

The Newshot Island boat graveyard: an assemblage of 19th century vessels on the Clyde

Authors: Ellie Graham, University of St Andrews, St Katharine's Lodge, The Scores, St Andrews; Tom Dawson, University of St Andrews, St Katharine's Lodge, The Scores, St Andrews; Steve Liscoe, FSA Scot, Nautical Archaeology Society, Fort Cumberland, Portsmouth.

With contributions by Peter Dick, the Historical Diving Society, Ardmore, Church Road, Isleworth

Keywords: Scotland, Clyde, deepening, sailing ship, post-medieval, ship graveyard

ABSTRACT

A project by SCAPE, NAS and local volunteers at Newshot Island on the Clyde near Glasgow documented an important ships graveyard dating to the early 20th century. The vessels tell the story of the creation of the Clyde Navigation, represent a significant aspect of the river's history and exemplify the technological and industrial development of the region. The survey and research revealed that the remains on site include a unique survivor – the earliest diving support vessel known to have been recorded, and has resulted in the designation of the remains as a Scheduled Ancient Monument by Historic Environment Scotland.

INTRODUCTION

[Site location and description of remains](#)

The boat graveyard at Newshot Island comprises a group of at least 53 vessels in an area of intertidal sand, silt and mud on the south bank of the Clyde at Newshot Island Nature Reserve, Renfrewshire. The remains lie around 300m north of Inchinnan centred on NS 47808 70534 ([Figure 1](#)). They cover a c.600m length of foreshore on the south bank of the River Clyde and along the relict south channel which formed Newshot Island.

The vessels are in the intertidal zone and are partially buried in riverine sediment; salt marsh is developing around those to the east. Forty-eight are rectangular flat-bottomed wooden punts, four boats are wooden sailing vessels, with hulls upstanding to varying heights. There is one metal barge. The remains of further vessels may be located in the area, either obscured by accreted sediment or too broken up to be clearly recognisable.

The vessels form three main groups ([Figure 1](#)). Area 1 is adjacent to Park Quay and includes the remains of seven punts. Area 2, is centred on the mouth of the Newshot Creek, which originally divided Newshot Island from the south bank of the Clyde, and comprises ten further punts and four wooden sailing boats, one of which, in the middle of the creek, is mostly permanently submerged with only the top of the surviving parts of the hull exposed at low water springs. Area 3 lies c.200m to the south east of Area 2, on the south bank of Newshot Creek and consists of 28 wooden punts and the metal barge. Three further punts lie between Areas 2 and 3.

The National Monuments Record for Scotland (Canmore) entry for the site recorded the remains of mud punts which had been used in dredging the River Clyde and three other craft, thought to have been abandoned there after a wartime bombing raid.

[Project background](#)

In 2012, The SCAPE Trust (Scottish Coastal Archaeology and the Problem of Erosion) launched the Scotland's Coastal Heritage at Risk Project (SCHARP). The project aimed to work with local communities to update records of vulnerable coastal heritage sites around Scotland and carry out

practical projects (ShoreDIGs) at selected threatened, locally-valued sites. The potential for collaboration with the Nautical Archaeology Society (NAS) was identified early in the project. Suitable sites were discussed for joint ShoreDIGs / NAS projects, and Newshot Island was selected for detailed survey and research.

Initial contact with local archives and community groups put SCAPE in touch with local resident Ian Sinclair, who had undertaken independent research into the site and the history of the vessels.

A project to record the remains in detail was developed and four seasons of fieldwork were undertaken, in October 2014, February 2017, June 2017 and May 2018.

Organisation and community involvement

Project planning was undertaken by SCAPE and the NAS. In keeping with the emphasis on community involvement in both organisations, volunteer participation was a significant focus of the project design. Thirty-five local volunteers were involved in undertaking the fieldwork (shown recording Area 1 in Figure 2). Training in the principles of recording and site survey was delivered in classroom sessions at the start of the fieldwork and the partnership with the NAS allowed volunteers the opportunity to gain an accredited qualification. Thanks to support from Historic Environment Scotland, fifteen volunteers completed the Introduction to Nautical Archaeology course. Eight volunteers also received training in illustration software and digitised the drawings of the vessels. Staff from Museum of London Archaeology visited Scotland and participated in the project to inform the development of the Coastal and Intertidal Zone Archaeological Network project (CITiZAN).

Aims and objectives

- Create a detailed and comprehensive record of the vessels before they deteriorate further;
- Create a record of the vessels' condition which can be used as a basis for future condition monitoring;
- Research the history of the vessels which comprise the boat graveyard;
- Provide an opportunity for learning and involvement for the local community, SCHARP volunteers, and NAS members;
- Share the results with the West of Scotland Archaeological Service HER and Canmore;
- Publicise the results of the project through the SCHARP networks.

The survey identified the boat graveyard as comprising a group of wooden sailing vessels and the remains of the dredging plant operated by the Clyde Navigation Trust during the 19th and 20th centuries. The work both highlighted the inherent importance of this assemblage of vessels and the value that a community-focused approach can bring. It drew attention to the essential but often-overlooked role played by dredging activity in the operation of the ports of the Clyde and represents the first detailed archaeological recording of remains of this type. Furthermore, historical research precipitated by the archaeological recording work resulted in the identification of the earliest known surviving diving support vessel, ultimately leading to the decision by Historic Environment Scotland to protect the site as a Scheduled Monument in recognition of its rarity and the significance of the assemblage in the industrial and maritime landscape of the Firth of Clyde. The range of techniques and technologies employed form a case study in the effectiveness of different approaches for the ongoing monitoring and management of vulnerable sites.

HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

Boat graveyards

The importance of ship graveyards as a site type, their potential for informing our understanding of past societies that created them, and their value as a threatened, under-studied resource has been presented by Nathan Richards (2011). As a maritime nation with a long coastline, Scotland has a rich heritage of boats, ships and associated infrastructure. Recent work has focused on creating and enhancing accessible records of the maritime historical and archaeological resource (project Adair, RCAHMS & Historic Scotland 2012), working with local communities to record intertidal and submerged shipwrecks on Scotland's Atlantic coast (Project SAMPHIRE, McCarthy et al 2015), and surveys of the First and Second World War wreck sites at Scapa Flow (Christie et al 2014). There has also been significant detailed research on individual shipwrecked vessels underwater (Martin 1998, Martin 2017) and intertidal abandoned vessels (Wood 1997a).

Intertidal assemblages of vessels by the nature of their liminal location are particularly vulnerable to being overlooked, falling between the perceived remits of terrestrial and underwater archaeological disciplines. However, their significance for the wider understanding of maritime history has been highlighted by recent work in the UK (Milne et al 1998; Parker 1998; Barnett 2007; HWTMA 2008). In England, reports commissioned by English Heritage (now Historic England) (Davies 2011, Pett 2013) provided an audit of intertidal hulks and a national resource assessment, leading to a number of recommendations for further work, including regular re-survey for monitoring purposes, and emphasised the scope for volunteer involvement in such work. As stated by numerous authors, such groups should be viewed both as monuments in their own right and as part of the wider historic landscape (Richards 2011, 84-117; Beattie-Edwards & Satchell 2011, 80-82). Their vulnerability in the intertidal zone to natural processes of erosion and deterioration exacerbates the lack of investigation; they are a fragile and dwindling resource.

In Scotland, a number of intertidal boat graveyards have been surveyed at Kincardine (Wood 1997b) Aberlady (Groom & Oxley 2002) as well as assemblages of sailing drifters at Loch Fleet (Graham & Hambly 2017a) and Findhorn Bay (Graham & Hambly 2017b). Many further ships graveyards around Scotland however, have not yet been examined. The assemblage at Bowling Harbour, for example, is diverse but has not yet been fully studied.

