

# The Vrouw Maria Underwater project 2009–2012 final report

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# **1. The final report on the Vrouw Maria Underwater project in general**

This final report on the Vrouw Maria Underwater project describes and brings together the aims and results of the entire project from 2009 to 2012 on a year by year basis and by theme. These aims and results are also presented on the project website and in the publications from the exhibition and seminar associated with the project. Fieldwork has also been reported in more detail in line with the National Board of Antiquities' guidelines on fieldwork research reports. At the end of this report, views on the future of the Vrouw Maria are presented, particularly from the perspective of the National Board of Antiquities.

In its main features, the final report follows the structure and template of the project and research plan for the Vrouw Maria Underwater project drawn up in January 2011. The guidelines in the Annex (Project Design) to the UNESCO Convention on the Protection of the Underwater Cultural Heritage of 2001 were used as the basis of the plan. For the final report, the headings, content and order of the sections have been adapted to better correspond to the requirements of a final report. All the staff involved in the project have contributed towards writing the final report.

## **2. The Vrouw Maria Underwater project 2009–2012 in general**

The Vrouw Maria Underwater project comprised a planning phase and three research phases which took place between 1 April 2009 and 31 December 2012. Funding was applied for each year from the Ministry of Education and Culture as special funding via the Maritime Museum of Finland's support organisation Suomen merimuseon tuki ry. The Vrouw Maria Underwater project, which lasted three years and nine months in total, was divided into phases as follows:

- Planning phase 1.4.2009 – 31.3.2010 (budget €170,000),
- First research phase 1.4.2010 – 31.3.2011 (budget €270,000),
- Second research phase 1.4.2011 – 31.12.2011 (budget €300,000),
- Third research phase 1.1.2012 – 31.12.2012 (budget €300,000).

### **The aims of the entire project were**

- To produce new information about the wreck, its cargo and the landscape, etc. and to interpret and present this information in different ways. Concrete research questions included what the vessel the Vrouw Maria was like, what kind of cargo and art cargo she was carrying and what kind of elements were in the past and present landscape of the wreck site. The project also considered how the wreck should be preserved and whether the wreck could be protected in the location in which it was found (in situ).
- To increase access to the wreck, e.g. by means of a virtual simulation, a blog updated from the field, an exhibition and an exhibition publication as well as a seminar.
- To produce information for managing the wreck, including documents required in the preliminary Natura impact assessment, on in situ protection, to answer questions about the condition of the wreck and to monitor any changes.

The aims and methods of the first, second and third research phases were always defined in more detail on the basis of the results of the preceding research phase. Earlier research and its results were taken into account in the different phases.

The project and its results are presented in more detail in sections 5–24.

### **3. The background to and the reasoning behind the Vrouw Maria Underwater project**

In its report on the Vrouw Maria in 2007, the National Board of Antiquities presented five different options for the future of the Vrouw Maria wreck. After analysing the options, the National Board of Antiquities recommended what it termed a “Vrouw Maria Underwater” project, the aim of which was to ensure that the wreck was preserved at the site where it was found, for the time being, by protecting, managing, researching and presenting it in situ. Access to the wreck would be improved by a virtual simulation, fieldwork images uploaded to a website, webcams and/or a blog. In addition, changes in the condition of the wreck would continue to be monitored. As far as historical research was concerned, the aim would be to produce new information on the history of seafaring and shipbuilding and about the ship’s cargo and the works of art purchased for the collections of Catherine the Great referred to in documentary sources.

The main idea behind the report was partly to enable research into the wreck, which had been found to be historically significant, to continue. The report stated that the Vrouw Maria wreck could be considered to be of major historical importance from a national and an international perspective. The wreck of the Vrouw Maria is particularly well preserved, with an estimated 90 percent of its hull intact. The rig of the wreck is also preserved. The wreck of the Vrouw Maria represents a merchant vessel typical of its period, the late eighteenth century, in the Baltic region which transported a variety of cargo to meet the needs, among others, of the city of St. Petersburg.

The historic importance of the wreck is increased by the large volume and variety of the material it offers, the fact that the ship may have been carrying works of art destined for Empress of Russia, Catherine the Great, and the wealth of archive material and historical figures associated with the site.

The Vrouw Maria Underwater project was highlighted as a more realistic alternative than the various options of an excavation, raising the wreck or conserving the hull, as the methods involved were largely available and did not involve conservation of the hull. The project was also considered to be reasonable in terms of its technical demands, risk and cost. Additionally, the project was considered to be suitable for a historically significant site.

Options involving raising and conservation of the hull of the wreck were considered difficult because in the early 2000s, new and surprising problems had been found in conserving wooden wrecks. From existing examples, including the *Vasa* and the *Mary Rose*, it was known that raising entire wooden wrecks, conserving them and creating a museum around them was a question of an extremely expensive project lasting many years and demanding a financial commitment extending far into the future. The *Vasa* had also shown that preserving a wooden wreck in museum conditions was no simple task and that problems could arise – such as the problem of iron and sulphur compounds – which could not have been predicted when making the decision to raise the wreck. The problems of iron and sulphur compounds in preserving waterlogged timber were studied in an international research project in Sweden in the 2000s. Some of the issues have been resolved but many questions still remain to be answered.

In addition, in 2007 the Vrouw Maria Underwater option was justified on the basis that the prevailing conditions and environmental factors at the wreck site were favourable to preserving the wreck and measures aimed at protecting it were deemed to be sufficient (e.g. a protected area, monitoring by the coastguard). This being the case, there is no need to raise the Vrouw Maria in order to preserve it. Furthermore, preserving it in the site in which it is located complies with the principle of in situ conservation set out in the UNESCO Convention on the Protection of the Underwater Cultural Heritage (2001) and the ICOMOS Charter on the Protection and Management of Underwater Cultural Heritage (1996), where it is recommended that wrecks are preserved primarily at the location in which they were found.

The Vrouw Maria Underwater option was also considered to offer internationally relevant, challenging and innovative multi-disciplinary themes, such as in situ preservation and management, monitoring the condition of the wreck and prevailing conditions at the site and a virtual presentation of an underwater site. Thus the option offered opportunities to create an international project.

In weighing up the options, it was considered important that the option chosen would help to develop research, protection and management of cultural heritage. The aim of the project was to develop and create new practices which could also be applied to other underwater ancient monuments. For example, improving access to the wreck was one important aim. During the project, research into the Vrouw Maria could be followed on a blog and one of the end products of the project was a virtual simulation of the Vrouw Maria.

The largest amount of new information on eighteenth-century seafaring can naturally only be attained from an underwater excavation of the Vrouw Maria or by raising the wreck as a whole and excavating it in the laboratory. If, after a preliminary Natura impact assessment, permission were to be obtained from different authorities to move to more extensive excavation or even raising the wreck, the benefits of these options, such as new research information and wide-ranging accessibility, would be attained as the wreck and its contents could be presented in a museum environment. This would in all probability also result in clarity concerning the fate of the works of art which may still remain on board. For this reason, during the Vrouw Maria Underwater project, the Ministry of Education and Culture and the National Board of Antiquities were also interested in exploring various options for excavating and raising the wreck. During the project, the aim, after all, was to produce a Natura impact assessment for more extensive excavation and/or raising of the wreck, in order to obtain the official opinions, in line with the Natura process, as to whether, in principle, more extensive excavation could be carried out on the wreck or whether it could be raised. At the same time, a public debate on the limits set by the authorities on the options for the future of the wreck would also be obtained. During the project, a certain amount of background information was produced, including plans for raising the wreck, until in autumn 2010 the Ministry of Education and Culture decided that the raising scenario would not be taken forward in the foreseeable future due to insufficient resources, and that matters relating to it would not be explored further during the project. However, it can still be stated that the options of excavating or raising the wreck did partly underlie the Vrouw Maria Underwater project.



## 4. Basic information about the Vrouw Maria

### 4.1. The Vrouw Maria as a site

A two-masted merchant vessel, the Vrouw Maria was wrecked in an autumn storm on a voyage from Amsterdam to St. Petersburg, finally sinking in the outer Nauvo archipelago on 9 October 1771.

According to the Danish Sound Toll records, the vessel's cargo was sugar, dyestuffs, zinc and fabrics, as well as a variety of trade goods, whose customs value was higher than normal. The Vrouw Maria has garnered a reputation as a treasure ship as it was loaded with works of art purchased by Empress Catherine the Great of Russia and the Russian aristocracy, including seventeenth-century Dutch paintings. After the wreck, attempts were made to rescue the ship's cargo but the majority of it went down with the ship. The wreck was found in 1999 in a search using side scan sonar by the Pro Vrouw Maria association headed by Rauno Koivusaari.

The Vrouw Maria is located at a depth of 41 metres in a small dip surrounded by underwater shallows. The sea bed in the area comprises a thick layer of gyttja clay/clay, topped with sand. The ancient monument area covers approximately 2,000 m<sup>2</sup> (approximately 40 x 50 metres). The area is delimited on the basis of side scan sonar and ROV surveys. The hull of the wreck is approximately 26 metres long and 7 metres wide. The masts rise to a depth of 22–24 metres. Parts of the structure and the rig lie on the sea bed around the wreck.

The owner of the sea area is the Finnish government land authority Metsähallitus and it belongs to the town of Pargas. The wreck is surrounded by the exclusion zone created in an agreement between the National Board of Antiquities and Metsähallitus in 2000. The area is circular and has a diameter of 1,500 metres. No vessels are allowed to anchor in the protected area and diving is prohibited unless linked to sea rescue of a vessel in distress or engaged in research under the guidance of the National Board of Antiquities.

The wreck is located in the Natura area of the Archipelago National Park. The area is also a restricted zone in the National Park, in which entry, landing and scuba diving is prohibited all year round without a permit from Metsähallitus. The nesting season for water birds and the breeding season for seals lasts from spring to about mid-July, so permits for research at the Vrouw Maria are generally issued within the period 16 July to 31 January. In 2011–2012 field research was carried out earlier than this (in 2011 in early July, in 2012 in early June), because the aim was to achieve the best possible underwater visibility for research. An exemption was granted by Metsähallitus for this fieldwork.

### 4.2. Identifying the Vrouw Maria

The Vrouw Maria was found on 28 June 1999 in a search using side scan sonar by the Pro Vrouw Maria association headed by Rauno Koivusaari. The association's volunteer divers measured and photographed the wreck immediately it was located. Under the supervision

of the National Board of Antiquities, three clay pipes, a stoneware mineral water bottle, a zinc ingot and a lead seal from a bundle of fabric were raised from the wreck. The aim of the research was to establish the age of the wreck and to identify it.

Identification of the wreck was based on the following factors:

- The items raised from the wreck originated from the Netherlands or elsewhere in Europe (e.g. clay pipes, the lead seal) or they were typical of trade goods which passed through the Netherlands (including zinc, whose most important European export port was Amsterdam).
- The shape of the hull and the materials from which the vessel was constructed indicated that she was Dutch. The hull of the ship was possibly built from oak grown in an area which is now in Poland and the masts are possibly Norwegian pine. In the eighteenth century, the Netherlands obtained timber for shipbuilding from precisely these areas.
- The wreck site of the *Vrouw Maria* referred to in archival sources matches the location in which the wreck was found.
- There are no significant conflicts between the archival sources and the results of the archaeological research. Indigo, coffee beans and madder were found in the hold, corresponding to the information on the cargo of the ship in the archives. On the other hand, the cargo hold of the ship contained clay pipes, glass discs and pumice stone, which are not mentioned in written sources. They may be the “undefined trade goods” referred to in the Danish Sound Toll records.
- In the wreck it is observed that, for example, the spaces on deck (stern cabin, destroyed deck cabin) have been emptied. This corresponds to the rescue activities mentioned in the archival sources. The easily ruined goods such as books, maps, boxes of tea and snuff, and other equivalent products in the list of salvaged goods were usually packed in spaces that would remain dry during the voyage. Usually, valuable cargo was stored in areas reserved for the master of the vessel. The wreck appeared to be untouched when it was found, so the current assumption is that the areas in question were emptied at the time of the wreck.
- The only clear difference between the archival sources and the archaeological research is the sale document for the koff named *Vrouw Maria* dating from 1766 which has been presented as being the sale document for the snow the *Vrouw Maria* which sank in the Archipelago Sea on 9 October 1771. However, there are significant differences between this sale document and the measurement results obtained in the field research. This can be explained by it being possible that changes were made to the hull and the rig between 1766 and 1771, by the original measurements possibly being inaccurate, or largely indicative, or alternatively by the sale document from 1766 not relating to the ship which went down in the Archipelago Sea.

In summary, it can be stated that during the *Vrouw Maria* Underwater project no new factors emerged that would conflict with the current identification of the vessel. The vessel is the snow, the *Vrouw Maria*, which sank in the Archipelago Sea on 9 October 1771.

## 5. The phases of the Vrouw Maria Underwater project 2009–2012

This section presents the progress of the project year by year. Sections 6–11 present the project by theme, where it is possible to obtain an overall impression of the different sub-areas of the project.

### 5.1. Planning phase 1 April 2009 – 31 March 2010

The planning phase of the Vrouw Maria Underwater project proceeded largely in line with the aims set out. In 2009, fieldwork was carried out on 20–24 July, jointly with the National Board of Antiquities' Maritime Archaeology Unit.

The aims of the planning phase were to:

- Draw up a research plan and budget and plan the duration and the aims of the entire Vrouw Maria Underwater project.
- Produce documents for the preliminary Natura impact assessment for the project and pass them on to the environmental authorities for a statement.
- Clarify how non-intrusive field research methods could be used at the wreck in order to obtain additional information about the wreck, and the cargo and its condition.
- Survey objects and structural parts that could possibly be raised and take samples.
- Produce a summary, interpretation and suggestions for further measures to monitor the condition of the wreck.
- Clarify the opportunities to find more archive source material.
- Continue to attempt to answer the questions on the paintings which may remain on board.
- Present the results of the project in different ways.
- Survey international and Finnish project partners.
- Clarify the opportunities for external funding.
- Start planning more extensive excavation and draw up the Natura documentation required for this.
- Draw up an initial budget for potentially raising the wreck.

The goals of the planning phase also contained the following measures:

- Setting up an international advisory group and organising its two meetings (the first in late 2009 and the second in spring 2010).
- Organising two workshops on the theme of changes to the condition of the wreck (the first in late 2009 and the second in spring 2010). The workshops were to be held in conjunction with the meetings of the advisory group and attended largely by the same people.
- Commissioning a demo version of the virtual simulation of the Vrouw Maria wreck.
- Purchasing webcams to be used during fieldwork at the wreck site.

The following measures linked to the project were planned to be carried out by salaried staff within the operating budget of the National Board of Antiquities' Maritime Archaeology Unit:

- Participating in organising a seminar on the underwater landscape in spring 2009; subject linked to the virtual presentation of the Vrouw Maria wreck and its surrounding underwater environment, in partnership with Metsähallitus and others.
- A field trip to the wreck in spring 2009. The trip was partly linked to an existing research project on the deterioration of archaeological timber (Kari Steffen, University of Helsinki), one of the focuses of which was the wreck of the Vrouw Maria.
- Testing the webcams to be used later on the wreck, e.g. on the Kronprins Gustav Adolf wreck.
- Updating the Vrouw Maria website.
- Updating the Vrouw Maria management plan.
- Setting up a Vrouw Maria archive.
- Updating the wreck's safety and monitoring status.
- Maintaining international contacts.

The problems in the planning phase included difficulties arising in the competitive tender for the demo version of the virtual simulation, finding someone to produce the online concept, as well as technical problems with the system. Ultimately, the competitive tender was halted, and the online concept was abandoned and replaced with a blog. Some sub-areas (including the Vrouw Maria Underwater project's project and research plan, summary of archive sources) were not completed within the predicted schedule and were consequently moved to the following phase.

The inspection visit in 2009 (20–24 July 2009) concerned the protection and management of the wreck and the aims of the project. The research vessel was the r/v Muikku owned by the Finnish Environment Institute. The costs of the inspection visit in 2009 were met by the National Board of Antiquities' Maritime Archaeology Unit and the Vrouw Maria Underwater project.

During the inspection visit, a sample of oak timber was raised from the wreck, which was then sent to microbiologists and physicists at the University of Helsinki for study. Monitoring photographs were taken and in inspection dives at the wreck, it was found that no visually observable changes had taken place in the condition of the wreck. The results of the field research are presented in the combined fieldwork research reports for the years 2007 – 2009.

During the inspection visit, samples of the sea bed in the vicinity of the wreck were also taken by Monivesi Oy in order to study zoobenthos. This study was linked to research into the prevailing environmental conditions at the wreck. The information obtained was also used in the preliminary Natura impact assessment for the Vrouw Maria Underwater project. If more extensive fieldwork is carried out at the wreck in the future or if it is raised, this information can also be used in planning these options. The zoobenthos were particularly typical for the area (including clam worm, blue mussel) and nothing significant was found regarding zoobenthos in terms of research into the wreck or its preservation.

Because the wreck of the *Vrouw Maria* is located in a Natura area in the Archipelago National Park, before starting fieldwork in the *Vrouw Maria* Underwater project, it was essential to have a preliminary Natura impact assessment carried out. A preliminary Natura impact assessment determines whether there is a need for a full Natura impact assessment. Natura impact assessment is based on the Finnish Nature Conservation Act (Nature Conservation Act 1096/96, Sections 65–66). The Natura impact assessment is similar to environmental impact analysis (EIA) but is slightly less far-reaching. The body carrying out the project pays the costs of assessment. The impact assessment describes the project and its impact and evaluates the significance of its impacts. If the project would not significantly impair the reason for the area being protected, there is no need for a full Natura impact assessment.

The consultants chosen to carry out the preliminary Natura impact assessment for the *Vrouw Maria* Underwater project were Panu Oulasvirta (Alleco Oy) and Rauno Yrjölä (Ympäristötutkimus Yrjölä Oy), and the *Vrouw Maria* working group submitted a fieldwork plan to them in December 2009. The task of the consultants was to add to the environmental information required for the plan and to assess the effects of the fieldwork on the environment. The fieldwork presented in the impact assessment of the *Vrouw Maria* Underwater project also included a work plan in line with which maritime archaeological research on the wreck was carried out in 2010–2012. The document was submitted to the Centre for Economic Development, Transport and the Environment for Southwest Finland (ELY Centre for Southwest Finland) for a statement in early 2010. In its statement (23.3.2010, National Board of Antiquities reference 2/399/2010), the ELY Centre found that the impact assessment had been carried out with care and appropriately and that the *Vrouw Maria* Underwater project would not weaken the natural values of the Natura area in the Archipelago Sea, for which reason the area was selected as part of the Natura network. Nor was there a need for a full Natura impact assessment.

During the planning phase, work also began on drawing up the project and research plan for the *Vrouw Maria* Underwater project which described, among other things, the different phases of the whole project and the scientific aims of the fieldwork with methodology and raising of artefacts and samples. Descriptions were also provided of the aims and methods of the fieldwork and in situ preservation. The template provided in the annex to the UNESCO Convention on the Protection of the Underwater Cultural Heritage (2001) was used as a model for the project and research plan.

The seminar held during the first planning phase explored the underwater landscape. The “*Maisema vesirajan alla?*” (Landscape under the waterline?) seminar was held at the Helsinki Hall of Culture on 2 October 2009, jointly run by the National Board of Antiquities’ Maritime Archaeology Unit, the Finnish government land authority *Metsähallitus* and the Cultural Production and Landscape Studies unit at the University of Turku. The seminar cast an eye under the waterline and towards the people and bodies who work with the underwater landscape. The final result of the seminar was that a landscape does also exist under water. The seminar was an important way of raising the theme of the underwater landscape in the *Vrouw Maria* Underwater project.

The second seminar in the planning phase was the international Vrouw Maria Workshop held at Suomenlinna in November 2009, the purpose of which was to discuss the research carried out into the Vrouw Maria, consider the need for further research and to discuss the future of the wreck with maritime archaeologists and conservators as well as with international experts who had carried out environmental and material analyses. The workshop also aimed to evaluate the alternative plans of the National Board of Antiquities for the future of the wreck. The event took the form of a workshop, not an open seminar for the public. Nine foreign and three Finnish experts were invited, plus staff of the National Board of Antiquities. Three of the invited foreign experts were unable to attend due to illness.

As a result of the workshop, it can be stated that the international experts considered that the views of the National Board of Antiquities on the future of the wreck were to be recommended and that in their view too, the first option was in situ preservation of the wreck. No-one recommended raising the wreck as the primary option without reservations, but it was seen to have its plus points. Several experts emphasised that the issue of raising the wreck should also consider whether this particular wreck should be raised and what the best method of raising it would be. These issues are also linked to the question of the historical value of the wreck is and whether the Vrouw Maria is the wreck on which Finland wishes to focus. Discussions also raised the issue of the opportunities for underwater excavation but this option was found to be the most demanding alternative from the fieldwork point of view.

The workshop was successful on at least three levels:

1. Discussion of the Vrouw Maria and the current plans at international level,
2. Evaluation at international level of the Vrouw Maria Underwater project, which was considered to be a good project worthy of support,
3. Two current projects regarding wrecks were presented to the National Board of Antiquities: the museum project for the royal flagship, the Mary Rose which sank in 1545, and the processes associated with raising and conserving the American submarine the s/s Hunley which sank in 1864.

The Vasa and the Mary Rose, both raised and conserved, are clearly national symbols. The Vrouw Maria lacks this significance as a national symbol but is instead an example of international merchant seafaring in the Baltic Sea in the eighteenth century. The wreck is part of the shared history of Finland, the Netherlands and Russia. The wreck of the Vrouw Maria is also a good example of a maritime salvage operation off the Finnish coast in the eighteenth century.

