MoSS
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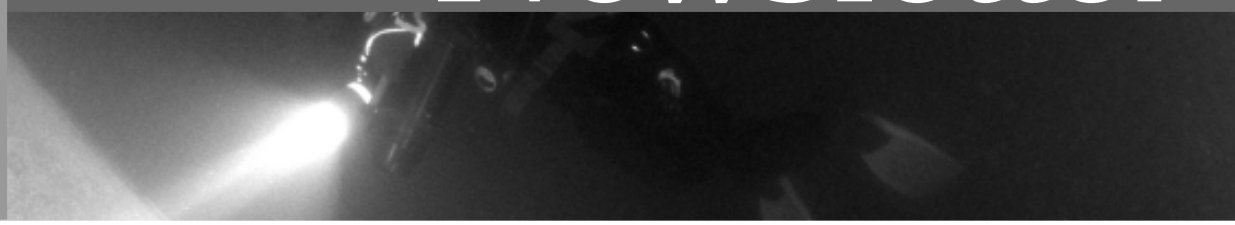
Newsletter

1/2003



A shipwreck research project funded by the European Union Culture 2000 Programme

Theme: Vrouw Maria

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Education and Culture
Culture 2000

Sallamaria Tikkanen, The Maritime Museum of Finland

What is MoSS?

MoSS is a three year shipwreck research project funded by the European Community Culture 2000 Programme. The project opens an underwater window to four significant European shipwreck sites in the Netherlands, Germany, Sweden and Finland. The project is organized by six European countries in 2001-2004. The project deals with the monitoring, safeguarding, and visualizing of shipwrecks. The project aims at telling European citizens about underwater cultural heritage and the importance of its protection.

The MoSS project is based on four shipwrecks, all of which are of great significance from a European point of view and show a diversity of intercultural relationships throughout a long period of history. The wrecks are located in Netherlands, Germany, Sweden, and Finland, and they represent different vessel types. The oldest of the wrecks is dated to the 13th century whereas the youngest is from the middle of the 19th century. The wrecks are in different kinds of underwater environments; in sea, lake, and brackish waters, and the conditions on the sites are both stable and unstable. The wrecks have preserved extremely well; two of them are almost intact.

"The project opens an underwater window to four significant European shipwreck sites in the Netherlands, Germany, Sweden and Finland."

The MoSS project has three main themes: monitoring, safeguarding and visualizing shipwrecks. The first theme includes monitoring the condition of the wrecks, or in other words doing research on the degradation of shipwrecks under water.

The aim of this theme is to develop and improve the methods used in monitoring the physical and environmental conditions of shipwrecks. The second theme is safeguarding, which aims at outlining and developing models to protect shipwrecks so that also the needs of different public groups are taken into account. The third theme is visualizing. The four shipwreck sites will be made physically visible using underwater and other images. The project will be advertised multilingually to the European public.

"The MoSS project has three main themes: monitoring, safeguarding and visualizing shipwrecks"

The MoSS project will consist also of fieldwork, Internet site, publications, posters, leaflets, reports, articles, meetings, and seminars. One of the objectives is to produce information not only to the general public but also to the experts in the area of protecting the cultural heritage. The aim is to awaken European peoples' interest to our common underwater cultural heritage and to have the general public participate in protecting the heritage. The wrecks of the project - ships that sailed on European waters - act as examples of maritime history as they tell us about the many local and international dimensions of the European culture.

The MoSS project is organized by The Maritime Museum of Finland (co-ordinator), The Mary Rose Archaeological Services Ltd. (United Kingdom), The National Service for Archaeological Heritage: Netherlands Institute for Ship- and Underwater Archaeology ROB/NISA (the Netherlands), The National Museum of Denmark/Centre for Maritime Archaeology (Denmark), The Department for Preservation of Archaeological Sites and Monuments / Archaeological State Museum of Mecklenburg-Vorpommern (Germany), and Södertörns högskola – University College (Sweden).

The MoSS Project is the first international shipwreck project that European Community Culture 2000 Programme funds. The European Community Culture 2000 Programme is a programme that supports international cultural co-operation projects that involve organizers from several countries. The objectives are among other things to encourage co-operation, to promote the common European cultural heritage, and to disseminate the knowledge of the history and culture of the peoples of Europe. In 2001, it was the first time projects on sub-aquatic archaeology were especially called to take part in the program.

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What's on?

Paola Palma, The Mary Rose Archaeological Services Ltd.

Monitoring

A monitoring strategy has been applied from the end of May 2002 to the three MoSS wreck sites measuring the environmental variables that affect wood on underwater archaeological sites.

Very often these variables are identified as threats to the preservation and the survival of a site. Therefore the monitoring procedure aims to identify and analyse the potential dangers in order to study and provide the right methodology for conducting and possibly piloting the development of monitoring protocols.

It is fundamental to assess the environmental dynamics as well as analyse the sediments that encapsulate archaeological material.

The investigation of the site formation processes will be focused on chemical, physical and biological factors. The biological aspects to be researched are the presence of bacteria and marine fungi activities as well as that of wood boring animals and human activities. The chemical aspects to be investigated are water quality and the chemistry of the sediment. The physical aspect will focus on sediment and water movements and erosion of timbers or artefacts.

Jaakko Nygrén, The Maritime Museum of Finland

The MoSS Web Site: New Information

In the spring of 2003, the MoSS Web Site will be updated with new layout and fresh information. The site is now in three languages - Germany, English and Finnish – but the renewed site will also be in Dutch and Swedish.

The new MoSS Web Site uses Macromedia Flash 6 and Shockwave 3D Internet technology. It will be an accessible and rich site with video material, 3D virtual wrecks and animations. It is already possible to go on a virtual tour at the Vrouw Maria 3D reconstruction, where for example the hull of the ship can be seen the way it once was.

Both Macromedia Flash and Shockwave can be downloaded in the Internet.

You are welcome to visit the new MoSS Web Site at **www.mossproject.com**

Minna Leino, The Maritime Museum of Finland

Introduction of the Wreck of Vrouw Maria

In Finland's territorial waters, there are more than thousand wrecks from different eras. One of these is of special interest: it is a wreck of a ship of the type snow in the archipelago in the most southwestern parts of the country. At the depth of over 40 meters, the wreck appears well preserved. By the help of historical documents and maritime archaeological research, we now know the wreck is that of a Dutch Sailing ship called *Vrouw Maria*.

Vrouw Maria was a two-masted merchant vessel on her way from Amsterdam to St. Petersburg in the autumn of the year 1771. On a stormy night in the outer archipelago of Nauvo, *Vrouw Maria* suffered shipwreck and, a few days later, sank. According to the entries of the Sound customs house in Denmark, she was with a cargo of sugar, dyestuff, zinc, cloths, and unspecified single items. *Vrouw Maria* has a reputation of a treasure ship because her cargo consisted of art treasures bought by Russian aristocrats and Catherine the Great. Among the works of art there were for example Dutch paintings from the 17th century. A part of the cargo was salvaged soon after the shipwreck, but the majority of it went down with the ship.

History of Research

The very first documents about the history of *Vrouw Maria* were found by Dr. Christian Ahlström in the Finnish National Archives as early as in the 1970's. The most important source for researchers is the ship's protest, which was found in the municipal archives of Turku. The document consists of an extract of *Vrouw Maria*'s logbook and a list of the things that were salvaged. In the Diplomatica Collection in Riksarkivet, the Swedish National Archives in Stockholm, there is diplomatic correspondence concerning the attempts to search and salvage the ship.

For years, amateur divers tried to find the wreck. In 1999 Mr Rauno Koivusaari and other members of a society called *Pro Vrouw Maria* managed to locate the wreck using a side-scan sonar. The Finnish Maritime Museum, being responsible for the underwater cultural heritage in Finland, started field research on the wreck site in the summer of 2000. Since 2001 Vrouw Maria has been a part of a European project called MoSS (Monitoring, Safeguarding and Visualizing North-European Shipwreck Sites), the first international shipwreck project within the European Community Culture 2000 Programme.

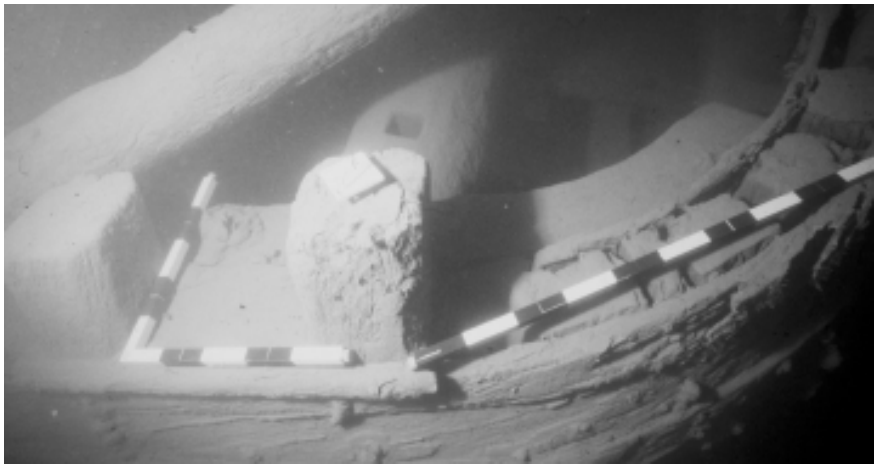
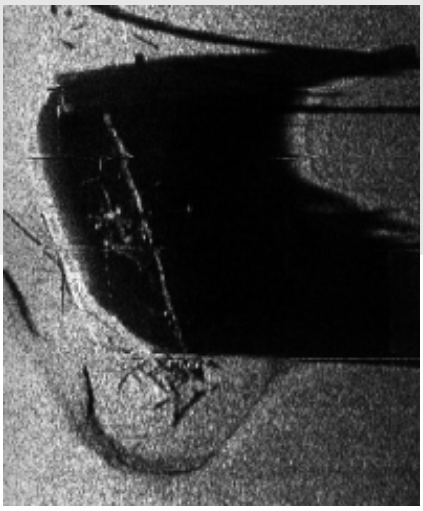


Fig. 2. The reference point No. 1 on top of a bollard. Photo: Jouni Polkko.

Fig. 1. A side scan sonar image of the wreck of Vrouw Maria. Image: The Finnish Defense Forces.



The Wreck

The wreck appears at sailing position in a small deep that is surrounded by shallows. The wreck is approximately 26 meters long and 7 meters wide. It lies on its keel on the bottom of the sea and leans on its starboard side. The masts, which are standing up, rise to a depth of 22 - 24 meters. The masts are made of three parts, and the upper parts have fallen down on the starboard side of the wreck on the bottom of the sea.

In general, the framework of the ship seems to be in good condition. The salvage operations at the time of the shipwreck did, however, damage the ship: the rudder is lacking, and the transom is lost as well. The ship's five-meter-long tiller lies partly crosswise on the stern deck on the starboard side. On the deck, there are various single parts of the framework that either came off when the ship sank or that have fallen down from the rigging in the course of time. Among these pieces are the remains of the deck cabin. The windlass is undamaged, and there is still a lever attached to the windlass stock. Both the pumps are still upright, and one of them still has the piston rod in its place.

The Field Research

of the Maritime Museum of Finland at the Wreck Site of Vrouw Maria in

2001 – 2002

In the years of 2001 and 2002, the Maritime Museum of Finland used all in all seven weeks on the field research at the wreck of Vrouw Maria. Besides the researchers of the Museum, at the site there were also voluntary divers. The divers used both compressed air and trimix as breathing gas. The researchers and the divers used the old coastguard station of Bodö as their base on land and an old trawler called m/s Teredo was the group's support vessel. The working days were rather long since the mere ride from Bodö to the wreck site takes an hour and a half.

Safeguarding

The wreck is located in the outer archipelago, by the open sea, where it is exposed to winds. There are no shipping channels or human settlement near the wreck. The Coast Guard of Finland has the area under constant camera surveillance, and there has not been any kind of unauthorized activity at the site. Lowering the anchor and diving are in fact forbidden at the site since 2000.

The research work itself is a danger to the wreck. When anchoring the support vessel near the wreck, there is a notable risk that the remains of the almost intact hull are damaged. When the fieldwork was first started, the divers went underwater from a moving small boat. To ease the diving, a fixed anchoring system was put up on the support vessel in the summer of 2001. The Finnish Maritime Administration placed heavy weights near the wreck and now buoys are fastened to the bottom of the sea.

