BSAJT 2021

Visualizing the "Drottningen af Sverige"

A Virtual Website Tour of the Historic Wreck "Queen of Sweden".

A Project Report written by Andrew Inkster for the British Sub-Aqua Jubilee Trust

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The End of Project Report has been produced to full fill the requirement of the British Sub Aqua Jubilee Trust Grant Scheme.

It is also submitted for submission to the Duke of Cambridge award.

1 Executive Summary

In 2017 Historic Environment Scotland (HES) commissioned an undesignated site assessment of the historic wreck site of the *Drottningen af Sverige*, known locally as *the Queen of Sweden*. The objectives were to carry out a desk based and diving assessment. This would inform HES advice to the Scottish Government for designating the site as a Historic Marine Protected Area (HMPA) under the Marine (Scotland) Act 2010. This project, through funding from British Sub Aqua Jubilee Trust (BSAJT) built on this work, and previous HES funded work on the site.

The projects aim was to produce, through community engagement, a virtual interactive web-based dive trail of the Historic Wreck "*Drottningen af Sverige*" translated as "*Queen of Sweden*" and foster a local sense of community ownership and stewardship of the local Marine Historic Environment. To this end the project has fully engaged with the local volunteer and original excavation teams, as well as staff at the local museum.

The projects aim was delivered through the objectives of a desk-based assessment of the sites history and the ships history has been completed and forms the basis of the story lines for the web site. Original excavation documentation and historical documents pertaining to the *Drottningen af Sverige* have also been accessed and are included in the sites story line. Due to changes in personal circumstance of the volunteer team, training was reprogrammed to September and October 2019. This included 48.75 hours of diving and 94 hours of volunteer work in the museum stores.

The diving and archaeological training was coordinated by Andrew Inkster and ensured the success of the project. The BSAJT funding was used to fund the diving activates. Without this funding the project would not have been such a success and part of the UK's National Heritage Protected for future generations.

The outcome of the project and diving can be seen on the web tour at:
https://www.cloudtour.tv/queen-of-sweden/information/0_0

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2 Introduction

2.1 Background

2.1.1.1 The wreck of the "*Drottningen af Sverige"*, known locally as "*the Queen of Sweden"* or just "*the Queen"*, has been considered for designation as an Historic Marine Protected Area (MPA) (HES, 2019). The activities reported within this project report have supported this designation.

2.1.1.2 In 2017 Wessex Archaeology (Scotland) (WA) was commissioned by Historic Environment Scotland (HES) to carry out an undesignated site assessment of the *Drottningen af Sverige* (HES Reference: HS/C/2804). The objectives were to collate all plans and geophysical data of the wreck, undertake a diving assessment to delineate the extent and nature of its archaeological potential and to enhance the photographic record of visible features. The assessment would underpin HES advice to the Scottish Government for designating the site as an Historic Marine Protected Area (HMPA) under the Marine (Scotland) Act 2010. A base line site plan was not achieved.

2.1.1.3 In 2018 to support HES advice to the Scottish Government for designation HES commissioned *TrenDive* to produce the required baseline site plan. This would be achieved through a community-based volunteer led project to record the wrecks artefacts, known site features and create a web tour. The project included volunteer training activities. Separate funding was required for diving operations.

2.1.1.4 With the Support of *TrenDive* Andrew Inkster, Diving Officer of Shetland Sub Aqua Club, volunteered to lead the club members and conduct the required onsite recording. An application to the BSAJT for financial support for the project proved successful to help fund the clubs' diving operations.

2.1.1.5 The Queen of Sweden wreck (Figure 1) is recorded by HES as Canmore ID 206700, Site number HU44SE 8010 (Cranmore, 2021).

2.2 Site Location

2.2.1.1 The site of the Historic Wreck the Queen of Sweden is situated at the southwestern entrance to Lerwick Harbour and Bressay Sound known as Twageos Point. (see Fig 1).

Queen of Sweden WGS84 (UTM Zone 30N)	
Latitude:	51o 16.4561' N
Longitude:	01o 30.4121' E

2.2.1.2 The location map shows the boundary of the Queen of Sweden Historic MPA. This is the area of sea within a distance of 80m from the position with coordinates; latitude 60º 08.803 north and longitude 001º 07.980' west. The Map uses the WGS84 (UTM Zone 30N) projection. The location map is copyright, with all rights reserved, to the British Crown and Oceanwise (License number EK001-20140401).

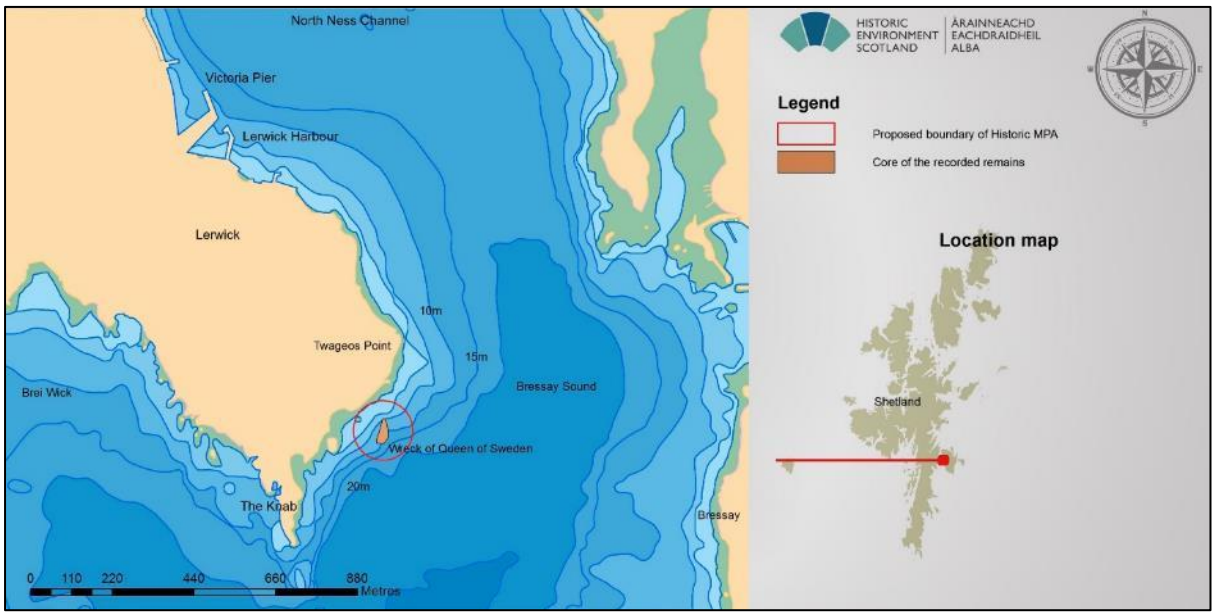

Figure 1 Queen of Sweden Location Map showing the Boundary of the Queen of Sweden Historic MPA (Copyright British Crown and Oceanwise. All rights reserved. License number EK001-20140401).