The foreign experts attending the workshop were of the opinion that the environmental conditions of the Vrouw Maria had already been researched in depth and that they were found to be particularly favourable conditions for a wooden ship. The biological, physical and chemical processes which cause materials to deteriorate are very slow, so the wreck is not at immediate risk of being destroyed. In practice, this means that in the in situ option, the amount of research into materials and the environment already carried out was sufficient and that there was no longer a need for further research during the Vrouw

Maria Underwater project. It was thought that the potential spread of the mercury referred to in the *Vrouw Maria*'s cargo lists into the hold of the ship should, however, be investigated (see *Vrouw Maria* field research report 2001) and this was carried out in conjunction with field research in 2011. With the raising option, on the other hand, considerably more wide-ranging field research and laboratory analyses would have to be carried out in order to establish the durability of the structures of the wreck and to identify the conservation challenges.

In the end, only one workshop was held because the first workshop produced sufficient information. It was also difficult to organise a second workshop in view of the timetable. The advisory group was not set up partly due to a lack of common research interests.

Historical research studied questions relating to the paintings which may be on the wreck, the origin of the cargo and archive sources relating to the wreck. The story of the wreck was publicised in Russia in an article in a Russian scientific publication (*Eero Ehanti: The wreck of Vrouw Maria. Study on the Maritime Archaeology, Volume 6: 2009*). A meeting was also held with Russians interested in the wreck in Helsinki in November 2009. Process descriptions and a budget were drawn up for the possible raising of the wreck, its conservation and a new museum building and its maintenance, which came in at a total of approximately €80–100 million.

During the planning phase, work began to plan a *Vrouw Maria* exhibition, which opened at the Maritime Museum of Finland in Kotka on 24 April 2012, entitled “Spoil of Riches – Stories of the *Vrouw Maria* and the *St. Michel*”.

During the planning phase, meetings were also held with Finnish and international experts, the website was updated, presentations were given and an archive was set up.

The more extensive documents drawn up in the planning phase (sub-reports, summaries, consultations, etc.) are listed in Annex 2.

## 5.2. First research phase 1 April 2010 – 31 March 2011

The first research phase of the *Vrouw Maria* Underwater project largely proceeded according to plan. It complied with the solutions reached in the planning phase regarding staff, goals and other arrangements, as well as the budget. The aims and methods were defined in more detail on the basis of the results of the preceding research phase. In its main features, the field research complied with the operating plan for the preceding phase regarding archaeological research. The field research in 2010 was carried out between 30 August and 10 September 2010.

The aims of the first research phase were to:

- Continue fieldwork on the basis of the situation and the results in 2009. More detailed plans were presented in the fieldwork plan for 2010.
- Communicate information about the fieldwork using the blog launched in summer 2010.
- Organise a one-day field trip to the wreck for interested international partners.



Preparing to dive. Photo: Vesa Hautsalo, National Board of Antiquities.

- Produce an interactive real-time virtual simulation of the wreck and its underwater landscape and soundscape.
- Continue more extensive excavation of the wreck and plan raising the wreck within the budget framework and start to draw up the full Natura impact assessment documents.
- Continue the historical research and archive research.
- Publish and present the results of the project in different ways.
- Continue to survey international and Finnish project partners.
- Continue planning the “Spoil of Riches” exhibition and produce content for it in partnership with the Maritime Museum of Finland.

The purpose of the field research in the first research phase was to examine any changes that had taken place at the wreck using monitoring photography, and to determine the species of timber used to build the ship, the construction method and the location of the cargo inside the ship. Documentation was carried out by measuring and video recording using a hand-held camera and a robot camera. Also eight samples were sawn from the structural parts for timber species analysis and to clarify the condition of the wood. All the samples from the hull of the ship were oak, while the samples taken from the rig were pine. The samples were also subjected to elemental analysis. A dendrochronological analysis was also carried out on one of the samples. The samples were also subjected to microbiological analysis.



Any changes taking place at the wreck were investigated using monitoring photography with a robot camera. The monitoring photography examined particular pre-defined sites (including the masts, easily disturbed detached structural parts and parts of the rig) and comparing the results with earlier material. During the fieldwork, information was also gathered for the virtual simulation, including recording underwater sounds. The research was carried out from the ship r/v Muikku owned by the Finnish Environment Institute. The ROV operator/diver Immi Wallin's vessel Yoldia was also on site.

During the fieldwork, recorded surface and underwater video was uploaded to the blog maintained by the fieldwork team via the internet (<http://vrouwmariavedenalla.wordpress.com>). The fieldwork blog was launched on 30 August 2010 and attracted approximately 8,000 visitors on day one. The feedback was positive and it was decided to continue maintaining the blog throughout the project.

In 2010, the mooring system of the research vessel, dating from 2001, was updated before fieldwork started. In June 2010, a new multibeam sonar survey of the wreck and its environment was carried out. It had been ten years since the previous sonar survey and improvements in equipment meant that it was now possible to obtain a more accurate picture of the wreck and its environment. The work was commissioned from Meritaito Oy.

A field trip to the wreck for invited guests was arranged on 2 September 2010 using a chartered vessel. The day-long trip was attended by staff from the Ministry of Education and Culture, representatives from the Russian and Dutch embassies, officials from Metsähallitus and the ELY Centre for Southwest Finland, staff of the National Board of Antiquities and Russians interested in raising the wreck. During the trip, the decision was made to visit the location of the wreck to experience the "spirit of the place", although the research vessel Muikku had already returned to Kasnäs harbour due to high winds. Before putting to sea, guests had an opportunity to see Muikku and the video material from the wreck site.

A preliminary contract was signed with Aalto University's Media Lab for producing the virtual simulation. A final cooperation agreement was signed in February 2011. In autumn 2010, a workshop on the simulation was held at Aalto University (including lectures, Mind Map exercises and testing different user groups). Work on producing the simulation continued throughout the first research phase.

The staff of the first research phase participated in planning and producing content for the Maritime Museum of Finland's exhibition "Spoil of Riches – Stories of the Vrouw Maria and the St. Michel". The Maritime Museum of Finland acted as the producer and creator of the exhibition, obtaining funding and Finnish and international partners, etc. The purpose of the exhibition was partly to present the results of the Vrouw Maria research project (e.g. photographs, videos, underwater landscape/soundscape, virtual simulation, history, shipbuilding). During the research phase, the exhibition project largely progressed according to plan, including regarding the script, selecting objects and photographs and foreign loans. Work began on writing the text for the exhibition publication.

The aim of the first research phase was also to continue more extensive excavation of the wreck, to plan raising the wreck within the budget and start to draw up the full Natura impact assessment documents. In autumn 2010, the Ministry of Culture and Education decided that the issue of raising the Vrouw Maria would not be taken further during the

Vrouw Maria Underwater project due to a lack of resources and the full Natura impact assessment documents were consequently not produced.

During the first research phase, historical research and archive research continued. Meetings were also held with Finnish and foreign experts. To communicate information about the project, the blog and the website were updated and presentations were held in Finland and abroad.

### 5.3. Second research phase 1 April 2011 – 31 December 2011

The second research phase of the Vrouw Maria Underwater project largely proceeded according to plan. It complied with the solutions reached in the first research phase regarding staff, goals and other arrangements, as well as the budget. The aims and methods were defined in more detail on the basis of the results of the preceding research phase. In its main features, the field research complied with the operating plan for the preceding phase regarding archaeological research. The field research in 2011 was carried out between 4 and 15 July 2011.

The National Board of Antiquities changed to a new organisational structure on 1 May 2011 and the project became part of the Cultural Environment Management department's Archaeological Field Services Unit. At the same time, the National Board of Antiquities' Maritime Archaeology Unit was disbanded. In June, the project's staff moved from the Maritime Archaeology Unit's premises in Hylkysaari to the National Board of Antiquities' offices in Nervanderinkatu.

The aims of the second research phase were to:

- Continue fieldwork on the basis of the results in 2010. More detailed plans were presented in the fieldwork plan for 2011.
- Further examine the construction method of the vessel including the interior of the wreck.
- Examine the construction method and the joints of the hull and the rig.
- Study the condition of the metal parts of the wreck (especially nails and bolts) using visual observation methods and by taking samples where possible.
- Obtain additional information about the contents of the cargo. Where necessary, raise items or take samples, e.g. of the contents of the packing crates.
- Record any changes at the wreck monitoring points.
- Fill in the gaps in measurement data, e.g.:
  - The location and measurements of the stern cargo hatch.
  - The number of decks and their location.
  - The number of bulkheads and their location.
- Complete and update the 3D reconstruction created using Rhinoceros software during the MoSS project (Monitoring, Safeguarding and Visualizing North-European Shipwreck Sites 2001–2004).

- Create more detailed deck level drawings by adding elements from the in situ measurements and video material.
- Produce line drawings.
- Produce a 2D reconstruction picture of the rig.
- Upload the surface and underwater video to a blog via the internet.
- Continue to produce material for the virtual simulation (including the soundscape, missing details, fieldwork, new artist's view drawings, interviews, etc.).
- Continue producing the virtual simulation with Aalto University (including providing material, guiding modelling, regular meetings, presentations).
- Continue the historical research and archive research.
- Publish and present the results of the project in different ways.
- Continue to survey international and Finnish project partners.
- Continue producing content for the exhibition and the exhibition publication.

The main aim of the fieldwork in the second research phase was to measure the hull of the ship and the rig and to complete the existing 3D modelling, as well as identifying the cargo still present in the hold. In addition, the annual monitoring photography of the wreck was carried out using a robot camera. The aim was also to continue analysing the samples taken in 2010. Documentation mainly took place by measuring, drawing and video recording. The research vessel used was the r/v Muikku (Finnish Environment Institute). Immi Wallin's vessel r/v Yoldia was also involved in the fieldwork, used for diving and working on the surface due to the shortage of space on the deck of the Muikku. The work vessel was the National Board of Antiquities' Meri 2.

In order to identify the cargo, 24 glass lenses, 7 rolls of tobacco, 6 clay pipes, 2 pumice stones and dyestuff samples were raised from the cargo hold. In addition, a sample of the sediment was taken for mercury analysis, from which dyestuff and plant residue samples were also obtained. During the fieldwork, the underwater soundscape of the wreck site was also recorded and uploaded to the blog. Following the fieldwork period, objects and samples were researched and analysed. The buoys used to moor the support vessel were once again put out and retrieved by Meritaito Oy, who also stored them and carried out annual maintenance. Reports on the fieldwork were published on the project blog with text, photographs, sound samples and video. The blog was also updated after the fieldwork. During the second fieldwork phase, the blog attracted the majority of its visitors in July (3,688), achieving a total of 9,928 visitors over the year.

In order to examine the structure of the ship, the number of deck beams was counted, the method in which they were attached was examined, and the size of the base of the deck cabin and the details of the stern deck structure were measured. The parts of the collapsed deck cabin were located and work began to reconstruct it. It was not possible to clarify the number and location of the decks and bulkheads in more detail because, despite attempts being made, new sites for examining the decks and bulkheads could not be found on the hull, through the openings in the deck outside the hull or through the stern loading hatch. Studying the interior of the vessel would require excavation research.

In summer 2011, Meritaito Oy carried out a new, more extensive multibeam sonar survey of the wreck and its environment. The area studied was now extended both in the Namnlösan island environment and on the south-eastern side of the valley surrounding the wreck. In addition, laser scanning and 360° video was taken from Namnlösan. The laser scanning operation was hindered by windy weather. The 360° video can be seen on the project blog. The multibeam sonar was later able to be seen in the Maritime Museum of Finland's exhibition "Spoil of Riches – Stories of the Vrouw Maria and the St. Michel".

The project was in contact with various experts in Finland and the Netherlands regarding raised objects and studying and analysing samples. Research in the archives of different countries was carried out in conjunction with the exhibition project.

The 3D model produced using Rhinoceros software during the previous MoSS project continued to be updated. For this reason, some of the project's staff attended a Rhinoceros course at Helsinki Metropolia University of Applied Sciences. A new version of the software (Rhinoceros 4.0) was also purchased for use in the project. The software was used in addressing technical questions regarding the construction of the ship.

Collaboration with Aalto University's Media Lab continued to produce the Vrouw Maria virtual simulation. In February – April 2011, a series of lectures was held on the simulations at Aalto University, with presentations on digital cultural heritage, simulation user interfaces, the virtual simulation of the Finnish Pavilion at the 1900 World's Fair in Paris (produced at Aalto University), the underwater soundscape and the exhibition plans. The presentations also talked about the Vrouw Maria Underwater project and the research into the Vrouw Maria. Work also began on planning user testing of the simulation in early 2012.

The staff of the second research phase participated in planning, producing content and writing articles for the exhibition "Spoil of Riches – Stories of the Vrouw Maria and the St. Michel".

A meeting of sponsors of the exhibition project was held on 24 October 2011 at the residence of the Dutch Ambassador in Kaivopuisto, Helsinki. Riikka Alvik and Sallamaria Tikkanen represented the project at the event. Eero Ehanti was present as a representative of the Maritime Museum of Finland. At the event, invited guests were shown a video compilation of the simulation.

During the second research phase, work also began to plan the public seminar in 2012 by drawing up seminar schedules and content, obtaining speakers and drawing up a budget.

The second research phase also saw publication of Riikka Alvik and Maija Matikka's article "The wreck of the Vrouw Maria – problems and good practices in the protection of underwater sites", linked to the conference on legal and illicit trade in cultural heritage held in Poland.

During the second research phase, meetings were also held with Finnish and international experts. To communicate information about the project, the blog and the website were updated and presentations were held in Finland and abroad.

## 5.4. Third research phase 1 January 2012 – 31 December 2012

The third research phase of the Vrouw Maria Underwater project largely proceeded according to plan. It mainly complied with the solutions reached in the three previous phases regarding staff, goals and other arrangements, as well as the budget. The aims and methods were defined in more detail on the basis of the results of the preceding research phase. In its main features, the field research complied with the operating plan for the two preceding years regarding archaeological research. In 2012, field research was carried out in two sessions: 4–15 June 2012 and 10–14 September 2012.

The greatest difference compared with the two preceding research phases was that during the third research phase, a public seminar on the Vrouw Maria, “From the Vrouw Maria to the Titanic – What to do with intact wrecks?”, was held on 9–10 November 2012 at the Maritime Centre Vellamo in Kotka.

The aims of the third research phase were to:

- Carry out the field research lasting approximately two to three weeks at the wreck site in 2012, scheduled in late July/early August, continuing the fieldwork from the situation and the results in 2011.
- Produce new visual material of the wreck.
- Continue to explore the way the ship was constructed, also regarding its interior, through fieldwork.
- Continue to study the composition of the cargo through fieldwork.
- Continue to upload the surface and underwater photographic material obtained during fieldwork to the website and blog.
- Produce material for the virtual simulation (including the soundscape, missing details). This only if problems had arisen in producing the simulation by the end of 2011. In addition, it would be possible to add this material to the simulation at a later date.
- Photograph and video known monitoring points demanding particular attention.
- Continue the historical research and archive research.
- Publish and present the results of the project in different ways.
- Continue to survey foreign and Finnish project partners.
- Participate in producing the exhibition and additional programme.
- Organise a public seminar on the Vrouw Maria in November 2012 at Maritime Centre Vellamo in Kotka as an event accompanying the exhibition.

In early 2012, articles written by the project staff were completed for an exhibition publication “Lost at Sea, Rediscovered”.

In March 2012, user testing of the Vrouw Maria simulation was completed at the National Museum of Finland in partnership with Aalto University’s Media Lab. The completed simulation was presented as part of the exhibition “Spoil of Riches – Stories of the Vrouw Maria and the St. Michel” at the Maritime Museum of Finland. The final location of the simulation will be the Maritime Museum of Finland’s main exhibition in

Kotka. The simulation and its creation were presented in 2012 at the CIMUSET 2012 seminar (Brighter Perspectives for Science & Technology Museums) in Tampere on 28–31 August 2012 and by staff from Aalto University's Media Lab at the ArcheoVirtual 2012 seminar in Paestum in Italy on 15–18 November 2012.

The exhibition “Spoil of Riches – Stories of the Vrouw Maria and the St. Michel” produced jointly with the Maritime Museum of Finland opened at the Maritime Museum of Finland in Maritime Centre Vellamo on 24 April 2012. The project's staff attended the opening and presented the virtual simulation. The exhibition ran until 13 January 2013.

The publication which accompanied the exhibition “Mereen menetetyt, uudelleen löydetty” (eds. Eero Ehanti, Johanna Aartomaa, Irma Lounatvuori and Erik Tirkkonen; National Board of Antiquities 2012) was published in June 2012, followed by an English version, “Lost at Sea, Rediscovered”, in November 2012.

In 2012, the Vrouw Maria was investigated on two occasions, in a period of two weeks in June and one week in September. The aim of the fieldwork in June was to study the ship while the water was still cold and visibility as good as possible. An exemption was obtained from Metsähallitus for the fieldwork phase during the sea bird nesting period and seal breeding period. The permit was granted subject to an undertaking to comply with the instructions of Metsähallitus (avoiding landing and excessive movement). Both field research sessions continued identifying the cargo and documenting the structures, details and interior of the ship in order to determine in more detail what kind of vessel the Vrouw Maria was. For example, there was a desire to reconstruct the collapsed deck cabin and the transom in order to obtain a picture of the Vrouw Maria as a sailing ship. Measurements of the angle of the sides of the ship were taken using a goniometer and old measurements were also checked. The aim was to link the measurement data with the existing measurement data using the Rhinoceros software and thus to supplement the measurements taken of the wreck.

Regarding the cargo, the research begun the previous year was continued: samples were taken of packing cases and barrels and some objects were also raised. The lead sounding line that was part of the ship's equipment was raised from the deck. A fairly wide strip, made of knotted string, previously described as a lead line, which was still in a coil on the deck of the ship, was also raised from the same spot. One more clay pipe was also raised from the hold in order to determine whether the ship held clay pipes made by different manufacturers. The stamps on this pipe were very unclear but the same Gouda City arms as in several of the pipes already raised could be distinguished on the side of the heel at the base of the bowl. One barrel contained traces of a blue dyestuff and another contained coffee beans. The lid of a barrel and part of a lid of a barrel were also raised from the cargo hold. The almost entire barrel lid bore a large number of markings but it has not proved possible to link these to any written sources.

Analysis of the sample taken in 2011 by the Dutch Cultural Heritage Agency's laboratory revealed that the substance was indigo or woad. Because it is not possible to tell the difference between indigo and woad by chemical analysis, a new sample was taken from the barrel so that it could be studied using plant biological methods. A trace of the *Indigofera* plant was found in the sample, confirming that the barrel contained indigo.

The aim of the autumn fieldwork was to continue the documentation work that was not finished in June but research was difficult due to strong gusty winds. It proved possible to carry out intensive diving activity at the wreck on two days only, where the emphasis was placed on photographing and video recording the wreck. Cameras and lighting have improved over the past ten years and the team included two photographers and one video camera operator who produced a large amount of visual material valuable in researching and presenting the wreck. The trimix diving technique used by the photographers enabled longer periods on the sea bed so material was able to be obtained despite the fact that the visibility was poorer than in early summer.

Swedish underwater photographer Erik Rådström who took part in the fieldwork photographed the deck level of the wreck from several points using 360° photography techniques. The pictures were put together to create 360° images from two points on the wreck and the material was uploaded to the National Board of Antiquities website. By scanning the QR code for the material, the photograph can be moved 360 degrees and visitors can move about at the points photographed as if they were diving at the wreck.

The research carried out in the Vrouw Maria Underwater project culminated in a public seminar “From the Vrouw Maria to the Titanic – What to do with intact wrecks?” held on 9–10 November 2012 at the Maritime Centre Vellamo in Kotka. The seminar was one of the events that accompanied the “Spoil of Riches – Stories of the Vrouw Maria and the St. Michel” exhibition.

During the third research phase, historical research and archive research continued. Meetings were also held with Finnish and foreign experts. To communicate information about the project, the blog and the website were updated and presentations were held in Finland and abroad.

## 6. Summary of the fieldwork carried out in the Vrouw Maria Underwater project 2009–2012

### 6.1. Preconditions and starting points for the fieldwork

The length of the annual fieldwork carried out as part of the Vrouw Maria Underwater project varied from two to three weeks. The aim was to avoid fieldwork sessions lasting only a week (five working days, weekends free) because it was probable that any period of five days would include a day of wind on which working at the site would be impossible. This meant that in the best case scenario there would in effect be only a few working days. Work at the Vrouw Maria is affected by the direction of the wind and its speed (depending on the wind direction, wind at a speed of only 7 to 8 m/s prevents working at the site). The weather conditions are at their most optimal in early summer. In late summer, the water contains more floating particles which hamper visibility. Algae floating on the surface of the water start to grow when the water warms up normally in early July. In early autumn, there may also be favourable weather conditions for fieldwork, but often underwater visibility is poorer than in early summer.

In order to work and move around on the wreck of the Vrouw Maria, the National Board of Antiquities required a permit from the owner of the water area (Metsähallitus) to operate in the restricted area of the Archipelago National Park. The permit procedure is based on the Archipelago National Park Bylaw (8.12.1994/1123, Section 4), according to which activity permitted under a permit granted by Metsähallitus includes research in accordance with the Antiquities Act (295/63).

The initial preconditions set by Metsähallitus for fieldwork carried out in the Vrouw Maria Underwater project were:

- A preliminary Natura impact assessment regarding the effect of the fieldwork is needed.
- On account of the seal and bird population, fieldwork at the wreck could only be carried out between 16 July and 31 January. Work should take into account the fact that the effects of disturbance during the autumn period on seals breeding in February are not known.
- The route to and from the wreck should be defined such that areas covered by a movement ban are avoided as much as possible.
- Landing was prohibited on all the islands within the restricted area during the working period.
- In publicising the research, the movement ban in the area always had to be stated.
- There was always to be one person in charge while work was being carried out and the boats and people covered by the permit had to be clearly defined. The nature of the tasks carried out (research tasks, etc.) and any disturbing factors, such as noise, had to be reported in advance to the issuer of the permit.