Surroundings and Monitoring

The Finnish Maritime Administration and the Geological Survey of Finland were appointed to investigate the surroundings of the wreck in the summer of 2001. The Finnish Maritime Administration examined the profile of the sea bottom near the wreck with a multi-beam sonar. The geological analysis made by the Geological Survey of Finland showed that Vrouw Maria lies on a thick layer of clay. Only the thin top layer is of sand/moraine.

The monitoring of the wreck was started in 2001 in co-operation with the Finnish Institute of Marine Research. The environmental investigations and the monitoring of the wreck help not only in the research of the condition of the wreck but also in the planning of the conservation and the possible salvage of the wreck. At the beginning of June, an ADCP (*Acoustic Doppler Current Profiler*) apparatus that measures water movements and two other apparatuses that measure temperature were placed at the site. Information about the water movements in the summer was unfortunately of no use but the data concerning the water temperature in June-November show that the water temperature near the wreck, in the depth of 41 meters, can change notably. At its lowest the temperature was not more than – 0.7°C.

Fig. 3. Above the windlass can be seen the bowsprit, which today is leaning against the bow next to the stempost. Photo: Jouni Polkko.

In the autumn of 2002, a CTD (*Conductivity Temperature Depth*) apparatus was placed near the stem of the wreck in order to investigate the water temperature, conductibility, salinity, oxygen, pH, turbidity and the redox potential. At the same time, the ADCP apparatus started measuring the current profile in the entire water column. The first set of data was collected in December 2002. According to preliminary results, the conditions near the sea bottom were rather stable from the beginning of September to the end of October. Only the oxygen level had dropped, which means that the stratification was so strong that the water at the bottom had yet not blended with the oxygenic water of the surface. On the 23rd of October, the qualities of the water at the bottom suddenly changed: the temperature and the level of oxygen rose, the salinity of the water dropped, and the water movements from the bottom up to the surface were very dynamic. The reason for the blending and moving was a strong wind that blew from the east that day.

The deterioration of wood is investigated by the help of wooden samples. In June 2002, five metal grids with 33 samples each were placed at the site. The samples help us to determine the types of wood boring animals, fungus and bacteria that decompose waterlogged wood. In addition, the aim is to find out how well the wood wears and what are the chemical changes that take place in it. A part of the samples are wrapped within filter-textile of different grades. The aim is to get information about the way the textile protects wooden wrecks from mechanical wear and different wood boring organisms that gnaw wood. The first set of samples was raised from the site and sent to the Mary Rose Archaeological Services to be analysed, but the results are not yet ready.

Fig. 4. Woodsamples are being prepared at the pier of Bodö. Photo: Ulla Klemelä.

Also the biological, chemical and physical changes in wood within the sea bottom are analysed by the help of wooden and textile samples. In the autumn of 2002, an ejector pump was used to insert three plastic tubes with samples to be embedded in the sea bottom near the stern of the wreck. The pump was not, however, very well suited for this purpose and the researchers did not manage to get the samples in an entirely anaerobic environment. The results from this set of samples can therefore not be compared with the results from the other two wrecks within the monitoring theme of the MoSS Project. The rest of the samples will be placed at the site in the summer of 2003, and it is our intention to embed them in the sea bottom so that the circumstances surely are anaerobic and that the results are of real use in the view of the project's monitoring theme.

Underwater Investigations

The extent of the site was measured by a side-scan sonar, divers, and a ROV operator. One of the ship's anchors was found deep within the sea bottom next to the wreck, which means that Vrouw Maria sank precisely where the shipwreck took place in 1771. When diving, the main emphasis of the research was put on basic documentation work with non-destructive methods. One of the aims was to receive information for a computer-aided three-dimensional reconstruction of the wreck. The information was gathered by measuring the hull and pieces of the wreck from the outside. It is difficult to estimate the strength of the wreck's structure since all the significant joints are under the cargo inside the wreck.

In the documentation work, the researchers did a lot of photographing and videotaping. Most of the different lengths were determined with tape measurement but also an Aqua-Metre D100 apparatus was used. The different angles were successfully gauged with a digital inclinometer and the shapes of the hull were easily detected. A mini robot camera (ROV) investigated the interior of the wreck. The interior investigating takes time because there is free space between the cargo and the deck beams only for half a meter. The wainscots, which can be seen through the sediment, are broken at their upper ends. What makes the research work even more difficult is the even layer of sediment that covers the cargo everywhere. This is why it has not been possible to find out the use of the inner parts of the ship.

"In the hold there are packing cases, half-broken barrels, a box filled with lenses, zinc ingots..."

The researchers have, however, managed to locate the crew's quarters in the bow, the hold, and a cabin in the stern. In front of the windlass there is a brick stovepipe that reveals the location of the ship's galley. The pipe reaches the deck. The use of a deck cabin behind the mainmast remains unclear since the top part of the mast has collapsed and damaged the cabin badly. In the hold there are packing cases, half-broken barrels, a box filled with lenses, zinc ingots, clay tobacco pipes, lead seals, and something that may well be rolls of cloths. We do not yet know all the art treasures in the cargo but we believe that there are at least eleven Flemish, Italian, and Dutch paintings from the 16th and 17th century.

Visualisation

The material collected during the basic documentation work was used when the wreck was visualized to the general public by the making of drawings. At the site there were also professional photographers and filming groups. In the summer of 2001 there was a Canadian production company *Echo Nova Productions* making a film called *Catherine the Greats Ghost Ship*. The film is a part of the National Geographic TV Series *Sea Hunters* and it tells about the history of Vrouw Maria. In the summer of 2002 there was a Finnish production company *Matila & Röhr Productions* at the site. The company had stationary lighting system with them so that the whole deck was almost completely lit up. In addition to this, we did some experimental photographing with a tripod and natural light.

We now have two models of the wreck; one is a traditional scale model and the other is a computer-aided three-dimensional reconstruction of the wreck. The scale model is on exhibition at the Maritime Museum of Finland. The builder of the model is Kalle Salonen who knows the wreck of Vrouw Maria extremely well. He has dived on the wreck dozens of times and worked as a ROV operator during our field research. Salonen has also used hundreds of hours in watching videotapes on the wreck.

In the view of the visualisation theme, the computer-aided three-dimensional reconstruction of the wreck is very useful since our intention is to have it on the Internet site of Vrouw Maria.

Future Investigations

Even if time seems to have stopped at the sea bottom, the degradation of the wreck will not come to a stop. During the three-year research project, the aim is to carefully examine the circumstances at the site in order to be able to foresee the changes that will take place in the near future. We cannot guarantee that the wreck will be preserved. The field research will go on in the summer and autumn of 2003.

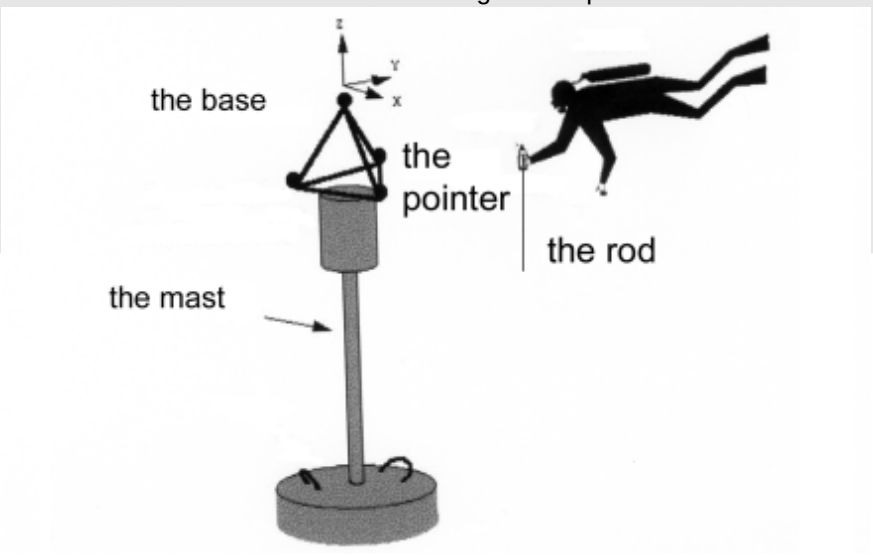
Fig. 5. A cathead at the bow of the wreck. Photo: Jukka Nurminen.

When the field season 2003 ends, we believe that most of the basic documentation work on Vrouw Maria is done. The collected information will then help us to make the right decisions when it comes to the future of Vrouw Maria. Should we salvage the wreck and have it on show in a museum? Should all or some of the excavation be done in the depth of 40 meters, or would it be better if the wreck were moved in shallower waters before the excavation? Or should we leave the wreck untouched for the future generations?

Minna Leino, The Maritime Museum of Finland

Experiences of the Underwater Positioning System AQUA-METRE D100

Figure 1. Aqua-Metre D100.



The Maritime Museum of Finland began field research on the wreck of Vrouw Maria in the summer of 2000. Researchers, who were aided by a group of voluntary divers, documented the wreck by photographing and videotaping it for two weeks. At the depth of over 40 metres, the wreck appears at sailing position with its hull intact. The depth and the state of preservation make the wreck a challenging target for documentation. To speed up the documentation process, the researchers needed modern technology, and they wanted to test an underwater positioning system already in the summer of 2001.

Acoustic positioning systems have a reputation amongst marine archaeologists for being expensive, complex and hard to get hold of. The fact is, however, that there are different sorts of underwater positioning systems that have been developed especially for underwater archaeology (e.g. SHARPS, HPASS etc.). At the Maritime Museum of Finland, we had no previous experience of equipment of this kind, and we decided to get familiar with one of these systems. We were looking for equipment that was inexpensive, easy to deal with and effective enough to be fit for use at the wreck of Vrouw Maria. The nearest offer of rent came from France from a company called P.L.S.M. (Positioning Locale Sur la Mer).

P.L.S.M. is specialised in accurate underwater acoustic positioning systems. The company started in 1996/97 with the development of a new local underwater positioning system for underwater archaeology. The marketed version of this system is called Aqua-Metre D100.

System Definition and Experiences of the Main Units

The Aqua-Metre D100 is a local underwater positioning system based on an acoustic interferometric scheme (mainly known as Ultra Short Base Line or USBL). It is particularly suited to accurate local 3D locating within the range of up to 100 metres from the reference point. It is a stand-alone system; there are no cables from the base to the surface, and a single diver can operate it. Measurement set up and retrieval are performed using standard PC based software and an infrared data link. The DXF file format output allows direct link to CAD tools.

The Aqua-Metre D100 is made of two main components: the base and the pointer (fig. 1). The measurement base constitutes the reference Cartesian coordinate system {0,0,0}) at the top of a mast, which is two and a half metres. The mast remains underwater during the whole measurement operation. The base has to be charged on the surface approximately once a day.

The system requires at least two reference points. The same coordinates can be used during the documentation even if the base is moved. The computer takes care of all of the coordinates in the data retrieval phase. The portable pointer, which includes a small keyboard and LCD display panel, allows the diver to measure positions (x, y and z coordinates) and save them in the back-up memory. The pointer is fitted with a rod that creates measurement offset from the sea bottom.

In principal the main components are pretty straightforward to use. The information is easy to pick up in the manual, which is available in French and also in English. In practice there are a few pitfalls. In our opinion, there ought to be a checklist the diver could follow at the beginning of the measuring. Once the pointer is at the measurement mode, it is easy to continue. The shields in the base and in the pointer ought to be easier to use. They are too delicate to be operated with cold-water-diving-gear (especially with gloves).

The rod of the pointer is 1,32 m long and in case you cannot attach yourself to anything, you really need to be a master in buoyancy because the pointer allows an inclination of 5 degrees only. The pointy end of the rod is made of plastic, which makes it very slippery - why not make it of rubber, for example? Normally the pointy end of the rod is the only thing touching the object that is being measured and therefore the touch of the rod should be as soft as possible. The LCD panel of the pointer is in a vertical position during the measuring operation, which makes it difficult for the diver to read and press the buttons.

Suitable Underwater Environment for the Use of Aqua-Metre D100

To be able to operate, the Aqua-Metre D100 requires a direct acoustic path between the base and the pointer. Below the direct acoustic path, there must be clear water at least for one metre so that reflections from the surface can be avoided (fig. 2). An obstacle between the base and the pointer affects the accuracy of the measurements or simply makes the acoustic wave vanish. For example, a diving partner can affect the measurements if he or she happens to swim across the path.