2.3 Business Case

2.3.1.1 This project sought funding from the British Sub-Aqua Jubilee Trust. Funding was required to ensure the timely production of a baseline plan of the site. This would inform the best decision-making process for the sites current and future management. It also ensured all previous work (including previous work funded by HES and its predecessors as well as the Shetland Museum) carried out on site was presented and made available to the widest possible audience in an innovative and inclusive way. The project has also left a legacy of skills and expertise and for future projects within Shetland.

2.4 Match funding

2.4.1.1 Match funding in financial support was secured from HES for:

- Archaeological training
- Developing the 3D website tour

2.4.1.2 Match funding in time, facilities and equipment was secured from:

- Shetland Museum - access to artefacts and collection plus provision of training faculties,
- Shetland Dive club – volunteers' equipment and time, dive boat personnel and provision of training facilities.

2.5 Key Stakeholders Support

2.5.1.1 The key stakeholders who have supported this project other than the BSAJT are:

- Diving Officer, Shetland BSAC Club - Andrew Inkster (AI)
- Director Shetland Museum - Iain Tait (IT)
- Lerwick Harbour Authority - Calum Scott (CS)
- Shetland Islands Council – Engineering Department – Andrew Inkster.
- Nautical Archaeology Society (Scotland) - Mark Beattie-Edwards (MB)
- Shetland Amenity Trust Archaeologist - Val Turner (VT)
- TrenDive – Dr Douglas McElvogue (DM)
- Historic Environment Scotland – Philip Robertson (PR)

3 Historical Background

3.1 The Swedish East India Company

3.1.1.1 The Swedish East India Company (Svenska Ostindiska Companiet or SOIC) was founded in 1731 by Henrik König, Nicolas Sahlgren and the Scotsman Colin Campbell.

Figure 2 Contemporary portrait of Colin Campbell.

3.1.1.2 The SOIC focused on the tea trade with China. Outgoing Swedish trade goods included metals, timber, wine and spirits. The SOIC ships set sail from their home port of Gothenburg. At the port of Cadiz in Spain a large proportion of these goods were traded for silver. The merchants then continued onwards to China where the company traded the silver and remaining goods for tea, porcelain, silk and other goods. Due to new regulations on tea imported to the United Kingdom and declining profits within the trade, the SOIC folded in 1806.

Figure 3 Contemporary painting of the Swedish British and French East India Companies in Canton.

3.2 The Queen of Sweden

3.2.1.1 The *Drottningen af Sverige* (‘*Queen of Sweden*’) was built in Stockholm by Carlos & Claes Grill and launched in September 1741. It was 44.8 m long, 11.9 m deep and 5.6 m beam (Joffre, 1982, p. 6). This gave it a cargo capacity of 387 läster or 947 metric tons. With 32 guns, it was at the time of its launch, the biggest ship built for the SOIC (Joffre, 1982, p. 6). After it was fitted out in 1741, the Queen of Sweden embarked on a very successful expedition to Canton in China before it was wrecked off Shetland on its second voyage (Joffre, 1982, p. 6).

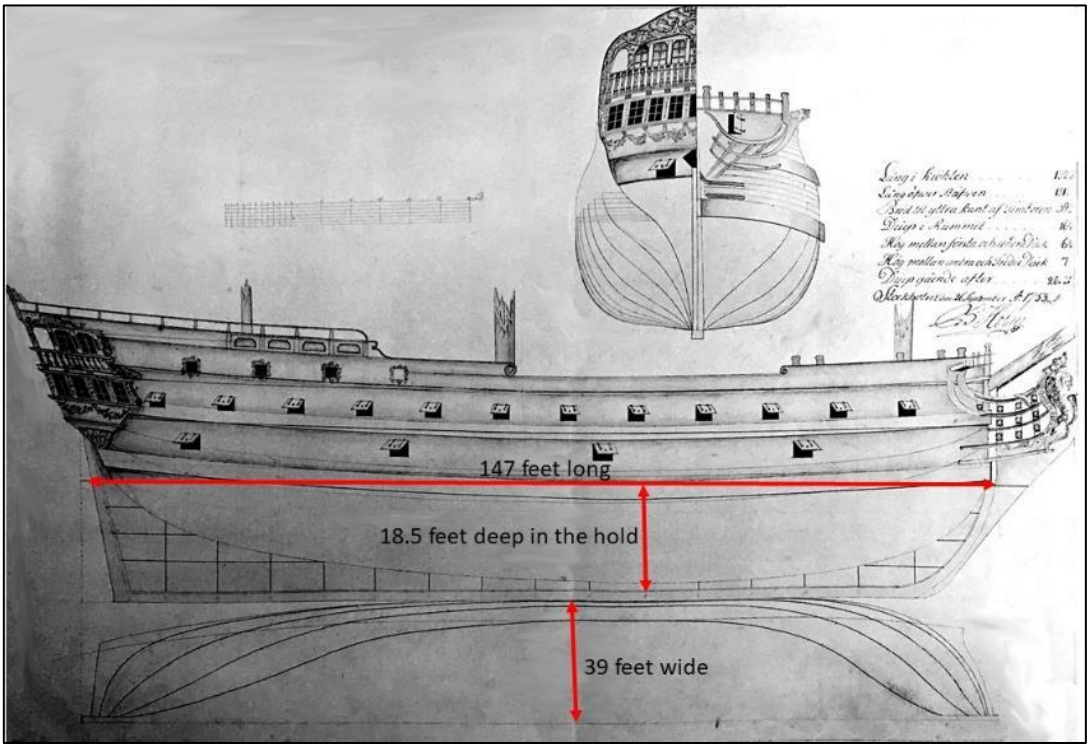

Figure 4 A contemporary ships lines drawing of a SOIC ship, highlighting the Queen of Sweden’s recorded dimensions.