During the fieldwork, the above preconditions were complied with. The preliminary Natura impact assessment was completed in March 2010 and the project fieldwork was able to start. An exemption was obtained from the Finnish government land authority Metsähallitus for the camp run in June 2012.

In the earliest research, the environment of the wreck was surveyed using side scan sonar and multibeam sonar, and by robot camera in order to locate detached parts of the wreck. The detached parts of the wreck were largely found immediately behind the stern. The surveyed area can be considered to be of sufficient size, e.g. in terms of protection of the wreck. During the Vrouw Maria Underwater project, the environment continued to be surveyed using multibeam sonar in 2010 and 2011 (Meritaito Oy). The surveys from 2010 were used in the Vrouw Maria virtual simulation in modelling the topography of the wreck landscape and the sea bed.

## 6.2. Documentation and research into the wreck using non-intrusive methods

Although the Vrouw Maria has been documented in several field research sessions since 2000, documentation had halted with the end of the MoSS project (2001–2004). Research into the environment and conditions was an important part of that project, and only part of the working time available for field research was able to be used for archaeological documentation of the wreck. The Vrouw Maria is a largish, three-dimensional site, with a large number of details. This being the case, at the start of the Vrouw Maria Underwater project, it was clear that documentation needed to be continued using different methods. In selecting wreck research methods, the primary methods tend to be non-intrusive research methods because physical contact usually speeds up the deterioration process and may cause changes to the wreck which are difficult to control. These methods include measuring, photography and video. In documenting the wreck and its environment, remote mapping tools were also used (robot camera, side scan sonar, multibeam sonar). Systematic documentation of the structural details served as a basis for the 3D and 2D wreck reconstructions, continuing to survey the interior of the ship, the virtual simulation, having outline, deck level and hull profile drawings produced and updating existing data, which were among the project aims.

During the Vrouw Maria Underwater project, the wreck was photographed particularly extensively from outside the hull on several occasions, using a robot camera (known as monitoring photography). A robot camera was also used to record different diving work at the wreck, such as taking samples and raising objects. More detailed and more accurate records were gained by divers using a video camera and a still camera (e.g. areas of the hold, different structural details). In the last year of research in particular (2012), emphasis was placed on photographing the wreck and a robot camera was used to photograph the interior of the ship by pushing the camera inside through an opening on the deck on the port side. This enabled an area to be videoed which had never previously been seen. In the material, it is possible to discern several barrels and packing crates, apparently in their

original positions. It is possible that the barrels and packing crates are stacked in several layers and it is also very possible that there are several decks. The structure of the interior of the *Vrouw Maria* – e.g. the number of decks – cannot, however, be determined without an archaeological excavation, because here and there the cargo hold is so full that there is only about a metre of free space between the top of the cargo and the deck of the ship. There is more “head room” in the bow, such that some structural details visible inside the wreck could be examined, e.g. through video taken by ROV. In addition, measurement, photography and video enabled the survey of, e.g., the deck level of the wreck, the structures of the collapsed deck cabin behind the main mast, the structure of the stern of the ship and the stern cabin, the structural parts on the sea bed behind the stern of the wreck, and the parts of the broken rig on the port side. The objects raised from the deck were measured *in situ* before being removed. The locations of the samples and objects raised from the hold were marked and the sites photographed before and after they were raised, including a measurement scale.

Monitoring photography was carried out largely complying with the photography plan for 2000 (mainly adding new monitoring points) so that any visually observable changes taking place could be monitored in the longer term. For example, no information can be obtained on the condition of the timber using this method, apart from some sites exposed to wear (e.g. the junction of the fore boom and the fore mast). However, for example, the movement of structures and visible objects can be monitored using this method. For instance, a sheet of metal on the starboard side of the ship had fallen inside the stern cabin. In 2011, a seal pup was observed on the wreck, which also entered the wreck. This provided confirmation that smaller and lighter objects or structures could have moved from their original locations for what could be termed “natural” reasons. Changes to the wreck can also be linked to human activity or deterioration processes caused by environmental factors. Different spots on the wreck were chosen for monitoring photography which are either particularly sensitive to changes or where changes had already occurred since the wreck had been found. The monitoring points were defined in 2000 but the visual material was available from 1999 onwards. In 2010–2012, monitoring photography was carried out using a robot camera. This proved to be a more efficient method than, for example, still or video photography taken by divers – the camera could be kept in the water for as much as 10 consecutive hours, making it possible to photograph more extensive areas.

One of the aims in the planning phase of the *Vrouw Maria* Underwater project was to determine whether any new methods or equipment were available for non-intrusive research. For example, multibeam sonar provided a good picture of the wreck as part of the environment in which it was found and similarly a more accurate result was now gained of the topography of the sea bed than from previous sonar exploration.

The current status of remote mapping equipment has moved on regarding multibeam sonar and interferometry sounding, but nevertheless, when used from the surface, they are not capable of producing new and more accurate information on a wreck located at a depth of 41 metres, but only of its environment. Because the previous survey carried out by multibeam sonar of the wreck and its environment was completed in 2001, a new multibeam sonar exploration of the wreck was commissioned during the project in order

to monitor the wreck and its environment. Meritaito Oy surveyed the environment of the site of the *Vrouw Maria* in 2010 and 2011 using multibeam sonar. The Finnish Maritime Administration had surveyed the area in 2001 and the area examined in 2010 largely matched this earlier area. In 2011, the area was extended to the northwest and southeast, such that it covered the entire area surrounding the island of Namnlösan. As part of the survey in 2011, the part of Namnlösan island above the waterline was laser scanned. The scan was hindered by a large swell.

From the multibeam sonar, it can be stated that it would be worth monitoring changes to the environment of the *Vrouw Maria* wreck at intervals of about ten years. If multibeam sonar was connected to a remotely controlled robot camera and this were to be guided around the wreck under water (for example at a distance of about 10 metres), it would be possible to produce more accurate 3D multibeam sonar images of the wreck. There were no opportunities to use this method during the project.

The surveys in 2010 were used in the virtual simulation to provide the actual shape of the sea bed in the underwater valley surrounding the wreck. The material from the surveys in 2010 and 2011 was also shown in the exhibition “Spoil of Riches – Stories of the *Vrouw Maria* and the *St. Michel*” on video.

The robot camera proved to be a very good tool for more detailed documentation of the wreck, studying the interior and documenting the phases of the work. The robot camera also acted as a link between the wreck and the surface, and served as a single source of light while work at the wreck site was being carried out.

Planning research into the condition of the timber structures of the *Vrouw Maria* was based, among other things, on research carried out at the University of Helsinki. The ultrasound equipment used by the physicists at the University of Helsinki to study the condition of waterlogged timber has so far only been tested in the laboratory. The equipment could also be useful in wreck research, but additional funding and time is needed to continue to develop and test equipment used in the field in authentic conditions. For this reason, the equipment could not be used during the *Vrouw Maria* Underwater project.

In summer 2010, an underwater sound recording of the *Vrouw Maria* site was made using a hydrophone. The aim was to use these sounds for the virtual simulation being produced at the time. Due to technical problems, however, the recordings were not able to be obtained on that occasion. Recording continued during the fieldwork in 2011. The first recordings were made from the *r/v Yoldia* on the morning of 5 July 2011, while the *r/v Muikku* was still en route to the *Vrouw Maria*. These recordings were made at a depth of approximately 19–20 metres. The recordings cover a period of slightly over two hours, which ended when the *Muikku* arrived above the wreck. In the recordings, knocking coming from the chains of the *Muikku*'s mooring system can be heard, as can various sounds which Seppo Madekivi from the Finnish Naval Research Institute has interpreted as being caused by seals.

Once the *r/v Muikku* had arrived, the recordings were continued from the *Muikku*. There are a total of nine of these recordings, and their length varies from half an hour to just over an hour. They were recorded at a depth of approximately 15 metres. The largest individual sound source in these recordings is the auxiliary engine of the *Muikku*. Sounds caused by the divers and the work being carried out at the wreck can also be heard.

Samples of the recordings taken on 5 July were uploaded to the Vrouw Maria Underwater blog as part of events for World Listening Day (<http://vrouwmariavedenalla.wordpress.com/2011/07/18/world-listening-day-2011/>, uploaded 13.12.2012).

### 6.3. Intrusive research methods, handling samples and raising objects

In choosing archaeological fieldwork methods for the Vrouw Maria Underwater project, the primary option was to use non-intrusive research methods. For example, there was no intention to raise large structural parts or to essentially change the prevailing balance at the wreck by carrying out extensive intrusive activity, for example in the hold of the ship. However, raising objects or taking samples were not ruled out, provided that they were well-founded. Intrusive research methods were taking samples, e.g. using a syringe or plastic tube (samples of the contents of barrels and packing crates, sediment sample in order to measure mercury content), sawing off timber samples and raising objects. The objects raised from the hold of the ship were raised by a diver (clay pipes, textile, glass discs, tobacco leaves and parts of a lid of a barrel) or using a rubbish picker (pumice stone), after which the object/material sample was placed in the raising basket on deck. The line and sounding lead raised from the deck were raised by hand from where they were found and moved to the lined lifting basket placed as close as possible. Smaller objects were transported to the surface in the raising basket lifted by a diver, while the sounding lead, which weighed approximately 15 kg was raised in a basket from the surface, guided by a diver. The places which were touched were videoed before and afterwards and the phases of the work were also videoed using a robot camera.

In drawing up the research plan in 2010, studying the hold of the ship was considered, for example by taking samples of the metal elements (bolts, washers) throughout the hull. This would have made it possible, for example, to determine the condition of the iron bolts running through the hull. However, this step was not taken so as not to impair the structural integrity of the hull. Weakening the integrity of a particularly intact hull would not have been sensible in relation to the possible benefits achieved, because it was impossible to judge whether all the bolts had been preserved in the same way. Samples would have had to have been taken on both sides of the ship in order to obtain a true picture of the condition of the metal parts. Each shipwreck is individual and the process of decay does not necessarily progress in the same way even within a single site. For this reason, the metal parts and joints of the Vrouw Maria were studied mainly by visual methods. Instead, research into the timber materials used to build the ship was carried out by taking samples from different structural parts of the ship's hull and rig. The samples were taken by sawing. The places from which samples were taken were photographed before and afterwards and the work itself was also videoed using a robot camera. This is explained in more detail in section 7.

During the project in 2009, the windlass barrel, part of the structure of the ship, was raised and a dating analysis carried out (last year ring dating from 1728). No other entire structural parts were raised. During the fieldwork in 2011 and 2012, samples were taken and objects belonging to the ship's cargo and ship equipment were raised. The purpose of the

samples was to analyse the content of the cargo still in the hold and to determine whether the mercury in the cargo had leaked into the cargo hold. The cargo hold was documented before and after the samples were taken by video taken by a diver and using a robot camera. The places where the samples were taken and from which the objects were raised were marked in the cargo hold. Analysis of the samples was agreed with the botanical museums of the University of Helsinki and the University of Turku. The raising of the artefacts was agreed with the conservation officer of the Maritime Museum of Finland. The objects raised and the samples are part of the collection of the Maritime Museum of Finland.

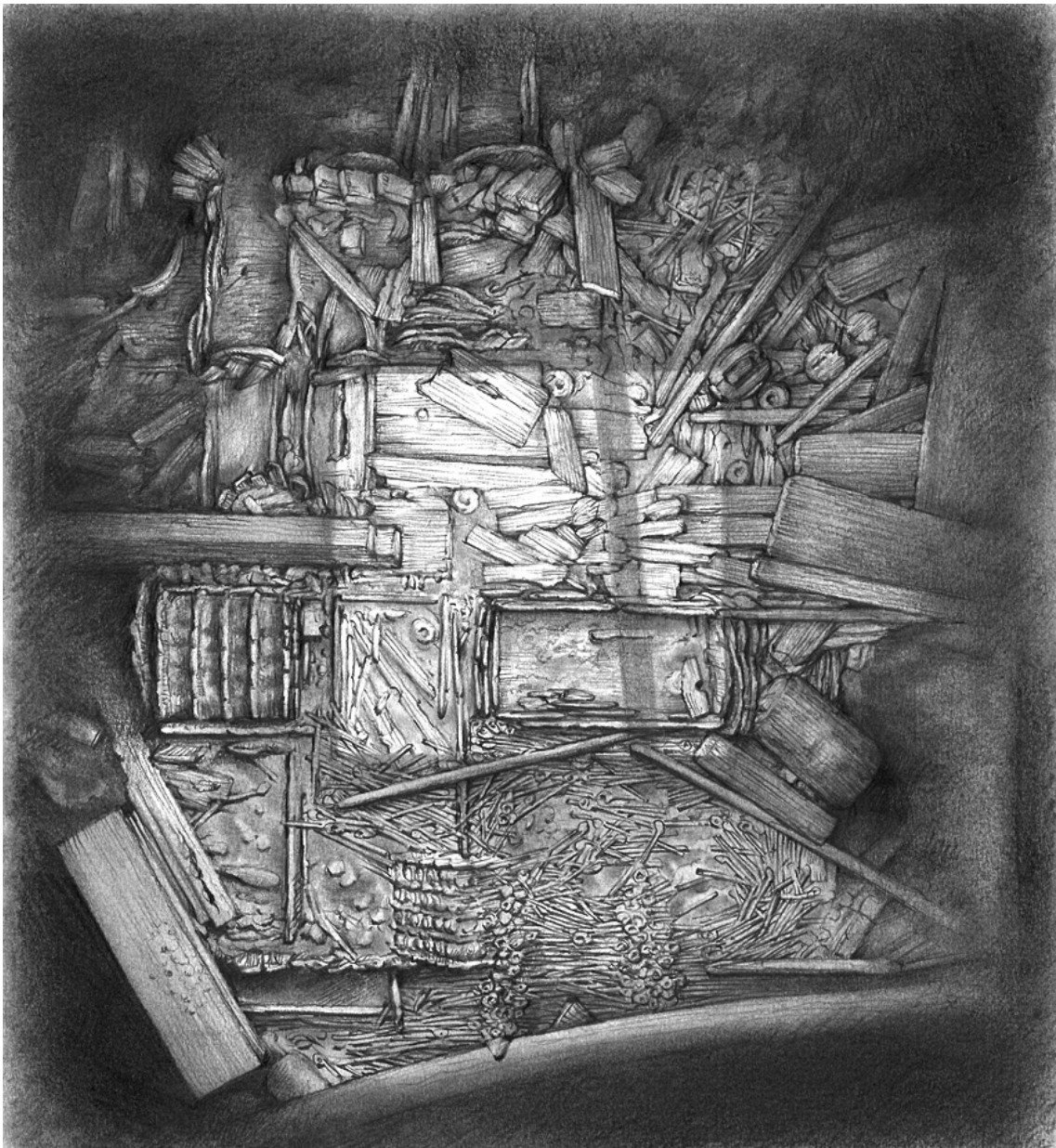
After the objects, structural parts and samples were raised, a researcher and/or conservator took care of handling and packing the items on the research vessel. The objects and samples were photographed after having been raised, were given a identifying code and packed such that they would remain in as stable conditions as possible until they were transported to the laboratory for conserving waterlogged materials in Hylkysaari in Helsinki. Existing information about the content of the cargo was used in drawing up plans to raise items and evaluating the need for conservation. The material analysis information was also essential.

## 6.4. Fieldwork results

### 6.4.1. The *Vrouw Maria*'s cargo

The *Vrouw Maria* Underwater project studied the cargo which still remains in the cargo hold. A total of 38 different objects were raised from the cargo hold and the deck of the wreck, including round glass discs, pumice stone, clay tobacco pipes, a sounding lead, a coiled, knotted strip, the lid of a barrel and part of a lid and some red woollen fabric. In order to determine the material from which the hull was constructed, 11 timber samples were taken from different parts of the structure. These timber samples were also studied to assess the accumulation of iron and sulphur in the structures of the ship and the density of the wood. Samples were taken of the packing cases and barrels in the ship's cargo hold in order to research the ship's cargo (see field research reports 2011 and 2012).

The cargo hold still contains woollen fabric in a wooden, rectangular packing crate, pumice stone also in a rectangular packing crate, round glass discs in compartments in a box, traces of grapes, coffee beans, tobacco leaves and indigo and madder. The tobacco leaves were packed in a packing case separated into compartments by interior walls. Indigo, grapes, coffee beans and madder were packed in barrels. Some of the finds are mentioned in the list of goods salvaged (a list which can be found, e.g., in the Swedish national archives) but some were completely new finds, such as the pumice stone, grapes and the rolls of tobacco leaves. Some of the results of the analysis have confirmed the information in the written sources, but some of the raw materials and objects have provided completely new information on the contents of the hold. For example, the glass discs, the pumice stone and the tobacco pipes can possibly be interpreted as part of the undefined trade goods mentioned in the cargo lists in the Danish Sound Toll records whose content is not specified.



The Vrouw Maria's cargo hold. Drawing: Tiina Miettinen, National Board of Antiquities.

The cargo list and the list of salvaged goods include valuable dyestuffs such as madder, indigo and brazilwood. Indigo is mentioned in both documents, the others only in the cargo list. There is a large amount of dyestuffs, including almost 9,000 kilos of madder and about 1,600 kilos of indigo. In 2011, a blue dyestuff was found in a sample from a barrel in the hold which, following analysis, is either indigo or woad. In 2012, further research was carried out and a new sample was found to contain a leaf of indigo which had been preserved despite the dye plant having been processed. Traces of madder root were also found in the samples from 2012.

The cargo list also includes a significant amount of textiles, such as wool and cotton fabrics. According to the archival sources, some of the fabrics were salvaged, although they were wet and spoiled. Close to the hatch to the larger cargo hold, there is still a packing crate which contains a beautifully red coloured wool fabric. Study of the textile



Lid of a barrel raised in summer 2012. Photo: Markku Haverinen, National Board of Antiquities.

has established that it was dyed using the valuable dyestuffs cochineal, madder and archil, obtained from lichen. New finds included grape seeds and pumice stone, which was used to polish floors, among other things. In summer 2012, one sample taken from a broken upright barrel was found to be a large amount of coffee beans. After the shipwreck, when the cargo hold filled with water, the coffee beans escaped their packaging and hindered the salvage operation after the wreck. This is also stated in the sample from the logbook which was attached to the documents describing the salvage operation (the Provincial Archives of Turku). According to the written sources, some of the coffee was salvaged and sold in St. Petersburg at auction in the spring of 1772. This is stated in a small advertisement published in a St. Petersburg newspaper.

Studies of the documentary sources and art collections have resulted in the conclusion that approximately 11 of the paintings sold in the auction of the art collector Braamcamp's

collection are missing and these are thought to still be on the wreck of the *Vrouw Maria*. The paintings were not found in the fieldwork carried out at the wreck but it must be stated that at least two packing crates can be observed in photographic material of the interior of the ship which still have their lids closed and about whose content there is no information. It is impossible to raise the crates without dismantling the deck structure and it is not possible to study their contents without going inside the wreck. This is impossible solely in view of health and safety. Studying the crates on the wreck would otherwise involve exposure to risk – their contents could be spread in an uncontrolled manner through the cargo hold and both the contents and the information they contain would be lost. Regarding the paintings, it must also be stated that one of the samples containing plant residues also contained traces of green paint. The paint traces have been sent to the Netherlands for analysis. The results of the analysis have not yet been received at the time of writing this report, but they will be appended to the field research report from 2012. At the moment, it is impossible to say whether the paint originates from the cargo goods, the packaging material or the ship itself. However, ships were generally painted to a certain extent.

If the paintings could be located and it was decided to raise them, preparations would have to be carefully made in advance to cope with the conservation challenges they would pose. Their materials and painting methods are known and on the basis of this information, it would be possible to start to consider methods for preserving, researching and conserving them. However, there is no knowledge of the methods used to package paintings at the time of the voyage and this makes planning more difficult. Based on archive sources, the assumption remains that the paintings are in wooden crates and are thus in a waterlogged state. It would be justified to put together an international group of experts to plan the raising of the paintings and their conservation because no equivalent project has ever been carried out anywhere else in the world. Identification of chemical substances linked to paint pigments and paintings is possible using current methods in Belgium, but the extent to which the paintings would have been preserved and whether the paints and other materials used in the paintings are still attached to their base are a different matter. At least some of the paintings bought at the Braamcamp auction in the name of Catherine the Great were painted on wooden panels. It can be assumed that the wooden panels would have been preserved and could be identified if these could be compared with the measurements of the paintings sold in the auction. This would require an archaeological excavation of the wreck of the *Vrouw Maria* in controlled conditions.

