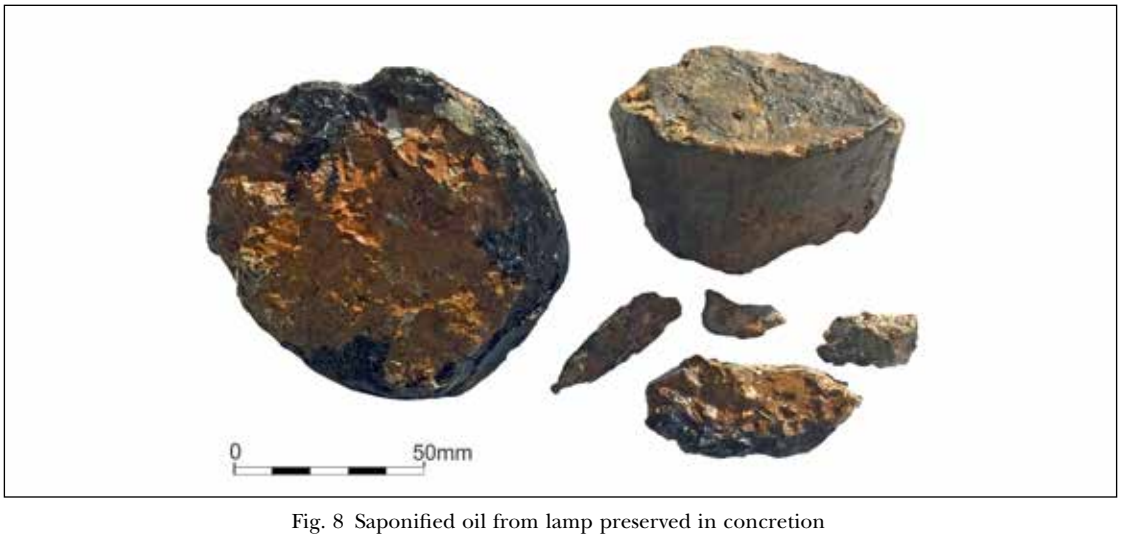

Fig. 8 Saponified oil from lamp preserved in concretion

Table 1 Dendrochronology and oxygen isotope dendrochronology sample details

Sample Code	*Conversion/Function*	*Genus*	*Date Range*	*Felling Date*
5064	Tangential	*Pinus* (pine)	Not measured	Not measured
5065	Tangential	*Ulmus* (elm)	Not measured	Not measured
5086	Radial hull plank	*Quercus* (oak)	1–102 total ring count	undated
5087	Tangential hull plank	*Quercus* (oak)	AD 1750–1812	after AD 1822
5088	Tangential hull plank	*Quercus* (oak)	AD 1778–1809	after AD 1819
5089	Tangential	*Ulmus* (elm)	Not measured	Not measured
5090	Quartered frame	*Quercus* (oak)	AD 1770–1826	AD 1836-187
5092	Sub whole	*Quercus* (oak)	1–43 total ring count	undated
5097	Radial hull plank	*Quercus* (oak)	AD 1752–1809	after AD 1819
5099	Tangential hull plank	*Quercus* (oak)	AD 1776–1818	after AD 1828
5101	Tangential plank	*Pinus* (pine)	AD 1633–1736	after AD 1736
5102	Tangential plank	*Pinus* (pine)	AD 1643–1760	after AD 1760
5104	Tangential plank	*Pinus* (pine)	AD 1643–1757	after AD 1757
5106	Quartered frame	*Pinus* (pine)	1–101 total ring count	undated

Note: shading indicated samples dated through oxygen isotope dendrochronology dating

chronology and selective absolute dating through oxygen isotope dendrochronology (Bale & Nayling 2019).

Five *Pinus* (pine) samples contained sufficient rings to warrant analysis, with dated reference conifer tree-ring chronologies from Scandinavia. However, all of the dates provide a *terminus post quem*, i.e., dates after which the parent trees were felled. Seven *Quercus* (oak) samples underwent ring width analysis; however, none could be dated against absolutely dated reference chronologies or site masters using their ring-width series. Therefore, two *Quercus* timbers underwent oxygen isotope dendrochronology (5087 and 5090) – a first for ship timbers from the UK – providing an absolute date for the last surviving ring (see Table 1). Unfortunately, none of the samples retained sapwood, except for framing timber 5090 which exhibited a possible heartwood/sapwood boundary indicating a possible felling date range between AD 1836 and AD 1872. This date range could be taken as indicative of the vessel's primary construction date.