The system requires a depth of at least 5 metres to be able to operate well because the base itself takes 2,5 metres and then there has to be water for at least another 2,5 metres between the interferometric frame of the base and the surface (fig. 2). If there is not enough water above the base, the acoustic reflections from the surface make a direct acoustic path impossible. When working on areas where the depth is not more than 5 metres, the distance between the base and the pointer cannot be more than 30 metres. Otherwise the accuracy may be reduced because of the severe multipath environment. According to the manufacturer, the maximum distance between the base and the pointer is 100 metres, and to operate well in this area, the system requires a depth of at least 10 or 15 metres. When planning the location of the mast in the investigation area, one must remember the blind area around the base (fig. 4). When the mast is in a slope the blind area is even larger.

If the documented area is surrounded by steep bedrock outbursts these will affect the measuring process. On areas too close to the outbursts, the use of Aqua-Metre D100 is impossible. We know now from our experience that one must not be within 2 - 4 metres from outbursts. (The distance depends on the steepness of the cliff.) One should pay attention to researching the topography of the investigation area beforehand!

Testing at the Vrouw Maria Wreck Site in 2001

There must be a direct acoustic path from the base to the reference points and therefore it is sensible to have several reference points to begin with to guarantee that the direct acoustic path is as wide as needed. A great deal of thought was put into planning how the reference points and the mast of the base had to be situated on the site of the Vrouw Maria. Our task was to map the deck level of the wreck and the loose parts on the sea bottom around the wreck.

Eight reference points were hammered into the wreck with copper nails. The points were situated on top of bollards and in the railing in different parts of the wreck. We chose copper nails because copper is not corrosive and in this way the wreck suffers only from the holes made by the nails. We decided to install two masts for the base on the deck of the wreck to avoid getting the upstanding masts in the way of our measurements. Between the hatches the deck was in such a good condition that it was possible to place the masts there. Normally one should prefer the sea bottom and not rely on the construction of the wreck.

We used both compressed air and trimix as breathing gas. The bottom time with trimix is half an hour, and with compressed air the time is not more than half of this. The system set up takes about five minutes diving time. The set up includes the fitting of the base into the mast, taking off the shield and switching on the power. The base starts a self-calibration procedure after this. In other words, when all this is done, one third of the bottom time of divers breathing compressed air has already passed. Therefore it was natural to have trimix-divers to do the first measurements with Aqua-Metre D100.

Divers managed to measure seven out of the eight reference points, and it was really hard work to keep still for several minutes. Four of the points took two minutes per point to measure, and the time spent for the rest of the points was from five to seven minutes. The system was not functioning as easily as in shallower waters. We began to believe that the NiMh batteries were the reason for the malfunctioning and contacted the inventor Mr. Medard. He came to Finland with a new type of batteries (NiCd). Meanwhile, we did several test dives but without success (Table 1). The seven successful measurements were then compared with

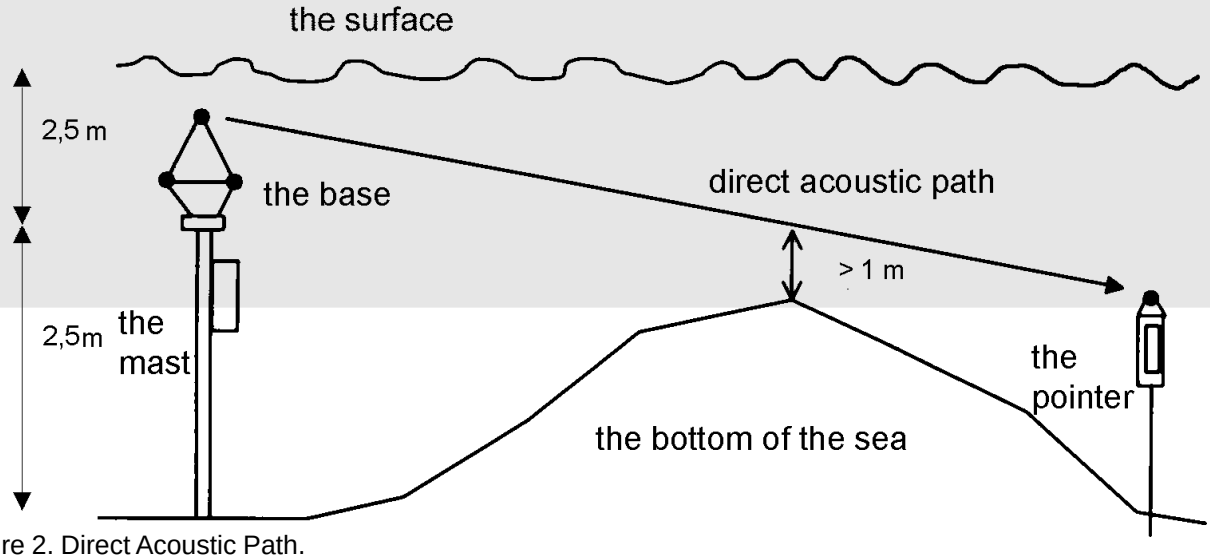


Figure 2. Direct Acoustic Path.

measurements that had been taken with tape measurement. The dispersion varied from 3-11 centimetres.

Mr. Medard suspected that there could be acoustic noise from the background interfering with the measurements but after having measured the silence of the deepness of the Baltic he had to reject this idea. However, it was an important point he made and one should always make sure that for example the echo sounders from the support vessels and other possible sources of acoustic noise are turned off. We managed to dive successfully with the new batteries once - although the diver had forgotten to take off the shield on top of the pointer. Unfortunately, after this dive the pointer started to warm up because of a leak. The leak was confirmed in the laboratory of the P.L.S.M. and at the same time also a fracture in a power wire was found. The P.L.S.M. suspected that our problems were caused by this fracture. This was a false conclusion, and it had an effect on our research in the following field-season!

Hard Testing Leads Us to Results

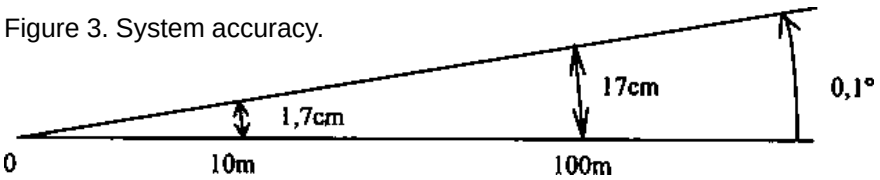
In the autumn of the year 2001 we hired the equipment again to test it in different underwater environments. We used Aqua-Metre D100 at the wreck of Kronprins Gustav Adolf and at two different wreck sites near the fortress island of Suomenlinna in front of Helsinki.

At the first wreck at Suomenlinna there were steep bedrock outbursts, which restricted our area, but whenever there was a connection the equipment was working fine. At the same wreck site we tested also the marking of the points. The marking labels were pressed into the wood with the aid of a copper thumb-pin. It did not attach well enough and more thoughts were given to improve the ROV co-operation in order to have an on-line connection. A good ROV co-operation would make the marking of the exact points unnecessary.

The third testing took place at a small wreck that is dated to late 17th century. The wreck is almost completely covered with mud and only parts of the frames were visible. The wreck, lying at the depth of seven metres, was mapped with a Total Station operated from the ice above the wreck. The points were measured also with the Aqua-Metre D100, and the accuracy seemed to be good. We were pleased with the test results. The equipment was sent back to France to wait for our next field season.

In May 2002 the Aqua-Metre D100 was back in Finland again and new staff of the Maritime Museum of Finland was rehearsing the use of the system on the nearby waters of the museum island. One day an old mine pond, Ojamo, acted as a test place for the voluntary divers of the Vrouw Maria Project. The equipment functioned properly and we prepared ourselves for the research camp with a peaceful mind.

Figure 3. System accuracy.



At the research camp, the difficulties started again. Bad experiences from the previous summer had made the research group a little suspicious about the equipment. Changes had been made in the parameters so that the address of the pointer was wrong, which led us to believe that all of a sudden the equipment was not working at all. The error was spotted after a while and the measuring at the Vrouw Maria wreck site could start. The equipment was tested during three different dives and every time there was a signal from the base, which indicated problems with the power system. Because the contact between the base and the pointer was very weak, we decided to give up testing and consult Mr. Medard in France.

After the field operations at the Vrouw Maria wreck site, the investigation team of the Maritime Museum of Finland moved to continue the research at a site nearby - a medieval ship wreckage scene at a place called Egelskär in the parish of Nauvo. The task was to document the top layer of the scene and to lift up foreseeable ceramic pots and other objects. The wreckage scene is on a slope and the base was located downhill. Reference points were created. At first we had difficulties in making the equipment work, but the reason for our problems turned out to be a diver's diving gear that had a very noisy Jetstream first stage. All in all 32 objects were taken off the site and the majority of the locations were determined by the help of the Aqua-Metre D100. The equipment did not work within a two-metre radius of the bedrock outburst. Otherwise the equipment was working just fine since the temperature of the surrounding water was +10 C. For the diver, the most difficult part of the dive was to try not to kick the 700-year old pots with his fins when keeping the pointer straight.

Conclusions

It is easy to agree with the common view that the acoustic positioning systems are expensive, complex and hard to get hold of. Nevertheless, after two years of testing the Aqua-Metre D100, we still have faith in the modern technology and its aid in documentation. The timetable has, however, become more realistic: the development of the systems will take some time. I believe that it is our moral duty to take part in this development process as thoroughly as we can. Our testing may help those who develop the systems and I would like to think that this way the many perspectives of our delicate research subjects become appreciated by technical experts as well.

The inventor of the Aqua-Metre D100 did finally test the NiMh batteries in cold water in the autumn of 2002. The test indicates clearly that the power diminishes when the water temperature drops under +5 C. At the Vrouw Maria wreck site the water temperature was +3,5 C at the time of our investigations. The power from the batteries was clearly insufficient. In the summer of 2003, we will once more try to make the Aqua-Metre D100 work at the wreck site of Vrouw Maria. If it still does not work, even with different batteries, that is, we will have to make the conclusion that the system operates only when the water temperature is over +5 C.

References

Green, Jeremy, Duncan, Alec 1999: Report on the 1998 evaluating trials of the High Precision Acoustic Surveying System (HPASS). The International Journal of Nautical Archaeology vol 28 no 1, 1999.

Greenough, J., Dart, P., Holt, P.: Recent Developments in Acoustic Techniques used in Marine Archaeology. Web-publication (http://www.threeh.demon.co.uk/Downloads/Recent Developments in Acoustic.pdf)

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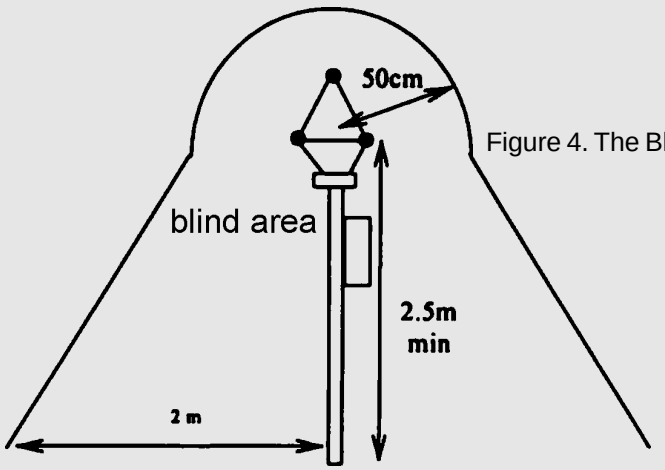


Figure 4. The Blind Area.

Table 1. Table over the measures taken for installment of the Aqua-metre D100 underwater positioning system at the Vrouw Maria site.