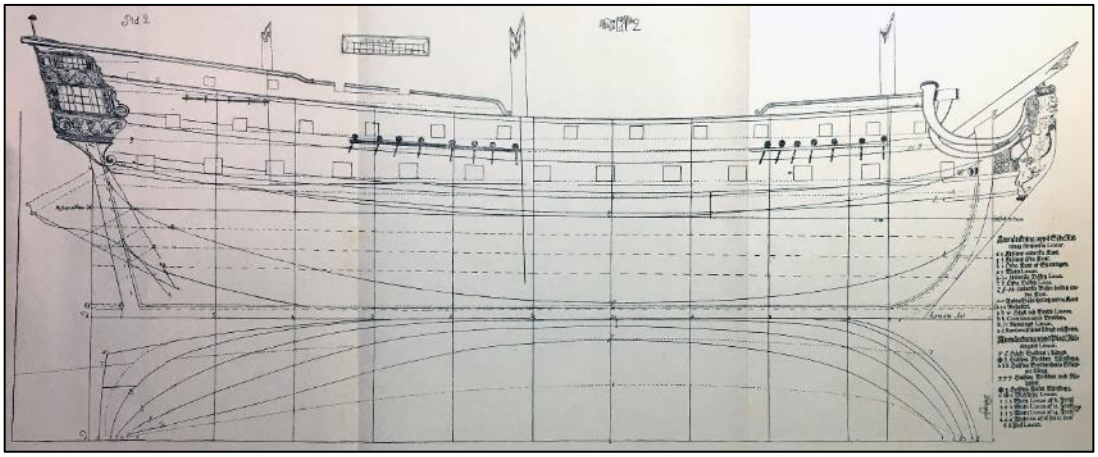

Figure 5 A contemporary plan of a SOIC Indiaman of the same size as the Queen of Sweden.

3.3 Queen of Sweden's first expedition 1742–1744 (Söderpalm S., 2016)

3.3.1.1 The Queen of Sweden's maiden voyage was on its expedition to China between 1742 and 1744. This was the SOIC's tenth trading voyage and compared to others was dramatic. After departing Gothenburg on January 10th, 1742, the Queen of Sweden went aground on an island off the Norwegian coast. Being able to get off without being cast away it none the less had to visit the Norwegian port of Langesund for repair and new rig. It took until mid-March of that year (2 months) before the Queen of Sweden could once more set sail on her voyage to China.

3.3.1.2 This unforeseen delay was compounded by the necessary stop in Cadiz. Reaching the Spanish port in June the "paying cargo" was off loaded and sold for silver currency. Due to this enforced lateness their pass to Canton had expired and they were forced to winter on the island of Aynam (Hainan) in southern China.

Figure 6 A near contemporary painting of the port of Gothenburg.

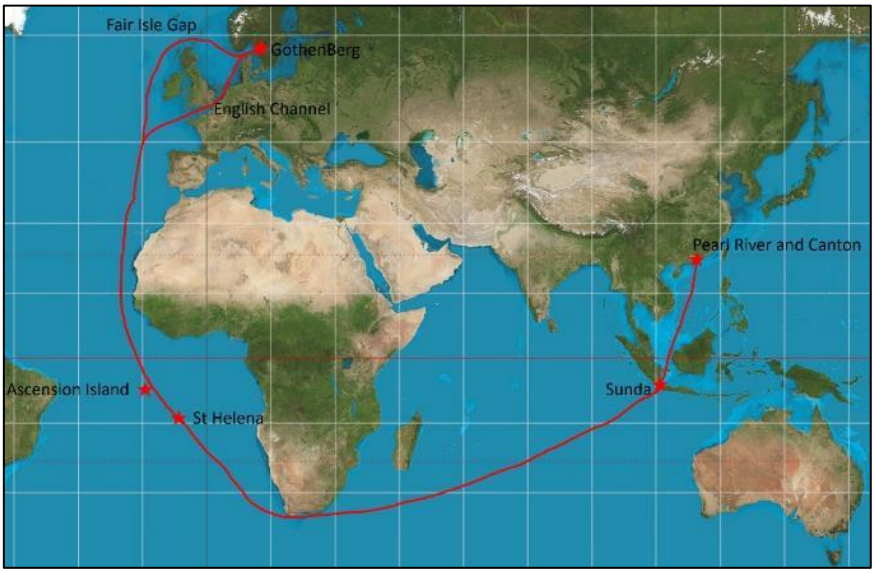

Figure 7 The outbound route of the SOIC ships. Depending on relations with England they either went North about around Scotland or through the English Channel.

3.3.1.3 The *Queen of Sweden* arrived at Aynam (Hainan) in November. A contemporary account highlights the rigours of the outbound voyages. Ekeberg tells us that, "almost starved, after a long and tiring endeavour against it already began the northeast wind, through a Tai-fou and other storms, as well as the loss of the masters, to cancel it for us more west winds." On the large and fertile island of Aynam however, food and water and the purchase of local produce was abundant. The crews lived ashore in their own tent camp attended to by the local mandarin who also sent a message to Canton for a "comprador" (business intermediary) and interpreter. By mid-March 1743 the *Queen of Sweden* was able to lift her anchor and set sail again.

3.3.1.4 As a portent of this voyages poor luck and highlighting the navigators lack of local knowledge the *Queen of Sweden* was caught in a local current and carried west of the Ladrones Islands (modern day Jiapeng Liedao and Dangan Liedao) at the southern mouth of the Pearl River Estuary, and further south than Hong Kong. Here they were delayed again, until the 15th of April, before they could continue on their journey to Macao. On April 18, the Queen of Sweden finally reached anchor off the island of Wampo, the anchorage of the European East Indies. This was just in time, as Ekeberg writes "We were there before Commander Anson, who was about to cross Philippine Islands". A timely reminder that the SOIC were not the only Company trading with Canton, still around one and half a mile upriver from Wampo.