#### 6.4.2. The *Vrouw Maria* as a ship

The hull of the *Vrouw Maria* was built using frame-first construction. The hull of the ship was built entirely in oak, while the parts of the rig were pine. The total length of the hull is approximately 26.3 metres, the beam at its widest point at deck level approximately 7.1 metres and the maximum beam at the waterline approximately 8.2 metres. The height of the hull was measured at three points. In considering the measurement results, it should be borne in mind that the ship, which is slightly tilted to starboard, has settled unevenly an estimated metre into the sediment of the sea bed along its entire length. At the bow,



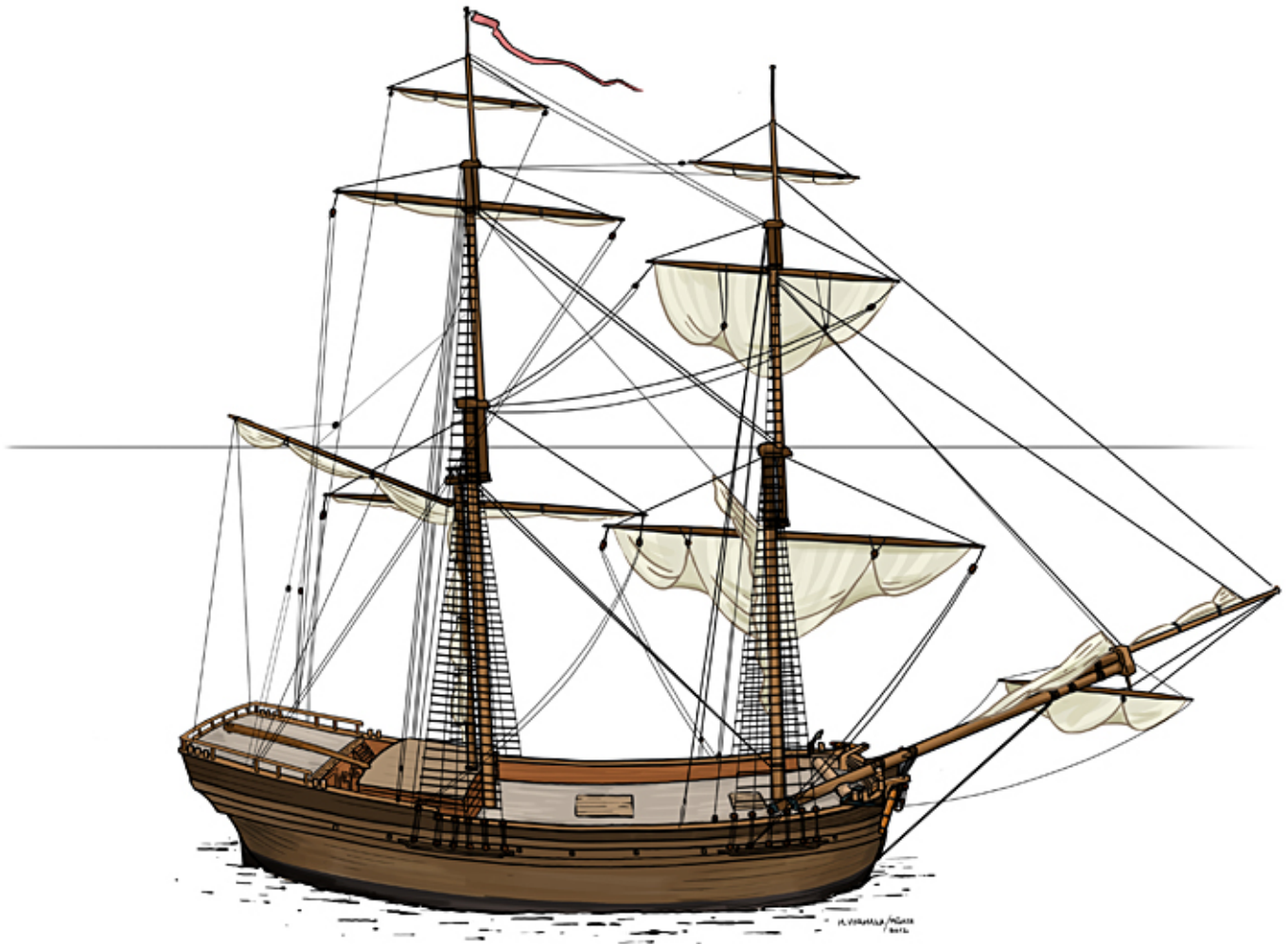


Curve of the prow and control point 1. Photo: Erik Rådström.

the ship measures 5.5 metres from the highest point of the prow to the sea bed and at the stern 6 metres correspondingly from the upper edge of the sternpost. In the centre of the ship at the lowest point of the hull, the height from the top of the rail to the sea bed is approximately 3.6 metres.

The interior of the ship can be divided into three main sections: the aft cabin, the cargo hold and the galley. The galley in the bow of the ship has an oven whose brick flue rises to the deck in front of the windlass. The total length of the cargo hold between the aft cabin and the galley is approximately 19 metres. The layer of sediment that has accumulated on top of the cargo of the ship, the parts of the rig that have fallen into the hull and collapsed structural parts of the hull have made it harder to document the cargo hold. Although at the moment the hull looks like a long open space, in amidst the layer of sediment it is possible to see the remains of vertical and horizontal bulkheads that have broken at the top. No mid-decks have been observed and it is not possible to investigate this without removing the cargo from the hold. According to the sea protest, the height of the cargo hold at the pumps was over 9 (Amsterdam) feet.

The shipwreck and the salvage work that followed it have particularly damaged the stern of the vessel. The ship is entirely missing its transom, parts of which have, however, been found on the sea bed. The deck beams of the raised deck at the stern are still in place but all the deck planking has been lost. The total length of the raised deck was approximately 4.2 metres measured from the inside edge of the sternpost to the first decorated deck beam



Reconstruction of the Vrouw Maria as a sailing ship. Drawing: Mikko Vormala.

on the bow side. Next to the sternpost on the starboard side, there is a rectangular cargo hatch of approximately 80 x 90 cm for loading planks and other long timber goods.

From the fore side of the aft deck, the Vrouw Maria's deck continues at the same level up to the prow. There is a very well preserved windlass in the bow, the barrel of which is carved from oak. Loading and unloading was carried out through the two cargo hatches between the masts. Between the mainmast and the raised aft deck, there was a wooden deckhouse. The measurements of the deckhouse, which has almost entirely collapsed, have been reconstructed on the basis of the structural components found at the site. The width of the rectangular room was approximately 3.7 metres, the length approximately 5.3 metres and the height approximately 1.6 metres. The lightly built deckhouse would have been used as crew quarters, for storage or possibly both.

Approximately a metre of deck space remains between the deckhouse and the raised deck. Roughly half way along are the ship's two pumps, still in their original positions. The rudder of the ship has been lost but the tiller used to steer it has been found and measured. The tiller is 5.2 metres long and assuming it was positioned attached to the upper edge of the rudder, it can be calculated that the head of the tiller would have extended between the raised deck and the deckhouse, at a height from which the ship would have been steered at that point.

Many of the component parts of the rig lie on the deck and on the sea bed, particularly on the starboard side. So far, the attention has mainly been focussed only on the rounded timbers (masts, spars, yards, bowsprit and gaff). The *Vrouw Maria* had two three-section square-rigged masts (standing mast, topmast, topgallant mast). The height of the main standing mast, still upright on the ship, is 15.2 metres from deck level, while that of the foremast's standing mast is 13.9 metres. The diameters of both masts are 47 cm at deck level. The snow mast has not yet been found on the wreck but its 8.1 metre-long gaff has been identified and documented. On the basis of the measurements of the gaff throat, it can be determined that the diameter of the snow mast would have been a maximum of approximately 25 cm. Both masts are assumed to have had three yards. Timber samples show that all the parts of the rig were pine.

A reconstruction has been completed on the basis of the documented parts of the rig of the *Vrouw Maria*, according to which the height of the mainmast would have been approximately 26 metres measured from deck level and the foremast approximately 24 metres. With the bowsprit (length 13.5 m) and the jib boom that extends it (length 8.3 m), the total length of the *Vrouw Maria* was a good 40 metres. Heavy rig and the ability to maximise the sail surface area are indicated by interesting information in the auction document stating that the *Vrouw Maria*'s equipment included two studding sails.

The origin and the dating of the *Vrouw Maria* which sank in the outer Nauvo archipelago in autumn 1771 have given rise to debate in the past. Research at the wreck site year by year has not produced any new information to contradict the known archival sources describing the shipwreck or the subsequent research carried out after the ship was located. For example, there appears to be no confusion regarding the type of rig – according to the sea protest by Captain Reynoud Lourens himself the vessel he commanded on the voyage from Amsterdam to St. Petersburg was a snow, “*Snau Skieppet Fru Maria*”. The sale document which, besides the rig and the main measurements, would also state with certainty where the ship was built and when, has not yet been found. On the basis of dendrochronological sampling from the structures of the *Vrouw Maria*, the construction of the ship can, however, be dated to roughly the mid-eighteenth century.

## **7. Summary of research into the condition of the Vrouw Maria 2000–2012**

### **7.1. Samples**

One of the aims of the Vrouw Maria Underwater project was to produce a summary of research into the samples taken from the hull and structural parts of the wreck, as well as interpretation and suggestions for further measures regarding the condition of the wreck and monitoring changes in the condition of the wreck. Particular consideration was also given to this issue in view of the question of raising the wreck. This summary is presented below.

Samples were taken from the wreck of the Vrouw Maria and its cargo in order to research the species of wood, the condition of the wood and the materials used. In conjunction with the MoSS project, timber samples were taken to the wreck, with the help of which it was possible to determine the speed of timber deterioration and identify the microbes destroying the timber. Below is a summary of the samples raised, with the year in which they were raised shown in parentheses.

1. MoSS project comparison samples (2002, 2003 and 2004), fresh pine, fresh oak and archaeological oak,
2. Detached pine timber sample (2007), detached piece of wood located on the deck, probably originating from the gunwale or the rig,
3. The barrel of the windlass (2009, collection number SMM222009:1), raised from the bow of the ship, sample piece taken for timber species and dating research,
4. Eight sawn samples from the timber structures of the wreck, eight timber samples, additional dating sample from the deck planking (2010),
5. Samples from two vertical supports and one horizontal support (2011).

The samples were raised for different analyses, which can be divided into five main groups:

1. Sample analyses aimed at obtaining information on the condition of the wreck as a whole and its preservation in the prevailing environmental conditions at the site in which it was found,
2. Sample analyses aimed at obtaining information on how the wreck could survive potentially being raised and how it could be conserved after being raised,
3. Sample analyses used to determine the construction materials and methods and to date the ship,
4. Sample analyses used to determine the cargo of the ship,
5. Sample analyses used to determine the environment of the ship.

A single sample can be analysed using different methods and can produce information in different sample analysis groups. More detailed information on samples and the analysis results can be found in field research reports and the final report from the MoSS project.

## 7.2. Results of research into the condition of the Vrouw Maria

Wood is a heterogeneous material which does not decompose in the same way at different points in the timber material. Decomposition is also affected by the environment where the timber material is located, the objects near it and the way the wood was worked and the condition it was in before it was submerged. For these reasons, it is not possible to provide a detailed picture of the condition of the wreck of the Vrouw Maria on the basis of the research carried out up to this point. On the basis of the results received, however, it can be stated that the timber material of the hull of the ship is in good condition apart from on the surface of the wood. The thickest structural parts are thus sturdy. The thin planks of the wreck, however, appear more fragile and their durability is questionable.

The decomposition of the timber material of the Vrouw Maria is progressing slowly mainly due to the effects of biological factors (erosion bacteria and soft-rot fungi), sometimes chemical and physical factors also affect the condition of the wreck. Foreign compounds accumulate in the timber from the environment and the parts of the wreck, the most important of which being sulphur and iron compounds.

Many international studies of the decomposition of timber in an aquatic environment support the results obtained from microbiological research into the wreck. No organisms which quickly destroy wood, such as naval shipworm (*Teredo navalis*) or the *Limnoria* crustacean, have been found at the site of the wreck in the Archipelago Sea. The main destroyers of wood are soft-rot fungi and erosion bacteria which destroy wood from the surface inwards. In the low-oxygen environment of the Vrouw Maria, the destruction they cause is extremely slow.

Visual research into the Vrouw Maria has found that the most external layer of the surface of the timber material present has worn and this wear will inexorably continue. Fungi and bacteria weaken the surface of the timber and the erosion caused by the flow of the current washes this soft layer away. Microbiologist Leone Montonen who participated in the research estimates that deterioration will progress in the pine parts of the ship at a rate of less than 1 cm per hundred years and the parts made from oak will deteriorate more slowly than this. The samples raised represent the well-preserved structural timber of the wreck. For this reason, Leone Montonen and Kari Steffen who also took part in the research emphasised that if the wreck of the Vrouw Maria is raised, research into the condition of the timber must also be carried out on other parts of the wreck. Regarding identifying the factors causing the timber to deteriorate, they state that the deterioration of the timber is a question of normal biological deterioration and that all the species of microbes identified are only species that live in submerged timber and they could not have been in the wooden materials of the Vrouw Maria before it was shipwrecked.

When the condition of the entire wreck is examined, it is noted that studying the degree of decomposition of the wood alone does not provide a detailed picture of the structural durability of the wreck. Besides timber, the hull of the Vrouw Maria is also made of iron nails and bolts, and there is no research information on the condition or structure of these. On the basis of the observations of divers, photographic material and general knowledge about corrosion, it can be assumed that the iron elements are badly corroded. This affects

the total structural durability. There are methods available for researching the condition of metal parts in situ but using these on the *Vrouw Maria* wreck could be extremely challenging and possibly even impossible. The condition of the iron parts would have to be analysed in the laboratory and then samples of the wreck's bolts would have to be taken.

At the start of the 2000s, white salt stains were noticed on the *Vasa* ship in Stockholm where the timber was very acidic. The reason turned out to be iron and sulphur compounds absorbed by the timber which had formed sulphuric acid in combination with damp air. These observations led to a great deal of international research into the decomposition, conservation, re-conservation and preservation of submerged archaeological timber. The research produced a large amount of new information about the decomposition of wood in an aquatic environment and in museum conditions. Research has also produced new methods for removing foreign substances absorbed in timber and for the preservation of entire wrecked ships following conservation. The decomposition of the timbers of the *Vasa* has been able to be halted, partly through correct storage conditions. If the decision was made to raise the *Vrouw Maria*, attention would have to be paid to the reactions caused by sulphur and iron in planning the conservation of the wreck and its preservation in a museum. In order to obtain initial information, in 2007 and 2010 the samples raised were analysed for amounts of iron and sulphur contained in the timber as well as for destructive microbes. On the basis of the results obtained, these are considerably lower than in the timber of the *Vasa* and the amounts alone would not prevent the raising of the *Vrouw Maria*.

The structural timber parts inside the hold of the *Vrouw Maria* have not been examined and, for example, no information is available about the types of wood used in the crates in the hold. It is probable that they were made from a species of wood whose biological durability is poorer than that of oak. This being the case, their timber material could be in a poorer condition than the hull of the wreck, even though they are located in the hold whose conditions are relatively stable. It must also be assumed that the iron structures which may have been inside the packing crates have corroded or that the bands around them have become detached and that the joints in the crates have loosened. If in the future it is intended to raise one of the crates from the hold, it must be well supported before it is raised.

Photographic monitoring of the development of the condition of the *Vrouw Maria* wreck began in 2000 but visual material suitable for monitoring was already available from 1999. There are 29 points on the wreck whose condition is always monitored in conjunction with field research or inspection dives. During the *Vrouw Maria* Underwater project between 2009 and 2012, monitoring was carried out using still, ROV and video photography. Up until now, the changes occurring in the wreck have been fairly small, and no clear deterioration of the structural parts has been observed. Damage is mainly seen in wear to the softened surface of the timber and movement in some of the detached parts or objects, arising due to research work or the environment. The material and its interpretations can be seen in the fieldwork research reports.

The standing masts of the *Vrouw Maria*'s foremast and mainmast are still upright and no acute risk of their collapse has been observed. Movement of the masts was studied in

2007 and 2008 by attaching the mast-o-meter developed by Jussi Kaasinen to the mainmast. Measurements were taken between 25 July 2007 and 16 May 2008. Research found that the mast moved due to the effects of the current. The movement is causing mechanical erosion, e.g. at mast and upper deck level. Wear is also caused by the foremast and the bowsprit rubbing against each other (see monitoring photography 2011). Research carried out into the wreck of the Vrouw Maria so far provides basic information on the condition and preservation of the wreck and its timbers and there is currently no need to take new samples. The samples analysed do not, however, provide entirely satisfactory answers to the questions relating to any potential raising of the wreck. Because decomposition of the timber does not take place in the same way at every location, critical points for the raising of the wreck would need to be surveyed and the condition of the timber clarified at these points. For conservation plans to be drawn up, more detailed information on the sulphur and iron absorbed by the timber would be required, although samples for this research could also be taken after raising the ship and emptying the hull. Then information would also be obtained on the parts of the hull which are now in completely anaerobic conditions either because the wood has become buried in the sediment or because it is covered by the cargo and the sediment.

## 8. Summary of the environmental conditions of the Vrouw Maria

The environmental conditions of the Vrouw Maria were surveyed as part of the MoSS project in 2001–2004. A survey of the topography of the sea bed and the geology was also carried out as part of the MoSS project and a new multibeam sonar survey was carried out in 2010 and 2011.

The results of the research were published in the MoSS project newsletters and an extensive summary with conclusions was published in 2010.<sup>1</sup>

In summer 2009, samples were raised to survey the zoobenthos.<sup>2</sup> Regarding zoobenthos, it can be stated that the zoobenthos observed in the study and the numbers of individuals were typical for the area and no threatened or near threatened species were found.

Although the environmental conditions of the Vrouw Maria are subject to annual changes, on the basis of research it can be said that the environmental conditions are currently relatively favourable to the long-term preservation of the wreck. A low temperature, low salinity, low oxygen, a weak current, a lack of molluscs which destroy timber and darkness form a particularly favourable environment from the point of view of preserving organic material. However, it must be emphasised that the wreck is not fully protected. While none of the most destructive molluscs are present, on the basis of the analysed timber samples, other organisms which damage wood such as erosion bacteria and soft-rot fungi will affect the preservation and possible conservation of the Vrouw Maria. The natural biological decomposition of the wood and the process of destruction of the wreck will continue slowly and the thin planks in particular may already be very fragile. The corrosion of the metal parts is also progressing which will weaken the strength of the joints. In summary, it can be said that the environmental conditions have been studied in great depth and that additional research is not required in the immediate future. However, changes taking place at the wreck should be monitored regularly, for example by photographing the wreck in detail in accordance with the monitoring photography plan. Monitoring is one of the basic principles of in situ preservation. The decomposition processes taking place at the wreck can only be established by taking samples from the timber material of the wreck but any collapse of structures and failure of joints can be established from visual material.

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<sup>1</sup> Leino, M. et al 2010. The Natural Environment of the Shipwreck *Vrouw Maria* (1771) in the Northern Baltic Sea: an assessment of her state of preservation. *International Journal of Nautical Archaeology*.

<sup>2</sup> Survey of the zoobenthos at the Vrouw Maria wreck 2009. Monivesi Oy, Kimmo Karell, Ari Ruuskanen, Niko Nappu.



## 9. Summary of the Vrouw Maria's underwater landscape and soundscape

One of the important aims of the Vrouw Maria Underwater project was to study the underwater landscape and the soundscape of the Vrouw Maria site. The underwater landscape and soundscape were approached from a human geography landscape research point of view, and point of hearing, one might say. The aim was to use words and various visual presentations, video and photographs as well as an innovative, interactive 3D virtual simulation, to describe the landscape and the soundscape of the Vrouw Maria's underwater valley, and what the place and the space could be like beneath the water. Additionally, comparisons were sought with onshore landscapes and familiar presentations of scenery. Other important elements were the personal experiences of the divers who visited the Vrouw Maria of the place, the space and the soundscape. The Vrouw Maria's landscape and soundscape were described in more detail in two articles in the National Board of Antiquities' book "Lost at Sea, Rediscovered" published to accompany the exhibition. The source material used in the articles includes multi-disciplinary data collected during the fieldwork at the Vrouw Maria site, statements of experts, literature and interviews with the divers.

Humans cannot see or hear very well underwater. Seeing and hearing are also different from on land. In the Baltic Sea, the challenge is even greater due to the hooded diving suits worn against the cold and to the darkness and opacity of the water. Because of the restricted underwater visibility, the landscape of the Vrouw Maria's underwater valley can never be perceived at a single glance. This means that the people who have dived on the Vrouw Maria have not seen this landscape from the wreck.

The underwater valley in which the Vrouw Maria sank in 1771 is located in the Archipelago Sea on the edge of the Baltic Basin. The valley is approximately 850 metres long and approximately 300 metres wide. This valley landscape can be examined from constructed images which provide a panoramic bird's eye view from above, in which the wreck can be distinguished in the middle of the valley at a depth of 41 metres on its northern slope. Other elements are the flat bottom of the valley, the low terraces next to the wreck and the rocky slopes surrounding the valley. At the bottom of the valley, the environmental conditions, the "underwater weather", are largely stable. It is likely that they were the same at the time of the shipwreck. There is no plant life in the valley but it is home to various fauna. The effects of the winter ice do not extend as far down as the wreck. According to archival sources, no people were drowned in the shipwreck of the Vrouw Maria so it is not a burial site. The wreck is the only historic element in the valley landscape and it can be seen either as a romantic ruin or as material evidence of a maritime disaster. The valley can unofficially be termed the Vrouw Maria valley. The maritime archaeological research has seen the start of interaction between humans and nature in the valley. Humans as users also means taking ownership of the location. The importance of the site is also increased by legislation, as is its identity by naming it.

The Vrouw Maria site also has a geographical and spatial dimension. As a site, the wreck has a concrete location and a material form. It encompasses places of departure, arrival and



Diver on the Vrouw Maria wreck. Photo: Erik Rådström.

waiting, non-places, paths and intermediate waters representing abstract space. The landscape and soundscape of the Vrouw Maria are also linked to the experiences and memories of the divers, which produce cultural meanings and tell the story of the site. The Vrouw Maria has been made a workplace, characterised by the fact that it is not possible to dive there for merely recreational purposes and that almost all diving is linked to professional maritime archaeological research. The divers have observed their environment by multi-sensory means, distinguishing, among other things, worlds of colour, auditory experiences, and pressure and temperature variations.

The landscape of the Vrouw Maria's underwater valley can be observed as a whole entity only indirectly and with the aid of equipment, including representations made using data produced by various remote sensing equipment, particularly images. The landscape can also be experienced through a broader range of methods; it is not necessarily essential to go and visit the site itself or even to be present at presentations of photographic or video material. The landscape can also be conveyed through books, television programmes, a website and second-hand reports. It can also be merely a mental experience, a landscape of the mind, founded on the knowledge, experience and the mental interpretation of the individual or the group.