Date	Divers	Mission	Success
17th of June 2001	Minna Leino Matias Laitinen	To find suitable places for the masts.	Between the hatches there was a suitable area on which there were no vulnerable objects.
18th of June 2001	Pasi Raasakka Leo Teräväinen	To install the first mast.	The mast was taken to the right place and straightened into upright postion.
20th of June 2001	Pasi Raasakka Leo Teräväinen	To install the second mast.	The mast was taken to the right place and straightened into upright postion.
20th of June 2001	Minna Leino Matias Laitinen	To check the direct acoustic paths between the reference points and the masts with tape measurements.	Direct acoustic paths were possible between both of the masts and four different reference points.
20th of June 2001	Niko Nappu Kai Jahnsson	To check the direct acoustic paths between the reference points and the masts with tape measurements.	Direct acoustic paths were possible between both of the masts and two different reference points.
20th of June 2001	Pasi Raasakka Leo Teräväinen	To check the direct acoustic paths between the reference points and the masts with tape measurements.	Direct acoustic paths were possible between both of the masts and two different reference points.
21st of June 2001	Pasi Raasakka Leo Teräväinen	To install reference points 1 - 4.	Reference points (copper nails and code signs) were hammered into the right positions.
21st of June 2001	Niko Nappu Kai Jahnsson	To install reference points 5 - 8.	Reference points (copper nails and code signs) were hammered into the right positions.
21st of June 2001	Minna Leino Maija Flinkman	To check the reference points.	Some of the nails were moving so they needed to be hammered more.
25th of June 2001	Topi Sellman Pekka Paanasalo	To reinstall the reference points.	Reference points (copper nails and code signs) are ready to be used.
25th of June 2001	Pasi Raasakka Kalle Salonen Petri Puromies	To install the interface into the mast.	One of the two interfaces was installed.
25th of June 2001	Timo Niemi Juha Flinkman	To install the base and start the measuring of the reference points.	Seven out of the eight reference points were measured, problems with the batteries.
25th of June 2001	Tetti Sinisalo Peik Joutsen	To move the base into the SB mast and measure the reference points.	The pointer gave error signs only. Tried to increase the threshold.
26th of June 2001	Timo Niemi Juha Flinkman	To continue measuring and test different threshold levels.	-45 db,-35 db, -30 db, and -20 db were tested without any influence. It took 10 minutes to measure one point.
26th of June 2001	Topi Sellman Pekka Paanasalo	To test the equipment.	At the reference point no 1 the pointer collected information until 3/94. The base was giving red signal.
27th of June 2001	Minna Leino Pasi Raasakka	To test the equipment.	The test was unsuccessful (the shield on the base was not removed).
28th of June 2001	Minna Leino Pasi Raasakka	To test the equipment.	The pointer gave error signs only.
29th of June 2001	xxxxxx	To change the batteries.	Mr. Joel Medard replaced the NiMh -batteries of the pointer by NiCd -batteries.
2nd of July 2001	Mikko Kiirikki Jaakko Nurmela	To install the base into the mast and continue the measuring of the reference points.	All of the reference points were measured successfully.The diver forgot to remove the shiled on the pointer. The pointer had a leak and was completely distroyed.

Invitation

to the Second MoSS Seminar:

A Seminar on the Visualization of Shipwrecks and Shipwreck Sites.

To be held on Friday-Saturday, the 27th and 28th of June 2003 in Sweden at the Vasa Museum, Stockholm and at Forsvik Industrial Heritage and Shipyard Association, Karlsborg.

The Seminar is open for the general public

Preliminary Program

Friday, 27 June 2003

General public day:

Session I. The visualization of the Vasa and the Vasa museum:

Chairman: Director-General Keith Wijkander.

13.00 – 13.15 Welcome words. By Director-General of the Swedish National Maritime Museums, Dr. Keith Wijkander

13.15 – 16.00 Tour at Vasa Museum, followed by three presentations:

1. How it is working? By Klas Helmerson, Museum Director of The Vasa Museum

2. The conservation of the Vasa – today and in the future. By Ingrid Hall-Roth, Head of preservation of the Swedish National Maritime Museums

3. National and international aspects on the use and preservation of the maritime cultural heritage. By Björn Varenius, Head of the dept of Cultural History of the Swedish National Maritime Museums

The general public in the Vasa Museum will be welcome to follow the lecture program. (The seminar and the lectures in it will be announced in the museum's newsletter for the summer.)

16.30 – 20.30 Trip by bus to Forsvik (4 hours)

21.30 – 22.30 A light supper in Forsvik

Saturday, 28 June 2003

General public day:

Session II. Introduction session / The Forsvik Industrial Heritage and Forsvik Shipyard Association:

Chairman: Director-General Birger Bäckström

08.30 – 08.45 Welcome words. By Director-General Birger Bäckström, Chairman of the Board of the Forsvik Shipyard Association, and Lars Bergström, Director of The Forsvik Industrial Heritage.

08.45 – 09.30 Tour at The Forsvik Industrial Heritage and The Forsvik Shipyard Association.

09.30 - 09.45 The Progress of the MoSS Project in 2001-2003. By the Coordinator of the MoSS Project, Curator Sallamaria Tikkanen, The National Maritime Museum of Finland, Helsinki.

09.45 – 10.05 What is visualization? By Professor Carl Olof Cederlund, Södertörns högskola (University college).

10.05 – 10.25 The MoSS project as a tool to create awareness of the protection of the maritime heritage in the Netherlands. By Toon De Boer, NISA.

10.25 – 10.45 Coffee

Session III. The E. Nordevall projects and the visualization perspective:

Chairman: Lars Bergström

10.45 – 11.05 The paddle steamer Eric Nordevall in its own time. By Chief of Staff of the Swedish National Maritime Museums, Hans-Lennart Ohlsson.

11.05 – 11.25 The underwater archaeological documentation and the salvage plans for the E. Nordevall 1980-2002. By Carl Olof Cederlund.

11.25 – 11.45 Eric Nordevall and the plans for the salvage of the ship in the perspective of the motives in the Swedish Ancient Monuments Act. By the Head of Care of Ancient Monuments / Östergötland county, Bengt Häger.

11.45 – 12.00 Discussion

12.00 – 13.15 Lunch

Session IV. Means of visualization:

Chairman: The External Evaluator of the MoSS project, Dr Francisco Alves, Director of the Inst. Portugues de Arqueologia. Centro Nacional de Arqueologia Nautica e Subaquatica.

13.15 – 14.15 Visualization: Underwater Films:

The salvage of the engine of The Xantho. By Ray Sutcliffe, UK.

Wreck Sites and Underwater filming in the Baltic Sea. By Marko Röhr, Director, Matila & Röhr Productions Oy, Finland

14.15 – 14.55 Visualization: 3D Models in a Digital and Virtual World - its Use in Archaeology. By Kari Uotila, Associate Professor, Department of Archaeology, University of Turku, Finland

14.55 - 15.40 The visualization of shipwrecks through the arranging of underwater parks. By a representative of a national park service.

15.40 – 16.00 Discussion

16.00 – 16.20 Coffee break

Session V. The visualization perspective applied on North European shipwrecks:

Chairwoman: Sallamaria Tikkanen

The visualization of four well preserved ship wrecks in Northern Europe of different ages and in differing states, treated by the MoSS project, preserved and visualized under differing conditions:

16.20 –16.40 Visualization, models & reconstructions and their use for both public and scholarly interpretation of the 16th century British warship Mary Rose. By Christopher Dobbs, Maritime Archaeologist, The Mary Rose Trust.

16.40– 17.00 The Burgzand Noord 10 Site: a merchant ship from the 17th century, preserved at the Dutch coast By Project Director Martin Manders, NISA.

17.00 – 17.20 From photos to measurements and reconstruction – visualizing the Medieval Darss Cog. By Head of the Agency of Preservation of Archaeological Monuments, Hauke Jöns, Archaeological State Museum of Mecklenburg Vorpommern.

17.20 – 17.40 The Vrouw Maria - From wreck to virtual wreck. By Stefan Wessman, The National Maritime Museum of Finland, Helsinki.

17.40 – Discussion

The general public at The Forsvik Industrial Heritage and Forsvik Shipyard Association will be

welcome to follow the lecture program. (During this weekend is arranged the yearly Forsvik

Days with usually a big audience visiting the site).

19.00 – Excursion with steam sloops and dinner for the participants registering for this.

End of seminar

For more information, Please visit www.mossproject.com

INFORMATION ON THE ARRANGEMENTS OF THE MoSS SEMINAR ON THE VISUALIZATION OF SHIPWRECKS AND SHIPWRECK SITES IN STOCKHOLM AND FORSVIK THE 27TH TO THE 28TH OF JUNE 2003

General program information:
The seminar will start at the Vasa Museum on Friday the 27th of June 2003 at 1.00 PM and continue with the proceedings of this first day at the museum during the afternoon.
After the end of the proceedings at about 4.30 PM the participants, that have registered for the MoSS bus transportation, will be taken by bus from the Vasa Museum to The Forsvik Industrial Heritage and Shipyard Association, Karlsborg, at lake Vättern, about 4 hours drive south of Stockholm.
The proceedings of the second day of the seminar will be held at the Forsvik site during Saturday the 28th. The seminar will end with a dinner in Forsvik on the evening of the 28th of June.
While the seminar is held in Forsvik at the same time the event "The Forsvik Days" (Forsviksdagarna) is arranged at the Industrial Heritage, with the presentation and visualization of the building of the paddle steamer replica "The Eric Nordevall II", exhibition and driving of old engines and many other arrangements. This event is visited by a big number of visitors.
Both at the Vasa Museum and at The Forsvik Industrial Heritage and Shipyard Association the general public at these museum sites will be welcomed to follow the proceedings of the MoSS seminar.

Registration:

The registration to the seminar is done by filling in and sending the registration form attached here to "Karlsborgs Fästnings- och Turistbyrå" (see addresses for this at the same form).

The registration has to be done by the 30th of March 2003 at the latest in order that we can guarantee your lodging.

Travels:
The participants will arrange their own travel to Stockholm and back. The MoSS project will arrange free bus transportation to Forsvik on the afternoon the 27th and back to Stockholm after the seminar day in Forsvik on the morning of the 29th at 10.00 AM. The bus transportation is offered free of charge for those MoSS seminar guests participating that have registered to the seminar and to the same bus transportation (see registration form enclosed), as well as for MoSS representatives, session chairpersons and guest lecturers.

Lodging:
The participants will arrange their own lodging in Stockholm, if necessary. Lodging during the nights between the 27th and 28th and the 28th and the 29th of June, for the stay in Forsvik, can be booked through *Karlsborgs Fästnings- och Turistbyrå*. See registration form for the booking of lodging.

Meals:
There is a restaurant at the Vasa Museum for those who want to take their lunch there before the start of the seminar at 1.00 PM.
The Forsvik Industrial Heritage gives a special offer for meals during the stay in Forsvik. This offer includes a light supper at Forsvik at the arrival in the evening of the 27th, meals etc during the day of the 28th and a special dinner arrangement on the evening of the 28th. (Those guests who want to accept this meals arrangement are asked to book for the same at the registration form enclosed). Breakfast is included in the hotel prices.

Karlsborgs Fästning AB
Att: Siw Adamson
Ankarvägen 2
S-546 30 Karlsborg
Email-address: siwadamson@karlsborgsfastning.se

Registration Form for
The MoSS Seminar 2003 in Stockholm and Forsvik
(To be sent to the address above by mail or e-mail)

I will come to the MoSS Seminar

"Visualization of Shipwrecks and Shipwreck Sites",

Friday the 27th at the Vasa Museum in Stockholm and at Forsvik Industrial Heritage and Forsvik Shipyard Association Saturday the 28th of June 2003.

Name: ……..

Address: …….

……..……

……

Fax: ….....……

E-mail: ….....……

I intend to accept the bus transportation from Stockholm to Forsvik on the 27th of June and back to Stockholm on the 29th:

Yes *No*

_____
Signature

The Tourist Office in Karlsborg will organize accommodation in Forsvik.

If you are interested in this service, please fill out the hotel reservation form and send it together with this registration form to the same address *the 30 of March 2003 at the latest*.

HOTEL RESERVATION FORM

(To be sent to the address below by mail or e-mail.)

Name:……Tel.: ….....……

Address:..……Fax:…….....……

…….……. E-mail:…….....…….

Date of arrival: _____ **Date of departure: _____**

Karlsborgs Fästning
Ankarvägen 2
(0)505 173 49
S-546 30 Karlsborg
siwadamson@karlsborgsfastning.se

Phone: +46 (0)505 173 50
Fax: +46
E-mail:

Accommodation for the MoSS Seminar "Visualization of Shipwrecks and Shipwreck Sites", Forsvik 27-28-29 June 2003:

My reservation:

Hotel Wettern
Number of double rooms: ___ Number of single rooms: ___

Price for double room per night: SEK 795 Price for single room per night: SEK 595

Youth hostel Forsvik
Number of double rooms: ___ Number of single rooms: ___

Price for double room per night: SEK 620 Price for single room per night: SEK 310

Youth hostel Karlsborg
Number of double rooms: ___ Number of single rooms: ___

Price for double room per night: SEK 540 Price for single room per night: SEK 345
All prices include breakfast.

Meals and registration fee in Forsvik:
Dinner at the arrival 27.6, lunch, coffee etc. during the day of 28.6: SEK 410 Yes No

Evening of 28.6: A trip with steam launch at Forsvik and dinner: SEK 275 Yes No

Please tell us if you are vegetarian, or have any food allergy.

Special demands:

_____

Date/Signature

Research in the history of the Snow Vrouw Maria

Dr. Christian Ahlström discovered in the 1970s at the National Archives of Finland documents concerning the attempts to salvage the wreck of the Vrouw Maria. He published his results already in a book in 1979 (Ahlström 1979), for which he used Finnish, Swedish and Danish sources. These include a lot of information about the shipwreck, the cargo and the attempts to locate and salvage the wreck.