Table 2 List of other samples examined

Sample Number	*Composition*
26	Black powder
27	Black powder with a number of fibres
28	Black powder with a number of fibres
35	Grey powder with some fibres
36	Grey powder with some fibres
37	A few fibres

A total of 12 environmental samples were taken and sent to Durham Archaeomaterials Research Centre (DARC) for assessment. Two bulk sediment samples taken from between planks were processed by flotation for the recovery and assessment of the environmental evidence. Six samples (Sample numbers 26–28 and 35–37) from waterproofing (tar and luting) material were submitted for chemical analysis.

The bulk sediment samples contained a volume of one litre, and they were processed by standard flotation methods, with the flot retained on a 0.25mm mesh. The flots were scanned using a stereo incident light microscopy (Leica MS5 microscope) at magnifications of up to x40 for the identification of environmental remains.

To investigate and positively identify the composition of the waterproofing samples, Optical Microscopy (OM) and Scanning Electron Microscopy (SEM-EDS) was utilised to investigate the fibrous composition of all six samples (Table 2) and Pyrolysis Gas Chromatography – Mass Spectrometry (Py-GC-MS) were utilized on one sample (sample 27) to determine the presence and nature of any organic binder. All six samples were examined by microscopy and two samples were analysed by Py-GC-MS to understand their composition.

The flots from the bulk sediment samples were small and they had variable but moderate to low amounts of environmental remains, comprising plant macrofossils (both wood charcoal and waterlogged plant remains), insects, marine molluscs, ostracods and foraminifera, in addition to a small amount of coal fragments.

The environmental remains in the samples are evidence of natural processes of sedimentation, and due to their small number, have little potential for further analysis to provide detailed information on the depositional environment. No remains associated to human activities during the vessels' use were identified, other than a small amount of wood charcoal and coal fragments.

The analysis of the waterproofing samples indicated the presence of thin-fibrous materials resembling hemp or jute. The samples were most likely composed of hemp, although jute remains a possibility for the material composition but tends to have thicker fibres than was observed for these samples. This material was treated with good quality pitch or a specific 'branded tar', such as Stockholm, Archangel or Boston tar.

DISCUSSION

A substantial amount of the upper port side of the vessel has survived, dating to the early 19th century, facilitating a tentative reconstruction of the vessel. However, the lack of any evidence of internal structures pertaining to the lower half of the vessel, such as floor timbers, the keel and mast steps, along with other elements such as knees, decking, internal bulkheads, flared or bevelled surfaces on some frames, or other accoutrements make this interpretation tentative at best (see Fig. 12).

The general geographical area of the wreck location, within the Solent, represents a wealth of watercraft remains dating from the early Saxon period through to the Second World War (Hampshire and Wight Trust for Maritime Archaeology *et al.* 2007). There are still several abandoned hulks visible along the foreshore within the various waterways of the Solent, pertaining to a variety of vessel types and often having a secondary function as maritime infrastructure, such as mooring pontoons. The wooden hulks located at Woolston Riverside were two such examples of barges which were laid down for land reclamation during the First World War and later buried in industrial waste (Southampton City Council 2009).

Due to the possible felling date range between AD 1836 and AD 1872 and the length of time

such vessels were used, there are currently no primary records, or any secondary sources, specifically linked to, and reporting the loss of the vessel. The extant remains also do not provide any discrete evidence for the wrecking event. Preservation of the outer port hull planking was overall in a good state, potentially indicating an immediate burial of the vessel in this orientation once it was lost or discarded. This might also imply that this section of the hull was preserved *in situ* for a substantial amount of time, with a short time span between its working life and localised deposition.

Available secondary sources, including Recorded Losses within the United Kingdom Hydrographic Office (UKHO) database and droit records from the Receiver of Wreck, reported a significant number of vessels and loose finds lost at sea or ashore within the area of this wreck, suggesting that this is a secondary wreck site, with the main undiscovered assemblage residing somewhere in the vicinity. Although the following are purely hypothetical explanations, it has been suggested that the extent remains belong to a ship that had been partially salvaged or belong to an abandoned hulk which later broke up and was carried down Southampton Water before sinking. The latter is more likely, as the unique tidal curve within these waters present a high energy environment, where material can easily get broken up and washed downstream out into the Solent.