The Firth of Clyde

The Firth of Clyde and Clyde estuary form part of the fjord landscape of the west coast of Scotland, where the River Clyde drains the western part of the southern uplands. With a small catchment area and length of 100 miles, the river's volume and flow are limited, becoming estuarine just upstream of Glasgow at the upper tidal limit. The channel opens into the outer Firth at Greenock, ultimately connecting the Scottish Lowlands to the Atlantic.

The natural channel of the River Clyde was originally very shallow. The bed of the outer Firth of Clyde shoals abruptly between Greenock and Dumbarton, with the first of the pinch points at Dumbuck, as attested by a putative ford of Roman date (Canmore ID 43350) which crossed the river here. At this point, and several other locations on the upper stretch of the estuary as it approached Glasgow, depths as shallow as 18 inches at low tide were recorded by a series of surveys between 1755 and 1769 (Riddell 1979, 22, 23, 36, see **Figure 3**). The historic strategic importance of Dumbuck Shoal at the head of the navigable waters of the estuary is suggested by the presence of an Iron Age crannog here (Canmore ID 43402) which may have been located to take advantage of this location,

as suggested by Hale (2000), and by the Early Historic stronghold of the Kingdom of Stathclyde at Dumbarton (Stevenson 1985, 68).

Glasgow became a Royal Burgh in 1175 and by the 17th century, was engaged in international trade, but due to the problems posed by the shallow river, cargoes were unloaded at ports downstream and either transported by road or transhipped onto small boats to navigate the upper channel. Although the construction of Port Glasgow, begun in 1669, gave the city its own deepwater port, it was 18 miles away from Glasgow itself (Riddell 1979, 8-10).

With the Act of Union in 1707 the opportunity for trade with the American colonies was opened up to Scotland. Thanks to its west-coast location, Glasgow was well-placed to take advantage of the opportunities for transatlantic trade. Commodities imported, principally tobacco, generated great wealth for the Glaswegian merchants engaged in the trade, and the 'Tobacco Lords' obtained significant influence on the running of the city. Their frustrations with the delays and expense caused by the transhipment of goods at Port Glasgow led to increasingly strident demands to improve the navigability of the Clyde to facilitate access by ship to Glasgow itself.

In response, a series of attempts were made to deepen the channel from the mid-18th century, both to expedite shipping and to reduce the flood risk the river posed. Early engineers identified the width of the river, divided by islets into multiple channels at several points, notably at Dumbuck and Newshot Island, and the soft, eroding banks as the cause of the problem. Initial work by John Golborne focused on narrowing the channel to speed the flow of the water and harness its natural scouring action in order to deepen the riverbed through erosion. Lateral jetties projecting into the channel were constructed, joined in 1773 by a training wall, the Lang Dyke, to narrow the river and increase its flow. Likewise, the southern channel at Newshot Island was blocked to concentrate the flow of water (Riddell 1979, 43-49). The programme of improvement, which fell within the remit of the River Improvement Trust, not only deepened the river, but straightened it along this stretch between Longhaugh Point and Dumbarton, and within 5 years, Golborne achieved the depth of 7 feet which he had been contracted to deliver.

Despite this success, there was constant demand for further improvement to meet the growing needs as ships continually increased in size and international trade from the city expanded. Furthermore, while the erosive action of the water achieved significant deepening along much of the channel, it had limited impact on harder rocky areas which by the 1820s had become the main constraint to the depth of the Clyde.

[The development of the Clyde Navigation](#)

Steam dredgers were first used on the river in 1824, (Riddell 1979, 84) both to excavate the riverbed further and to maintain the depth already achieved by removing silt deposited by the river. They worked in partnership with wooden barges, tethered to the sterns of the dredgers, which collected the excavated spoil, and transported it to the riverbank where it was used for land reclamation. This both further narrowed the channel and created new ground for riverside development. Although originally moved by punting, from which the term 'mud punts' was coined, by the 1830s the vessels were moved by steam tugs between the dredgers and dumping grounds. When being moved, they were lashed together in a raft of 10-12 vessels, (Riddell 1979, 275-283).

This combination of training walls and dredging significantly improved the navigability of the river, however the increasing size of ships, developing industries and the growing demands from Glasgow to expand its foreign trade generated a constant need for further deepening. The success of the dredgers at removing softer sediments also exposed large boulders and areas of rock on the riverbed,

which contemporary dredging equipment couldn't remove. In reports of 1827 and 1831 a diving bell was recommended by the engineer Robert Stevenson to deepen more difficult stretches of the riverbed (Riddell 1979, 275).

Although this technology had been in use since the early 16th century, it was further developed by the engineer John Smeaton with the introduction of a pumped air supply to the bell and used in 1779 at Hexham Bridge. It was subsequently employed by Smeaton and later John Rennie in the construction of Ramsgate harbour. Rennie also improved the design and employed a diving bell at Plymouth breakwater in 1812, which was later sent to Portsmouth dockyard. Perhaps most famously, Isambard Kingdom Brunel used a diving bell borrowed from the West India Docks to inspect the Thames Tunnel in 1827 after it was flooded during construction (Newton 1827, 292-294).

Accepting Stevenson's advice for developing the Clyde waterway, the River Improvement Trust ordered a diving bell and support apparatus in 1833. Initially retrofitted to a wooden punt, a custom-built support vessel was constructed in 1852. The Clyde Navigation Trust (which had superseded the River Improvement Trust in 1858) added a second bell and barge to their dredging fleet nine years later.

Excavated material from the riverbed illustrated the hazards the naturally shallow channel presented to shipping when deepening works around Newshot Island in the 1840s recovered scraps of copper and iron ripped from ships' hulls by the rocks (Riddell 1979, 123). Although the combination of dredgers and diving was extremely successful at deepening the river, a bank of volcanic rock discovered at Elderslie in 1854 required explosives, used in conjunction with the dredgers and diving bell to remove the debris.

By the middle of the 19th century, the improvement of the navigation of the Clyde was described as "one of the most successful engineering operations achieved in Great Britain" (Bald 1845, 234), thanks to the dredging plant of the Clyde Navigation Trust, which had a dedicated repair and maintenance yard at Dalmuir, opposite Newshot. The scale of the dredging fleet and its constant maintenance needs are illustrated by size of the workforce; 200 workers were employed there. This fleet, consisting of dredgers, punts, tugs and the two bell support barges could, by the early 20th century, be collectively called "the largest and most powerful in Britain" (Riddell 1979, 305), while in order to supply the needs of the dredging plant, the Renfrew yards Lobnitz & Co and Simons were world leaders in building dredger plant, supplying specialist vessels internationally (Walker 1984, 80-82).

With the success of the deepening work, Glasgow's harbours and shipyards could develop unencumbered by the constraints of the shallow channel. Alongside the improvement of the river channel, the 19th century saw massive development of docks and wharfage along the length of the river.

As well as quays lining the riverfront for much of its length, three general cargo docks were built by the Clyde Navigation Trust in the 19th century. The earliest, Windmillcroft, on the south side of the river, was initially constructed as a quay in 1839, and developed into a dock in 1864, opening three years later as Windmillcroft Basin, and becoming generally known as Kingston Dock. This was followed by Queens Dock (also known as Stobcross), begun in 1872 and opened in 1877, and the Princes (Cessnock) Dock, where work commenced in 1889 and was completed in 1897. These were followed by the George V Dock, which in the now well-established tradition of disregarding official names in favour of informally naming a dock after its location, was occasionally also known as

Shieldhall. Constructed in the 1920s and formally opened in 1931, its low-water draught of 32ft attests to the success of the ongoing deepening work (Riddell 1979, 192-8).