In 1999 the staff at the Amsterdam Gemeentearchief checked archive sources in Holland for Dr. Ahlström and Mikael Martikainen. The aim was to find new information to ease the finding of the wreck. A lot of documents concerning the Vrouw Maria, its shippers, insurance and voyages were discovered. However, now at this stage of archaeological research, it seems that some of these documents must concern an earlier ship with the same name.

The Maritime Museum of Finland in the autumn of 1999 hired Dr. Pavel Krotov at the St. Petersburg University to go through some Russian archives to search for information about the Vrouw Maria. Even though he went through major archives both in St. Petersburg and in Moscow, the results were marginal. The only documents concerning the Vrouw Maria dealt with that part of the salvaged cargo, which was transported to Russia via the city of Hamina. Furthermore he discovered information about an earlier visit of the Vrouw Maria to St. Petersburg in 1770. In 2002 both Dr. Philip Kelsall and Birger Thomsen kindly checked the Sound toll archives and the "Tyske kancelli" archives in Copenhagen in order to find to the Vrouw Maria related documents concerning the exceptions of customs for Royal persons and embassies. However, no new documents concerning the Vrouw Maria were found.

Altogether this material was already in year 2000 so extensive, that the Maritime Museum of Finland decided to start a research project of maritime history about the contexts of the Vrouw Maria. This project is lead by curator Ismo Malinen, who is going to do research on the shipwrecks of Dutch ships on the coast of Finland in the 18th century in general. At the moment the most important part of this project is research by Dr. Oscar Gelderblom at the University of Utrecht. He will in the near future finish his research on the reactions of Amsterdam merchants and ship owners to the loss of a ship and its cargo. In this he uses the case of the Vrouw Maria as an example. The results of this research will later be published in English. Dr. Gelderblom's research is financed by the Directie der Oostersche Handel en Reederijen, the Netherlands.

At the moment it seems that almost all relevant archives have been checked in order to find documents concerning the wreck of the Vrouw Maria and its history. But, as the notarial archives in the Netherlands are so extensive, it's still possible to find new documents. Even without new documents the case of the Vrouw Maria will make possible a close look at trade and shipping and people involved in this in the Baltic in the 18th century.

References

Ahlström, C., 1979, Sjunkna Skepp. Lund.

Stefan Wessman, The Maritime Museum of Finland

The Documentation and Reconstruction of the Wreck of Vrouw Maria

When I began the reconstruction work of the wreck of the Vrouw Maria I stood in front of a completely new problem. I was used to shipwrecks that were broken into hundreds of pieces, but in this case I had to deal with an almost complete wreck that was standing upright on a depth of more than 40 meters. I realised that it was not, except for the rigging and the deck structures, a question of reconstruction. It was more a question of how to document the ship so that one could get significant data in the form of measurements etc. and then decide the way in which one could show the Vrouw Maria for the general public.

A computer program called Rhinoceros makes the reconstruction work. I got familiar with the program while I was working at the Centre for Maritime Archaeology in Roskilde, Denmark. The program is a Cad-type program that accepts a wide range of data types and is very easy to use. It draws ship curves particularly well since it uses NURBS geometry. To get started with the work I got help from Mr Fred Hocker (NMF) who kindly visited me in Finland and spent a week to start the reconstruction process with me.

The material I had at the beginning was various data collected at the time when the Vrouw Maria was found in 1999 and during the field seasons of 2000 and 2001. It consisted of measurements, still photos, video material, a few Aqua Metre D100 measurements, side scan sonar data, multi-beam sonar data and sediment sonar data. With the help of this material the shape of the wreck of the Vrouw Maria started to take shape.

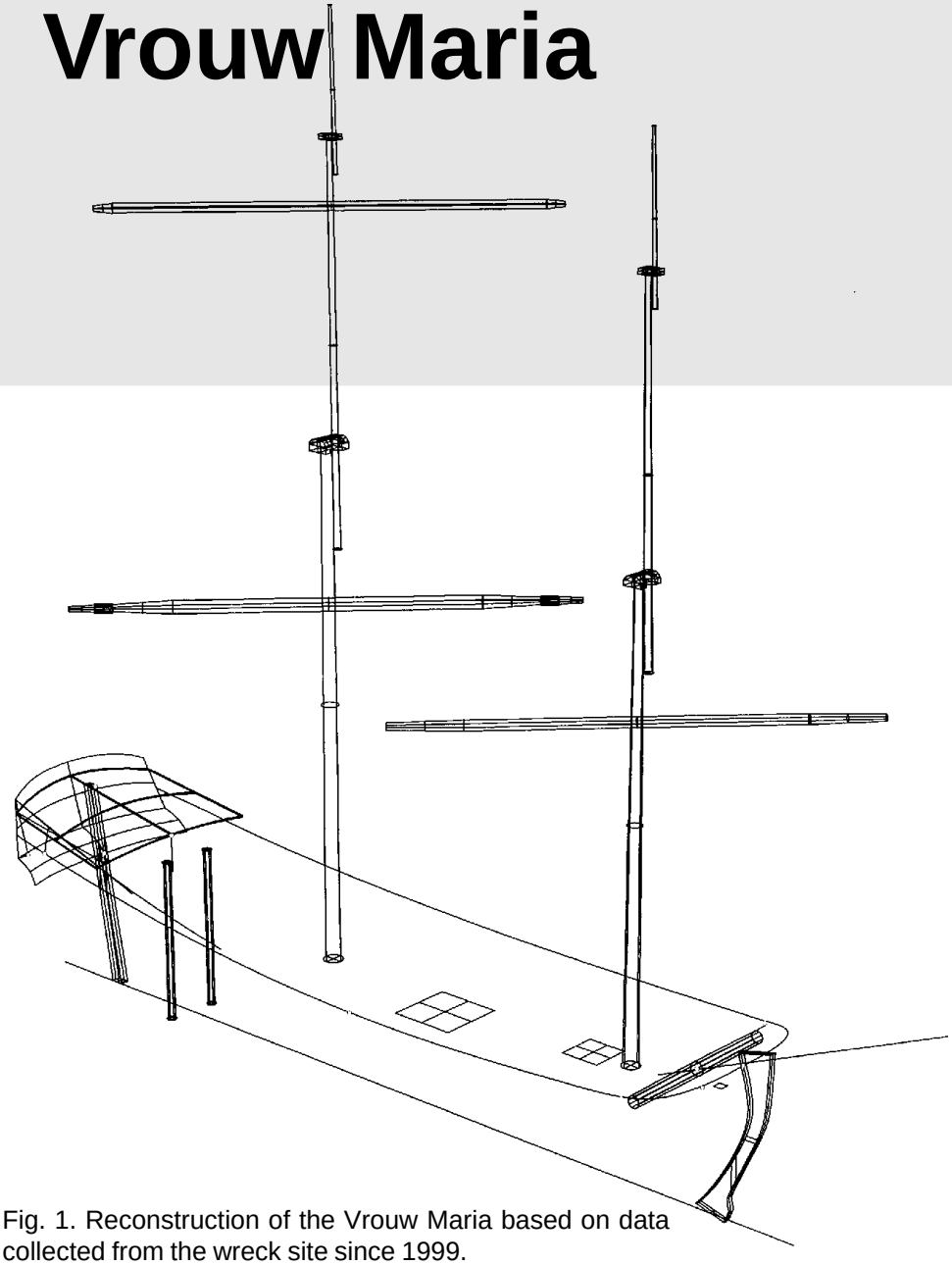


Fig. 1. Reconstruction of the Vrouw Maria based on data collected from the wreck site since 1999.

At first I used all the available measurements and then extracted dimensional data from the stills and video material. Next I added details from the video material. Finally the work reached a point where I had no motive to continue without getting new data (Fig. 1).

At the time of my reconstruction work, the Maritime Museum of Finland planned the field season of 2002. During the reconstruction it was fairly easy to see what essential data was still missing and had to be collected during the following summer. It soon turned out that we did not have enough measurements from the rigging and the deck level, and that the biggest problem was going to be the measuring of the shape of the hull. Except for the length of the hull and an approximate height of the stem and sternpost, the only pieces of information we had were those we could see on the videotape. It was obvious that we had to find an appropriate method for the measuring

of the hull's shape for the field season 2002.

The Goniometer

Operating at a depth of approximately 40 meters effectively cuts down the possibilities you have when performing an operation like this. You do not even want to think about building up some kind of measuring system down there. What you really want is a kind of system, which is fast, accurate, easy too operate, if possible cheap, and that does what it is supposed to do. The most amazing thing was that there actually exists a system like this - in North America they have developed an ideal system for measuring shapes.

In an article in the International Journal of Nautical Archaeology (volume 27, 1998) J. Cozzi describes the development and use of an instrument called the Goniometer. This instrument determines timber curvature in reference to other structures of the vessel. Basically the Goniometer is an inclinometer mounted in an underwater housing.

The instrument had, in among other places, been tested in the field in Lake Champlain on a wreck called Water Witch at the depth of 30 meters, and in Lake Superior on a wreck called Indiana at the depth of 40 meters. Both wrecks have more or less intact hulls and lie in deep, dark and cold waters. For us this was an extremely important piece of news since the environment in the Great Lakes along the US-Canadian border is similar to the environment at the wreck site of the Vrouw Maria. This was a fact that dramatically increased the chances for the method to work at our site.

We had two Goniometers for the recording of the hull of the Vrouw Maria in 2002. During six dives two teams measured hull sections, stem curvature, stern rakes, the vessel's sheer, and the position of the upstanding masts. The divers also took control measurements for determining the tilt of the ship. Altogether 257 measurements were made.

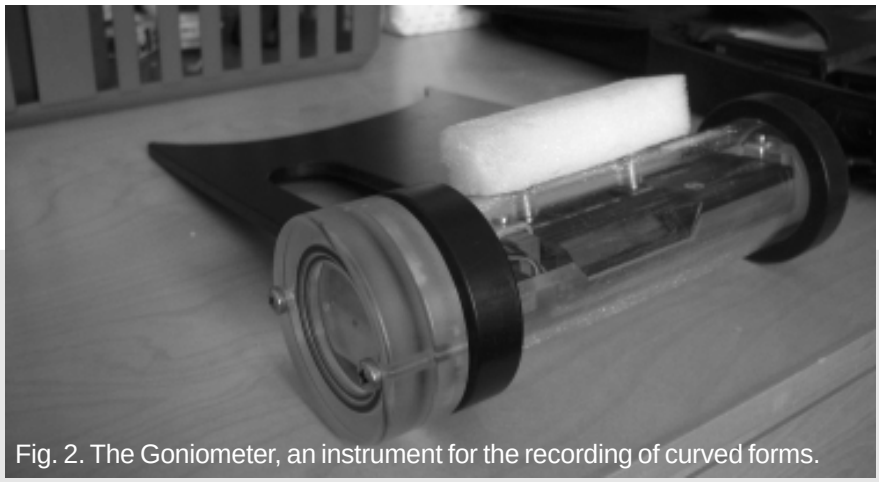


Fig. 2. The Goniometer, an instrument for the recording of curved forms.

The recording the Hull of the Vrouw Maria

Recording the hull's shape means recording cross sections of the ship from the gunwale to the keel. In most cases it is of course impossible to go all the way down to the keel. The recording process is simple: you hold the Goniometer against the hull and write down the angle measurements displayed. Then you move the Goniometer so that the next segment starts at the very spot where the last ended. This process goes on until you reach the bottom, or in best case, the keel. It would be possible to speed up the process if you could save the results digitally instead of writing them down, an improvement that we are working on at the moment.

The Goniometer was slightly modified for our purposes. Since we did not want to harm the wreck in any way we at an early stage gave up the idea to mark the cross sections on the hull. Instead we added a vertical indicator to the Goniometer that helped us to stay in line when measuring from the gunwale downwards. Fortunately the Goniometer left a very clear mark in the silt, a mark we could use when we moved the Goniometer.

Because of the darkness at the site it was necessary to use a light to be able to read the display. That again was somewhat complicated since we used an acrylic pipe for the underwater house of the former . The light was tested for pressure before use and the house cracked a bit during the test. The cracks and the round shape spread the light and it was sometimes a bit difficult to read the display. An inclinometer with highlighted numbers on the display is preferable. Another thing that we noticed was that the spring used in the push buttons on the goniometer could have been stiffer. At the depth of 40 meters, the pressure pushed down the HOLD button for a couple of times, which caused confusion. Except for these things everything went well and the recording process was problem-free.