The extant remains suggest that the point of separation is at the start of the turn of the bilge, an easy node for a vessel to break apart. This is based on the top timbers with bridle joints and the surviving wale (Fig. 9), pointing to a relatively shallow hulled wooden merchant vessel, with the possibility of it being a sailing barge.

From the visible wreck remains and through the deconstruction process, the construction sequence is likely to have consisted of skeleton first technique, with the keel, post ends and framing elements erected first, and hull planking fastened at a later stage. However, the construction sequence of barges is bottom first, using shell first technique, and switching to skeleton technique once the framing element for the hull are fitted into place. Unfortunately, from the remaining wreck elements this cannot be clearly established.

The method of assembling frames by means of bridle scarfs is prominent in the shipbuilding of barges along the south-east coast of England and within the Thames Estuary (Benham & Finch 1983). During the deconstruction of the three sections, no corresponding fastening holes were observed on the bridle joints where the floor timbers would have been slotted on. No pattern could be conclusively determined with regards to location of frames with bridle joints, whether these were paired or found as single frames, or whether they were located at specific intervals. Section WA5076 exhibits two top timbers which are paired timbers that do not retain a bridle joint but end flush towards the timber heel (Fig. 10). Most timber heads ended with a lap joint where the caprail would have fitted on.

Similarly, constructing watertight hulls by means of luting is a technique that was restricted to barges constructed in the Thames Estuary (Benham & Finch 1983, 43). The luting inserted between adjoining planks, along the longer edges, has been utilised in the wreck under study (Fig. 11). Caulking material was also identified between butt joints of the outer planks and between the two sets of outer planking.

Accessed literature shows that the side planking of barges consisted of either a single 3-inch (7.62cm) oak skin, or two skins of 1.5-inch (3.81cm) thickness (Cooper 1955, 34). Similarly, "if the planking was to be oak, it would be a single thickness with rebated joints set in hot stuff and hair" (Sattin 1990, 38). This thickness depended on the side of the barge being built, where river barges would have 2 to 2.5-inch-thick (5.08 to 6.35cm) planks, whilst coasting barges would have 3 to 3.5-inch-thick (7.62 to 8.89cm) planks (Sattin 1990, 38). Planks were rebated and tar and cow hair used in the joints (Cooper 1955, 36).

The double planking preserved in the wreck consists of an inner rebated oak plank layer measuring 1.5 inches (3.81cm) thick, and an outer layer of flush-laid pine or elm planking measuring 1.2 inches (3.048cm) thick (Fig. 12). Although the method of oak planking is the same as described above, the dimensions vary