Similarly, through the 19th century, shipyards along the Clyde developed, moving from the production of wooden sailing ships to the steam-power and iron hulls for which Clyde shipbuilding became famous (Walker 1984) and producing ever-larger vessels. By the early 20th century, the Clyde became one of the three principal centres of British shipbuilding, along with the northeast of England and Belfast (Pollard & Robertson 1979). Alongside iconic ships such as the *Cutty Sark* (1869) and HMS *Hood* (1918), Clyde yards produced the sister passenger liners *Lucania & Campania* (1892), *Lusitania* (1907), *Queen Mary* (1934) and *Queen Elizabeth* (1938), each of which was the largest passenger liner in the world when launched (Walker, 1984; Hope, 1990).

With the introduction of steam and subsequently diesel power, wooden sailing vessels declined from the middle of the 19th century onwards. Despite this, a number of sailing vessels remained in service well into the 20th century, but were increasingly concentrated on the home trade, in ever-decreasing numbers, with only a few continuing in service up to the Second World War (Greenhill 1968, 39-48).

The assemblage of vessels at the Newshot Island ship graveyard thus represent the rise of the Clyde and the decline of sail, embodying the larger themes of the development of maritime technology in the late 19th and early 20th centuries.

FIELDWORK

Methodology

On-site survey and recording

As preparation for the fieldwork, a drone flight over the site was carried out by Eddie Martin in September 2014, in order to create an aerial photogrammetric model using PhotoScan software. Two geo-rectified, accurate, highly detailed orthophotos of the boat graveyard were created from this model and made available online (<http://www.gigapan.com/gigapans/162364> and <http://www.gigapan.com/gigapans/162373>). An initial Total Station survey of the site established a site grid and located the remains relative to permanent ground control points. These two surveys then formed the basis for planning the further detailed recording.

The fieldwork was carried out with local volunteers over three seasons in October 2014, February 2017 and June 2017; with an additional day in May 2018. The 2014 work was focused on Area 1 (Figure 1) and recorded four mud punts. The 2017 surveys recorded three wooden sailing vessels in Area 2 and the metal barge in Area 3. Supplementary work in May 2018 investigated the metal barge.

The methodology comprised three basic elements; firstly completion of a wreck recording form (developed from the NAS and CITIZAN pro-forma), followed by photographic recording and scale drawing. Volunteers carried out the on-site recording under guidance from SCAPE staff and NAS tutors. The photographic record for each vessel included both general views of the remains and details, and a photo board was used for identification. General shots showing the overall site and working shots were also taken. Selected vessels were also drawn at a scale of 1:20 using a baseline and offsets with planning frames used for details where appropriate, and including fixed points recorded by the original Total Station survey, allowing the detailed records to be related to this survey and the permanent ground control points. The photographic and drawn surveys were undertaken concurrently, allowing the selection of features of interest and specific views for photographs to be informed by the process of observing and drawing the remains.

The selection of vessels for detailed recording was based on individuality and accessibility; all the exposed wooden sailing vessels were surveyed and drawn; the metal barge was recorded by comprehensive ground, pole and drone photography to give 360 degree views due to the difficulties of access in the deeper mud in this area. The mud punts which were recorded in detail were chosen based on their accessibility, being representational of the overall assemblage and degree of preservation. Where present and appropriate, upstanding elements were drawn as elevations, and some profiles were drawn.

In 2018, the original site grid and all accessible remains were located using a dGPS to create a basic site plan, allowing the detailed drawings and the photo-mosaic images to be accurately located.

This comprehensive record of the assemblage, supplemented by detailed information about selected vessels, can form a baseline for site monitoring. The results of repeat surveys in the future can be compared to examine changes in the site's condition. Rapid drone surveys used to create photogrammetric georectified 3-dimensional models will facilitate quick comparison, allow any changes in the site to be recognised, accurately quantified and threats to be identified. Already, the most recent survey in 2018 identified a number of changes to the site since the initial fieldwork in autumn 2014, including the movement of several of the punts in group 1 and the deterioration and partial disintegration of two, highlighting the need for regular site monitoring.

Post-excavation and historical research

The records, drawings and photos for each vessel were checked and digitised. Volunteers digitised the drawings in the free illustration package Inkscape in order to create a digital record of the remains and generate publication-standard images as well as further developing and reinforcing the archaeological recording skills learned on site.

Historical research was undertaken; reports from contemporary newspapers and online aerial photography collections were consulted. The project benefitted from the extensive archives of the Clyde Navigation Trust, held at the Glasgow City Archives in the Mitchell Library, which contain detailed documentary records about the Trust's dredging plant, and a large photographic collection. Oral history information about the site was collected from a local resident.

RESULTS

DREDGING PLANT

Mud punts and adjacent features

Of the c.48 mud punts identified at Newshot Island, four of the most accessible, most representative and best-preserved in Area 1 were recorded in detail, by photography and drawn plans at a scale of 1:20 and completion of a wreck-recording pro-forma. Despite varying levels of preservation, they were of very similar construction, and rapid survey of the punts in Areas 2 and 3 suggest that these also conformed to a very similar design. No record of the plans or designs for these vessels has been found within the archives of the Clyde Navigation Trust. As observed by a volunteer with experience of boatbuilding, these are essentially floating wooden boxes, and their construction was more closely aligned with joinery than boatbuilding, and it may be that no plans were ever produced. In the absence of original construction drawings, the archaeological documentation of these remains produced by this survey work may be the only record of the once-prolific vessels.

These punts are illustrated by the example of boat 5 in [Figure 4](#). They are simple, straight-sided, rectangular flat-bottomed wooden dumb barges, c.10m in length and 4.5m beam, and around a maximum of 1.1m in depth, designed to be simple but robust floating platforms for the removal of excavated spoil from the dredging and diving operations. Each punt had a carrying capacity of 10 tons (8 cubic yards / 6 cubic metres), and they worked in groups tethered together in rafts, which were towed from the dredging and diving operations to the spoil disposal grounds. The sturdy wooden construction is of timber frames 0.55m centre to centre, with carvel planking on the bottom, sides and deck. A grid of timber stanchions supported crossbeams for the deck planks, which in most cases has been lost, revealing the interior structure. Iron elements of the construction include fastenings, knees and reinforcement strapping at the corners. Four metal bollards at the corners were used for mooring, towing and tethering the punts into a raft.

One of the punts in Area 2 contained a bundle of reeds which appears to have been used as a fender, presumably during towing in rafts to prevent punts damaging each other. The punts in all three areas are closely grouped in regular formations. This suggests that they may simply have been abandoned on the foreshore at their former working moorings.

A cluster of square concrete mooring blocks with iron rings lies to the west of the punts in Area 1. A badly eroded stone quay formed the coast edge in Area 1 behind the punts. It appears to have been constructed of rubble used as fill behind large masonry blocks to consolidate that riverbank, but is now badly eroded with the rubble spread around the foreshore. One stone and one concrete jetty projects from the bank between Area 1 and the mooring blocks.

Bell Support Barge

Description

The metal barge (vessel 30) was identified as a diving bell barge by local volunteer Ian Sinclair, who had consulted the archives of the Clyde Navigation Trust prior to the involvement of SCAPE and the NAS. It is the only metal vessel on site, and was recorded by comprehensive aerial and ground photographic survey ([Figure 5](#)).