The Use of the Collected Data

Once you have the data collected by the Goniometer, a fairly exact reconstruction of the hull is a simple thing to do. Since the angle and the length of the Goniometer are known, it is easy to calculate the shape of the hull. I will not explain the details about how this is done. For those who are interested I strongly recommend J. Cozzi's excellent article in which the whole procedure is described in detail (Cozzi 1998).

A part of the collected data has already been used in the reconstruction. Using the measurements taken by the Goniometer we have created the form of the stem post as shown in Fig. 3. During the reconstruction work one sees right away if there are errors in the measurements. An error can be due to corrosion on the surface or damage on the wood, but in any case a mistake is easily detected since an inaccurate measurement immediately sticks out.

When all the data collected during the field season 2002 was processed we got a hull shape that very much started to look like a 18th century Dutch ship (Fig. 4). The only part that caused problems was the stern because the shape changes so much in the aft of the ship. A few more cross sections are needed here to get enough data for an exact reconstruction, and this information will be collected during our next field season. My next step will be the reconstruction of the part of the bottom that cannot be measured. Then I can make line drawings on the basis of the reconstruction.

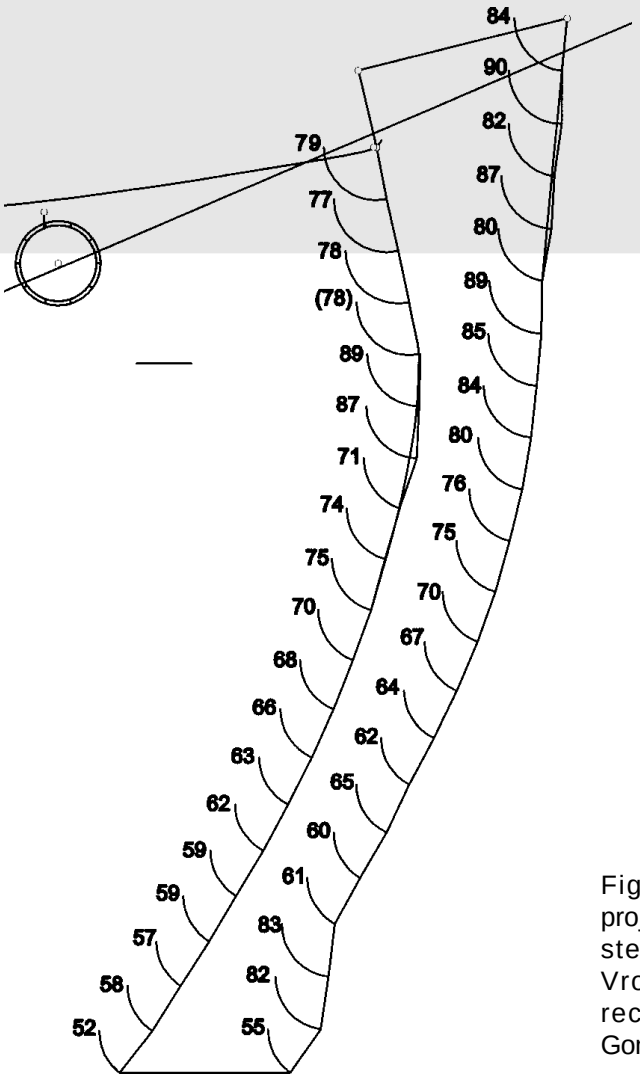


Fig. 3. A vertical projection plan of the stem post of the Vrouw Maria, recorded by the Goniometer.

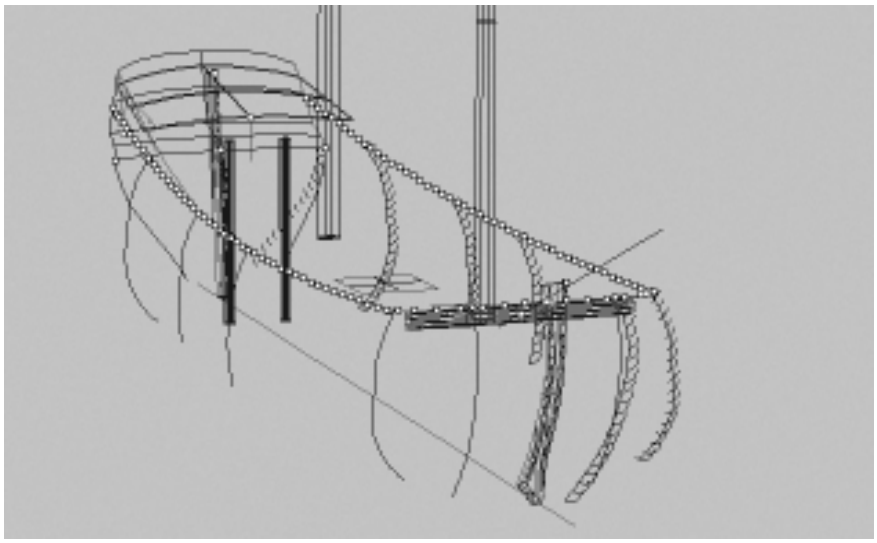


Fig 4. The shape of the hull of the Vrouw Maria as recorded by the Goniometer.

Visualizing

The reconstruction work has two goals. One is to make a wire-frame version of the Vrouw Maria that can be used for scientific purposes such as the performing of line plans, rigging plans or hydrostatic calculations (Fig. 5). The same digital model can also be used if one plans a salvage of the ship. The goal number two is to visualise the Vrouw Maria for a the general public. The plan is to show her not only the way she looks today as a wreck but also the way she looked as a sailing ship (Fig. 6). You have to remember that the majority of the public consists of non-divers who will never get the chance to see a wreck in its natural environment. That is why one of our final aims is to have a 3D virtual model of the Vrouw Maria made.

References

Cozzi, J., 1998, The Goniometer: an improved device for recording submerged shipwreck timbers. *The International Journal of Nautical Archaeology 27:1* (1998) 64-80.

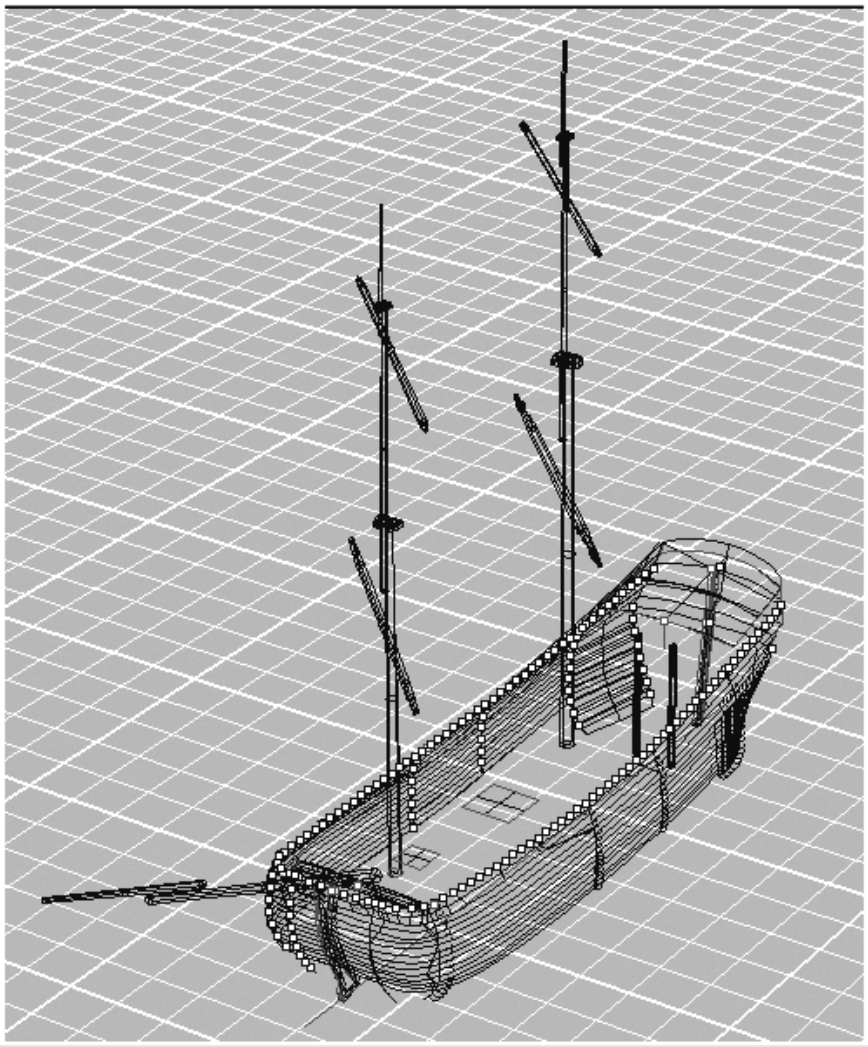


Fig 5. A wire frame, digital model of the wreck of the Vrouw Maria.

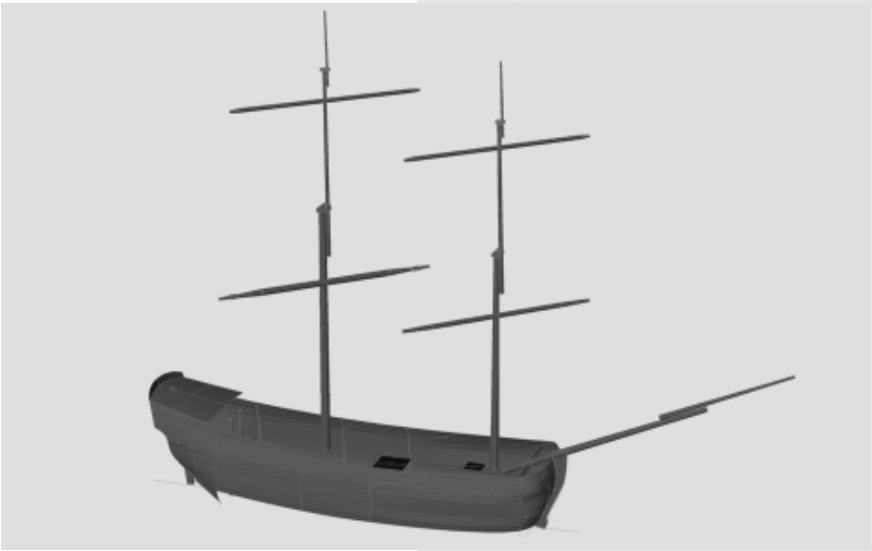


Fig. 6. Reconstruction of the Vrouw Maria in its original state made on the basis of digital and other recordings of the same.

Jaana Mellanen,
Helsinki City Museum

Clay tobacco pipes from the Vrouw Maria

In the summer of 1999 three long-stemmed clay tobacco pipes were raised from the Vrouw Maria's cargo hold in order to verify the date of the shipwreck. All three pipes were found in the same place, just below the rear edge of the main hatch of the hold. The cargo was covered with a vast layer of probably thousands of clay pipes. Unfortunately, no traces of the containers in which the pipes were transported have been preserved. The containers might have been barrels or baskets.

All three pipes are unbroken except for small pieces, which are missing at the end of the stems (the mouthpieces) of the same. Of the three pipes two have a mark constituted by a crowned B, and one a mark in the shape of a birdcage. The clay is discoloured in all of the pipes, especially in the pipes marked with a crowned B. The dark brownish colour is due to corrosion residues.

The pipe bowls are very similar in shape and size. The pipes with the crowned B are identical except for the height of the heel and the degree to which the marks on them are visible, depending on their degree of finishing (Fig. 4). The oval-shaped bowls of these pipes are typical of Dutch clay tobacco pipes of the latter half of the 18th and early 19th century (Duco 1982, p. 111 & Duco 1987, p. 27).