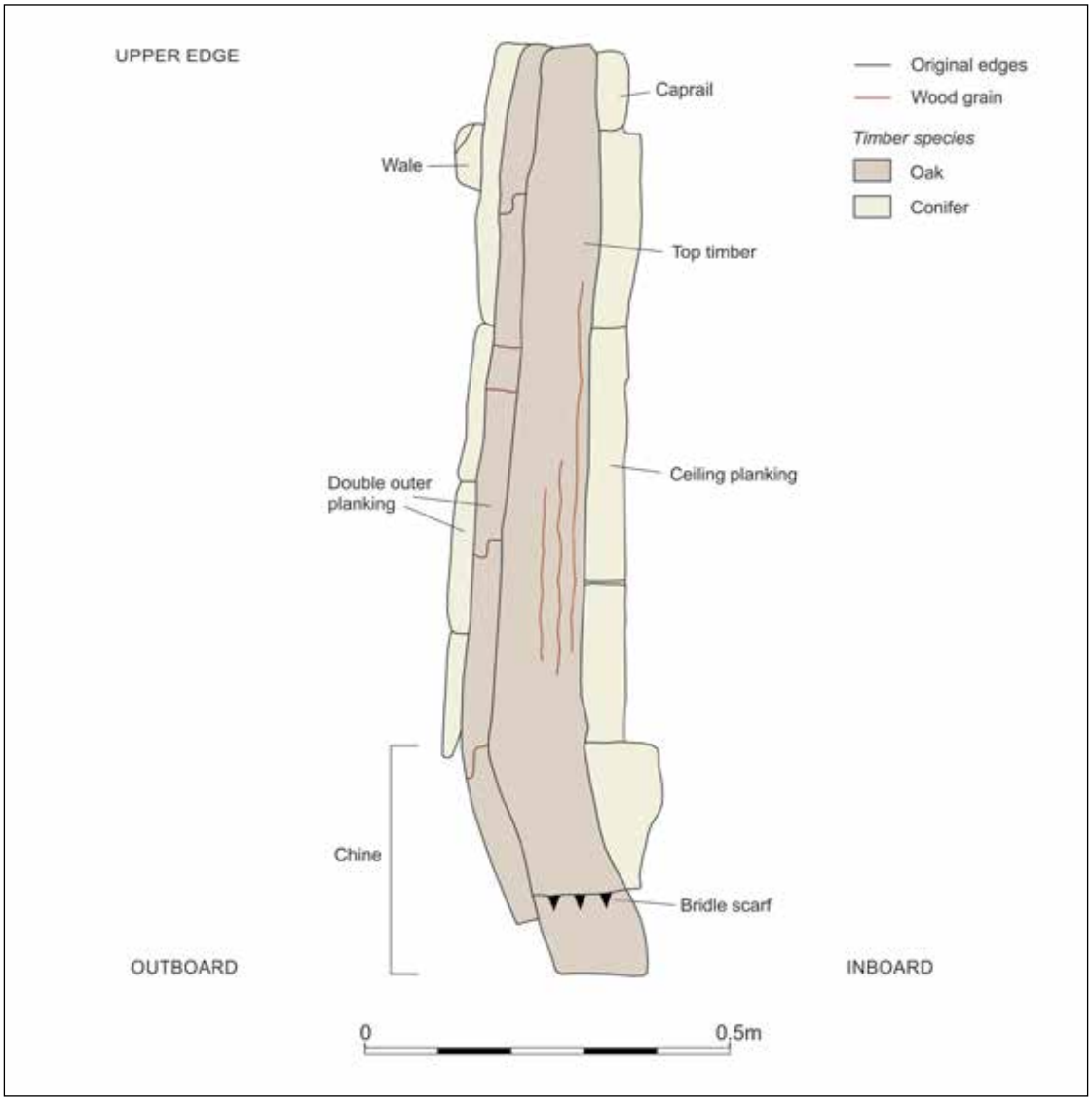

Fig. 9 Section plan of WA5074, showing bridle scarf located at the timber heel, wale, and double outer planking

slightly. This potentially implies that the barge was designed to have two skins of outer planking with an overall thickness of 3 inches (7.62cm) and therefore falling within those typically used on coasting barges.

Sailing barges generally had a maximum overall length of 100ft (30m) with a maximum breadth of 20ft (6m). The depth ranged from about 5 to 8ft (1.5 to 2.4m) from keel to deck level (Hazell 2001, 11). A larger type of sailing barge was built to trade at ports such as Ipswich, Yarmouth, Kings Lynn, the Humber, Portsmouth, Poole, Hull and others on the east and south coasts. These coasters had dimensions averaging 95ft × 23ft × 8–9ft depth (28.9m × 7m × 2.4–2.7m) (Leather