The landscape also incorporates a soundscape. Nature has always been the main feature of the soundscape of the Vrouw Maria. This can mainly be categorised into daily changes, weather conditions and seasonal changes. The sounds produced by nature do not usually

carry very deep into the water. Until the early 20th century, the Vrouw Maria's location was allowed to remain in acoustic peace. With the dawn of modernisation, various mechanical sounds arrived in the area at the same time as the depopulation of the archipelago and the founding of the Archipelago National Park silenced the soundscape. Today, the research into the Vrouw Maria is temporarily changing the nature-based emphasis of the soundscape. The typical and prevailing element of the Vrouw Maria's water column is silence, which even at deck level is undisturbed by the sound of the fieldwork. The soundscape of the Vrouw Maria can be said to be silent in four respects:

1. Under the water it is generally quiet from the point of view of human hearing,
2. The Finnish underwater soundscape is generally quiet,
3. The location of the wreck in an underwater valley surrounded by underwater shallows muffles the sound from outside the valley and
4. The wreck is located in the restricted area of the Archipelago National Park in which there is a year-round movement ban which considerably limits human activity and ship movements and the sound these produce.

Divers have personal experience of the soundscape of the Vrouw Maria. Silence at the Vrouw Maria can also act as a shared sound memory for the divers.

Various presentations of the current underwater landscape can be found, e.g. on the internet, and all of us have some kind of concept of what can be seen under the sea. The surface of the water is no longer the limit of the landscape. Different landscapes are not merely found at one particular stage but are produced structures, interpreted in different ways. They also have their own fashions, whose origin is influenced by different western concepts of landscape. Is it the turn of the underwater landscape next?

The Vrouw Maria's underwater landscape and soundscape was displayed until 13 January 2013 at the Maritime Museum of Finland in the exhibition "Spoil of Riches – Stories of the Vrouw Maria and the St. Michel", where it was possible to make a virtual underwater journey to the wreck of the Vrouw Maria and its underwater landscape using an interactive 3D simulation. This simulation, the only one of its kind in the world, opens a window on a landscape which no single human being has ever seen before – even the divers are only able to see a small part of the wreck or the sea bed at a time because underwater visibility at the wreck site usually varies between about half a metre to five metres.

## 10. Summary of the archival research

The archival research into the *Vrouw Maria* was carried out from the 1970s onwards in Finland, Sweden, Denmark, Russia and the Netherlands. Dr Christian Ahlström has carried out extensive archival research and published his results widely.<sup>3</sup> This being the case, the story of the ship has been extensively explored from archival sources. Archival research has further been carried out in the countries above by the National Board of Antiquities' researchers and commissioned by it, including as part of the MoSS project in the early 2000s. The finders of the wreck have also examined the archives in Finland and abroad.

During the *Vrouw Maria* Underwater project, additional research was carried out in the sources in different archives in Finland and abroad. The aim was to obtain copies of more original sources for use and to translate these from their original languages into Finnish. In addition, the aim was to clarify in more detail what kinds of archival sources can be found on the different stages of the ship's history in the Netherlands. During the project, a catalogue and a transcription of the material were also produced. Archival research was carried out in conjunction with the exhibition project. The archival sources known, mentioned in different contexts, are listed in the *Vrouw Maria*'s management plan.

In Finland, information was found in the National Library (research relating to the paintings) and the Provincial Archives of Turku. In Sweden, research was carried out in the National Archives of Sweden (Riksarkivet, including diplomatic correspondence and a list of the salvaged cargo) and in the Military Archives (Krigsarkivet, including documents relating to the rescue of the ship). The material in the National Archives was scanned for research use. In Denmark, research was carried out in the Danish National Archives (Rigsarkivet).

In Russia, research was carried out via the Embassy of the Russian Federation in the Russian Ministry of Foreign Affairs' history and documents department's archive of Russian Imperial foreign policy. The information matched the material in the Swedish archives, including regarding the salvaged goods and the people who had ordered them, although the list is slightly more concise.

In the Netherlands, research was carried out in archives including the following: The Rijksmuseum Research Library, the Netherlands Institute for Art History (RKD), the Hague; the National Library of the Netherlands (KB), the Hague; the Amsterdam City Archives and the National Maritime Museum (Scheepvaartmuseum). In addition, the Braamcamp auction catalogue was provided for use by its owner Ruud Priem. The Amsterdam City Archives contain ship's documents and muster rolls, on the basis of which it is possible to determine the ship's ports of departure and destination, name and tonnage and names of the crew, but not the type of rig, essential measurements (length, beam and depth) nor the place or year in which it was built. This information can only be found in the ship's actual sale documents and the taxation documents following the sale. A total of 18 vessels named the *Vrouw Maria* are found in Dutch archives for the period 1765–1771. To determine whether one of these 18 ships is the *Vrouw Maria* which sank in the Archipelago Sea, it

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<sup>3</sup> E.g. Ahlström, Christian 1979. *Sjunkna Skepp*, Lund.

is necessary to examine all the archive sources above and compare them with the results of archaeological field research.

In addition, during the project staff attended a seminar on the project to digitise the Sound Toll records. This is a joint project by Denmark and the Netherlands and the eighteenth-century material has been extensively digitised. At the seminar, information was also obtained on other Dutch digital archives, including newspapers. The content of this material should be studied further.

The following databases were accessed via the internet:

- Database of the Netherlands Institute for Art History (RKD),
- Databases of collections of several Dutch museums, (e.g. Amsterdam Museum, Rijksmuseum),
- The digitised material of the Sound Toll records ([www.soundtoll.nl](http://www.soundtoll.nl)),
- Maritiem Digitaal Collection search system for maritime museums,
- Amsterdam City Museum database,
- Google Books (including old catalogues, etc.).

After the *Vrouw Maria Underwater* project, it can be stated in summary that the archival research into the ship remains incomplete and new material may be found in the Dutch archives. It would be possible to continue archival research into the art cargo in Russia and the Netherlands. The Gallitzin archive in Moscow could be assumed to contain letters relating to the paintings. This archive has not yet been explored. Information on the Braamcamp auction and more general information on trade in art may be found in the Dutch archives. For example, existing auction catalogues were checked during the project and an auction catalogue was found in the Rijksmuseum Research Library in the Netherlands in which an unknown artist had produced sketches of the paintings to be sold.

## 11. Summary of improving access to the Vrouw Maria

### 11.1. Scanning objects

Some of the objects raised from the Vrouw Maria were documented by three-dimensional scanning. A total of 12 objects were scanned, seven of which were tobacco pipes. The other objects were a lead seal from a package of fabric, a tack block, a clay bottle, a glass bottle and a zinc ingot. The scanning was carried out by Cascade Computing AB using GOM optical measuring equipment, in addition to which surface colour was added to the scanned objects on the basis of the photographs taken.

The lead seal raised from the wreck was scanned twice. The first time the necessary preparations for turning it the other way round had not been made so turning it would have damaged it. The second time it was possible to scan both sides and it was also decided to carry out the scan using new equipment, where the result was considerably clearer than the first version.

The problem identified in the scanning method used is its inability to scan transparent objects, such as glass. Usually scanned glass surfaces are treated to make them non-transparent before scanning. It was not possible to do this with the glass bottle raised from the Vrouw Maria so the scan of the glass bottle was not properly successful.

Videos were taken of the scanned objects in which they were recorded from different sides. The videos were combined and displayed in the “Spoil of Riches – Stories of the Vrouw Maria and the St. Michel” exhibition next to the original objects, which enabled the fragile artefacts to be examined from different angles.

### 11.2. Blog

The wreck of the Vrouw Maria is located in a specially restricted zone in the Archipelago National Park and is also covered by an exclusion zone under the Finnish Antiquities Act, which means that no recreational diving to the wreck is permitted. Under these circumstances, it was important to improve access to the wreck by other means. Originally, the intention was to improve access to the wreck during the fieldwork in 2010–2012 using a webcam to upload images to the website in real time. Using webcams at the site of the Vrouw Maria wreck would have proved problematic, however, due to poor lighting conditions, the difficulty of obtaining a reliable data connection and the fact that there was nothing to monitor at the wreck other than during the fieldwork dives in the summer. In the end, it was decided to replace the cameras with a blog ([vrouwmariavedenalla.wordpress.com](http://vrouwmariavedenalla.wordpress.com)), which presented the fieldwork and the progress of work thereafter using text, pictures and video. WordPress was chosen as the blogging platform where the service provided also supported uploading video. A laptop, a router and an antenna was purchased in order to update the blog, which was available to staff during the fieldwork.

The internet connection to the Vrouw Maria site was created using a 3G router and a directional antenna. 3G coverage in the area improved considerably in 2010–2012. In 2010, a change of a few degrees in the direction of the antenna could cut the connection completely, while in 2012 a high speed connection could be achieved merely by pointing the antenna roughly towards land.

The blog was launched on 30 August 2010. By early December 2012, a total of 72 posts had been published on it, the majority of which during the fieldwork phases. The blog was also updated outside the fieldwork periods, describing the progress of the follow-up work, and talking about the samples and the public seminar in November 2012.

Usually, the blog received an average of fewer than 20 hits a day but during the fieldwork it received an average of almost 200 hits a day. The largest surge in visitors to the blog was on the day the blog launched, when it received a total of 3,502 hits. This exceptional figure is due to a link to the blog being published on the news sites of most major Finnish newspapers and the Finnish broadcasting company Yle.

### 11.3. Website

The National Board of Antiquities' website contained a section on the Vrouw Maria even before the Vrouw Maria Underwater project. During the project, the section on the Vrouw Maria was reorganised and made part of the project website ([www.nba.fi/fi/vrouwmaria](http://www.nba.fi/fi/vrouwmaria)). This site was updated on several occasions during the project with news from the project and new information about the Vrouw Maria and its research. The Swedish and English versions of the website were also kept up to date as far as possible.

A separate website was created for the public seminar in 2012, through which guests were also able to register for the seminar.

In 2013, the 360° pictorial material of the Vrouw Maria (Erik Rådström, WEC 360) compiled from photographs taken in autumn 2012 was uploaded to the National Board of Antiquities' website. This enables visitors to “dive” to two different parts of the wreck via the internet. The material can also be accessed using a QR code.

### 11.4. The virtual simulation of the Vrouw Maria

One of the ways of improving access to the Vrouw Maria was the 3D virtual simulation. The simulation presents the wreck and its underwater landscape and soundscape interactively using virtual technology. The virtual technology in the simulation offered an opportunity to filter out the poor underwater visibility and limited human hearing ability under the water. The simulation presents one possible interpretation of the wreck and its landscape and soundscape, partly based on multi-disciplinary data gathered on site.

The simulation begins by presenting the passing of time since the sinking of the Vrouw Maria in 1771 to the present day. This is followed by an interactive section in which visitors can navigate around the wreck itself and its surrounding landscape. The simulation contains



Use of the Vrouw Maria virtual simulation in the "Spoil of Riches" exhibition. Photo: Markku Haverinen, National Board of Antiquities.

14 information points which provide more information about the wreck and its landscape using video, photos, text and sound samples.

The original idea was to create a "teaser" presenting the virtual simulation during the planning phase of the project. However, this was abandoned when the tender revealed that producing a good teaser would cost approximately €30,000. At the same time, it was realised that a collaborative project would be a better way of achieving an end result of the kind desired than a purchased service. After researching a range of new options, it was decided to switch directly to producing the actual simulation.

In spring 2010, discussions began with Aalto University's Media Lab on joint production of a virtual simulation. A preliminary contract was signed on 23 June 2010, after which work on the simulation began. The final agreement was signed in February 2011. The agreement described the script of the simulation, workshops and lectures on producing the simulation and copyright. The majority of the simulation was completed in 2011.

The software platform used was Unity 3D. Navigating through the simulation was controlled using Microsoft's Kinect software and the display technology was a stereoscopic image using two projectors and polarised glasses which Aalto University's Media Lab had also used in their earlier installations. The sound reproduction system was a 5.1 channel speaker combination.

The sources for the simulation were several different types of material, such as underwater photography and video and the drawings made on the basis of this. The model of the



Vrouw Maria used in the simulation is based on the scale model made by Harry Alopaeus in Rauma Maritime Museum which was scanned in 3D. The topography of the sea bed of the Vrouw Maria's environment was obtained from the multibeam sonar survey carried out in 2010. The intention was to use genuine sound recorded at the site of the Vrouw Maria as the basis of the soundscape of the simulation but the failure of sound recording in summer 2010 due to technical problems meant that the soundscape was created on the basis of sounds collected in the Baltic area from different sources (e.g. the Finnish Naval Research Institute).

The simulation was tested on trial users in March 2012 at the National Museum of Finland. Testers were users picked from among the museum's visitors and representatives of predefined special user groups (e.g. school groups, pensioners). As a result of user testing, changes were made to aspects where problems emerged.

The virtual simulation was completed for the opening of the "Spoil of Riches – Stories of the Vrouw Maria and the St. Michel" exhibition on 24 April 2012. In the exhibition, the simulation was housed in a dimly lit space separated by curtains. The simulation could be used in the exhibition in Finnish, Swedish, English, Dutch and Russian.

The public feedback received was largely positive and interested. Some users only came to the exhibition because of the simulation, sometimes even more than once. In its 3D form, the simulation has been "the thing" that drew visitors to the exhibition.

### 11.5. The Vrouw Maria touring exhibition 2012–2013

The National Board of Antiquities' exhibition "Spoil of Riches – Stories of the Vrouw Maria and the St. Michel" which opened at the Maritime Museum of Finland on 25 April 2012 was an important part of the aims of the Vrouw Maria Underwater project. The exhibition was produced as part of the Vrouw Maria Underwater project in 2009–2011 and as a parallel project funded by the Ministry of Culture and Education in 2011–2012. The Maritime Museum of Finland acted as the producer and creator of the exhibition, obtaining Finnish and international partners and also funding the production of the exhibition. The results of the Vrouw Maria Underwater project (including photographs, videos, the underwater landscape, the virtual simulation, cultural history, shipbuilding) were all presented in the exhibition. In addition, the staff of the research project participated in producing content for the exhibition and in producing and writing the exhibition publication "Lost at Sea, Rediscovered".

The exhibition was based on the stories of the Vrouw Maria and a contemporary wreck, the St. Michel. Besides the history of the vessels, the artefacts raised from the wrecks and other materials, the exhibition also looked at broader eighteenth-century history, trade and social phenomena. The exhibition also presented the research history of the wrecks and their current situation and considered their future. One of the most important elements, which attracted the most attention, was the virtual simulation on the wreck of the Vrouw Maria produced as part of the Vrouw Maria Underwater project. The "Spoil of Riches" exhibition was open at the Maritime Museum of Finland until 13 January 2013. The exhibition attracted 22,135 visitors.



General view of the “Spoil of Riches” exhibition at the Maritime Museum of Finland. Photo: Markku Haverinen, National Board of Antiquities.

The exhibition is on display at the Forum Marinum Maritime Centre in Turku from 18 October 2013 to 6 April 2014. The Maritime Museum of Finland is still in negotiation on a foreign tour of the exhibition with a Dutch party. Negotiations were also held on taking the exhibition to Russia but they did not lead to concrete results. After a potential tour, the virtual simulation which was part of the exhibition will become part of the Maritime Museum of Finland’s main exhibition at Maritime Centre Vellamo in Kotka.

### 11.6. The publication “Lost at Sea, Rediscovered”

The publication accompanying the exhibition “Mereen menetetyt, uudelleen löydetyt” (eds. Eero Ehanti, Johanna Aartomaa, Irma Lounatvuori and Erik Tirkkonen; National Board of Antiquities 2012) was published in June 2012 followed by an English version (“Lost at Sea, Rediscovered”) in November 2012. A print run of 500 was produced for both language versions.

The following articles in the publication related particularly to the Vrouw Maria Underwater project:

- Alvik, Riikka 2012: The Vrouw Maria.
- Alvik, Riikka 2012: The St. Michel

- Alvik, Riikka 2012: The merchant vessels St. Michel and Vrouw Maria and their cargo.
- Diaz, Lily & Sen, Ferhat & Maraš, Svetlana & Reunanen, Markku & Horttana, Tommi & Hovi, Mikko 2012: Rediscovering the Vrouw Maria.
- Kostet, Juhani & Tikkanen, Sallamaria: Vrouw Maria Underwater Project.
- Matikka, Hannu 2012: The Snow Vrouw Maria.
- Maraš, Svetlana 2012: Recreating the underwater soundscape in the Vrouw Maria virtual simulation.
- Steffen, Kari & Montonen, Leone 2012: Microbial degradation affecting the condition of the Vrouw Maria.
- Tikkanen, Sallamaria 2012: The Vrouw Maria's unheard soundscape.
- Tikkanen, Sallamaria 2012: The Vrouw Maria's underwater landscape.
- Vajanto, Krista 2012: A rococo skirt, silk stocking and printed cotton.
- Vajanto, Krista 2012: Colours from beyond the sea.

### 11.7. The public seminar "From the Vrouw Maria to the Titanic – What to do with intact wrecks?"

The research carried out in the Vrouw Maria underwater project culminated in a public seminar "From the Vrouw Maria to the Titanic – What to do with intact wrecks?" held on 9–10 November 2012 at the Maritime Centre Vellamo in Kotka. Experts from countries including the Netherlands, Sweden, Denmark, Russia, the UK and the US were invited to speak at the seminar. The seminar also featured several presentations on the Vrouw Maria Underwater project and its final results. The speakers examined ways of researching and accessing underwater cultural heritage.

The purpose of the seminar was to draw on international examples to spark a debate on how underwater cultural heritage should be researched and presented. These experiences can be exploited in shaping the future of the Vrouw Maria and other well-preserved historic sites in the Baltic area. The seminar languages were Finnish and English. The seminar was open to the public and free of charge. The publication of abstracts of the presentations in Finnish and English<sup>4</sup> was distributed to those attending the seminar on registration. A small holder was also produced for the seminar. The seminar was attended by approximately 130 people.

Before the seminar on 8 November 2012 an international meeting of experts was held, whose themes were in situ protection, accessibility and monitoring the condition of underwater sites. The meeting discussed the themes and established the usefulness of management plans.

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<sup>4</sup> Vrouw Mariasta Titanicin – Mitä tehdä ehjille hyllyille?, From the Vrouw Maria to the Titanic – What to do with intact wrecks?

## 12. International and Finnish activities and collaborative bodies

### 12.1. Expert meetings with Russians

Meetings were held with Russians interested in the wreck before and during the Vrouw Maria Underwater project. Russian interest in the wreck of the Vrouw Maria and especially its cargo surged in May 2007. Contact on the matter initially progressed through the Ministries of Foreign Affairs of both countries. Later, negotiations moved to expert level at the Ministry of Education and Culture and the National Board of Antiquities.

The first expert meeting on the subject was held on 24 October 2007 at the Finnish Ministry of Foreign Affairs. The meeting concentrated on exchanging information on the Vrouw Maria and clarifying the starting points for cooperation. The second expert meeting was also held in Finland on 9 June 2008 and was additionally attended by experts from Sweden and the Netherlands. At the event, maritime archaeology, conservation and microbiology experts set out the basics and a view was obtained of questions concerning the protection of the natural and cultural environment which wreck research must take into account.

The third expert meeting was held in Moscow on 18 November 2008. From the Russian side, the Moscow meeting was attended by high-ranking officials, potential project financiers, representatives of a company specialised in salvaging wrecks, an expert on environmental issues, an archaeologist from the St. Petersburg Academy of Sciences and a representative from the Hermitage. The meeting was held in the premises of the Pushkin Museum in which representatives of the media were also present throughout the meeting as well as at the official press conference. In Finland's concluding speech, Director General of the Ministry of Education and Culture Riitta Kaivosoja stated that there were grounds to appoint a work group of international experts to draw up a project plan together. In Finland's opinion, cooperation should be international, not only between Russia and Finland. Cooperation should also comply with the principles of the annex to the UNESCO Convention on the Protection of the Underwater Cultural Heritage (2001).

The fourth meeting was held in Helsinki on 13 November 2009. The fifth meeting was a one-day field trip to the wreck of the Vrouw Maria on a chartered vessel on 2 September 2010. After the trip, no new meetings were organised with the 2007 group. An international advisory group was not set up given the lack of shared research goals but cooperation with Russia continued in other ways.

During the Vrouw Maria Underwater project, the National Board of Antiquities was interested in carrying out cooperation on research into the Vrouw Maria and emphasised that Russia has a cultural tie to the wreck and especially to its cargo which contained paintings destined to the collections of Empress Catherine the Great. Suitable forms of cooperation between Russia, the Netherlands and Finland would have been historical research, e.g. linked to the art cargo, researcher exchanges, different exhibitions, seminar and

publication projects, maritime archaeology training, producing a virtual simulation, building an updated scale model of the wreck and building a replica as proposed by the Russians. Some of these projects could have been carried out with Russian funding. Negotiations were also held on taking the “Spoil of Riches – Stories of the Vrouw Maria and the St. Michel” exhibition to Russia. However, negotiations did not lead to any concrete actions.

The National Board of Antiquities is still interested in continuing cooperation with different bodies regarding the Vrouw Maria.

## 12.2. Other international operations and cooperative bodies

During the Vrouw Maria Underwater project, different collaborative ventures were carried out with a number of different bodies. The project was discussed in different phases, e.g. in person, by e-mail and in seminars both in Finland and abroad.

The purpose of the international Vrouw Maria Workshop held at Suomenlinna on 17–18 November 2009 was to discuss the research carried out, consider the need for further research and to discuss the future of the wreck with maritime archaeologists and conservators as well as with international experts who had carried out environmental and material analyses. The workshop also aimed to evaluate the alternative plans of the National Board of Antiquities for the future of the wreck. The event took the form of a workshop, not an open seminar for the public. Nine foreign and three Finnish experts were invited, plus the staff of the Maritime Archaeology Unit.