Figure 8 Anchor on the island of Wampo, the anchorage of the European East Indies.

3.3.1.5 The portents of failure for this first voyage did not ring true, once the Queen of Sweden off loaded its paying cargo at Wampo and bought the tea, spices, porcelain and other "oriental" goods in Canton it set sail again for home water. Here it sold its cargo for a huge profit. Its voyage proved to be the companies most profitable.

3.4 The Second and Final Voyage

3.4.1.1 The Queen of Sweden in company with the Stockholm set sail on its second and last voyage in 1745. Together with the Stockholm and a crew of 130 men it left Gothenburg for Canton on the 9th January (Joffre, 1981). On its outbound voyage the Queen of Sweden's cargo included 1.9 tons of lead ingots, French wine, German spirits, Chinese porcelain (for sale in Spain) as well as navigational and medical instruments.

Figure 9 An artist impression of the Queen of Sweden and Stockholm leaving the Katergate enroute to Canton.

3.4.1.2 This time both vessels made their way into the North Sea without any mishaps. However, on January 12th strong winds sent them towards Shetland. In squally weather with snow and low light the dangerous Shetland coast would appear before them, before disappearing again in squall of snow and waves. Separated by the weather the *Stockholm* wrecked off the coast of Dunrossness whilst the *Queen of Sweden* attempting to make the Shelter of Bressay sound and Lerwick wrecked at the entrance of Bressay Sound just of Twageos Point at the south mouth of Lerwick harbour. There were no losses from either of the ships' crews.

Figure 10 Artist Impression of the SOIC ship Gothenburg in a storm.

3.5 Historic Salvage

3.5.1.1 After the wrecking the sails, ropes, masts, yards, weapons, and some of the cargo was salvaged. Following this initial salvage professional salvors Robert Hunter & Co. recovered 154 bars of lead by June 1746. Two French salvors, the 'Eschauzier Brothers' recovered a further 1330 bars of lead, four anchors and one gun. A final salvage operation was completed by George Innes & Co. on the 22nd of October 1746 when a further 266 pigs of lead were recovered (Joffre, 1981).

Figure 11 Contemporary artist impression of the Stockholm wrecking.

3.6 Modern Day Intervention

3.6.1.1 In October 1979 the site was re-discovered by Jean-Claude Joffre (Joffre, 1982). Over the next three years he surveyed and excavated selected areas and recovered many artefacts. These are now curated by the Lerwick Museum. Over 248 artefacts were recovered including: glass bottles and flagons, pieces of China porcelain, lead weights, clay pipes, wooden tableware, musket shot and cannonballs and a variety of coins. Datum points (pitons) were placed in the bedrock close to the site. To assist in excavation cannons were moved to a gully in the north-eastern part of the site. After three years Joffre did not return to the site.

Figure 12 Joffre's divers working over the site and recovering artefact in 1979-82.

3.6.1.2 In October 1987 an archaeological site assessment was carried out by John Adams and Chris Dobbs (Dobbs, 1987). This was followed in 1990 by a pre-disturbance survey of the site, undertaken during a Nautical Archaeology Society (NAS) training course with the Shetland Scottish Sub Aqua Club (SS-SAC). Additional NAS courses were undertaken at the site including survey work and excavation in 2001 and 2002. Test pits were excavated on the edge of the flint mound and in the area north of the guns.

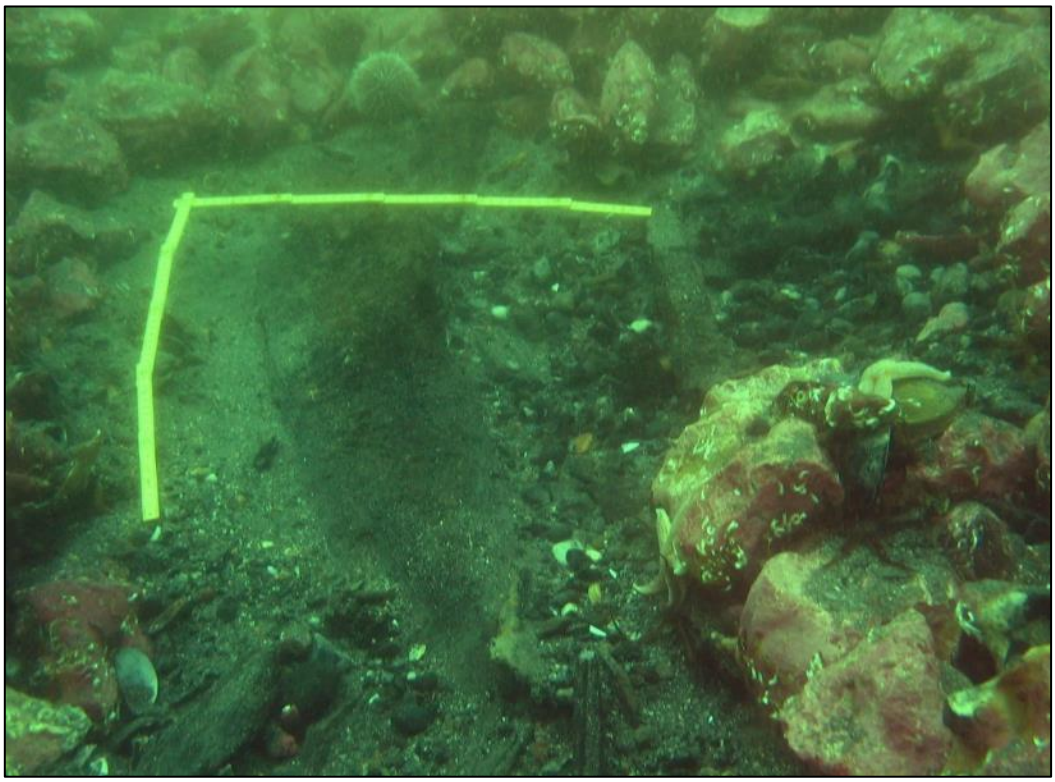

Figure 13 Test pit from 2001 highlighting the archaeological potential of the site. Hull timbers can be seen in the middle of the photograph.