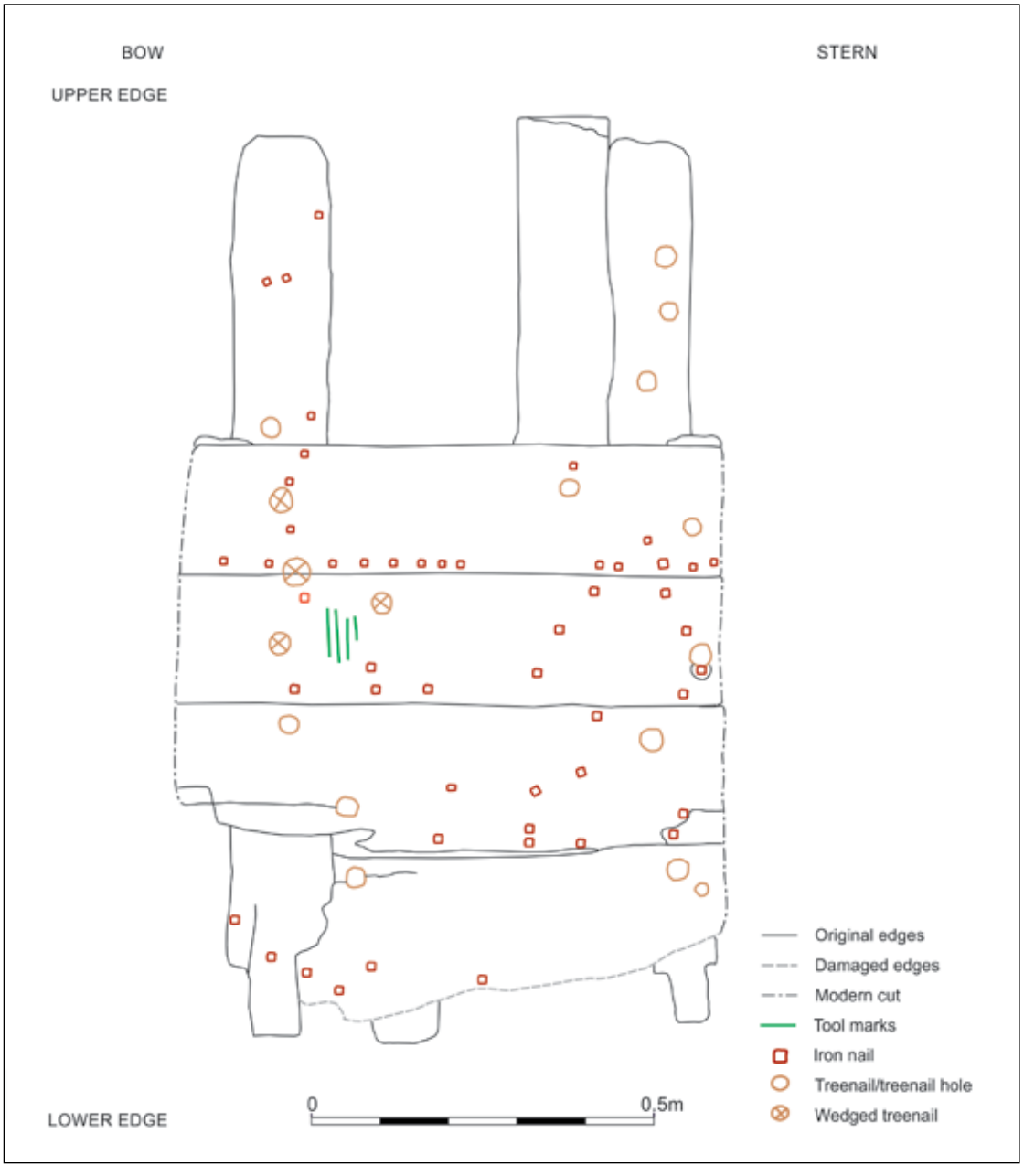

Fig. 10 Outboard plan of WA5076

1984, 12). The remains of the wreck have an overall length of approximately 14m and an overall width of 1.40m. No remains were found pertaining to the stern of the vessel and therefore it can be speculated that the vessel measured approximately 20m in overall length, with a beam of 4.0–5.0m and draught of 1.50–2.40m. Figure 10 represents the lines