The Vrouw Maria Underwater project attracted attention from around the world. During the project, for example, on 4 May 2010 a meeting was held with Russian television journalist Alexander Chizhenok, on 2 September 2010 a group of Russians interested in raising the wreck were taken to the site of the wreck, and on 28 August 2012 a meeting was held with Korean professor Kim Do-Hyun, who was studying Nordic underwater cultural heritage and maritime archaeology with a view to developing maritime archaeology in South Korea. The Dutch media and Dutch researchers were also interested in the Vrouw Maria and an article was published, for example in the Dutch Tresoor – Frisian Historical and Literary Centre’s publication Letterhoeke.

On 11 September 2012, a second Russian group headed by Sergey Fazlullin was taken to see the fieldwork at the Vrouw Maria site. The group consisted of researchers in different areas and diving instructors. Due to strong winds, it was not possible to dive to the wreck and the site could only be visited on the surface. Research vessel r/v Muikku was presented in Borstö where the Russian guests were able to meet the field staff of the project and dive close to the shore. The visit was attended by four Russian guests, Sallamaria Tikkanen from the Vrouw Maria Underwater project and Minna Leino from the National Board of Antiquities. In addition, the group dived at the diving training centre at the Ojamo Mine in Lohja and the Kronprins Gustav Adolf underwater park outside Helsinki. The group also saw the National Board of Antiquities’ conservation laboratory for waterlogged materials in Hylkysaari and the Maritime Museum of Finland in Kotka. The guests were given an information pack about the Vrouw Maria, research into the wreck and the Vrouw Maria Underwater project.

Analysis of the sample taken from the Vrouw Maria's hold in 2011 was carried out by the Dutch Cultural Heritage Agency's laboratory. Results of archaeological research and their interpretation were compared with written sources (archival sources in Sweden, Denmark and the Netherlands, for example). Archaeologist, postgraduate student Krista Vajanto studied the structure, materials and weaving method of the textiles raised from the wreck, providing valuable information on processes for researching textiles and dyestuffs. The Vrouw Maria research into textiles and dyestuffs was presented twice at international conferences in the sector in the UK and Belgium. The degree to which the material had been preserved and the wealth of material attracted a great deal of attention and led to good relationships with other researchers and research laboratories.

Research into the archival sources involved consultation with Dutch experts (including the University of Groningen, the Sound Toll Registers Online project, Eero Ehami's research into art history).

### 12.3. Finnish activities and cooperative bodies

Material analyses were carried out in partnership with researchers from the University of Helsinki, among others, who carried out analyses as part of their own research projects (Microbiology, Department of Food and Environmental Sciences, Faculty of Agriculture and Forestry). In researching the condition of timber the most important were microbiologists Kari Steffen and Leone Montonen. The Vrouw Maria was an essential site in Kari Steffen's research project "Microbial degradation of archaeological wood", which continued until 2010.

Physicists from the University of Helsinki (Edward Häggström and students) studied samples from the Vrouw Maria in partnership with Kari Steffen. The physicists were interested in developing ultrasound methods for wreck research and conservation applications, but this collaboration was unable to continue due to a lack of funding. The ultrasound method developed by the physicists might have been of great benefit in surveying the condition of the wreck and developing conservation processes and continuing this collaboration in the future would be particularly advisable.

The glass discs raised from the wreck were studied by bodies including the Finnish Museum of Horology and Helsinki University Central Hospital's eye clinic, and researchers from the Finnish Glass Museum in Riihimäki also assessed the objects. The clay pipes were studied by Jaana Mellanen at Helsinki City Museum. The pumice stones were analysed at the Geological Survey of Finland by special researcher Kari A. Kinnunen. The plant traces (tobacco samples, seeds and lingonberry leaf) were analysed at the Botanical Museum of the University of Helsinki, part of the Finnish Museum of Natural History (Tuuli Timonen and Pirkko Harju) and at the Botanical Museum of the University of Turku (Mia Lempiäinen). Dendrochronological analyses were carried out at the University of Eastern Finland (Pentti Zetterberg), and elemental analysis was carried out by the Top Analytica laboratory in Turku. The possible spread of mercury in the cargo into the cargo hold was studied using a sediment sample and a ground sample of pumice taken from the hold. The samples were analysed at the Labitum analysis laboratory.

The virtual simulation of the wreck was created jointly with the international team at Aalto University's Media Lab. The contact was Professor Lily Diaz. Underwater sound material for the simulation was obtained from the Finnish Naval Research Institute. The contact was Seppo Madekivi. Marine biologist Ari Ruuskanen also took part in creating the simulation. For landscape research, divers who had explored the Vrouw Maria were interviewed, as was Jouko Högmänder from Metsähallitus and Sinikka Marjanen who had spent her summers in the area in which the Vrouw Maria was found.

The partner in scanning objects raised from the wreck was Cascade Computing Ab.

Research was also carried out with staff from the National Board of Antiquities across departmental boundaries (including researchers and conservators from the National Museum of Finland and the Maritime Museum of Finland).

### **13. Post-fieldwork activities and analysis after the fieldwork**

Work following the fieldwork in the Vrouw Maria Underwater project was carried out in accordance with the quality guidelines of the National Board of Antiquities' Archaeological Field Services and for Finnish archaeology. The fieldwork research reports are archived in the National Board of Antiquities archive. The objects raised have been conserved at the National Board of Antiquities' conservation laboratory for waterlogged materials in Hylkysaari in Helsinki and are stored in the Maritime Museum of Finland's collections. The samples are also stored in the collections of the Maritime Museum of Finland for possible later research. The pumice stone is stored as a reference sample in the collections of the Geological Survey of Finland. The necessary details were updated in the Vrouw Maria's management plan annually after the fieldwork. The intention is to write scientific articles on particular research topics (plant residues, dyestuffs).

Analyses, and where necessary interpreting them, were carried out using various bodies as partners, as set out in the section on collaborative bodies (see section 12).

## 14. Project management

The Vrouw Maria Underwater project was funded by the Finnish Ministry of Education and Culture as state aid (special funding). The body responsible for carrying out the project was the Maritime Museum of Finland's support organisation (Suomen merimuseon tuki ry), which also made the funding applications and was responsible for reporting on the project to the funding body. Staff working on the project were employed by Suomen merimuseon tuki ry. Project management was carried out at the National Board of Antiquities. The project was steered by the Ministry of Education and Culture and the National Board of Antiquities jointly in accordance with the aims agreed. For this reason, a steering group was created for the project on 14 January 2011. In 2012, the steering group comprised Director General of the National Board of Antiquities Juhani Kostet (chair), Director General of the National Museum of Finland Helena Edgren, Museum Director of the Maritime Museum of Finland Tiina Mertanen, Chief Intendant of the Archaeological Field Services Unit Marianna Niukkanen, Keeper Marja Pelanne, Researcher Eero Ehanti and representing the Ministry of Education and Culture, Counsellor for Cultural Affairs Päivi Salonen. The secretary was project manager Sallamaria Tikkanen. The field research on the Vrouw Maria was performed by the National Board of Antiquities. The project's field staff were employed by the National Board of Antiquities during the fieldwork.

When the National Board of Antiquities changed to a new organisational structure on 1 May 2011, the project was moved from the now defunct Maritime Archaeology Unit to become part of the Archaeological Field Services Unit in the new Cultural Environment Management department.

The project manager was responsible for work in drawing up funding applications and reporting jointly with Suomen merimuseon tuki ry's secretary Erik Tirkkonen. The project manager monitored achievement of the project aims at operational level. The project manager's immediate superior at the National Board of Antiquities was the Superintendent of the Archaeological Field Services Unit. An exhibition researcher, the Maritime Museum of Finland and the National Museum of Finland were responsible for the exhibition project. The immediate superior of the exhibition researcher was the Director of the Maritime Museum of Finland.



## 15. The staff of the Vrouw Maria Underwater project 2009–2012

Staff whose expertise and experience match the demands of the project were chosen to perform the various tasks and field research in the Vrouw Maria Underwater project. The following areas of expertise were required:

- Project management,
- Maritime archaeology and maritime archaeological fieldwork,
- Historical shipbuilding,
- Conservation of waterlogged materials,
- Exhibition research,
- SCUBA diving at a depth of 35–41 metres,
- Trimix training,
- ROV operation,
- Technical staff: diving and ship equipment management

In general, the entire project staff had the appropriate training and previous experience of equivalent or almost equivalent work to that which they performed during the project. During the project, attention was also paid to updating staff training and knowledge. The staff attended the following training in health and safety: occupational safety card training, welding work card training, first aid training and updates, DAN (Divers Alert Network) diving first aid course, defibrillator training and training in sailing in the archipelago. A separate diving safety training course was also held in spring 2012. In addition, the staff who dived during the project carried out dives at sufficient depth at regular intervals to maintain their skills. These dives included using specialist technical equipment and practising the tasks required at work. Some of the dives took place in pools, others in open water.

Staff of the Vrouw Maria Underwater project 2009–2012:

- Project manager Sallamaria Tikkanen 2009–2012,
- Archaeologist Riikka Alvik 2009–2012,
- Archaeologist Riikka Tevali 2011–2012,
- Assistant researcher Aki Leinonen 2011–2012,
- Planner Vesa Hautsalo 2010–2012,
- Assistant researcher Eeva Vakkari 2012,
- Researcher Eero Ehanti 2009–2010 (also 2011–2012 in the Vrouw Maria and St. Michel exhibition project),
- Conservator-researcher/archaeologist Rami Kokko 2010–2011,
- Assistant researcher Essi Tulonen 2010.

The above staff worked in the project in the years stated either full time or part time for periods varying in length. The total amount of work carried out by project staff for Suomen

merimuseon tuki ry was 9.84 years, FTE. In different years, some additional field staff were also employed on fixed-term contracts.

In 2009–2012, several staff employed by different units of the National Board of Antiquities also took part in the project. In particular, work was carried out by specialist researcher Hannu Matikka, who examined the underwater video, film and still photography taken at the Vrouw Maria in 2000–2009. The aim was to establish in greater detail how the Vrouw Maria was constructed. Hannu Matikka's task also included guiding the divers in documenting the wreck from the point of view of ship construction. The drawings for the project were drawn by National Board of Antiquities' artist Tiina Miettinen. In addition, the managers of the National Board of Antiquities Maritime Archaeology Unit and Archaeological Field Services Unit and the Vrouw Maria Underwater project steering group's members from the National Board of Antiquities were involved in steering the project in its different stages.

## **16. Equipment**

The field research in the Vrouw Maria Underwater project used the National Board of Antiquities' Archaeological Field Services Unit's equipment plus hired equipment and the divers' own equipment. Due to the challenging research conditions at the Vrouw Maria wreck, self-contained breathing apparatus was purchased for two employees. This supported the idea that each worker diving at the wreck has as diving equipment duplicated mutually independent breathing apparatus whose tanks can be separated from each other by valves. During the project, two efficient battery-operated diving lights were also purchased as well as one Buddy Phone listening and speaking unit for the divers. The National Board of Antiquities' first aid equipment was also updated by purchasing new oxygen first aid equipment. In 2012, a defibrillator was purchased in order to improve first aid readiness.

External services were contracted in for some of the fieldwork sessions. The work carried out by contract services was performed using the service providers' own equipment. Work carried out by contract services involved operation of the ROV robot camera and video and still photography carried out by trimix divers. Functions linked to trimix diving were also purchased from subcontractors.

The National Board of Antiquities' inflatable dinghy Meri 2 was used in fieldwork particularly in getting the r/v Muikku into position in the immediate vicinity of the wreck site and locating the wreck and placing buoys. The inflatable dinghy also served as an auxiliary vessel in raising the artefacts during fieldwork.

## 17. Fieldwork safety

The safety plans for the fieldwork during the Vrouw Maria Underwater project were updated each year. Before departing on fieldwork, annual risk analyses were carried out of diving and work at the surface and a rescue and safety plan was drawn up. First aid equipment and rescue plans were always examined at the start of fieldwork. The research vessels had oxygen first aid equipment, capable of providing oxygen first aid to two to three people at the same time. A defibrillator was also available for use. The staff had valid Finnish Red Cross first aid training (at least level I). The diving apparatus and equipment were maintained and inspected on an annual basis. The West Finland Coast Guard and the Maritime Rescue Co-Ordination Centre Turku were informed of the fieldwork.

The research vessel's mooring system was updated in 2010. Annual maintenance of the system was part of both health and safety, and wreck protection. Meritaito Oy was responsible for maintenance and prepared the mooring systems (including four buoys, chains and ropes) before field research and removed the part of the system above the surface when the research ended. Meritaito Oy also stored and maintained the parts of the mooring system. Two buoys were lost due to strong winds in summer 2012. At the end of the project in December 2012, the buoys were moved from the Pärnäs fairway station for storage at the National Board of Antiquities' premises in Hylkysaari in Helsinki.

## 18. Environmental issues in fieldwork

During the Vrouw Maria Underwater project, the research vessel used was the Finnish Environment Institute's r/v Muikku. No measurements of the vessel's emissions or noise were taken apart from in the interior of the vessel where noise levels were measured from the point of view of health and safety. The vessel's engines were relatively old and did not have catalytic converters. Installing catalytic converters was not found to be worthwhile unless the engines were replaced. The fuel used by the Muikku is sulphur-free light fuel oil, with consumption of approximately 80 litres an hour at normal speeds. In moving in the environment surrounding the Vrouw Maria wreck, consumption was approximately 40 litres an hour, and when the vessel was kept in position using the bow thruster, consumption was only approximately 7 litres an hour. After updating the mooring system in 2010, it was possible to moor the Muikku safely using a four-point mooring, which considerably reduced the need to keep the engine running.

Underwater noise or other disturbance was caused, among other things, by diving operations, the engines of the research vessel and the auxiliary vessel and filling the compressed air/trimix tanks needed for diving. Muikku's noise levels were not measured but the issue was discussed before project fieldwork commenced with Professor Mikael Hildén at the Finnish Environment Institute regarding the research vessel r/v Muikku.

The auxiliary vessel used in the Vrouw Maria research was the National Board of Antiquities' Viking 580 RIB, Meri 2. The boat is 5.8 metres long, 2.5 metres wide and has a petrol-driven Honda BF90A outboard motor. The outboard motor uses 95 octane lead-free petrol, and consumption at normal speeds is approximately 20 litres an hour. According to information from the manufacturer, the noise level of the electric Bauer compressor used to fill the compressed air tanks was approximately 97 dB. The oil used by the equipment was disposed of in an eco-friendly manner, in accordance with legislation in force. The emissions were measured in 2002. The waste which accumulated during the research was dealt with appropriately.

The robot camera used to photograph the wreck was a small Video Ray Pro. The camera did not have a grappling hook. The equipment was powered by electricity and its use did not cause noise or emissions. The ROV was operated from the surface.

## 19. Reporting

The staff of the Vrouw Maria Underwater project reported the project's progress in the different phases in 2009–2012 both orally and in writing to the Chief Intendant of the Maritime Archaeology Unit (until 1 January 2011), the Chief Intendant of the Archaeological Field Services Unit, the Director General and the management of the National Board of Antiquities, to Suomen merimuseon tuki ry, to the Ministry of Education and Culture and to the project steering group. Suomen merimuseon tuki ry submitted a written report to the Ministry of Education and Culture every year on the progress of the project (person responsible: project manager) and the finances (person responsible: Suomen merimuseon tuki ry's secretary). Interim reports were submitted as necessary. These reports were freeform.

The research reports on fieldwork at the wreck site were written by the project archaeologist together with other fieldwork staff. The field research was reported in line with the National Board of Antiquities' guidelines for research reports. The reports are archived in the National Board of Antiquities' archive.

The Vrouw Maria's management plan was also updated. Updated information was also entered in the National Board of Antiquities' project register and ancient monuments register.

## 20. Best practice

One of the aims of the Vrouw Maria Underwater project was to create best practice in fieldwork and other project activities. This best practice is recorded, particularly from the point of view of the Vrouw Maria, in the various sections of this final report. These describe the planning of the fieldwork, carrying out the fieldwork and reporting. In addition, the final report describes staff experiences of multibeam sonar material, laser scanning, the blog, 3D scans of objects, documenting the underwater soundscape and producing the Vrouw Maria virtual simulation. Best practice is also presented on the project website. The project staff hope that these experiences will also be incorporated in the National Board of Antiquities' quality guidelines for Finnish archaeological fieldwork where possible. The guidelines were adopted in the fieldwork period in 2013. It would also be worth incorporating the practices into the fieldwork guidelines of the Archaeological Field Services Unit, the archaeological fieldwork health and safety guidelines, the National Board of Antiquities' diving guidelines and the document "Instructions for drawing up archaeological research reports".

## 21. Archiving and availability of material

The material gathered and chosen to be archived during the Vrouw Maria Underwater project was mainly archived in the National Board of Antiquities' archive in accordance with the archiving plan (AMS) approved by the National Board of Antiquities on 22 January 2009, where it is publically accessible and available for the use of different bodies. The form in which data is stored is primarily on paper. Paper copies of material to be preserved permanently have been taken for filing. The Vrouw Maria simulation, the multibeam sonar material and the scans of objects have been preserved digitally. The long-term preservation of this material remains unresolved. Documentation has been created on the above material. The table below sets out the archiving, cataloguing system and location of the material.

Archived material	Archive/cataloguing system/location
Field research reports 2009–2012	National Board of Antiquities' archive
Field research photographs and video	National Board of Antiquities' archive/ Musketi database
Objects raised during the field research	Maritime Museum of Finland collections/ Musketi database
Samples taken during the project	Maritime Museum of Finland collections
Publications and brochures produced during the project	National Board of Antiquities' library
Other documents	National Board of Antiquities' archive
Copy of the final project report	National Board of Antiquities' archive
Staff and financial management documents for the project	Suomen merimuseon tuki ry archive, Kotka
Vrouw Maria simulation	National Board of Antiquities, Knowledge Management Unit
Vrouw Maria multibeam sonar	National Board of Antiquities, Knowledge Management Unit
Vrouw Maria 3D scans of objects	National Board of Antiquities, Knowledge Management Unit
Project website and blog	National Board of Antiquities' archive
Press cuttings archive (not complete)	National Board of Antiquities' archive
Interviews with divers	National Board of Antiquities' archive

## 22. Dissemination and publication policy

Information was provided on the Vrouw Maria Underwater project by means of two or three press releases a year. The first press release announced the start of the new phase and the second announced the start of fieldwork and described the aims of the fieldwork in more detail. The results of the fieldwork were also publicised each year. The fieldwork was also referred to in the field research press releases issued by the National Board of Antiquities' Archaeological Field Services Unit. The National Board of Antiquities' Communications and Marketing Services Unit was responsible for publishing press releases. Information was usually planned in partnership between the National Board of Antiquities, the Ministry of Education and Culture and Metsähallitus.

Information on the different phases of the project, the progress of the fieldwork and its results was also published on the National Board of Antiquities' Vrouw Maria Underwater project website, on the blog and on Facebook. At the same time, real-time video was broadcast from the field both from the surface and under the water. The website was updated throughout the project. The exhibition project was publicised separately by the Maritime Museum of Finland.

In 2009–2012, the project's staff held dozens of presentations on the aims and results of the project at different events in Finland and abroad, to the general public and to researchers. Articles were also written where possible for popular and academic publications. The entire project staff participated in producing content for the Maritime Museum of Finland's exhibition "Spoil of Riches – Stories of the Vrouw Maria and the St. Michel" and the accompanying publication.

During the Vrouw Maria Underwater project, a media trip to the wreck was held on 13 June 2012. It was attended by 16 media representatives. The trip was attended by TV stations YLE TV1 and YLE Fem, the news programme Nelosen uutiset as well as press representatives from STT-Lehtikuva, Turun Sanomat, Kymen Sanomat and Iltalehti. The aim of the media trip was to talk about the fieldwork in progress at the wreck, the aims of the project and the Maritime Museum of Finland's exhibition "Spoil of Riches – Stories of the Vrouw Maria and the St. Michel". The trip was also attended by project staff, officials from the National Board of Antiquities and Metsähallitus and professor Lily Diaz from Aalto University's Media Lab, whose team were involved in creating the interactive 3D virtual simulation shown in the "Spoil of Riches" exhibition.

The media representatives were sent an information pack in advance and on the trip they were given a folder containing additional information and leaflets as well as a DVD of the latest video and stills from the wreck. The wreck was presented by means of underwater videos and a video presenting the virtual simulation on board the charter vessel the m/s Linnea. The media representatives were already familiar with the story of the Vrouw Maria.

The success of trips to sea always depends on favourable weather conditions. During the trip, the sea was calm and the weather varied from fog to sunshine. Fortunately, during the trip it did not prove necessary to implement the plan B option for windy weather and the visitors were able to be taken to the actual place where the field research was carried out, in the open sea above the Vrouw Maria.

## **23. The current situation regarding in situ preservation of the wreck of the Vrouw Maria**

One of the aims of the Vrouw Maria Underwater project was to update the aims and methods regarding in situ preservation of the Vrouw Maria.

In 2013, the in situ preservation of the Vrouw Maria could be considered to still be founded on the following four starting points (not in order of precedence):

1. An exclusion zone was established around the wreck in 2000 which prevents incursion without permission. This measure has been found to be sufficient when combined with monitoring by the authorities. The direction of the camera monitoring the area could be checked further such that it is better focussed directly on the area in which the wreck is located. On the other hand, during the fieldwork it was found that movement in the area is well observed by the cameras of the Finnish Coast Guard.
2. Regular visual checks on the wreck as a whole and 29 monitoring points (still and/or video photography) and comparison, i.e. visual monitoring has been found to be a functional method.
3. Favourable and relatively stable environmental conditions from the point of view of preservation. So far, no major factors or changes threatening the wreck were found in the environmental conditions.
4. Material analyses, on the basis of which the current state of the wreck and the conditions prevailing in its future are defined. On the basis of the analyses, it is known that the decomposition of the timber material of the Vrouw Maria is progressing slowly mainly due to the effects of biological factors. Sometimes chemical and physical factors also affect the condition of the wreck. The degree of damage to timber samples raised from the wreck, the decomposition processes and the challenges to conserving the hull of the wreck are known particularly well. However, sampling does not provide a complete picture of the strength of the hull, which means that additional research is necessary if it is decided to raise the wreck or start extensive excavations. There is no research information on the structure and condition of the metal parts of the wreck (nails, bolts) but on the basis of visual observation, the iron parts have at least partly corroded.