3.6.1.3 In 2001, 13 lead ingots were raised by John Morrison of the Shetland Scottish Sub Aqua Club (SS-SAC). A single lead ingot and bronze sheave were donated to the Lerwick Museum (Mr T. Watt, 2002, written communication 02.05.2002). Following this recovery, the Archaeological Diving Unit (ADU) inspected the site in 2002 with a mini ROV (Archaeological Diving Unit, 2002).

Figure 14 Lead ingot recovered from the site.

Figure 15 Bronze sheath recovered from the site.

3.6.1.4 In 2012 Wessex Archaeology was commissioned by Historic Scotland to undertake a geophysical survey over the wreck site. Eight anomalies were identified in the area around the wreck site.

3.6.1.5 In 2015 15 ingots and a single ships' timber were raised by local diver Donald Jefferies. These ingots were reported to the Receiver of Wreck (Mr D. Jefferies 2017, pers. comm., 11.08.2017).

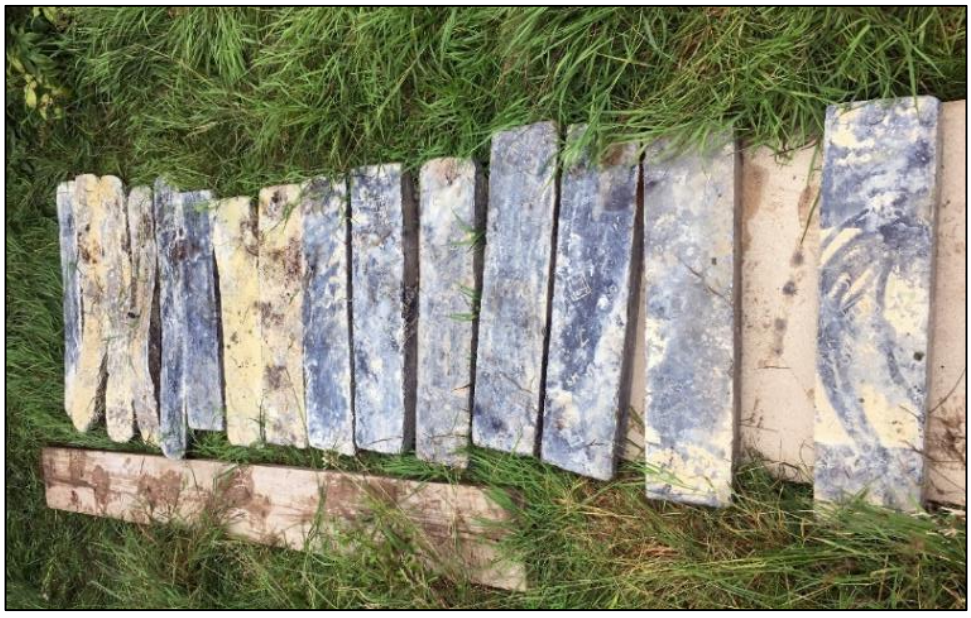

Figure 16 Lead ingots recovered from the site in 2015.

3.6.1.6 In 2017 Wessex Archaeology (Scotland) (WA) was commissioned by HES to carry out an undesignated site assessment of the site. This further enhanced the photographic record of features visible within the site and confirmed the archaeological potential of the site.

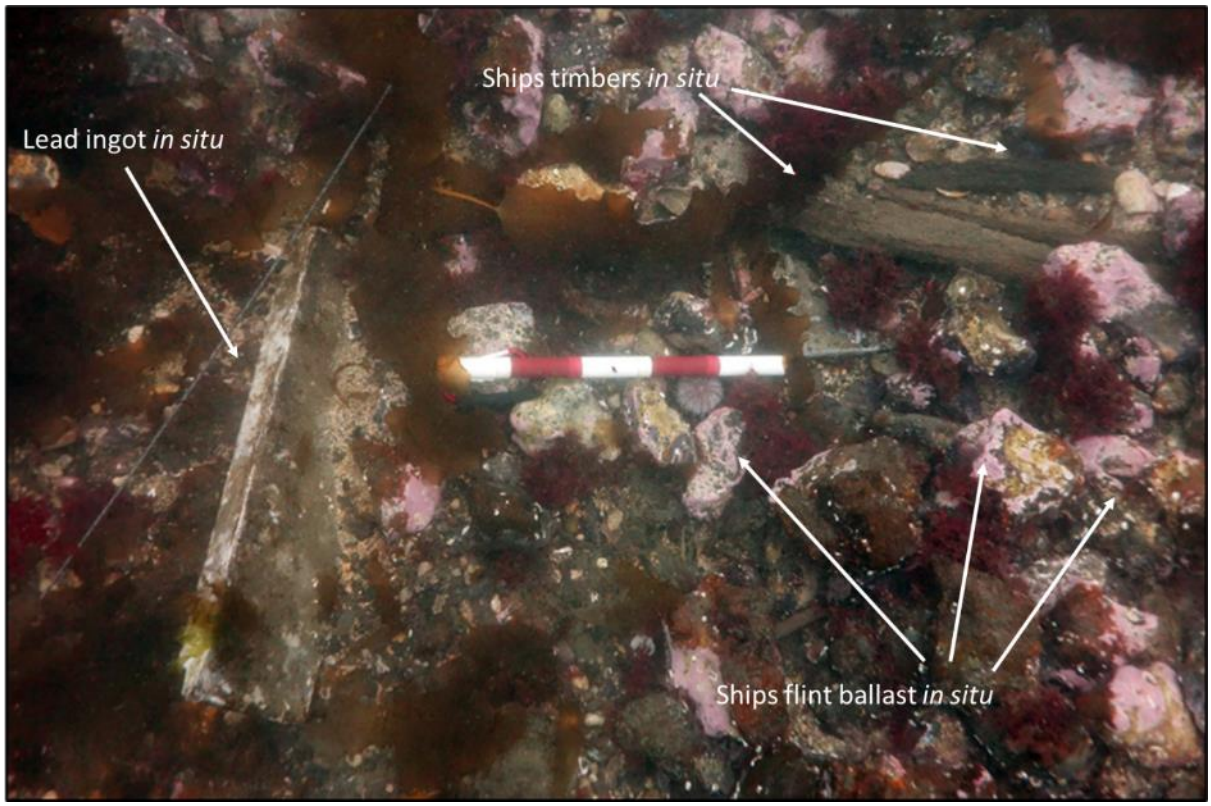

Figure 17 Artefacts in situ highlighting the continued archaeological potential of the site.