It is an iron barge, measuring c. 15.24m in length, 6m in breadth and up to 2.5m at its highest point, with a spoon bow, and distinctive flat transom with a central square cut-out. The lower part of the hull is buried in the foreshore sediment and the interior is filled with silt. The main body of the hull

stands above the current (2017) beach level by c.0.75m on average; in parts to the original deck height. The hull is formed of iron plates densely riveted together, but now corroded through in several places. On the port side and around the cut-out stern, sections of the hull have been deliberately removed, with drips of molten metal around the cut edge attesting to the use of a gas cutting torch. Two sections of the hull plating have been detached by this means but left on site around the stern. The iron stem, frames and hanging knees are visible in the interior of the hull plating. Occasional timber elements include wooden frames, attached by square-section iron bolts, and wooden wales running the length of the outside of the hull. There are small circular portholes in the hull towards the stem. A cast iron post c.1.5m high stands on the starboard quarter. No deck structures survive other than this post and two bollards attached to the remains of the deck on the starboard side. A wooden punt lies alongside on the inshore, port side, possibly originally tethered to the vessel. A riveted rectangular metal structure which measures 1.27m by 1.98m and appears to taper slightly lies adjacent to the vessel on the starboard side and is almost completely buried. It is badly corroded, leaving only the edges where plates are riveted to frames. No form of propulsion is evident, and the information about the vessel in the documentary records confirm that it was a dumb barge, which was towed to and from the excavation grounds.

Identification

Two diving bell barges were constructed by the Clyde Navigation Trust as part of their deepening work. The first diving bell was built in 1833, and was initially retro-fitted to operate from a mud punt. A custom-built support vessel with a bell-carriage, lifting gear, crab winch and cranes, was ordered in 1852 and built by Clyde shipbuilders A & J Inglis & Co. (Figure 6), onto which the existing diving bell was mounted. In reflection of its success, a second barge and bell were ordered, and built to very similar specifications in 1861 by the London Works, Renfrew (Figure 7).

The Trust's specifications for the two diving bell barges, the tender documents from the successful yards for both contracts and the plans for the 1852 diving bell barge were examined and compared with the remains of the metal vessel on site. The specifications were very precise in the requirements for the barges and the bell, and the detail the plans and tenders contain show that there was very little difference between the earlier and later vessels, other than a slight increase in size from a 50ft length to 56ft, and from 20ft breadth at the stern to 23ft. These minor differences in size allowed comparison between the two sets of specifications and the vessel on site.

Measurements of 6m (20ft) breadth at the stern of the metal barge confirm its identity as the earlier of the two diving bell barges, dating it to 1852.

A suggestion was made that the rectangular metal box adjacent to the barge could be associated to it, as its visible dimensions in plan (1.98m x 1.27m; i.e. 6ft 6in x 4ft 2in) closely matched the dimensions of the first diving bell and the cut-out in the barge's transom. However, its lightweight construction, with the thin plating largely corroded through in many places, countered this. On further investigation, it was found to be an asymmetric shallow box of only about 0.3m depth (Figure 8) and has been tentatively identified as a water tank which has come adrift from one of the nearby wooden sailing vessels and lodged against the hull of the barge.

The archives of the Clyde Navigation Trust record the first diving bell barge as derelict and out of commission in 1931, and broken up in 1933; though given the substantial survival of the hull, this presumably constituted its abandonment after useful elements had been salvaged – as illustrated by the lack of deck structures and the partial removal of metal plates from the hull – rather than complete dismantling (Figure 9).

The similarity in the specifications for the two vessels suggests that the first diving bell was found to operate so successfully that little improvement was required. However, changes include an increase to the size of the bell itself, and expanded crew capacity, from 8 berths on the first barge, to 14 on the second, as well as more detailed specifications for the construction of the cabin and accommodation. The two stern cranes on the first barge were reduced to one on the second.

Discussion

This group of vessels is located opposite the repair and maintenance yard for the Clyde Navigation Trust's dredging plant at Dalmuir, constructed in 1867. In addition to the remains of the vessels, other features on the riverbank at Newshot include the square concrete mooring blocks near Area 1, suggesting that parts of the fleet were moored here when they were not in use (Figure 10). Historic aerial photographs dating to the 1930s and 40s appear to show rafts of punts in this location, demonstrating the close association of the dredging fleet with this area.

Furthermore, the Clyde Navigation Trust rented Newshot Island as a disposal site in 1860. By this time, due to the development of much of the riverbank for industry and infrastructure, disposal of spoil had become problematic for the Trust, and this was the only site they were able to acquire (Riddell 1979, 284).

With the increasing difficulty of spoil disposal, the ongoing need for deepening, and development of new technology offering opportunities to improve speed and efficiency, the dredging plant became larger and more advanced through the late 19th and early 20th centuries. More powerful dredgers were built, increasing the volume of spoil produced. In response, self-propelled hopper barges, which could dump dredged material at sea, were introduced on the Clyde in 1862, leading to a decline in the use of punts. Development of this new technology led to major expansion and overhaul of the dredging plant, with almost complete replacement of the fleet in the first decade of the 20th century, rendering many of the older vessels, particularly the mud punts, redundant. Their numbers declined from 355 at their height in the early 1860s, to 270 in 1871, and 80 by the turn of the century. This coincided with a move away from the Dalmuir yard when the site was sold to a shipbuilding company in 1905, with work transferred to a new site at Renfrew in 1908.

Despite this geographic and technological shift, however, Newshot Island continued in use as a dumping ground where spoil was delivered by the older punts into the 20th century, the last location where they were employed in disposal. Likewise, elements of earlier technology remained in use; the first diving bell barge was active until 1931, and the second until 1935, when it was replaced by a third diving bell mounted on a much larger support barge. Punts remained in service, in ever-declining numbers, dwindling to around a dozen by 1965, employed in general duties and carrying stone from quarries, supplies to the dredgers, and partnering the last of the older style of dredgers (Riddell 1979, 276-284).

The group of punts in Area 1 may represent the latest of these vessels to be used. The now-eroded quay here and the adjacent jetty appear to date to the mid-20th century; neither is shown on the 4th edition (1939) OS map but both are first depicted on the 1958 1:1000 scale OS map, while the rubble which has eroded from the quay is of this period. It has been suggested that this rubble fill may be some of the debris cleared from the wartime bombing of Glasgow. A late date for the construction of this quay suggests that the punts of Area 1 had not yet been deposited here, as they would have formed an obstruction for craft using it. Their abandonment here in the second half of the 20th century thus implies that they were amongst the last of the punts to have remained in use on the river.

This assemblage of dredging vessels at Newshot Island represents the last survivors of the Clyde Navigation Trust's once vast dredging fleet, and the only archaeological record of these remains and of the activity itself. They exemplify the vital role that dredging played in the creation and maintenance of the channel of the Clyde, without which the development of the city of Glasgow and the ongoing operation of any Clyde ports would have been impossible. The contribution made by the dredging fleet to the industrial expansion of this region was essential but often largely overlooked. The remains are inherently important as rare survivors of vessels of this type and date, but are also intertwined with their setting. They are of major significance for the maritime landscape they occupy on the banks of the river Clyde, which owes its international standing as a shipping channel and shipbuilding centre to the fleet of which these are the only remnants.

WOODEN SAILING VESSELS

Description

The four wooden sailing vessels are preserved to varying degrees (Figures 11-13). The three accessible boats were recorded by ground and aerial photography, scale drawing, completion of a wreck-recording pro-forma and surveyed and located using a dGPS. The fourth vessel sits in the middle of Newshot Creek and remains almost completely submerged at ordinary low tides.