The wreck of the Vrouw Maria is located in the Archipelago National Park in an area which may only be entered with a permit. The wreck is surrounded by an exclusion zone inside which anchoring and diving are prohibited. Consequently external threat factors are minimal. The in situ preservation of the wreck of the Vrouw Maria thus means mainly examining the current status of the wreck and monitoring changes in its condition as well as identifying any observed causes of change. In situ preservation does not at this point require new samples to be raised from the immediate environment of the wreck or from the wreck itself.



Diving operations cause wear and tear to the wreck, such that this must be justified and recreational diving at the wreck of Vrouw Maria, for example, is not permitted. Over the years, e.g. divers' ropes, diving operations and the codes used to mark the measuring points on the wreck have left a certain number of traces on the wreck but these changes are relatively minor.

However, it must be emphasised that the wreck formation process – including the decomposition of the timber – is progressing and that the wreck cannot be preserved in its current form for ever. Protection solutions of the type in which the wreck is covered are not easily applicable to this kind of intact and three dimensional wreck and would result in the site being virtually encased, beyond the reach of the human eye or research.

If the Vrouw Maria is not going to be raised, in the future protection measures should be considered, such as, for example, supporting parts at risk of collapse or moving them to a safer location. Because the deterioration processes are very slow, these kinds of measures are not likely to be required in the immediate future. Visual monitoring of the wreck should, however, be continued at regular intervals (2–4 years).

## 24. Summary of the results of the Vrouw Maria Underwater project and their presentation

As stated at the start, the aims of the Vrouw Maria Underwater project were:

- To produce new information about the wreck, its cargo and the landscape, etc. and to interpret and present this information in different ways. Concrete research questions included what the vessel the Vrouw Maria was like, what kind of cargo and art cargo she was carrying and what kind of elements were in the past and present landscape of the wreck site, how the wreck should be preserved and whether the wreck could be protected in the location in which it was found.
- To increase access to the wreck, e.g. by means of a virtual simulation, a blog updated from the field, 360° images, an exhibition and an exhibition publication and a seminar.
- To produce information for managing the wreck, including documents required in evaluating the need for a preliminary Natura impact assessment, on in situ preservation, to answer questions about the condition of the wreck and monitoring any changes.

The above results were achieved during the project as follows:

1. The fieldwork (eight weeks) carried out at the Vrouw Maria produced new information about the ship itself, its cargo and the landscape at the wreck site. 38 objects were raised from the wreck, including 24 small round glass discs, clay pipes, pumice stone, a strip made from knotted string and a lead sounding line used to measure the depth of the water. Samples were taken of the packing crates and barrels in the ship's cargo hold. The samples included indigo, madder, traces of grapes, tobacco leaves and other plant residues, not all of which have been able to be identified. In addition, 11 timber samples were taken from the structures of the ship. 538 digital photographs and about 30 hours of underwater video were selected to be archived. Almost 140 hours of diving were carried out at the wreck. Furthermore, two new multibeam sonar surveys were commissioned and underwater soundscape recordings made.
2. The accessibility of the wreck was increased through the blog, Facebook, the project website, the Vrouw Maria virtual simulation, 3D scanning of objects raised from the wreck, the exhibition "Spoil of Riches – Stories of the Vrouw Maria and the St. Michel" and the publication "Lost at Sea, Rediscovered" as well as the public seminar "From the Vrouw Maria to the Titanic" and its brochure and the publication of abstracts of the presentations. Tens of presentations were also given in Finland and abroad. The project also attracted a great deal of media attention.
3. The project also produced new information about the protection and management of the Vrouw Maria. In the light of the information currently available, the protection of the wreck is sufficient but cooperation between authorities, for example, could be increased and developed. The condition of the timber structures of the wreck was studied during the project and was found to be reasonably good. Various chemical

elements have accumulated on the surface of the timber, such as iron and sulphur, while bacteria and fungi are also feeding on the timber. The decomposition processes are slow, however.

The Vrouw Maria Underwater project addressed challenging, innovative and internationally topical multi-disciplinary subjects such as the in situ preservation of wrecks recommended by UNESCO and ICOMOS and virtual accessibility. The project succeeded in identifying and developing good practical methods for improving access to underwater sites without raising them or carrying out extensive excavations. These methods can also be applied to other underwater cultural heritage sites. One such method is the virtual simulation produced on the basis of a scale model of the Vrouw Maria and the results of the field research.

A central part of the project was the underwater archaeological research carried out at the Vrouw Maria. During the Vrouw Maria Underwater project between 2009 and 2012, a total of eight weeks of fieldwork were carried out. The aim was to continue documenting the wreck and to gather together the measurements of the vessel already taken to reconstruct the sailing ship, and to research the content of the cargo hold by taking samples and raising objects. The Vrouw Maria was documented by measurements, photography and video. The fieldwork produced new information about the ship and its cargo, and, for example, its trade links and the life of the upper echelons of society in the eighteenth century. Numerous analyses and the interpretation of the results from these, cooperation between experts, and research into the archival and literature sources produced further details about the story of the Vrouw Maria. The research carried out on the wreck also demonstrated that non-intrusive or minimally intrusive techniques were capable of providing new information.

The scientific work was made more accessible by reporting the progress of the fieldwork and its results on the project's blog and on Facebook. Besides text, the blog also contained video, photographs and the sound samples recorded underwater at the wreck site. The project website also provided information on the project, the fieldwork and the research results.

As its name suggests, the main emphasis of the Vrouw Maria Underwater project was on the underwater world. One of the important aims of the Vrouw Maria Underwater project was to study the underwater landscape and soundscape of the Vrouw Maria site. The purpose of the research was to broaden people's assumptions about wrecks by showing that each wreck has its own unique landscape and soundscape and that documenting and presenting these provides added value to research into underwater cultural heritage and its in situ preservation. The landscape aspect was also linked to showing that each site is governed by its own unique underwater landscape and soundscape and that each and every diver who has visited and worked at the wreck site has their own memories and experiences of it. The divers' experiences remind us that cultural heritage is made up not only of the site itself but of its users and their personal experiences. Landscape studies can also be considered to bring a new and fresh angle to wreck sites.

The exhibition also provided additional information about the story of the Vrouw Maria, the finding of the wreck and its cargo, the ship itself and the eighteenth century, when people were already living in an international age. The exhibition also offered a chance to explore the digitised objects raised from the wreck and to find out more about the debate

surrounding its discovery. In addition, the illustrated exhibition publication “Lost at Sea, Rediscovered” provides interesting reading.

The high point of the Vrouw Maria Underwater project was the international seminar “From the Vrouw Maria to the Titanic – What to do with intact wrecks?” run in partnership with the Maritime Museum of Finland on 9–10 November 2012 at the Maritime Centre Vellamo in Kotka. Besides the research into the Vrouw Maria, the seminar also explored other current wreck projects. It also provided an excellent opportunity to consider what should be done with well-preserved wrecks in the Baltic.

The story of the Vrouw Maria can be encapsulated at this point as three different storylines, as follows:

1. The story of the archaeology/history,
2. The story of the environment,
3. The story of the landscape/soundscape.

Research into the first story began immediately the wreck was discovered in 1999. The theme of a historical story continued in the EU-funded MoSS project in 2001–2004. This was naturally also a central theme of the Vrouw Maria Underwater project. Research to survey the underwater environmental conditions of the Vrouw Maria began during the MoSS project, where measuring equipment was used to obtain information for example on the temperature, current and oxygen content. During the Vrouw Maria Underwater project, information was gathered on the organisms on the sea bed, etc. and a more accurate view of the condition of the wreck was obtained. The Vrouw Maria Underwater project added a new perspective on the underwater landscape and soundscape. The divers were also interviewed about their experiences of the site and what it was like under the water. The landscape of the Vrouw Maria could be explored in the virtual simulation and the exhibition “Spoil of Riches – Stories of the Vrouw Maria and the St. Michel” at the Maritime Museum of Finland until 13 January 2013.

The aims of the whole project shown above can be presented in the following actual results:

Results of field research, presented in the following files and drawings, etc.	
Updated 3D reconstruction created in the Rhinoceros software (also depicts the rigging)	Updated picture of the hull. The latest measurement data recorded using a goniometer has not yet been transferred to the model. The measurement data will be entered in the 2012 research report.
2D reconstruction drawing with rig	Mikko Vormala’s visualisation drawing 7.11.2012.
Line drawings (also include cross sections)	Sufficient data to produce drawings is still lacking.
Profile drawing (e.g. showing the width of the planks and the nailing pattern at selected points)	See Rami Kokko’s drawing. Research was also carried out into the location of the deck bulkheads and the ribs (drawings in the research reports).

Updated drawing of the deck of the wreck	The structural parts of the deck cabin, etc. were measured at deck level for the reconstruction (sketch available).
Updated version of the plan showing the location of the cargo	See Tiina Miettinen's drawing of the view through the large cargo hatch.
Sketch of the interior of the wreck	New information was obtained on the interior of the wreck but the drawing has not been completed. For example, a drawing of the stern cabin could be produced. In addition, a drawing could be produced of almost the entire hold by combining the video and photographic material with Tiina Miettinen's drawings.
Multibeam sonar material	Meritaito's multibeam sonar in 2010 and 2011.
A new and repaired mooring system for the research vessel at the wreck	Mooring system updated in 2010. The remaining two buoys were moved to Hylkysaari on 14 December 2012. Two buoys were lost in storms.
The blog and the equipment relating to it (including antenna)	The blog was launched on 30 August 2010 and continued throughout the project.
Raising objects	A total of 38 objects were raised from the Vrouw Maria in 2009–2012.
Raised structural elements	Windlass barrel.
Raised samples and their analysis	11 timber samples were raised from the Vrouw Maria, plus tobacco, fabric with sediment and sediment samples. Samples were not taken of the metal parts of the wreck (nails and bolts) because a suitable, acceptable method was not available.
The virtual simulation presenting the underwater landscape and soundscape of the wreck	The simulation was produced in partnership with Aalto University's Media Lab. The final location of the simulation will be the Maritime Museum of Finland's main exhibition in Kotka.
New artist's view drawings (Tiina Miettinen, National Board of Antiquities)	In 2009–2012, Tiina Miettinen produced four new drawings on the subject of the Vrouw Maria.
The exhibition (the Vrouw Maria and the St. Michel, the exhibition is the result of a project, cooperation with the exhibition project).	
The exhibition in which the 3D virtual simulation is presented	"Spoil of Riches – Stories of the Vrouw Maria and the St. Mikael" 25 April 2012 – 13 January 2013.
The exhibition publication (including, art, research history, shipbuilding, the underwater landscape, the cargo, the future)	Exhibition publication: <i>Mereen menetetyt, uudelleen löydetyt</i> (eds. Eero Ehanti, Johanna Aartomaa, Irma Lounatvuori and Erik Tirkkonen. Museovirasto 2012). Exhibition publication in English: <i>Lost at Sea, Rediscovered</i> (eds. Eero Ehanti, Johanna Aartomaa, Irma Lounatvuori and Erik Tirkkonen. Finnish National Board of Antiquities 2012).
Events accompanying the exhibition (including lectures).	"Tietoherkku" lectures at Maritime Centre Vellamo, autumn 2012.

The public seminar in 2012	"From the Vrouw Maria to the Titanic – What to do with intact wrecks?" seminar at the Maritime Centre Vellamo in Kotka, 9–10 November 2012. At the seminar, a publication containing abstracts of the presentations was also distributed in Finnish and English.
Separate documents:	
Project and research report	January 2011 (Alvik, Riikka; Ehanti, Eero; Kokko, Rami and Tikkanen, Sallamaria).
Final report on the Vrouw Maria Underwater project	January 2013 (Alvik, Riikka; Hautsalo, Vesa; Klemelä, Ulla; Leinonen, Aki and Tikkanen, Sallamaria).
2009 Suomenlinna Workshop reports	Workshop summaries completed (Vrouw Maria Workshop, Helsinki, Suomenlinna, 17–18 November 2009. Summary and conclusions, December 2009, Riikka Alvik, Eero Ehanti and Sallamaria Tikkanen, also in English (translation Eero Ehanti).
Documents relating to the preliminary Natura impact assessment	The Vrouw Maria Underwater project, preliminary Natura impact assessment (Alleco Oy, Ympäristötutkimus Yrjölä Oy, Helsinki 2012).
Fieldwork reports	2009, 2010, 2011 and 2012 completed (National Board of Antiquities archive).
Special aid applications and project reports on an annual basis (project aims and results plus budgets, provided annually to the Ministry of Education and Culture and Suomen merimuseon tuki ry)	Completed.
Process diagram (presentation of the project and the raising project with budgets)	Completed.
Documents relating to plans of raising the wreck 2009–2010	Draft completed.
In situ and condition reports	See the final report on the Vrouw Maria Underwater project.
Obtaining and translating copies of original archive sources	The material in the Swedish National Archives has been scanned, a copy of the list of salvaged cargo has been ordered from The City of Turku's Central Archive, the sea protest and the logbook in The City of Turku's Central Archive have been transcribed and translated.
Updated management plan	The management plan has been updated. Monitoring of the wreck will continue.
Updated data in the ancient monuments and project register	Completed after conclusion of the project in early 2013.
Press releases	Archived in the National Board of Antiquities archive.
Other documents	Archived in the National Board of Antiquities archive.

## **25. What next after the Vrouw Maria Underwater project?**

### **25.1. General**

In the current economic climate, the National Board of Antiquities has no plans to continue underwater research into the Vrouw Maria wreck or to raise the wreck. However, the National Board of Antiquities is open to various options and new potential scenarios regarding the future of the wreck. At the same time, it is keen to emphasise that the National Board of Antiquities does not have to be the only body involved at the wreck. A permit for archaeological research needs to be obtained for any field research from the National Board of Antiquities. Research must comply with the National Board of Antiquities' fieldwork quality guidelines 2013.

The data gained in the research projects between 1999 and 2012 can also be used and exploited in future projects and research. The material gathered so far also provides a great deal of scope for further analysis from different points of view. Nor is it always necessary to work in the field; instead research can be continued in libraries, archives and research institutions.

### **25.2. Regular monitoring of the Vrouw Maria wreck**

The National Board of Antiquities is responsible for preservation, management and research into the Vrouw Maria wreck. Following the Vrouw Maria Underwater project, the intention is to monitor the wreck and changes in its condition by means of inspection dives arranged by the National Board of Antiquities. The condition of the wreck will be examined regularly, partly by photographic monitoring at the 29 selected monitoring points. The points have been selected at locations where there is an existing risk of collapse and/or wear or a fear that parts or objects may move from one place to another. The inspections will avoid touching the wreck or the sea bed. It may be possible to take different material samples from the wreck or nearby as part of monitoring the condition of the wreck. Visual monitoring methods may also be used to establish whether the wreck has been touched without a permit. Multibeam sonar of the Vrouw Maria should be carried out at intervals of approximately every ten years in order to obtain information on the movement of the sediment on the sea bed.

### **25.3. Mercury and madder lucidin on the wreck of the Vrouw Maria**

According to the archival sources, the Vrouw Maria was carrying about 123 kg of mercury, i.e. about 10 litres. No observations were made of the mercury or its packaging during the fieldwork. In spring 2010, a statement was requested from the ELY Centre for Southwest Finland on the mercury. In its statement on 23 March 2010, the ELY Centre stated that

“the amount is small and the risk it causes can be determined from sediment samples taken in the vicinity of the wreck. It is not necessary to take samples of bivalves in order to determine the mercury risk”. The samples taken from inside the wreck did not reveal mercury contamination (sediment sample, pumice stone).

The samples taken in summer 2012 included madder root, which was part of the *Vrouw Maria*'s cargo and used in dyeing. The sample was analysed in the Netherlands together with other raised dyestuff samples. The analysis found extremely high lucidin content. Lucidin is the sugar decomposition product in madder root and is carcinogenic. Madder has been used for medical purposes for centuries so is not considered to be poisonous. Lucidin, which is one of its constituents, however, has been found to cause cancer in large amounts. Taking into account that there may still be thousands of kilos of madder on board the *Vrouw Maria*, the potential environmental impact of the accumulated lucidin content should be investigated.

#### 25.4. MoSS project sample batches in 2013

During the MoSS project in 2002 and 2003, timber samples were taken to the exterior of the wreck of the *Vrouw Maria*. Five batches of samples were taken to an aerobic environment and seven batches to an anaerobic environment. Some of the samples have been raised and analysed but there are still two sample batches at the *Vrouw Maria* wreck in an aquatic environment and five sample batches in the sediment of the sea bed. During the MoSS project, a schedule was drawn up for researching the timber samples according to which the next time for raising the samples was to be summer 2013. However, there is currently a large amount of information on the timber decomposition process at the *Vrouw Maria* wreck and there was no need to raise the samples at this precise moment. Obtaining the samples from the wreck and analysing them alike demand resources that are beyond what is currently possible. It might be worth studying the MoSS samples in combination with other research at the wreck in the future or using the samples to support other research.

#### 25.5. *Vrouw Maria* research subject bank

The *Vrouw Maria* offers topics for a wide range of research in different disciplines. A research subject bank has been set up on the National Board of Antiquities' website which is updated as required. These topics are also presented in the sections of this report. The National Board of Antiquities hopes that the research subject bank will inspire universities and other bodies to carry out research. The research subjects are divided into fieldwork and other research mainly on the basis of their emphasis. The fieldwork concerned would be small-scale fieldwork. More extensive excavations and raising the *Vrouw Maria* would naturally give rise to additional research paths. This would also result in a large amount of new research data.



The National Board of Antiquities' fieldwork in 2000–2012 has produced a large amount of research material, scientific analyses and reports. On the basis of this material, research can be continued even solely on the basis of the literature and archive material. The existing data (including multibeam sonar, video material) can also be used to produce new visual presentations. Thus, the multidisciplinary research associated with the Vrouw Maria opens doors to a wide variety of further research. The subjects presented in this report are largely based on the National Board of Antiquities' earlier research goals and those aspects which remain incomplete, as it can rarely be said that a particular site has been thoroughly researched. The topics presented here are more in the nature of examples and naturally other research topics can be found.

## 25.6. How could research into the Vrouw Maria be continued in the field?

### 1. The Vrouw Maria as a ship

Using the research methods applied up until now it is not possible to obtain any more essential information about the structure of the ship. If it is desired to use ship archaeology methods, for example, to determine how the Vrouw Maria was constructed, the cargo must be raised from the vessel before research is carried out. This would enable the ship's construction tradition, etc. to be established.

### 2. The Vrouw Maria's cargo hold

Surveys of the Vrouw Maria's cargo hold could be continued. This would enable a more accurate picture to be obtained of how the cargo hold, 19 metres long, was loaded and packed. Packaging methods and research into the timber material of barrels and packing crates, for example, is one research path, as is pollen analysis of their content. This would enable conclusions to be drawn on the route of the cargo, among other things.

### 3. Scanning sonar

In recent years, scanning sonar technology has progressed by leaps and bounds. Currently, this technology produces remarkably accurate 3D images also underwater. This method could be used to obtain an overall picture of the structure of the Vrouw Maria and of various details, e.g. the sides (side profiles). If four pieces of equipment were sited under the water and their beams directed only towards the wreck, the documentation itself would be relatively fast.

### 4. Measuring the environmental parameters of the Vrouw Maria wreck

In 2002, in partnership with the then Finnish Institute of Marine Research, the National Board of Antiquities bought recording measuring equipment to survey environmental conditions which measures the following parameters: aquatic oxygen content, redox potential, pH and turbidity. The equipment was most recently used to explore the environmental factors affecting the wreck of the Vrouw Maria in 2004, with the Finnish Institute of Marine Research's thermometers and current meters. After this, the measuring equipment was used

on the wrecks of the St. Michel and the Kasuuni and in research into Suomenlinna. In order to obtain information about any environmental changes occurring at the wreck of the Vrouw Maria, it would be helpful if new measurements of the environmental parameters were taken regularly, e.g. at intervals of 12–15 years. The National Board of Antiquities has no expertise in interpreting the results obtained from the measurements or servicing the equipment. The Finnish Institute of Marine Research and the current Finnish Meteorological Institute have maintained the equipment in line with the needs of the National Board of Antiquities in accordance with the cooperation agreement between the agencies. It would be useful to obtain the measurements taken at the Vrouw Maria within the remit of this cooperation agreement.

## 25.7 How can Vrouw Maria research continue on the basis of existing material?

### 1. The Vrouw Maria as a ship

It is possible to improve the accuracy of the documentation of the ship in drawings on the basis of existing visual material, for example updating of the drawings at deck level is still in progress. It is also possible to continue research cooperation with the Netherlands and Russia and research, for example, the wrecks of merchant ships originating from the Netherlands as a broader whole. For example, the research on the sea bed required for the construction of the Nord Stream gas pipe in the Baltic Sea produced extensive research material, where the wreck dating to the eighteenth century found in the Russian sea area could be compared with the Vrouw Maria. Research into the Dutch written sources should be continued regarding the Vrouw Maria and the Vrouw Maria should be compared with other Dutch merchant ships of the period. Each ship is unique in its own way but is the Vrouw Maria a typical representative of its period, e.g. in terms of its size or not?

### 2. Vrouw Maria archive research

The most important element from the point of view of establishing the history of the ship would be to locate the sale document for the vessel which sank in the Archipelago Sea in the Amsterdam City Archives. Archive material can be ordered from the Netherlands by researchers in Finland.