4 Project Aim, Objectives and Outcomes

4.1.1.1 The aim of the project was to produce, through community engagement, a virtual interactive web-based dive trail of the Historic Wreck "*Drottningen af Sverige*" translated as "*Queen of Sweden*" and foster a local sense of community ownership and stewardship of the Marine Historic Environment. To this end the project has fully engaged with the local volunteer and original excavation teams, as well as staff at the local museum and Historic Environment Scotland

4.2 Objectives

4.2.1.1 The Projects aim was achieved by Shetland Sub-Aqua Club through the following objectives:

1. Undertaking a desk-based assessment of the site to collate all known published material, images and video of the site for the Web Tour.
2. Creating a baseline site plan of the site and all archaeological material onsite for the Web Tour.
3. Training volunteers in archaeological techniques and methods to enhance the current record both on site and within the museum.

4. Training volunteers in 3D photogrammetric survey techniques to produce
   a. 3D photogrammetric plan of the main area of the site,
   b. 3D models of the upstanding archaeological features on site,
   c. 3D models of key artefacts from the site held at Shetland Museum.
5. Drafting and preparing interpretation material necessary for the virtual diver trail.
6. Contracting a specialist in virtual 3D diver trails to build the 3D virtualisation.
7. Promoting international links through fostering partnerships with interested organisations such as the Gothenburg Project (www.gotheborg.com).
8. Promotion of the virtual web-based diver trail through press releases (to be agreed with Historic Environment Scotland) publications in dive magazines and other appropriate publications and digital media, as well as through the use of the hashtag #QofSdivetrail.

4.3 Outcomes

4.3.1.1 The project outcomes can be seen on the project website at: https://www.cloudtour.tv/queen-of-sweden/information/0_0

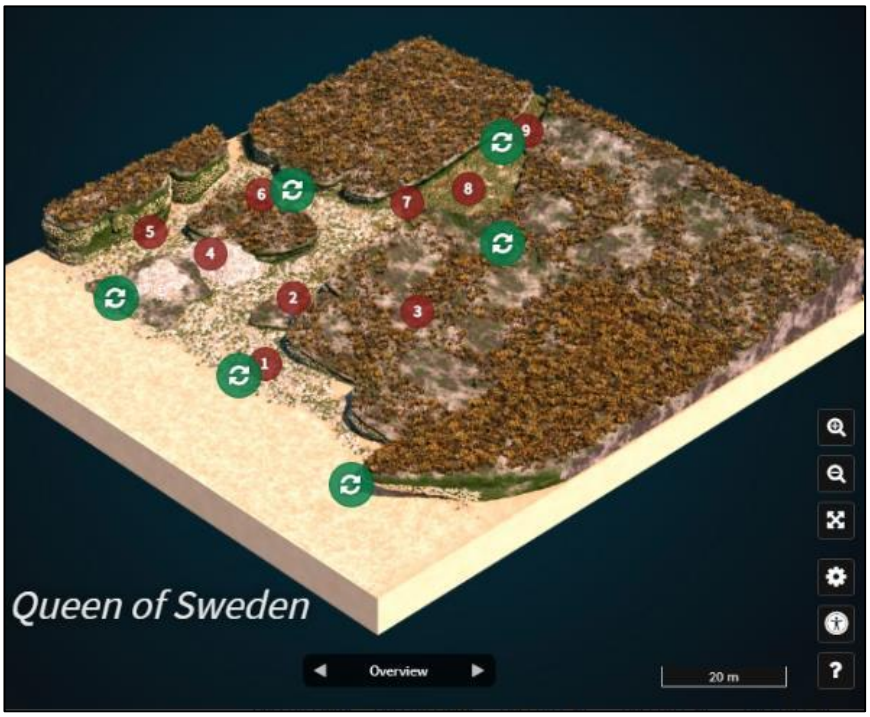

Figure 18 Screen shot of cloud tour web-based dive tour of the site of the Queen of Sweden.

9. Further less tangible outcomes and added value were achieved by the Shetland Sub Aqua Club through the delivery of diving Archaeology by;
10. Fostering a culture of collaboration and ambition locally, nationally and internationally by involving all stakeholders (see below) in an inclusive and innovative project.
11. Innovatively archiving and disseminate all previous work on site by creating a web-based database.
12. Raising standards and ethics through training and leading by example in best practise.

Figure 19 Archaeological Training on site.

13. Successfully enhancing understanding by promoting and supporting a research lead project that aimed to produce baseline information for future informed management of the site.
14. Making knowledge about the site discoverable, accessible, referable and reusable now and for future generations and to the widest possible audience via a web based interactive site tour. This will support access to, and engagement with the site for new audiences such as non-divers and people who cannot travel to the Shetlands.
15. Caring and protecting the archaeology by engaging with the community to encourage sustainable management and protection of the archaeological resource by developing a new method to produce an innovative product to showcase the local volunteer's work.
16. Making the archaeological resource held on site underwater and within the Shetland Museum accessible for learning, research, creativity and participation for all and for future generation through the web based virtual site tour.
17. Encouraging greater engagement by encouraging creative and collaborative archaeological activities through the training in the use of new digital technologies (3D Photogrammetry) to engage the local community in the archaeological process and results.
18. Maximising the role archaeology can play in learning for people of all ages by creating a web based virtual tour that can be accessed by as wide an audience as possible.
19. Increasing and improving the presentation and interpretation of archaeological information about the site by presenting it within an accessible web based virtual tour.