Vessel 8 (Figure 11) is a wooden sailing vessel, with a visible length of 24.6m with remains spread over a beam of c6.8m and a maximum height of 1m. Only the one end is visible on the intertidal riverbank, thought to be the stern, though this has not been definitively proven. The other end, presumed to be the bow, has been buried in encroaching salt marsh and only the lowest part of the hull survives; partially filled with silt which obscures internal details presumed to survive buried. It has been destroyed to the level of the keel around the stern, but is better preserved amidships. The keel, keelson and garboard strakes survive visible around the exposed sternpost and are presumed to survive beneath the silt elsewhere. The surviving lower part of the planking and ceiling planking indicates that this was a carvel built vessel. Both ceiling and planking appear to have originally been double-skinned, with the ends of iron fastenings which protrude beyond the surviving layer of planking, indicating that the outer layer has been removed, presumably salvaged. Ten floor timbers are visible, more are likely to survive buried in silt. The vessel was robustly built, with futtock scantlings of 0.25m (moulded) and between 0.15 and 0.3m (sided) with the majority being between 0.2 and 0.25m, and variable timber and space of c.0.2-0.3m, frequently with no space between frames, and alternating floor timbers and half timbers. The visible floors at the stern end are uniformly 0.25m (moulded) and 0.3m (sided). However, many of the timbers are badly eroded, affecting the accuracy of the visible measured dimensions. Sixty-nine first futtocks are visible, though further are likely to survive beneath the silt. Amidships, the hull survives to the 2nd futtock joint, and 32 second futtocks are visible. A detached section of the port side hull consisting of planking and second futtocks has broken from the main body of the wreck at the joint between the first and second futtock. The visible fastenings are of mixed materials, mostly iron, but copper alloy and occasional treenails were also noted, most densely around the stern area. The extent of erosion on the planking and exposed treenails has destroyed any evidence of marks on their heads or accurate diameters. The base of the stern post survives attached to the keel, and part of the port side of the hull has collapsed adjacent to the stern, comprising a detached portion of planking with an iron-lined hole c.0.15m in diameter. The upper part of the hull and any deck structures, masts and rigging have been destroyed. Only the lowest part of the hull survives around the stern, but there is no evidence of machinery having been fitted, suggesting that this was a sailing vessel.

Vessel 9 (Figure 12) is the remains of a wooden sailing vessels , the best-preserved of the wooden sailing ships on the site. The hull survives for its full original length of 26m up to the turn of the bilge, with a surviving beam of 7.4m. The wooden hull survives to a total height of c.3m, with the upper 1.5m exposed, and the lower c.1.5m buried in foreshore sediment. Iron frames attached to the interior of the ceiling planking stand to a further c.1.5m above the wooden structure, and appear to indicate the original height of the weather deck. A 5 foot draught mark is visible as attached lead numerals on both sides of the stem post, indicating the depth of the hull still buried in the silts. The lower elements of the hull structure (keel, keelson, floors) were not seen but are presumed to survive. The lower parts of both the stem and stern posts survive. Ceiling planking and planking survive, indicating that this was a carvel built vessel, but obscuring the details of the frame construction. The framing appears to be robust, with variable spacing averaging 0.2-0.3m and occasionally no space between frames. All of the lower futtocks appear to survive. Eleven knees were noted, one timber knee has become detached and was recorded out of situ in the interior. The external planking has possibly been repaired on the port side with a large scarphed strake insert; a similar scarphed insert was observed in the starboard hull planking. A large vertical timber stands behind the stem post, possibly a stanchion, and a large, long transverse timber lying across the vessel amidships on top of the sediment which fills the hull may be a crossbeam. An iron-lined hawse-hole survives at the bow. Fastenings are predominantly treenails, with some iron and occasional copper alloy. The treenails have eroded badly, destroying constructional details and leaving voids in the planking, which average 0.1m diameter. Iron sheeting, strapping and gudgeons survive on the stern post, with one pintle still in situ apparently corroded in place and broken off from the rudder. The rudder is detached but lies adjacent to the stern, with further iron pintles attached. Although the superstructure has been destroyed and there is no evidence of masts or rigging, the lack of machinery or propeller around the stern and rudder supports its identification as a sailing vessel. Information from a local resident has suggested that a mast may have been detached and lay adjacent in the saltmarsh within living memory, but no evidence of this was observed on site. Possible charring was noted on a small area of ceiling planking towards the stern. A patch of white leaching through the planking on the port side has been tentatively identified as kaolin clay, which may indicate the final cargo.

Vessel 10 (Figure 13) is a wooden sailing vessels , with a visible length of 13.5m and breadth of 5.7m. Only the bow is visible, the stern of the vessel has been buried by saltmarsh. The lower 1m of the hull is buried in foreshore mud and the interior is filled with silt with heavy reed growth filling all but the front 5m of the remains, leaving an exposed height of up to 1.3m. The lower elements of the hull (keel, keelson and floors) as well as much of the stern end are not visible, buried in silt but are presumed to survive within the sediment and saltmarsh. Seven strakes of the carvel planking are visible, and three of the ceiling planking. The futtocks appear to have been built as pairs, with spaces of between 0.18 and 0.2m, with 35 first futtocks visible on the port side, and 41 on the starboard side, scantlings .0.13-0.14m (sided) by 0.14-0.17m (moulded), no floor timbers are visible as they are obscured by ceiling planking and sediment. The stem post is visible to a height of 1.25m, with draught marks incised in Roman numerals, the four and five foot marks are visible on the port side, and the four foot mark on the starboard side. The stem deadwood is partially exposed and is attached to the stem post by a threaded iron bolt. Square-section iron bolts attach the deadwood and the frames to the planking. The planking is also fastened by treenails of 0.03m diameter at regular intervals, the heads of which, where they survive, are marked with an X. A detached section of the upper part of the bow lies a short distance in front of the vessel, partly submerged at normal low tides and consists of part of the stem post and attached pieces of planking. This also has an iron-lined hawse hole. An iron chain lies 3.7m from the bow on the port side. Although the

superstructure has been destroyed and there is no evidence of masts or rigging – and this is the only one of the three accessible boats where the stern is not visible – this is presumed like the others to have been a sailing vessel as there is no evidence to suggest otherwise.

Vessel 11 appears to be a wooden carvel-built sailing vessels slightly smaller than the other three vessels, but has not been surveyed in detail as it lies across the mouth of the creek which separates Newshot Island from the south bank of the Clyde and is inaccessible. Stem post, stern post, frames and planking survive, and are exposed to a maximum of approximately 0.4m at low tide. Lower elements of the hull's construction are presumed to survive submerged.

The construction of the three wooden vessels (8, 9 and 10) is consistent with their identification as late 19th century sailing ships of the sort which were engaged in the coastal trade and around the Firth of Clyde in the early 20th century. Although the location of the fourth boat (vessel 11) in the channel prevents detailed examination, it seems to be of similar type.

Documentary research

Three of the four wooden ships at Newshot Island were recorded in the National Monuments Record as schooners, and the entry stated that they had been abandoned there following a “wartime bombing incident in one of Glasgow’s docks” (Canmore ID 102974). The Clydebank Blitz of March 1941 caused extensive damage to the Glasgow riverfront, and aerial reconnaissance photos taken by the Luftwaffe in 1939 show targets identified around Newshot Island and the adjacent saltings. Modern aerial satellite imagery shows bomb craters on Newshot Island. However, historic aerial photographs held by HES and available through the National Collection of Aerial Photographs showed the vessels on site in 1937, prior to the outbreak of the war (Figure 10). Second World War bombing therefore cannot account for their dumping at Newshot; and Glasgow was not targeted by Zeppelin raids in the First World War. However, four schooners are recorded as having been destroyed by a major fire at Kingston Dock in June 1914.