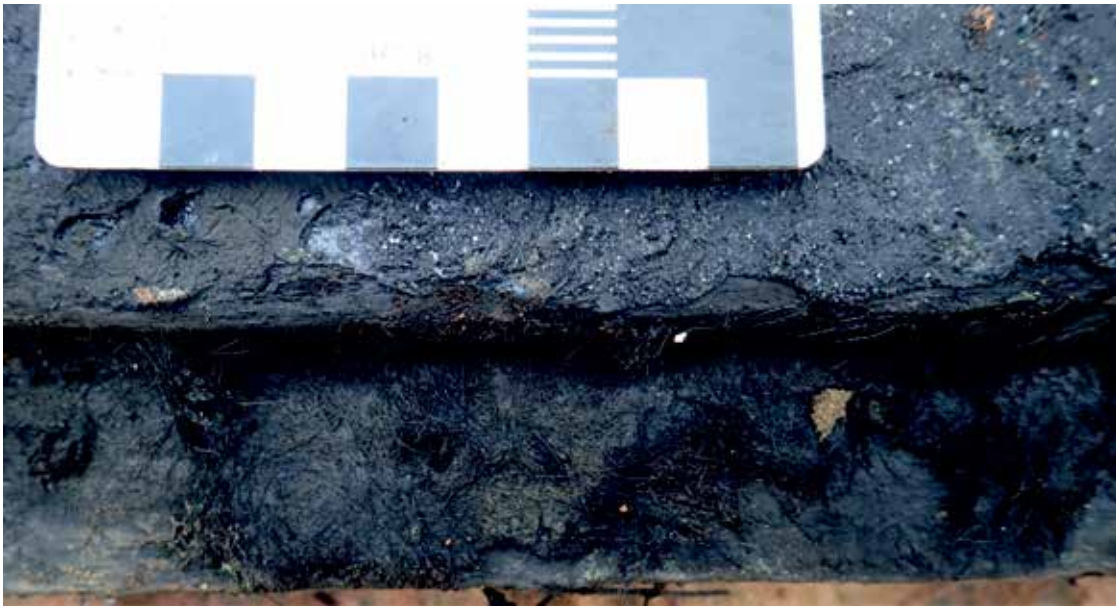

Fig. 11 Luting present on rebate found along planking

plan of the boomsail barge *Pearl* (1889), scaled down to match the IFA2 shipwreck overall dimensions. Three frames taken from each of the sampled sections are shown in their approximate location on the body plan of the *Pearl* (shown at Stations 2, 4 and 9).

The above features are suggestive of a barge type vessel. However, no comparative examples have been identified at the time of writing and no recorded losses of barges have been recorded within the area under study (Walsh 2012). The presence of what appear to be the concreted remains of chain dogs, suggest however, that the vessel was at some point masted, though it is possible these were stays for a derrick. With no surviving lower hull sections, it is only possible to make a deduction based on the surviving material.

CONCLUSIONS

Although the shipwreck was not conclusively identified with a specific vessel, we are confident in deeming the wreck to pertain to those of a relatively shallow hulled wooden vernacular vessel, constructed during the later period of the 19th century, and potentially lost by the early 20th century. The constructional features do tally with those utilised in sailing barges; cargo barges that plied along the south-east coast of England, from the River Stour, the Thames Estuary and Medway, and along towards the Solent.

There are still a handful of sailing wooden barges plying the UK coastline, with a general concentration within the Thames and River Severn. However, these are few in number and decreasing every year. A few are listed as part of the National Historic Ships UK, including *Centaur* and *Pudge*. Both spritsail barges are currently preserved and kept in sailing condition by The Thames Sailing Barge Trust (TSBT). Another example of an abandoned hulked traditional wooden barge is the scheduled *Harriett* at Purton, Gloucestershire (Historic England 2017). The decline in the use of barges and other vessels is clearly seen during the first half of the 20th century with the development of inland rail and road networks making this the preferred mode of transporting goods.