### 3. Eighteenth-century merchant ships

The wrecks of merchant ships found in Finnish waters dating from the eighteenth century would offer an interesting research subject for broader research. One example of this kind of research is the operations of the salvage and diving and rescue companies in the eighteenth century. Already known wreck material could be reassessed and compared with the Vrouw Maria and it would be useful to continue research both in the field and in archives. This research viewpoint has partly been carried out in Riikka Alvik's thesis "Things on Board" which examines trade routes from Amsterdam to St. Petersburg particularly on the basis of the source material provided by wreck research.

#### 4. The historical figures linked to the story of the Vrouw Maria

The Vrouw Maria is also associated with several important historical figures in Swedish and Russian history. So far, research has gained new angles, for example, from the correspondence of Catherine the Great and French philosopher Voltaire. After the shipwreck of the Vrouw Maria, the list of goods salvaged included the names of several members of the Russian court and merchants whose personal history could be researched further. For example, interest in plants typical of the Enlightenment can also be seen in the cargo of the Vrouw Maria in the form of bulbs and flower seeds. Personal histories would also offer an interesting topic for research, particularly if they were examined, for example, in the light of court life or typical phenomena of the Age of Enlightenment. Several members of the court ordered, among other things, various printed products, snuff, tobacco, textiles and decorative items.

#### 5. Presenting the Vrouw Maria visually and virtually

Virtual technology is developing and changing quickly. For this reason, it is clear that the simulation produced during the Vrouw Maria Underwater project will become out of date in terms of its technology. The simulation was created such that it would be able to be updated if necessary, e.g. by adding new video or sound. At the moment, doing so does not pose a problem. It is possible, however, that in the future as presentation technology is updated, technical problems may arise, partly as the current Unity platform becomes insufficient and due to the technical limitations of the Kinect software used for the user interface. The Vrouw Maria Underwater project sees the simulation now produced as a special kind of starting point in presenting underwater cultural heritage.

#### 6. The cultural and social importance of the Vrouw Maria?

It would also be useful to assess the information offered by the Vrouw Maria and its value as a cultural heritage site from a broader social point of view. What is the importance of the Vrouw Maria at local, national and international level? What is the significance of the wreck to local residents? What does the general public think of the Vrouw Maria and does it attract interest? How is the Vrouw Maria presented in the media in Finland and abroad?

## **26. Options for the future of the Vrouw Maria wreck in the 2007 report**

The Vrouw Maria Underwater project (option B) was one of the five different options presented for the future of the wreck in the 2007 Vrouw Maria report ([www.nba.fi/fi/File/496/vrouw-maria-selvitys.pdf](http://www.nba.fi/fi/File/496/vrouw-maria-selvitys.pdf)). Below, the options which were not carried out are briefly set out and the option of raising the wreck is examined in slightly more detail based on the situation in 2013. It was not possible to produce new updated information or views on the other options; information on methods available, budgets, etc. is thus based on the situation in the mid 2000s.

### **Option A: The current situation continues**

#### **Summary:**

The wreck of the Vrouw Maria, its contents and all the loose material outside the wreck are preserved in the place in which they were found. The development of the condition of the wreck is monitored using inspection dives. In addition, where possible, the timber samples taken to the site during the MoSS project will be raised. No new field research will be carried out at the wreck on the initiative of the National Board of Antiquities. The option can be carried out by salaried staff at the National Board of Antiquities. The option is the minimum requirement for preserving a historically important site. Protection of the wreck is safeguarded by continuing to monitor the wreck and the existence of a protective zone in accordance with the Antiquities Act. Where necessary, the need for protection and monitoring of the wreck will be re-assessed.

Further information: This report, section 25. What next after the Vrouw Maria Underwater project? and the Vrouw Maria report 2007.

### **Option C 1: Underwater excavation and preserving items in a museum**

#### **Summary:**

The Vrouw Maria wreck is excavated in the place in which it was found at a depth of 40 metres, items are raised and conserved and displayed in a museum. The hull of the wreck is documented, protected and preserved in situ. The emptied hull of the wreck is documented and protected. The hull is displayed in situ and virtually. The objects from the wreck of the Vrouw Maria are displayed in a museum. This option requires approximately ten years of continuing archaeological research excavation which includes documentation, excavation work, dismantling and supporting the hull of the wreck, raising items and protecting the hull of the wreck in situ. In some cases, conservation of raised items may take more than ten years.

Further information: Vrouw Maria report 2007.

## Option C 2: Underwater excavation and creating a museum

### Summary:

The wreck of the *Vrouw Maria* is excavated in the place in which it was found. The objects on board and the hull are raised. The wreck of the *Vrouw Maria* and the items on board are displayed in a museum. This option requires approximately fifteen years of continuing fieldwork which includes documentation, excavation work, dismantling the hull of the wreck and raising items and the hull. In some cases, conservation of raised items may take more than ten years. Conservation of the hull of the raised wreck takes 15–20 years. This option requires that the emptied hull of the wreck is documented and raised in parts and/or as larger sections. After the hull is raised, the site is examined. This option requires a new museum building and sufficient staff.

Further information: *Vrouw Maria* report 2007.

## Option D: Raising the wreck in its entirety and creating a museum

### Summary:

The wreck of the *Vrouw Maria* is raised with its cargo and excavated on land in controlled conditions. The wreck of the *Vrouw Maria* and the items on board are displayed in a museum. Planning to raise the wreck and the preparatory fieldwork takes about three years. After the hull is raised, the site is examined. In some cases, conservation of raised items may take more than ten years. Conservation of the hull of the raised wreck takes 15–20 years. This option requires a new museum building and sufficient staff.

## 27. Potentially raising the wreck of the Vrouw Maria

The situation regarding the raising of the Vrouw Maria has changed since 2007, when the report published into the Vrouw Maria proposed the Vrouw Maria Underwater project rather than raising the wreck.

The legal process has been resolved; the wreck and its cargo are owned by the Finnish state. Research into raised wooden wrecks has also progressed much further. We know more about the timber decomposition process in water and the conservation of waterlogged timber and new solutions have been found for preserving collections of objects comprising different materials in museum conditions. Despite this, the raised and conserved wooden wreck cannot be retained in museum conditions without management, proper monitoring and continuing conservation measures.

In principle, however, the situation has changed, and the outlook in terms of raising the wreck is more positive. In addition, the Vrouw Maria Underwater project has produced new information about the wreck and its condition, its cargo and the underwater landscape and the Vrouw Maria simulation has been completed. This paves the way for a unique combination in which a raised and conserved wreck and the underwater landscape in which the Vrouw Maria was once located could both be presented. This would enable museum visitors to explore both the underwater landscape of the wreck using the virtual simulation and the genuine conserved merchant vessel dating from the late eighteenth century.

During the Vrouw Maria Underwater project, some factors relating to raising the wreck were clarified. This work ended in autumn 2010 when the Ministry of Culture and Education decided that the raising scenario would not be taken further due to a lack of resources.

Before any new decision is reached on raising the wreck, the following issues should be examined and resolved: a raising plan in order to gain a Natura permit, other permits required, conservation method(s), funding for the entire project as well as the site of the raised wreck and the principle on which a museum would operate. The degree of deterioration of the timber of the Vrouw Maria wreck and the structural condition of the wreck would also have to be ascertained. In addition, different administrative questions need to be resolved. It must also be decided whether the Vrouw Maria is the wreck – maybe the only wreck – which Finland wishes to and is able to raise.

The above questions can be grouped as follows:

1. Permits from authorities, including Metsähallitus, ELY Centre for Southwest Finland, Ministry of the Environment (?), government (?), European Commission (?). (Here permits also mean statements on the Natura process, permission for a new museum building, administrative arrangements, etc.)
2. Resolving conservation (conservation methods need to be chosen, researched and tested such that they are suitable for the subject).
3. Finding funding and resources (fieldwork, excavation/raising, transport, conservation, preservation, new museum building, staff and maintenance costs, etc.)

The process diagram created during the Vrouw Maria Underwater project in 2012 may prove useful to those considering raising the Vrouw Maria in providing a tentative outline of the different stages involved. The diagram sets out one possible method for raising the wreck, its conservation and the creation of a museum. It also includes the budget estimates and the costs of the different stages (total budget EUR 80–100 million).

## 28. Basic site data

National Board of Antiquities ancient monument register no.	1658 (non-moveable ancient monument)
Municipality and village	Town of Pargas, village of Trunsjö, Archipelago National Park
Site	Rno 533-893-2-1, Archipelago National Park
Map	1033 01 Smedskären 1: 20,000, Helsinki 1993
Finnish National Coordinate System	6629357, 1544334
Chart	FIN24, Jurmo – Vänö
Description	The ancient monument area is approximately 2,000 m <sup>2</sup> (approximately 40 x 50 m). The area is delimited on the basis of side scan sonar and ROV surveys. The hull of the wreck is approximately 26 metres long and 7 metres wide. Parts of the structure and the rig lie on the sea bed around the wreck.
Depth	Depth at the sea bed 41 metres. The masts rise to a depth of 22–24 metres.
Land owner	Metsähallitus / Finnish State
Found by	Rauno Koivusaari / Pro Vrouw Maria ry 1999 (MV 15/306/1999)

## ANNEX 1

### Summary of research carried out at the wreck of the *Vrouw Maria* 1999–2012

Between 1999 and 2012, the following fieldwork research, inspection dives and surveys took place at the *Vrouw Maria* wreck:

- Identification and basic measurements 28.6 – 9.7.1999, Rauno Koivusaari, Pro *Vrouw Maria* organisation and Maija Fast, Maritime Museum of Finland, National Board of Antiquities.
- Field research camp 26.6 – 7.7.2000, Matias Laitinen, Maritime Museum of Finland.
- Inspection visit 28.5 – 30.5.2001, Matias Laitinen, Maritime Museum of Finland and Finnish Navy.
- Field research camp 15.6 – 6.7.2001, Matias Laitinen, Maritime Museum of Finland.
- Soil survey 2001, Jyrki Rantataro, Geological Survey of Finland.
- Topographical survey 2001, Finnish Maritime Administration.
- Inspection visit 12.2 – 14.2.2002, Minna Leino, Maritime Museum of Finland, Finnish Institute of Marine Research and the Archipelago Sea Coast Guard.
- Field research camp 1.6 – 20.6.2002, Minna Leino, Maritime Museum of Finland.
- Inspection visit 8.9 – 12.9.2002, Stefan Wessman, Maritime Museum of Finland.
- Inspection visit 10.12 – 14.12.2002, Stefan Wessman and Minna Leino, Maritime Museum of Finland, Finnish Institute of Marine Research and the Archipelago Sea Coast Guard.
- Field research camp 26.5 – 6.6.2003, Stefan Wessman, Maritime Museum of Finland.
- Inspection visit 26.8.2003, Stefan Wessman, Maritime Museum of Finland.
- Inspection visit 9.10.2003, Stefan Wessman, Maritime Museum of Finland, Finnish Institute of Marine Research and the Archipelago Sea Coast Guard.
- Field research camp 3.5 – 7.5.2004, Stefan Wessman, Maritime Archaeology Unit.
- Inspection visit 23.7 – 26.7.2007, Minna Leino, Maritime Archaeology Unit.
- Inspection visit 20.7 – 24.7.2009, Minna Leino, Maritime Archaeology Unit and *Vrouw Maria* Underwater project (jointly funded, included Riikka Alvik and Eero Ehanti).
- Field research camp 30.8 – 10.9.2010, Riikka Alvik, Maritime Archaeology Unit and *Vrouw Maria* Underwater project.
- Field research camp 4.7 – 15.7.2011, Riikka Alvik, Cultural Environment Management, Archaeological Field Services, *Vrouw Maria* Underwater project.
- Field research camp 4.6 – 15.6.2012, Riikka Alvik, Cultural Environment Management, Archaeological Field Services, *Vrouw Maria* Underwater project.
- Field research camp 10.9 – 14.9.2012, Riikka Alvik, Cultural Environment Management, Archaeological Field Services, *Vrouw Maria* Underwater project.



## ANNEX 2

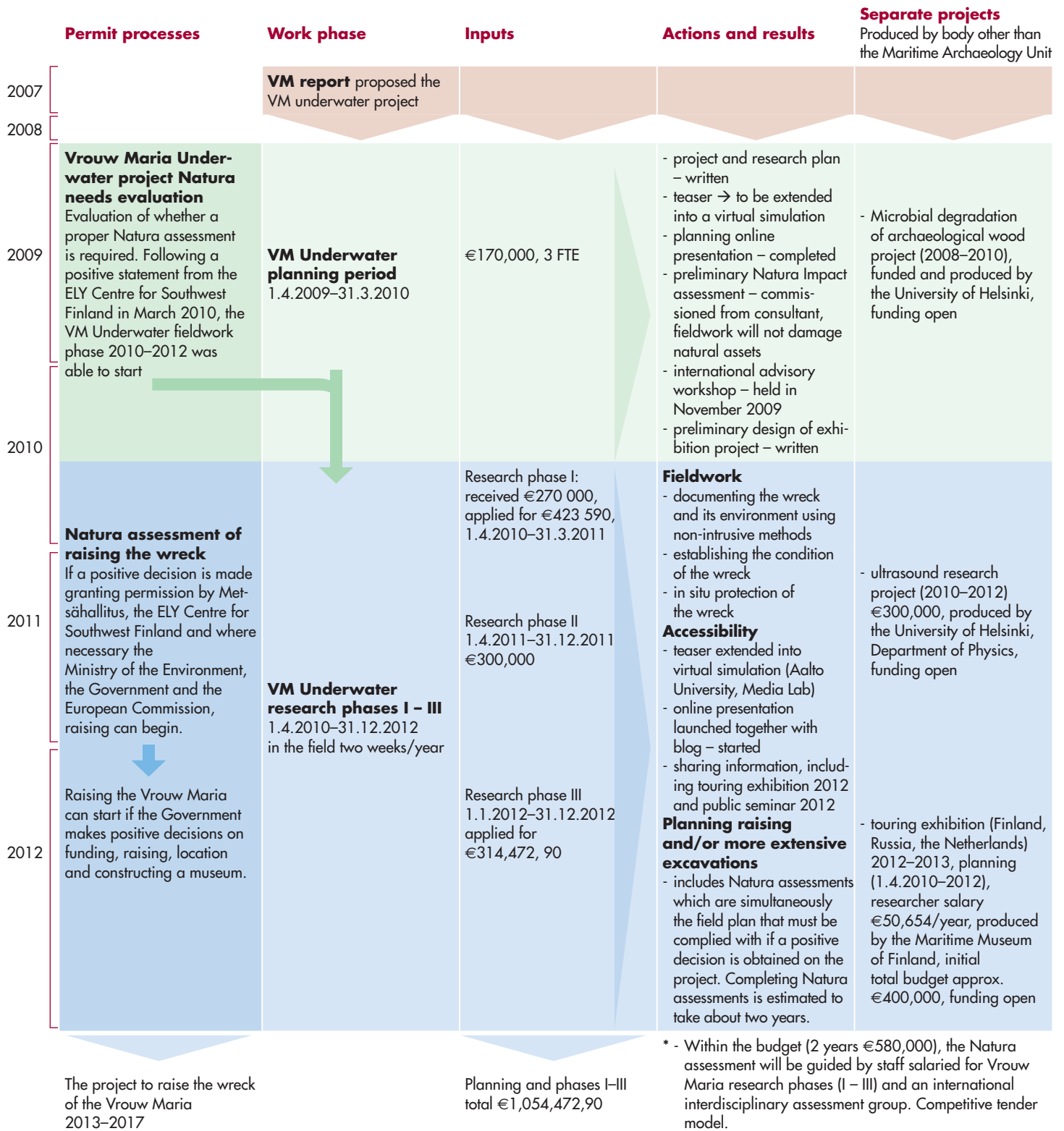
### The more extensive documents drawn up in the planning phase

Following sub reports, summaries, consultations, etc. were drawn up in the planning phase:

- Survey of the zoobenthos at the Vrouw Maria wreck 2009 (Monivesi Oy, Kimmo Karell, Ari Ruuskanen, Niko Nappu).
- Vrouw Maria Workshop, Helsinki, Suomenlinna 17–18 November 2009, summary and conclusions (Riikka Alvik, Eero Ehanti and Sallamaria Tikkanen), also in English (translation Eero Ehanti).
- Vrouw Maria, report on the inspection trip 2007–2009 (Minna Leino, Riikka Alvik, Eero Ehanti).
- The Vrouw Maria Underwater project, field research plan 2010 (Riikka Alvik).
- The Vrouw Maria Underwater project, preliminary Natura impact assessment (Alleco Oy, Ympäristötutkimus Yrjölä Oy).
- The Vrouw Maria Underwater project, project and research plan.
- Process diagram of Vrouw Maria research, raising, conservation and a new museum building.

The wreck of the Vrouw Maria 2010–2017:  
The Vrouw Maria Underwater project and the raising project, process diagram

Version November 2011, National Board of Antiquities



The project to raise the wreck of the Vrouw Maria 2013–2017

Planning and phases I–III total €1,054,472,90

\* - Within the budget (2 years €580,000), the Natura assessment will be guided by staff salaried for Vrouw Maria research phases (I – III) and an international interdisciplinary assessment group. Competitive tender model.

- Expert groups, consultancy fees, technical calculations, computer modelling, laboratory testing, meetings and travel, etc. involved in the planning and Natura assessment are included in the €580,000.

### Raising project 2013-2017

(Raising the wreck in its entirety with its cargo)

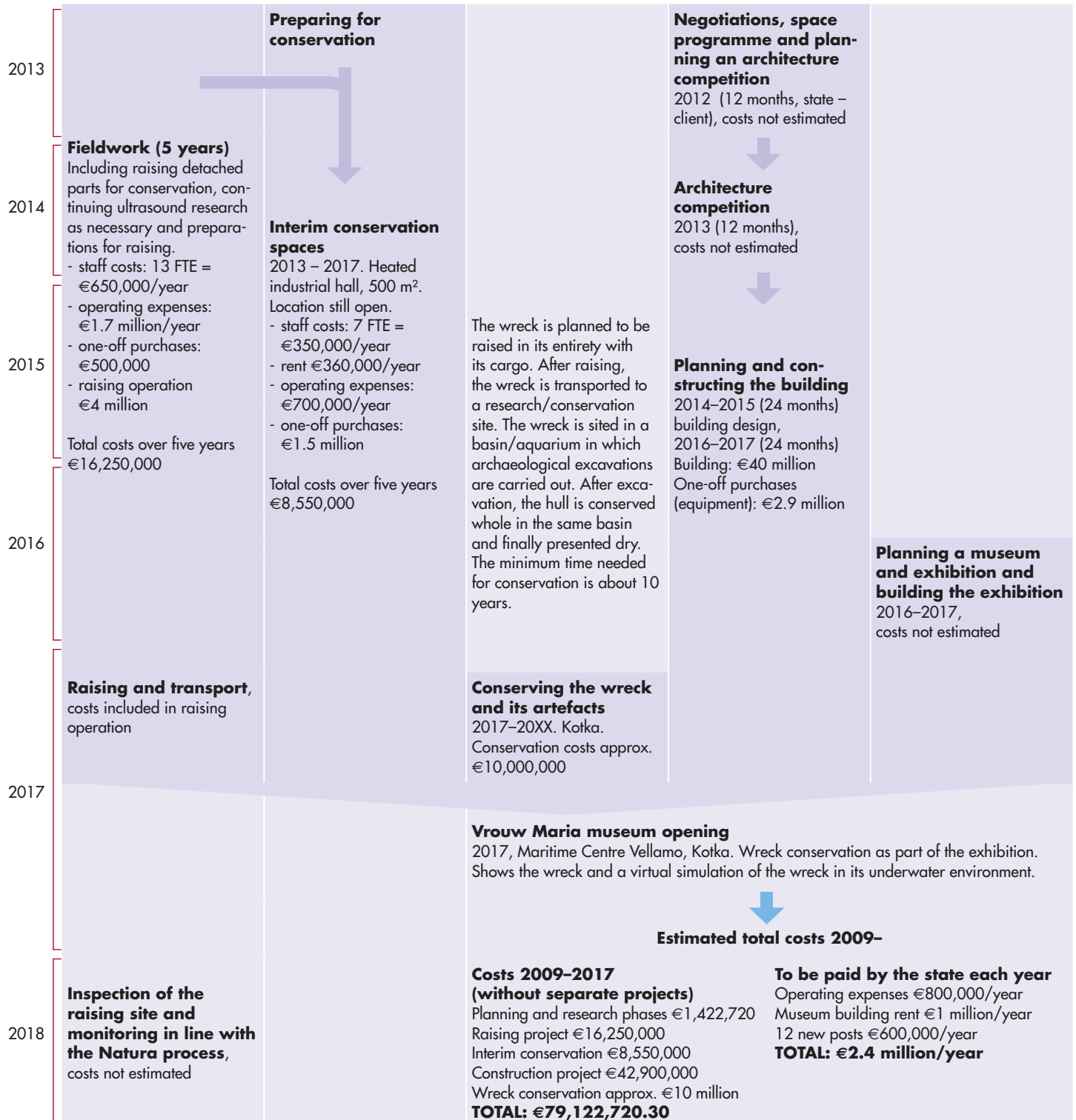
### Conservation project

### Building project

Construction and funding options to be explored, the National Board of Antiquities as a tenant.

Size 3,000 m<sup>2</sup>. Completed detailed plans.

- construction: €? (e.g. Maritime Centre Vellamo in Kotka approx. €40 million (12,000 m<sup>2</sup>))



- The different phases and their budgets are indicative and as the processes progress these will be specified where necessary (e.g. the costs of designing the exhibition are not shown in the process diagrams), entirely new cost groups may also arise as costs are specified further
- Different phases include research and documentation using different methods, including archaeology and conservation
- Information about different phases will be publicised and publications produced.