As the first of the four docks on the Clyde, the Kingston Dock had initially accommodated the largest foreign trading vessels on the river. However by the early years of the 20th century, its depth was unsuitable for the larger ships then in use, and it was used only by the coastal trade. In 1913, work was started to improve the facilities by widening and deepening the dock. However, in June 1914, a catastrophic fire was started by workmen using a red hot iron to bore a hole in creosoted timber. The internal quays of the dock had been constructed of timber, with masonry walls confined to the area around the entrance. Although both cheaper and quicker, and possibly a solution to the sandy soil into which the dock was excavated, this left it vulnerable to fire, a risk that was foreseen during the building of the later Princes Dock in 1884, when the initial design for wooden wharfs was changed in favour of brick and concrete (Riddell 1979, 221).

The fire was reported in international newspapers which contained various levels of detail, including that four schooners were destroyed in the fire. Many of the reports list the burned vessels:

- The *Warsash*, from Dumfries
- The *Navigator*, from Portsmouth
- The *Volant*, from Wick
- The *Dashwood*, from Penzance

A fifth vessel, the *Edith* (a Cornish ship) was named in a single report (Shields Daily News 19th June 1914) as having been destroyed. Ian Whittaker’s research (1998) corroborates the destruction of the

Warsash and the *Navigator*, and adds the *Edith* and *J.T.S.* (from Barrow, Cumbria) as casualties of the fire, but does not list the *Volant* or the *Dashwood*.

Examination of shipping registers for the home ports of the vessels clarified the conflicting reports. The *Warsash* is listed in the Dumfries Port records as having been destroyed by fire in Glasgow on 18th June 1914. The Portsmouth records for the *Navigator* also confirm destruction by fire in 1914. The register entry for *J.T.S.* was closed on 6th July 1914, citing destruction by fire at Kingston Dock. The *Edith* is also recorded as having been destroyed in fire (though this is erroneously listed as Princes Dock http://www.cotswoldcanalsheritage.org.uk/page_id_132.aspx) prior to the First World War.

However, the other vessels listed by the newspaper reports, the *Volant* and the *Dashwood*, appear to have remained active after the date of the Kingston Dock fire. The *Volant* was sold to an Irish owner in 1916, and the registry wasn't closed until 1956; a vessel of this name was also recorded as being windbound at Holyhead in 1934 while bound for Ireland (Greenhill 1968, 202). Records for the *Dashwood* state that the ship was owned by a Mr Tregaskis of Penzance and remained active until wrecked in 1918.

In summary, the historical records appear to indicate that the majority of the contemporary news reports were incorrect in the names of two of the vessels which were destroyed in the fire, and that the four schooners destroyed were *Warsash*, *Navigator*, *Edith* and *J.T.S.*. None of the three vessels which have been examined in detail have yet been positively identified; given their condition and the extent of the damage they have suffered, it is possible that no definitive identification can be made. The tentative identification of white material leaching from between the strakes of vessel 9 as kaolin clay, however, could potentially indicate the cargo the vessel was carrying, and the port or area of origin on its last journey. Contemporary newspaper accounts of the fire list the *Navigator's* cargo as clay (of unspecified type) from Falmouth, Cornwall. Not only does this detail further link the remains on site with the Kingston Docks fire, but it could indicate that this vessel is the *Navigator*, with a cargo likely bound for Glasgow's prolific clay pipe industry when destroyed by the fire.

Moreover, with the widespread news reports on the fire, a number of contemporary photographs have also survived showing both the event itself and its immediate aftermath. One of the most relevant shows a burnt out ship in the foreground of the destroyed dock (Figure 14) very similar in appearance to the surviving hulk of vessel 9.

Furthermore, oral history collected from local resident Alex Lang included the detail that his grandfather remembered the four vessels being towed down the Clyde to Newshot Island in 1914 still smoking, while his own recollections included playing on the deck of one of the ships (vessel 9) in the 1950s when the stern showed clear evidence of burning.

The four wooden schooners destroyed in the fire are described as having been "burnt to the water's edge" (Western Mail 19th June 1914). The lower parts of the hulls are all that remain of the vessels at Newshot, however this could be entirely due to the deterioration of the remains over the intervening 100 years in the intertidal zone, rather than necessarily indicating that they were largely destroyed prior to their abandonment, while Alex Lang recalls playing on the deck of vessel 9 which stood to the height of the iron frames. His description of the remaining extent of this vessel tallied closely to what remained of the burnt schooner in the 1914 photograph.

Richards (2011, 160) highlights the deliberate use of fire in salvage activities in order to destroy unwanted elements of a hull and facilitate the recovery of fittings, but notes that in an intertidal context, any evidence of this would likely be destroyed by erosion and shipworm. In this case, it is

impossible to disentangle the fire damage from the natural processes of decay. However, the presence of substantial iron elements remaining on site, especially on vessel 9, counter any suggestion that this was burning to recover metals.

The balance of evidence, including the fire damage noted on the planking towards the stern of boat 9 and the contemporaneous abandonment of a group of four vessels strongly indicates that there is a link between this boat graveyard and the fire, and that these vessels are almost certainly the four schooners which were reported destroyed.

The complete loss of decks, superstructure and rigging, due to a combination of fire and the natural processes of decay, has destroyed any evidence that could conclusively allow the identification of the remains specifically as schooners. However, the documentary evidence regarding the Kingston Dock fire and the vessels destroyed by it confirms that they were all schooners, so identification of the Newshot remains with the Kingston Dock casualties corroborates the original description of the vessels in the National Monuments Record as schooners.

Occasional specific constructional details have been noted, such as the different styles of the draught marks on the stems on boats 9 and 10, the caulking cuts on boat 10, the iron straps on the interior of boat 9 and the double skin outer planking on boat 8. This represents a potential avenue of further research which may be explored in the future. The Lloyds Register or British Corporation survey records for these vessels may contain construction details and scantlings for the four schooners destroyed by the fire, and comparison with the remains on site may enable them to be related, possibly allowing differentiation between the four ships on site and specific identification of the individual vessels, which would conclusively prove the relationship between the remains and the Kingston Dock fire.

Discussion

Development of the boat graveyard

Richards (2011, 85-92) emphasises the importance of two considerations in selecting a site for disposal of vessels; somewhere they could easily be towed and where they would not form an obstruction. Newshot Creek meets these requirements. A relic of the original south channel of the Clyde, which formed Newshot Island until being blocked during the deepening work in the late 18th century, it is now a small tributary draining the marshy hinterland. The deep silt of the foreshore here may also have contributed to the choice of location; silty sediments are often preferred as vessels settle in and are less likely to refloat. Moreover, the identification of three substantial mooring anchors of apparently 18th century date slightly upstream of the vessels in the creek suggest that this location was in use as an informal anchorage for large vessels from the 18th to 20th centuries.

This boat graveyard formed through the first half of the 20th century. If the date of 1914 following the Kingston Dock fire is accepted for the abandonment of the schooners, these were probably among the first vessels to be disposed of here. Documentary sources date the decommissioning of the diving bell barge to 1933. Although no specific date has been found for the deposition of the associated mud punts in Area 3, it's likely, given the arrangement of the vessels on the foreshore, that this either was contemporary with the dumping of the diving bell barge, or post-dated it. Although there is potential for delay between the decommissioning of the diving bell barge and its disposal (see below), Area 3 is fully formed on an aerial photograph of 1943.