"All three pipes are unbroken except for small pieces which are missing from the end of the stem"

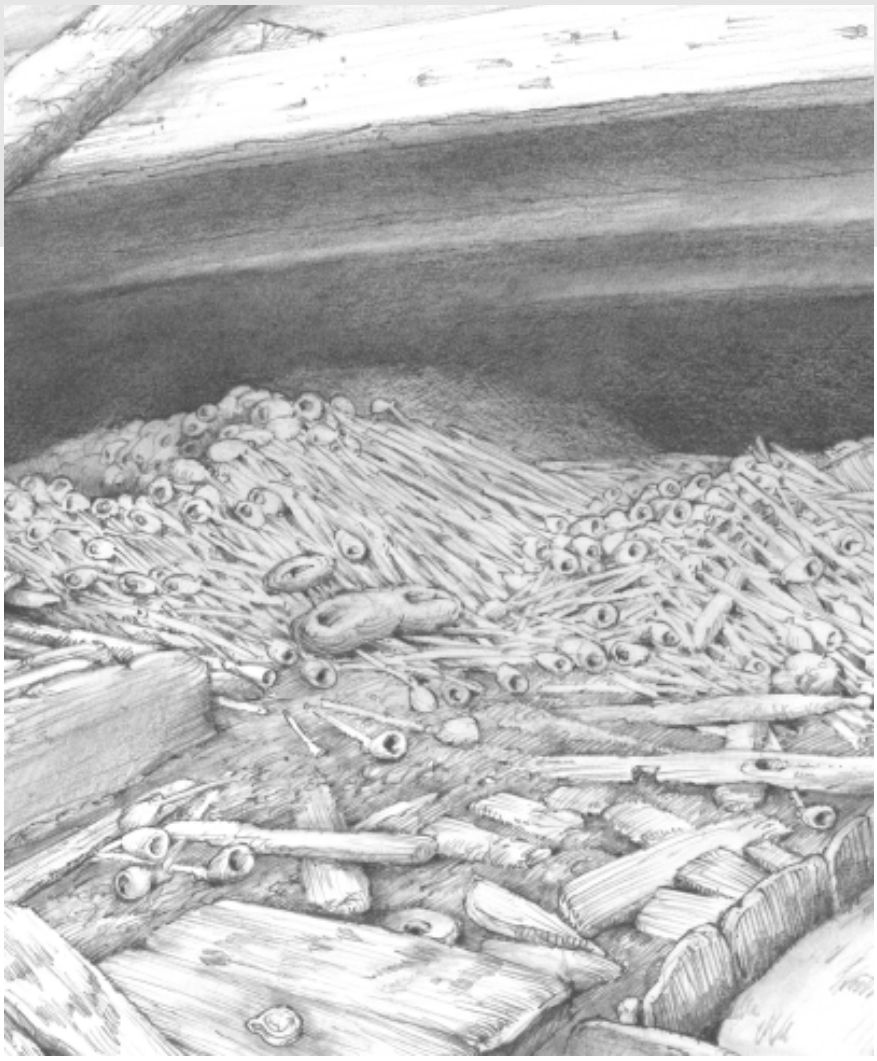


Fig. 1. The artist's view of the hold of the Vrouw Maria. Drawing: Tiina Miettinen, The Maritime Museum of Finland.

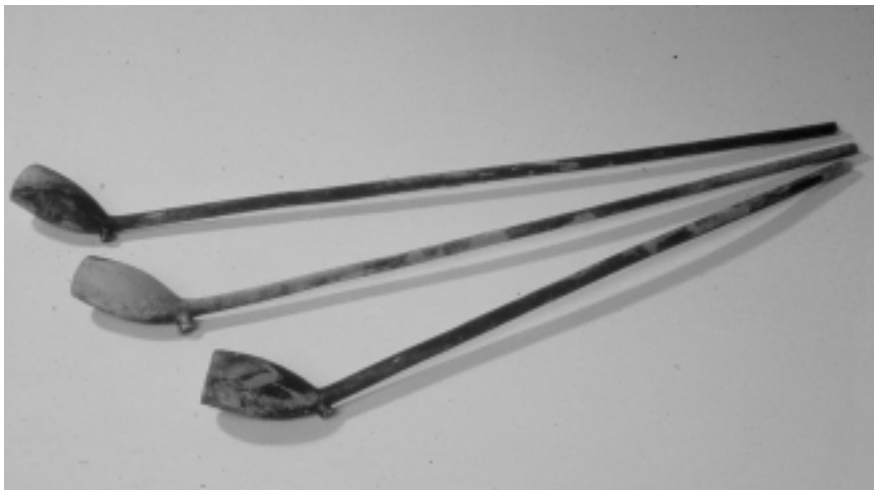
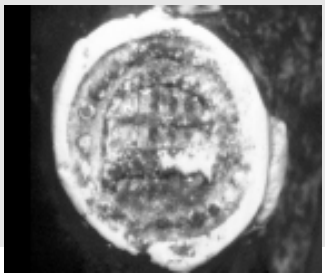


Fig. 2. The three clay pipes raised from the Vrouw Maria. Photo: The Maritime Museum of Finland

Fig. 3. Mark in the shape of a birdcage on one of the pipes. Photo The Maritime Museum of Finland.



The pipe with the mark in the shape of a birdcage

The overall quality of this pipe is better than in the pipes with the crowned B. There is a maker's mark - "boogkooi" - stamped on the bottom of the heel, which is a chaffinch's cage, and a relief mark on the side of the heel. In 1739, the pipe makers' guild in Gouda ordered its members to add the arms of Gouda on the side of the heel to distinguish the pipes made in Gouda from pipes made in other towns. In 1740, the letter "S" was added to mark an ordinary pipe. The best quality pipes were left without the letter (Duco 1987, pp. 77-78).

At some point in time, a pipe maker called Jan Soufree used the "boogkooi". His active years span from 1732 to 1796, the year of his death (Duco in e-mail message on 14.8.2002). The same pipe maker is mentioned in Jan van der Meulen's catalogue (1994, p. 69) as Jan Souffreu whose active years were 1732 - 1782 (qualified to guild in 18.10.1732). The "boogkooi" was also used by an Anthony Souffreu sometime between 1730 -1760 (van der Meulen 1994, p. 69).

The inscription on the stem is very clear: SOUFRE(E/U) IN GOUDA. The makers' name on the stem of a pipe became more common in the second quarter of the 18th century, but some early examples of such inscriptions date back to the latter half of the 17th century (Duco 1987, p. 83).

The two pipes with a mark in the shape of a crowned B

The inscriptions on the stems of the pipes with a crowned B are somewhat unclear. However, there are sufficient amount of letters to suggest who the maker was (… RW… /…ERWE…) and to identify the place of production. (…UD…/ …OUIN…). In both pipes a coat of arms appears on the side of the heel but the number of dots and other details are difficult to make out.

The crowned B was used by Bastiaan Overwesel at some point of time in his active years 1737 -1770 in Gouda. The letter "B" was also used by a Jan Overwesel (van der Meulen 1994, p. 62). All the same, the size and shape of The Vrouw Maria's pipe bowls indicate that they are from a later period than his active years 1730-1746. Bastiaan Overwesel was primarily a merchant and other makers made his pipes on his request, which explains the variations in quality. The coat of arms on the side of the heel of these two pipes is the arms of Gouda (Duco in e-mail message on 14.8.2002).

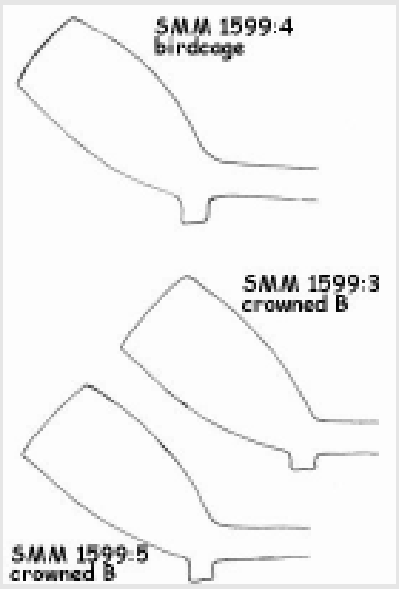


Fig. 4. The profiles of the bowls of the three salvaged pipes. Of these one had a mark in the shape of a birdcage, and two a mark in the shape of a crowned B. Drawing: Jaana Mellanen.

Future prospects

It would be of interest to study the last phases of Bastiaan Overwesel's production and trade because they ended just a little before the Vrouw Maria's fateful journey from Amsterdam to St. Petersburg in 1771. Further samples of clay tobacco pipes from the ship's cargo would also tell us more about the trade connections and the dating of the makers' marks in general in the Dutch clay pipe production.

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Discussion by letter and by e-mail on 1.7.2002 and 14.8.2002 with Mr. Don Duco.

Martijn Manders, NISA

What's on? The BZN-10 Site

What's on:

Introduction: The Netherlands Institute for Ship- and underwater-Archaeology (NISA) is within the project responsible for the work done on the Burgzand Noord 10 wreck (BZN 10); a seventeenth century trader that sunk on the Texel Roads. More information about this wreck site will follow in the 4th issue of the MoSS Newsletter.

Monitoring: The datalogger has been installed in the wreck in June. The strategy was to install one datalogger on the wrecksite and to exchange this one after a few months for the second datalogger. In this way we were able to test both loggers before placing, cleaning and callibrating them. With the spare logger we have been testing on other sites to see if we could find differences on different wrecks. The first datalogger has been working well except for a few software problems. The second datalogger however had more severe problems and it had to be sent back to the producer. After that, the first datalogger has been on site until December the 17th 2002.

At the same time in June when the datalogger was installed, also woodblocks for aerobic and anaerobic degradation research (short, middle and long term degradation) were placed on the wreck as well as cellulose (shirley textile, short term degradation). Samples after 3 months and 6 months have already been retrieved from the wrecksite and sent to the MRAS for analysis. Unique about the BZN 10 wreck is the fact that it is protected against degradation and covered up with gauze. The wood and cellulose samples have been given the same condition as the wreck. By doing this, hopefully, we can find out if this kind of protection is valid and functional.

In 2003 we will have to change the dataloggers and retrieve samples for four times.

Also visual monitoring of the wrecksite has been undertaken. At the same time, areas that had been exposed were covered as well.

Safeguarding: The Wadden Sea is still on the Tentative List for the Unesco World Heritage Sites. It is not yet known when it will be accepted.

The wreck is physically protected by gauze. This (scaffolding) gauze lets the sand through, but due to a lack of current under it, the sand settles and builds up an artificial reef. The conclusion of our visual monitoring is that this method works very well. The whole wreck is covered with a thick layer of sand. The seabottom around the wreck is lowering rapidly.

In 2003 the protection of the wreck will be visually inspected every third month.

Visualizing: In 2002 we have made side scan sonar and multibeam sonar images. This will have a follow up in 2003. In this way we will be able to monitor the erosion around the wreck. The idea was also to measure the currents around the wreck and to record them. However due to technical problems this is postponed to 2003. Natural erosion seems to be the biggest threat to the wreck site.

For the monitoring theme also video films and photo's have been made.

In the summer 2002 our German colleagues of the MoSS project have visited us to test their photographic mapping method in the Wadden Sea. Unfortunately the conditions here seem not to be appropriate for this method since the visibility is too bad and the suspension in the water too high. The tidal movements with strong currents make it only possible to dive for a short time.

All actions above water have been documented on video and digital photography as well.

This will be continued in 2003.

Information to the general public, students and specialists: During 2002 we have worked intensively together with Sven Ober, a specialist in dataloggers from the Netherland Institute for the research of the Sea (NIOZ) and with the people working on the EU-project BACPOLES. Some samples of wood have been given to Dr. Wolff from the Groningen University to investigate it on the existence of woodboring organisms.

Lectures have been held at the DEGUWA conference in Aachen and the symposium held by the MoSS-project in Schwerin (Germany). A poster has been shown on the Reuvens symposium in the Netherlands.

Interviews have been given for national and local newspapers and television.

Different articles have been written about this subject for colleagues and the general public.

In 2003 we will present the project at different symposiums in the Netherlands (DEGUWA, Reuvens), Danmark (ISBSA), Sweden (MoSS International Seminar) and hopefully others.

What's on?

The E. Nordevall project and it's developments 2001-2002

The paddle steamer E.Nordevall (1836-1856) is the shipwreck of Sweden within the MoSS Project and its three main themes. The Shipwreck Project E.Nordevall is at the same time treated and developed by several other parties.

The management and the protection of the wreck as such rest with the County Administration of the county of Östergötland because the ship is situated within the borders of this county. The main activities of the County Administration are related to the preservation and safeguarding of the wreck, its protection as a unique site, for example. Due to damage, diving has been prohibited at the site for a couple of years now. The site is under the supervision of the county authorities.

There are ongoing plans to salvage the wreck of the E.Nordevall in order to preserve it and exhibit it in a museum in the town of Motala on the east side of Lake Vättern. A special group is developing this matter. As a part of the preparations, the Swedish National Maritime Museum has recently performed underwater recording on the site to collect information about the ship's superstructure. There are pieces of the superstructure lying around the wreck on the bottom of the lake.

The Swedish Central Board of National Antiquities has given its principal permission to salvage the ship – under the condition that the costs of the operation in all its phases (from the salvage to the museum exhibition) are covered from the very beginning. In addition to this, the questions concerning the premises and the arrangement of an E. Nordevall Museum must be solved before the salvage project can be launched.The National Maritime Museum of Sweden shares this opinion.