5 Method Statement

5.1.1.1 The diving and archaeological training was coordinated by Andrew Inkster of Shetland Sub-Aqua Club and ensured the success of the project. Due to changes in personal circumstance of the volunteer team the initial spring and summer time diving and training was reprogrammed to September and October 2019. This included 48.75 hours of diving and 94 hours of volunteer work in the museum stores.

5.1.1.2 To deliver the projects aim, objectives and outcomes the following methods were undertaken.

5.2 Desk-Based Assessment

5.2.1.1 A desk-based assessment of all previous works carried out on site was performed. This identified all known phases of previous work carried out on the site by the Shetland Sub Aqua Club, people and institutions with information pertaining to the work onsite. People contacted include Chris Dobbs and Kester Keighley from the 1987 site assessment, Patrice Lettelieur an original diver from 1979-82 salvage, Sarah Joeffre, daughter of the original saviour of the 1979-82 salvage expeditions. Institutions whose archives were researched are Shetland Museum, Receiver of Wreck and Shetland Archives.

5.2.1.2 A bonus from this work was correspondence with the daughter of the original excavator of the site, who gave access to pictures and video from her father's archive. These have been used within the web tour.

5.3 Archaeological Training

5.3.1.1 The local community of divers (Shetland British Sub Aqua Club) and other known divers were trained in Nautical Archaeology Society course. This training encompassed:

- Archaeological ethics and standards
- Desk based Research
- Report Writing

Figure 20 Nautical Archaeology Society Training in the Shetland Sub Aqua Club, club house.

- Underwater surveying (the various methods and their pros and cons)
- Creating the archaeological record (why we do it, context recording, sketches, measuring)
- Artefact recording (photography and drawing) within the Museum.

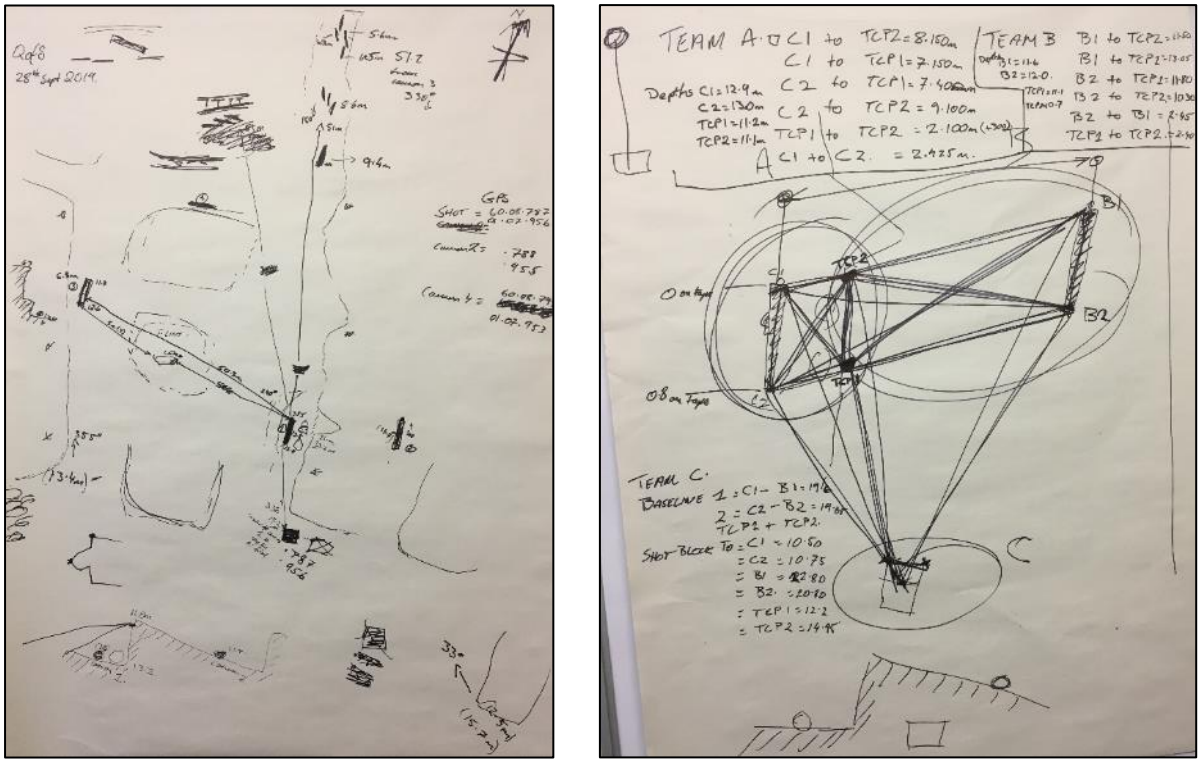

Figure 21 (left) Sketch of site plan as divers build up the detail and take measurements (right) to prove positions of artefacts.

5.3.1.2 The NAS practical training was undertaken at the Shetland Sub Aqua Club dive club on the 27th 28th and 29th September 2019. This included diving on the site to record distance between artefacts. This allowed the previous site plans to be corrected and feed into the site tour.

Figure 22 Shetland Sub Aqua Club diver recording the geological features plus depths and heights of the site for the site plan.

5.4 3D Photogrammetry Training

5.4.1.1 A separate 3D Photogrammetry course taught 3D photogrammetry of underwater sites, underwater artefacts / features and artefacts in a museum setting. This was carried out over 2 days on October 19 and 20 2019.

Figure 23 Shetland Sub Aqua Club member and volunteer taking photographs for a photogrammetric model.

5.4.1.2 The training included practical elements to record artefacts within the museum. A total of 36 artefacts were modelled of which 12 are displayed within the web tour.

Figure 24 The collection of 3D models of artefacts in the virtual museum.

5.4.1.3 It also included practise photogrammetry for onsite diving recording of similar artefacts, such as ingots and cannon. Diving allowed the techniques learnt to be put into practise to record the archaeological features on site. The output of which can be seen in the web tour.

Figure 25 Practising creating a 3D photogrammetric model of a cannon in the Museum stores.