Finally, Area 1 appears to be the latest area of the boat graveyard to have formed, with the small group of punts here likely to have been the last vessels abandoned at the site. Documentary sources indicate that some mud punts were in use up to the 1960s. A 1947 aerial photograph shows several punts moored here, which appear to be in better condition than those in Area 3, and may have still been in use. Further, the 1950s construction of the now-eroded quay on this stretch of the bank possibly indicates that their abandonment here was later than this. These punts may therefore represent some of the last to have been in service on the river. Thus, although it is tempting to link the boat graveyard's location to the dredger maintenance yard opposite, this is likely to have been incidental and merely represents reuse of an established mooring and disposal site which continued long after the relocation of the yard away from this stretch of the river.

Salvage

This group of vessels also offers limited insight into the pre- and post-abandonment salvage processes employed. The destruction of the schooners in the fire would have compromised potential for salvage from the hulks. Richards (2011, 149) states that both rudders and the means of propulsion were often removed, however the masts and rigging of the sailing vessels would have been destroyed by the fire, while the rudder of boat 9 is on site and seems to have become unshipped post-deposition. It's possible that under the circumstances, no serious attempts were made to salvage material from these vessels.

Between the stern of vessel 9 and the bow of vessel 10 lies a large section of the upper part of a stem, with hood ends of strakes still attached, that has, at some time, been cut from the bow of one of the vessels and abandoned. Though it was not possible to determine which boat it originated from it is believed to represent some minor, local attempt at salvaging timber from the schooners.

The diving bell barge is recorded as having been 'broken up' in 1933; however as discussed by Richards (2011) this most often refers to the salvage and recovery of reusable elements followed by

disposal of the hull rather than complete dismantling. The deck structures, cranes and winches on the barge have been removed, either pre- or post-deposition.

Historic aerial photography confirms that the diving support barge and the punts were on site by 1937, and that the superstructures had been removed by this date. During the global depression of the 1930s, the steel and iron industry was dependent on scrap metal, which was being imported in large quantities (Richards 2011, 152). Despite the high value of scrap iron at this time, however, the recovery of metal from the upper section and the deck of the hull by gas torches, with detached pieces left next to the vessel, attests to in-situ post-abandonment salvage activity, representing a later return to the hulk as opposed to having been part of an initial salvage attempt. The punt moored on the port (shoreward) side of the hull was likely used as a platform from which salvagers worked; the port hull has been cut to the level of the punt's deck. Aerial photographs of the site dating to the 1940s show that the hulk has been cut down by this date. If the attempted salvage of plates from the hull was undertaken on site, post-deposition, rather than forming part of the original process, the recovery of the plating may date to the scrap metal drives of the wartime years.

Conclusion

This boat graveyard is significant both for the value of individual vessels and as assemblage which forms part of the historic maritime landscape of the Clyde.

The remains of the schooners represent a turning point in maritime history. Although wooden sailing ships were once prolific around Britain and further afield, they were in decline by the early 20th century. The fire at the Kingston Dock occurred at a time when sailing ships, out-competed by bigger and faster engine-powered vessels, were increasingly confined to working on the home trade and as coasters. Diesel engines were introduced prior to 1914, but the First World War acted as the major catalyst for change, and after this few schooners continued in use, with sail predominantly replaced by engine power. Although the abandonment of these four ships was due to a specific catastrophic event, they were already towards the end of their economically viable lives. They thus illustrate a watershed when maritime technology was moving from sail to steam power and from wooden to metal hulls. Their destruction, due to their presence at an outdated dock which was undergoing refurbishment, is a further reminder of the threat of obsolescence and reflects the needs for not only ships, but also ports to keep up with new technology. Their significance is further enhanced by the rarity of such remains, despite the former abundance of such ships. Paradoxically, the survival of these examples is probably only due to their destruction in the fire and resulting abandonment in a backwater.

The diving bell barge is arguably the earliest known surviving diving support vessel, possibly a unique survivor of original 19th century diving equipment. The distinctiveness of the remains on site coupled with the extensive archives of the Clyde Navigation Trust allowed its identification as a specific vessel, which illustrates the development of diving techniques, the history of civil engineering on the river and the innovation, development and ultimately obsolescence of this technology.

The importance of this remnant dredging fleet is reinforced by their group value and setting. They are closely linked to their immediate environment; this stretch of the river was a focus of activity; with the Dalmuir maintenance yard, the last active spoil disposal ground and habitual mooring place of some of the vessels.

The remains also offer insight into the formation of the river and the history of the wider area. The vessels played a key role in the creation and development of the Clyde navigation and therefore in the growth of Glasgow as a centre of industry and shipbuilding. They reflect the ongoing demands placed on the river to serve the needs of the economy that relied upon it. Their design, function and eventual redundancy and disposal are a microcosm of the evolution of the Clyde and illustrate the role of human agency in shaping the landscape, presenting an essential but arguably under-appreciated aspect of the maritime history of the region.

The groups of vessels in this boat graveyard are therefore representative of two aspects of the Clyde's history; and both illustrate underlying trends of technological and societal change. They mirror the Clyde's technological, economic and industrial development and the continual importance of the river to the city and the wider area.

This site is thus an example of how boat graveyards form an important part of the wider maritime landscape, and of how such sites have the potential to add significantly to our understanding of the development of maritime technology. Boat graveyards are a rare and declining resource and, as highlighted by a number of authors (Milne et al 1998, Richards 2011, Beattie-Edwards & Satchell 2011, Davies 2011, Pett 2013) more work is needed to record such sites. They present a number of

management challenges. Wooden – and metal – remains in the intertidal zone are inherently vulnerable to a number of natural processes, subject to decay, corrosion, erosion and biodegradation. Responsibility and ownership can also be difficult to ascertain. However, projects to survey these sites can ensure their inclusion in historic environment datasets and raise awareness of their importance. Although this alone does not confer protection, as a result of this particular project, in June 2018 the ship graveyard at Newshot Island was designated as a Scheduled Ancient Monument by Historic Environment Scotland. Although now subject to this statutory protection, the record created by this work can provide a baseline for ongoing monitoring, against which future re-surveys can be compared. The site was also featured in an episode of the TV series *Britain at Low Tide* which showcased intertidal archaeological sites on the Clyde, bringing the heritage to a wider audience. By involving local volunteers in the survey and research, the project not only demonstrated public interest and the potential for work of this type to integrate community involvement in research projects, but also to enhance public appreciation of this important heritage.

Acknowledgements

The SCHARP Project is funded by the Heritage Lottery Fund, Historic Environment Scotland (HES) and the Crown Estate and is supported by the University of St Andrews. Thanks are due to the staff of archives around Britain for their assistance in researching the history of the vessels on this site. The work of Catherine Abbott, and other members of the *Britain at Low Tide* production team was very valuable in furthering elements of the historical research. The authors gratefully acknowledge the contribution made by all the volunteers and colleagues who have participated in the Newshot survey.