Therefore, the remains of this wreck high-

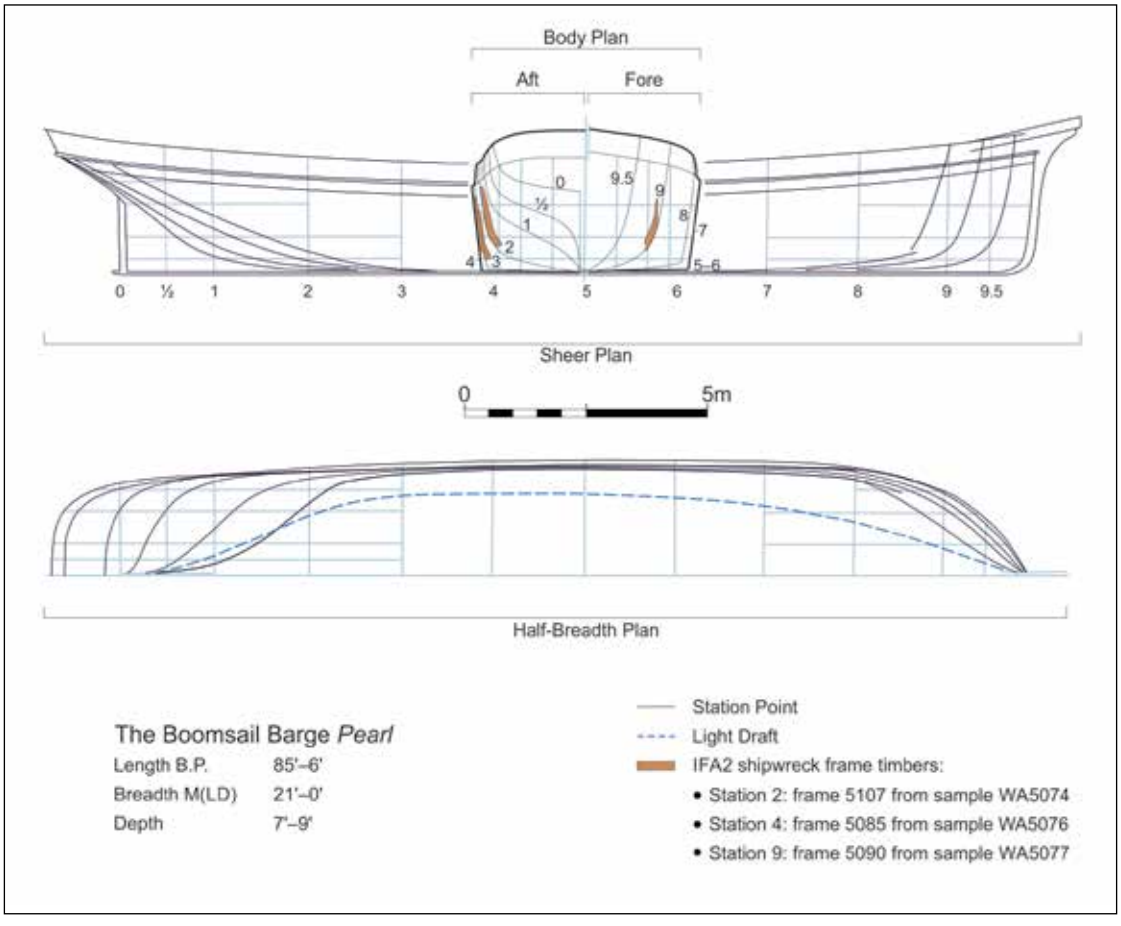

Fig. 12 Frame timbers of the IFA2 wreck (5095, 5107, 5085) superimposed on the body plan of the Boom Barge Pearl (taken from Benham & Finch 1983, 45)

lights the importance of the more vernacular shipbuilding techniques that were applied by independent shipyards along the different stretches of coastlines at the turn of the century, during the heyday of commercial activity, when transporting in bulk was necessary for the outputs of the varied industries.

THE ARCHIVE

The paper archive and all artefacts are currently held at Wessex Archaeology's headquarters at Portway House where they are given temporary storage under the project code 202920. The project will be transferred to an accredited repository to be agreed upon in the future.

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APPENDIX 1 GLOSSARY OF SHIP AND BOAT TERMS*

Bilge	The area of the hull's bottom on which it would rest if grounded; generally, the outer end of the floor
Bow	The forward part of a hull, specifically, from the point where the sides curve inward to the stem
Bulkhead	A vertical partition, either fore-and-aft or athwartships
Butt Joint	The union of two planks or timbers whose ends are cut perpendicularly to their lengths; sometimes called carvel joint
Caprail (Main rail, Cap)	A timber attached to the top of a vessel's frames
Caulk	To drive oakum, moss, animal hair, or other fibrous material into the seams of planking and cover it with pitch to make the seams watertight
Ceiling Planking	The internal planking of a vessel
Chine	The angular junction of the bottom and side of a vessel; usually found on flat-bottomed hulls, or those with little deadrise
Chock	An angular block or wedge used to fill out areas between timbers or to separate them
Floor timber	A frame timber that crosses the keel and spans the bottom; the central piece of a compound frame
Frames	A transverse timber, or line or assembly of timbers, that describe the body shape of a vessel and to which the planking and ceiling are fastened
Futtock	A frame timber other than a floor timber, half-frame, or top timber; one of the middle pieces of a frame
Keel	The main longitudinal timber of most hulls, upon which the frames, deadwoods, and ends of the hull are mounted; the backbone of the hull
Knee	An angular piece of timber used to reinforce the junction of two surfaces of different planes
Lap Joint	The union of two planks or timbers whose ends overlap
Luting	Luting generally refers to caulking inserted between two hull members before they were assembled, as opposed to driven caulking (see Caulk)
Mast step	A mortise cut into the top of a keelson or large floor timber, or a mortised wooden block or assembly of blocks mounted on the floor timbers or keelson, into which the tenoned heel of a mast was seated
Planking	The outer lining, or shell, of a hull
Scarf	An overlapping joint used to connect two timbers or planks without increasing their dimensions
Strake	A continuous line of planks, running from bow to stern
Treenail	A round or multi-sided piece of hardwood, driven through planks and timbers to connect them
Wale	A thick strake of planking, or a belt of thick planking strakes, located along the side of a vessel for the purpose of girding and stiffening the outer hull

*Adopted from *The Oxford Handbook of Maritime Archaeology* (2013)