5.4.1.4 All on site archaeological features were also modelled (see appendix).

5.5 Create a baseline site plan of the site and all archaeological material onsite.

5.5.1.1 This was produced during the training by the *Shetland Sub Aqua Club* divers. The BSAJT funding facilitated the diving to allow for this survey work to take place.

5.5.1.2 A total of 24 individual dives were carried out on the site over two days of training. Further dives clarified features and data whilst the web tour was being developed.

Figure 26 A cannon in the foreground with divers surveying the area around it in the background.

5.6 3D Virtual Wreck site Tour Production

5.6.1.1 To allow the viewer to immerse themselves in the site of the *Queen of Sweden* a virtual reality 3D tour was developed. This consists of virtual tours from 5 points of view. They are created from the 3D models by rendering out equirectangular images in a 3D camera, viewed from a chosen point of view from within the 3D model. These points of view are at the South, North, East, West and middle of the site.

5.6.1.2 The final virtual dive trail is hosted on a website that allows for multiple web-based platforms to interface with it. This includes inter-operability between different operating systems (IOS, Android, Windows, Mac OS) smartphones, tablets and computer.

5.6.1.3 The virtual Dive trail can be accessed at: https://www.cloudtour.tv/queen-of-sweden/information/0_0

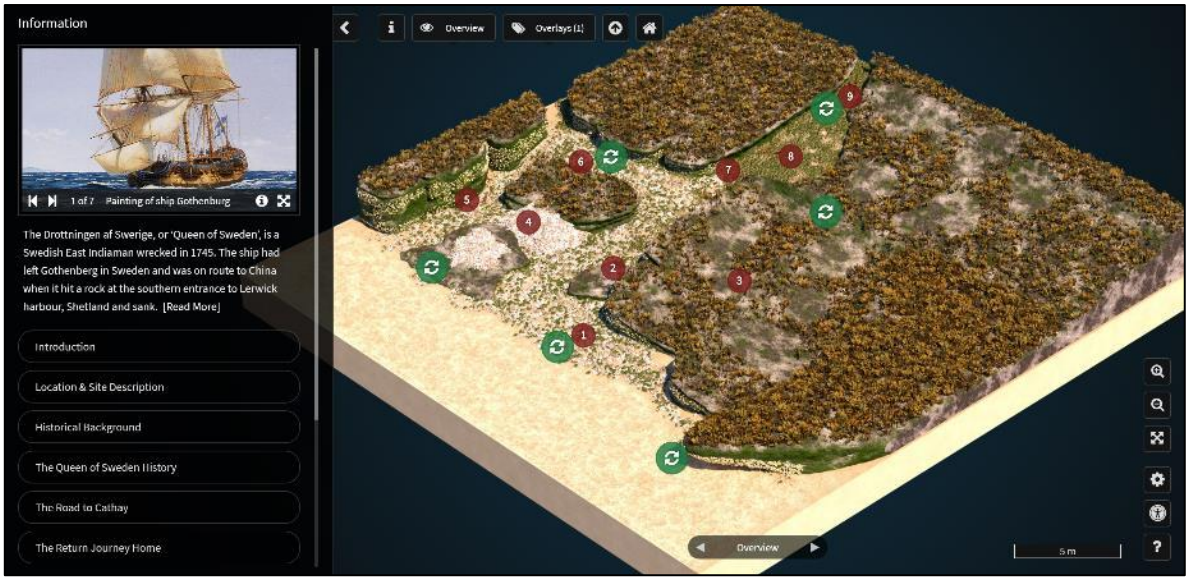

Figure 27 Screen shot of Web Tour home page.

6 Project Team

6.1.1.1 A number of people representing different organisations were directly involved in the delivery of the project. These are listed below by organisation.

6.1.1.2 Shetland Sub Aqua Club

- Diving Officer – Andrew Inkster
- Club members – Fraser Johnson
  Nigel Pickett
  Neil Finlayson
  Scott Jamieson
  Kelly Thompson
  Philip Jamieson

6.1.1.3 TrenDive

- Project Management, Senior NAS Tutor – Dr Douglas M. McElvogue
- 3D Model and Tour development – Grant Cox
- Photography – Donald Jefferies
- Project Assurance and Administration – Victoria Harris

6.1.1.4 Shetland Museum

- Director Shetland Museum – Iain Tait
- Curator – Jenny Murry

7 Total Project Budget: June 2019 –September 2019

7.1.1.1 The total budget costs for diving are listed below. The BSAJT trust project funding was for £1000. The short fall was made up by club funds.

Boat fuel per day	**Days**	**Cost**
£75.00	6	£450
Survey Consumables		**Cost**
Stationary		£25.00
Permatrace		£75.00
Travel		£225.00
Air		£360.00
	Total Cost	**£1,135.00**

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9 Appendix

9.1 Sketchfab Underwater Museum Links

9.1.1 Cannon 01
https://sketchfab.com/3d-models/e05e3a9a9c5746709e22f0d9263afd48

9.1.2 Cannon 02
https://sketchfab.com/3d-models/18d28861428b4e19b62697d5cba0c498

9.1.3 Cannon 03
https://sketchfab.com/3d-models/3fdbf6738cc5434398cb202e82ec7e49

9.1.4 Cannon 04
https://sketchfab.com/3d-models/be1c7e39109448bebd2abdc0376acfb5

9.1.5 Cannon 05, 06
https://sketchfab.com/3d-models/d27feb7b9ef44402a0cbd7cf941b1150

9.1.6 Cannon 07, 08, 09 and 10
https://sketchfab.com/3d-models/ad153a59276c4deabb7c16da94353dcc

9.1.7 Cannon 11
https://sketchfab.com/3d-models/3ae2ad9356424e368f5c96e9791f5585

9.1.8 Lead Ingot In situ
https://sketchfab.com/3d-models/1043a252ede041bb9e510a6762192cb3

9.1.9 Lead Ingot
https://sketchfab.com/3d-models/34d27c1704284d8c9715f4f8a09e70d8

9.1.10 Kelly Block
https://sketchfab.com/3d-models/f0b27cc1f70744798f8a435ecca2d791