Bibliography

- Bald. W., 1845, 'Account of the Improvement of the Navigation of the River Clyde'. *Civil Engineers and Architect's Journal* 8: 235-235.
- Barnett, L P, 2007, *Fore & Aft: the story of the Purton Ships Graveyard*, Gloucester: Friends of Purton Publishing.
- Beattie-Edwards, M & Satchell, J. 2011, The Hulks of Forton Lake, Gosport: the Forton Lake archaeology project 2006-2009. BAR Report 536. Oxford: Archaeopress.
- Christie, A, Heath, K and Littlewood, M, 2014, Scapa Flow 2013 Marine Archaeology Survey: Final Report. Kirkwall: ORCA Marine.
- Davies, L, 2011, *Hulk Assemblages: assessing the national context*. English Heritage Project Number 5919, Report Number 129/2011. London, MOLA
- Graham, E. and Hambly, J. 2017a. *Loch Fleet boat graveyard*. Unpublished Data Structure Report.
- Graham, E. and Hambly, J. 2017b. *Findhorn Bay boat graveyard*. Unpublished Data Structure Report.
- Greenhill, B., 1968, *The Merchant Schooners*. Newton Abbott: David & Charles.
- Groom, D & Oxley, I, 2002, Scotland's ship graveyard survey: interim report 1. Aberlady Bay, East Lothian. Maritime Fife unpublished report.
- Hale, A., 2000, *Scottish Marine Crannogs*. BAR Report No. 369. Oxford: Archaeopress.
- Hope, R., 1990 *A New History of British Shipping*. London: John Murray
- HWTMA, 2008, *Recording archaeological remains on the River Hamble*.
<http://www.maritimearchaeologytrust.org/uploads/publications/HambleHLFProjectReport1.pdf>
- MacGregor, D., 1997, *The Schooner: its design and development from 1600 to the present*. London: Chatham Publishing.
- Martin, C, 1998, *Scotland's historic shipwrecks*. London: B.T. Batsford; Edinburgh: Historic Scotland
- Martin, C, 2017, *A Cromwellian warship wrecked off Duart Castle, Mull, Scotland, in 1653*. Edinburgh: Society of Antiquaries of Scotland
- McCarthy, J, Roberts, A. and Benjamin, J, 2015 *SAMPHIRE. The Scottish Atlantic Maritime Past: Heritage, Investigation, Research & Education. Non-Technical Report*. Edinburgh: Wessex Archaeology.
- Milne, G, McKewan, C. and Goodburn, G., 1998, *Nautical Archaeology on the Foreshore: hulk recording on the Medway*. Swindon: RCHM.
- Newton, 1827, *The London Journal of Arts and Sciences*, Volume 13 Sherwood, Neely, and Jones, 1827
- Parker, T, 1998, 'Survey of the Purton hulks', *Archaeology of the Severn Estuary*, 9, 91-3.
- Pett, L, 2013, *Hulk Assemblages: assessing the national context (Part Two)*. English Heritage Project Number 5919, Report Number 79/2013. London, MOLA

Pollard, S & Robertson, P, 1979, *The British Shipbuilding Industry 1870-1914*. Cambridge, Massachusetts & London: Harvard University Press

RCAHMS & Historic Scotland 2012, *Project Adair: Mapping Marine Heritage Sites to Support New Marine Legislation*. Edinburgh: RCAHMS.

Richards, N, 2011, *Ships' Graveyards: Abandoned Watercraft and the Archaeological Site Formation Process*. Florida Scholarship Online DOI: 10.5744/florida/9780813032573.001.0001

Riddell, J., 1979, *Clyde Navigation: a history of the development and deepening of the River Clyde*. Edinburgh: John Donald Publishers.

Stevenson, J B., 1985, *Exploring Scotland's heritage: the Clyde estuary and Central Region*, Exploring Scotland's heritage series. Edinburgh: RCAHMS.

Walker, F, 1984, *Song of the Clyde*. Cambridge: Patrick Stephens.

Whittaker, I., 1998, *Off Scotland: a comprehensive record of maritime and aviation losses in Scottish waters*. Edinburgh: C. Anne Publishing.

Williams, R., 2009. A Directory of Ships. *History, Memories & Photos from the Cotswold Canals*. Website: http://www.cotswoldcanalsheritage.org.uk/page_id_132.aspx, accessed 06/07/2017

Wood, A 1997a, *Newport on Tay Wreck*, Maritime Fife unpublished report.

Wood, A 1997b, *Kincardine Foreshore Survey*, Maritime Fife unpublished report.

Primary sources

Ordnance Survey County Series 3rd Revision, 1939. 1:2500 Renfrewshire Sheet VIII.02

Ordnance Survey National Grid, 1958. 1:2500 National Grid Tile NS 4770

Clyde Navigation Trust archives:

T-CN 12.40: blueprint and specification of diving bell barge, 1852.

T-CN 19.431: photograph of second diving bell barge in use, 1914.

T-CN 19.12.293: photograph of Kingston Dock following the fire, 1914.

Historic Environment Scotland:

SC 1315612, aerial photograph of Newshot Island, 1937.

Western Mail, 19th June 1914, *Eleven Hours Fire Fight – A Glasgow Dock Destroyed - £250,000 Damage – Blaze Sweeps Sheds and Ships*. Trinity Mirror.

Shields Daily News, 19th June 1914, *Fearful Fire – Great Blaze At Glasgow Dock – Damage £250,000 – Four Vessels and Sheds Burnt*. Johnston Press.

Figures & captions:

1. Location map & site plan. 1:25 000 Scale Colour Raster [TIFF geospatial data], Scale 1:25000, Tiles: ns46_clipped, ns47, ns56_clipped, ns57, ns66_clipped, ns67_clipped, ns68_clipped, ns36_clipped, ns38_clipped, ns58_clipped, ns48_clipped, ns37_clipped, Updated: 12 March 2018, Ordnance Survey (GB), Using: EDINA Digimap Ordnance Survey Service,

<<https://digimap.edina.ac.uk>>, Downloaded: 2018-08-07 12:10:18.68. MiniScale® [TIFF geospatial data], Scale 1:1000000, Tiles: GB, Updated: 14 November 2017, Ordnance Survey (GB), Using: EDINA Digimap Ordnance Survey Service, <<https://digimap.edina.ac.uk>>, Downloaded: 2018-08-07 15:18:11.962. Plan digitised by Caroline Stepniak.

2. Aerial photo of area 1 group of punts. Eddie Martin.
3. Plan of the River Clyde showing depths in 1755/1769. SCAPE, after Riddell 1979.
4. Punt 5. Photo: SCAPE. Plan: Irene Dayer, Gillian Dawson, Carla Rennie, Colin Young, Mel Bush and Sue Bush.
5. Diving Bell Barge. Photo: SCAPE. Aerial view: Eddie Martin.
6. Blueprint of diving bell barge 1, 1852. T-CN 12.40. Glasgow City Archives
7. Diving bell barge 2 in use, 1914. T-CN 19.431. Glasgow City Archives
8. Excavated side of square feature adjacent to diving bell barge hull, showing shallow depth. SCAPE.
9. Evidence of salvage from diving bell barge: molten metal droplets on hull demonstrating use of gas cutting torch, and metal plates removed from stern. SCAPE.
10. Aerial photo of Newshot Island, showing the remains of the schooners in on site in 1937. © HES: Aerofilms Collection SC 1315612.
11. Schooner, boat 8. Photo: SCAPE. Plan: Dawn Hollis, Allison Gleadhill, Irene Dayer, Katherine Price, Justine Tarelli, Derek Wilson and Pat Wilson.
12. Schooner, boat 9. Photo: SCAPE. Plan: Steve Liscoe, Stephen Stockdale, Nick Bulpitt, Tanya Freke and Tom Dawson.
13. Schooner, boat 10. Photo: Steve Liscoe. Plan: Alexandra Deamer-John, Katherine Price, Kelsey Jackson-Williams and Joanna Hambly.
14. Kingston dock after the 1914 fire, with a burnt-out schooner in the foreground. T-CN 19/12/293. Glasgow City Archives