A project recreating the E.Nordevall as a full-scale replica was launched at the Forsvik Industrial Heritage Centre on the western shore of Lake Vättern in the middle of the 1990's. This project, which is managed by the Forsvik Shipyard Association, is at present far advanced. In the fall of 2002 one has started to put up boarding planks on the frames. The iron parts of the engines have been forged, and preparations to mount and test the two engines at the Motala Verkstad have been made. The original engines of the E.Nordevall were built in this mechanical factory in the 1830's.

The goal of the Project Eric Nordevall II is to have the replica in passenger service on the Göta Canal, on the old route of the original paddle steamer.

One important aim within this project is to reconstruct and visualize one of the first paddle steamers in Swedish waters and to give the general public the possibility to experience a journey on a ship like this. The visualization of the time period in question is an important issue in the project as well. These issues were under discussion at a seminar at Forsvik. A seminar report has been printed (Cederlund, C.O., (ed.) 2002. Hjulångfartyget Eric Nordevall under byggnad och under ånga Nessebro).

Extensive reconstruction work has been done to build the replica as a true copy of the original. Special attention has been put on the building materials and on those features that reflect the circumstances of the life on board this kind of a vessel. For the reconstruction, complementary documentation has been made on the shipwreck to get a better idea especially of the structure and the fittings of the interior of the ship.

"The goal of the Project Eric Nordevall II is to have the replica in passenger service on the Göta Canal, on the old route of the original paddle steamer."

If the original ship is salvaged, the intention is to have the two projects – both the museum in Motala displaying the preserved original and the replica in passenger service on the old routes of the ship - support and complement each other in the visualization of the vessel and its era.

Within the MoSS Project, the work on the E. Nordevall will concentrate on an evaluation of the different actions developed concerning the ship and its preservation. The replica project is under evaluation as well. Because the wreck was located 22 years ago, and has been under research since then, we now have a noteworthy amount of documented information. This means that we can discuss the three main themes of the MoSS Project in a general perspective. In addition to this, we can reach general conclusions by using the experiences that are gathered by the different bodies working on this now well-known shipwreck in one of Sweden's largest and deepest lakes. An account of the collected information is under work, and it will be seen in the MoSS Project Report.

Hauke Jöns, Landesamt für Bodendenkmalpflege und
Archäologisches Landesmuseum von Mecklenburg-Vorpommern

What's on?
The Darsser Kogge Site

Within the MoSS Project, the research unit of the Archaeological state museum of Mecklenburg-Vorpommern is responsible for the detailed investigation of a cog from the late 13th century, the so called Darsser Cog. The investigations on the Darsser Cog site will be described in detail in the third issue of the MoSS Newsletter.

Documentation

Innovative technologies were used for the documentation and visualisation of the Darsser Cog. By the help of new radar and sonar technology, we were able to visualise the structure of the wreck above and under the sea bottom in April 2002. In other words, we managed to record the submerged structures of the wreck. These investigations give us a detailed view of the surroundings of the wreck and of those parts of the wreck that are covered in sediment. We will continue these investigations in the spring of 2003.

Excavations

After having investigated the sediment around the wreck, the fore ship was excavated from the stem to the mast step in 2001 and 2002. Especially the starboard side is very well preserved. It is nearly complete, and it was possible to study the stem construction and the V-shaped frames as well as the planks in detail. The removed sediment was investigated carefully, too. In order to get even the smallest finds, the sediment was sifted. During the excavations, remains of the cargo, the equipment, and the personal belongings of the crew members were rescued. These finds tells us about trading contacts and life on board. The excavations will be finished in August 2003.

"Although the shipworm* Teredo navalis *has infested the upper parts of the wreck badly, the cog shall not be lifted but safeguarded at the site."

Visualising by photogrammetry

Within the MoSS Project, the development of the routines for photogrammetrical documentation and measuring of shipwrecks is an important goal. We hope that in the future the photogrammetry of ship wrecks leads directly to the visualisation and finally to the virtual reconstruction of the wrecks. During the fieldwork at the Darsser Cog site, all visible and excavated parts of the wreck were documented by overlapping photos. To connect these pictures and to process the data, we used computer programs such as Autocad and Photo Modeller. In Winter 2002/2003 these pictures will be worked out and combined for the reconstruction of the Darsser Cog.

Monitoring

The Darsser Cog is also a part of the monitoring theme of the MoSS Project. In August 2002, wooden and textile samples were placed at the wreck in order to give us information about the biotic factors at the site. At the same time we placed data loggers to collect environmental data. The first pieces of information from the loggers and the samples were taken in November 2002. Till the end of the project, data will be collected at regular intervals.

Safeguarding

Although the shipworm *Teredo navalis* has infested the upper parts of the wreck badly, the cog shall not be lifted but safeguarded at the site. That is why the wreck was refilled with sediment and covered with fleece material and sandbags. Finally it was partly covered by special polypropylene gauze. The same kind of gauze has been in use in the Netherlands for a couple of years now.

Information to the general public, students and specialists

The results of the MoSS research at the Darsser Cog are presented to the public in different ways. There are exhibitions at the Darssmuseum in Prerow and at the Museum for Underwater Archaeology in Sassnitz. In addition to this, there have been reports about the wreck site in numerous newspaper articles as well as in radio and TV shows. A direct connection between the protection of the Darsser Cog as a part of maritime heritage and the protection of the medieval Hanse towns was shown in a series of lectures that were organized as an accompanying programme for the exhibition "Fired history – The ways to the gothic architecture built in brick". The exhibition was about the importance of the Hanse, and it was staged in Lübeck, Wismar, Rostock, Stralsund, Neubrandenburg, and Greifswald.

The First MoSS Seminar in Schwerin, Germany.

What Happened?

The first MoSS Seminar was held in Schwerin, Germany, on Sunday the 10th of November. The seminar focused on the different possibilities we have to document shipwreck sites. A special emphasis was put on modern technologies such as photogrammetry and geophysical measurement. The seminar took place in the residence of the parliament of Mecklenburg-Vorpommern, in the Castle of Schwerin. The seminar was open for the general public, and about 70 persons from eight countries (Sweden, Denmark, Finland, England, Portugal, the Netherlands, Germany and Poland) joined the occasion.

On behalf of the Minister of Education, Science and Culture of Mecklenburg-Vorpommern, U. Petschulat welcomed the audience and pointed out that the management of the common underwater cultural heritage is a good example of the neccessity of international co-operation and the exchange of ideas and knowledge. Petschulat was followed by Senatsrat J. I. Weber who gave an overview of the actual and future possibilities of getting funding for underwater cultural heritage from the Culture 2000 program and other programs.

In the first session of the seminar, the MoSS project coordinator S. Tikkanen described the structure, the methods, the aims, and the scientific goals of the MoSS Project. Her lecture was followed by a short characterization of the MoSS wreck sites in Finland (the Vrouw Maria by M. Leino), in Germany (the Darsser Cog by H. Jöns), in Sweden (the Eric Nordevall by C.O. Cederlund), and in the Netherlands (the Burgzand Noord 10 by M. Manders).

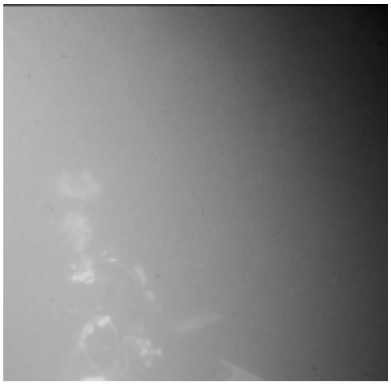
During the second session, the different documentation techniques used at the MoSS wreck sites were introduced. The session started with three lectures about the Darsser Cog. First F. Lüth told the audience about the practical experiences of the survey and documentation at this site. This work is done by aerial photography, side-scan-sonar, sediment-sonar and georadar as well as by drawings, videotapes, and photographs. The last part of his lecture was about the requirements of underwater photogrammetry.

At this point S. Brozio took over and summarised the principles of the underwater photogrammetry and the problems of the data processing based on Autocad. Autocad is a program that enables us to make a precise reconstruction of a documented wreck. Brozio was followed by P. Korduan who told us about his experiences in the use of a program called Photo Modeller. The program is used for the 3D-reconstruction and the photogrammetrical measurement of the Darsser Cog.

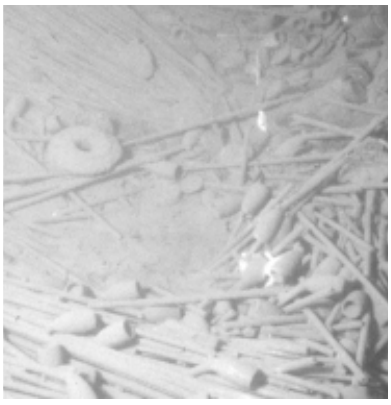
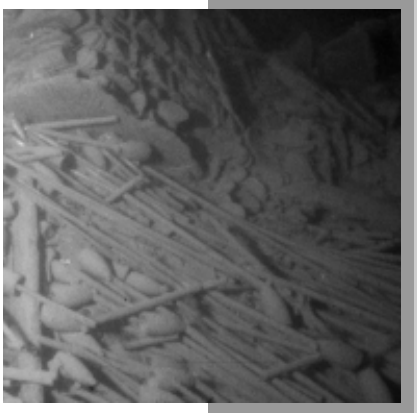
The next lecture was given by M. Leino and S. Wessman who gave a report about the documentation of the Vrouw Maria site with the Video Ray Pro mini-ROV and the underwater positioning system AquaMeter D100. The following lecture was about the documentation routines developed by the Netherlands Institute for Ship and Underwater Archaeology (NISA) for shipwreck sites in the Wadden Sea. The lecture was given by M. Manders. The lectures about the wreck sites of the MoSS Project were finished by a report from C.O. Cederlund about the underwater documentation of the paddle steamer E. Nordevall in Sweden in Lake Vättern in the years 1985-1989.

In the third session of the seminar, five experts from Sweden, Denmark, England and Portugal gave an account of their experiences of different documentation techniques. L. Einarsson started with a lecture about the twenty years of research, excavation, and recording of the Swedish wreck of the warship Kronan from the 17th century. In the next lecture A. Olsson informed us about the aims and the recording strategies for the documentation of the so-called Göta wreck, a wreck that was found in Gothenburg some years ago.

The following lecture was given by J. Dix who presented new geophysical methods for the survey and the non-destructive investigation of submerged archaeological sites based on acoustics. The next report was given by A. Englert who described the recording and documentation techniques used at the medieval Karschau wreck site. The wreck was found near Schleswig, on the bottom of the Schlei. Finally F. Alves summarised his experiences of the management of the underwater cultural heritage in the coastal waters of Portugal.





what's on?

meetings & seminars

Meetings

The project meetings act as our internal communication, and the meetings are held mainly by the project participants themselves. In the meetings the partners discuss the project in detail, make plans for the future, and develop the general idea of the project. The participants discuss the different themes of the project and/or one theme at a time. Additionally, the aim of the meetings is to evaluate the project and discuss the many practical and scientific questions that are raised in the course of the project. The different themes can be discussed, if needed, in sub-groups. Our plan is to have two meetings per year: one in the beginning of March, and another in the beginning of November.

Indicative timetable of the meetings

The fourth meeting March 2003
The fifth meeting November 2003
The sixth meeting March 2004

Seminars

Our plan is to have three seminars; the first seminar has been held in Germany on Sunday 10th November 2002 (theme: the documentation of shipwreck sites and photogrammetry), the second will be held in Sweden in 2003 (theme: the visualization of shipwreck sites), and the third in the United Kingdom in 2004 (theme: the monitoring and safeguarding of shipwreck sites).

Seminars are bigger meetings with external experts and a wide range of lectures that bring extra expertise into the project. The seminars last for three days; they begin on a Friday and continue on Saturdays and Sundays. Seminars are open for the general public, which is why they are scheduled on weekends. At each of the seminars, five experts are invited as special advisors and lecturers. The experts are specialists on underwater documenting, visualizing, monitoring and management.

The aim of the seminars is not only to provide the partners and the general public with information and expert knowledge but also to produce dialogue between the different groups who have an interest in the management and exploitation of the underwater cultural heritage. The seminars are intended for the general public and the media as well as for the students and cultural operators and professionals of underwater cultural heritage.

Indicative timetable of the seminars

The second seminar will be held in Sweden in 27-28 June 2003.
(theme: the visualization of shipwreck sites).

The third seminar will be held in the United Kingdom in the spring of 2004
(theme: the monitoring, safeguarding and management of shipwreck sites).

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