Sri Lanka Maritime Archaeological Unit Report on the Avondster Project 2001 - 2002

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3. Maritime History - The Netherlands. I. Parthesius, R. II. Millar, K.
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Message of the Hon. Minister of Human Rescource Development, Education and Cultural Affairs Dr. Kurunasena Kodituwakku

The joint work of the Maritime Archaeology Unit of the Dept. Archaeology, and the Central Cultural Fund comes directly under the purview of my ministry. I am indeed happy to add this message to the First Underwater Archaeological Excavation and Research Report of the 'Avondster' Excavation and Conservation Project of the Maritime Archaeology Unit which is being implemented by the Mutual Heritage Center of the Central Cultural Fund in collaboration with the Dept. of Archaeology, the Amsterdam Historical Museum in the Netherlands and the Western Australian Maritime Museum.

As the minister in charge of the subject of Human Resource Development, Education and Cultural Affairs in particular, I appreciate the work carried out by the 'Avondster' Excavation Project in Galle, as it is involved in human resource development through its training programmes conducted for the young Sri Lankan underwater archaeologists, maritime artifact conservators and related scientific research and also in conducting programmes of dissemination of knowledge among the general public including school children. Sri Lanka, a nation that possesses a rich natural and cultural maritime heritage with great potentials in research needs trained resources to meet her future needs.

I would like to take this opportunity to extend my sincere gratitude to the government of the Royal Netherlands, its Embassy in Colombo, and the Amsterdam Historical Museum in the Netherlands for their instant co-operation and assistance in the preservation of Cultural Heritage of Sri Lanka. I also wish to acknowledge with gratitude,the important work being carried out by the Directorate and all other team members of the 'Avondster'Excavation, conservation and research project for the work they have accomplished in the First Year of the programme and congratulate them on the publication of their First Progress Report.

Karunasena Kodituwakku

Minister of Human Rescource Development, Education and Cultural Affairs.

Ministry of Human Resources, Education and Cultural Affairs,
'Sethsiriaya', Battaramulla, Srilanka.
15th of October 2003

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The Avondster Project would like to thank:

Board of Governors of the Central Cultural Fund for granting approval to the Mutual Heritage Centre of the CCF to carryout the project.

The Netherlands Cultural Fund

Ministry of Human Resources, Education and Cultural Affairs,
Sri Lanka
Department of Archaeology, Sri Lanka
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Galle Heritage Foundation.
Government Agent of Galle
His Worship the Mayor of Galle
Sri Lanka Ports Authority – Galle Harbour.
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The Royal Netherlands Embassy– Colombo
The Ministry of Foreign Affairs, The Netherlands –
The Ministry of Education Culture and Science, The Netherlands
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The Netherlands National Archives

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Preface

The Report, which this prefaces, covers the work done during the first year (2001-2002) of the "Avondster" project which is expected to continue up to 2005. This project is the latest form in which the maritime archaeology studies in Galle Bay are being manifest. Before the commencement of this project, the Archaeological Department of Sri Lanka, in concert with the Western Australian Maritime Museum, the Post Graduate Institute of Archaeology, the Central Cultural fund and other government Departments had conducted preliminary work since 1993. The assistance afforded in these activities by non-government bodies as the Maritime Heritage Trust of Sri Lanka and the Sri Lanka Sub Aqua Club needs to be acknowledged here.

During the period 1993-2001, many significant developments took place, the most important of which – from a long-term point of view – was the establishment of a core group experienced in maritime archaeological work, which would form the Maritime Archaeological Unit of the future. Technically, the most important activity was that of conducting a survey of the underwater landscape of Galle Bay. Not only did this work provide the basis for the selection of the "Avondster" site for further investigation, but it also formed the basis of a cultural environmental impact survey preceding the planned expansion of the commercial port of Galle. As a result, the plans for the expansion (not yet taken in hand) were drawn up in such a manner as provide maximum protection to the underwater archaeological sites.

In the present project, the Archaeological Department has authorised the Mutual Heritage Centre of the Central Cultural Fund (comprising all the Sri Lankan Institutions) to be the main player, in partnership with the University of Amsterdam, the Amsterdam Historical Museum and the Western Australian Maritime Museum. Unlike in the past, this project is not an exploration or survey project, but is the first archaeological project undertaken under license from this Department. It is significant that the commencement of the project coincided with the adoption of the UNESCO Convention on the Protection of the Underwater Cultural Heritage. This enabled Sri Lanka to design a licensing system that reflected the concerns of UNESCO and ICOMOS. The "Avondster" project, therefore, is conducted strictly in accordance with the Convention and its Annexe, even though Sri Lanka has not yet become a signatory to the Convention. The intention of this country to practise maritime archaeology in keeping with its own well-established archaeological principles as well as with the new UNESCO Convention is, thereby, amply demonstrated.

On behalf of the Mutual Heritage Centre I extend my thanks to the Central Cultural Fund and its partners in the Netherlands and Australia for the good work done and invite you to read this, the first Report on our first maritime archaeological project.

Dr.W.H.Wijepala
Director-General, Department of Archaeology
Chairman, Mutual Heritage Centre

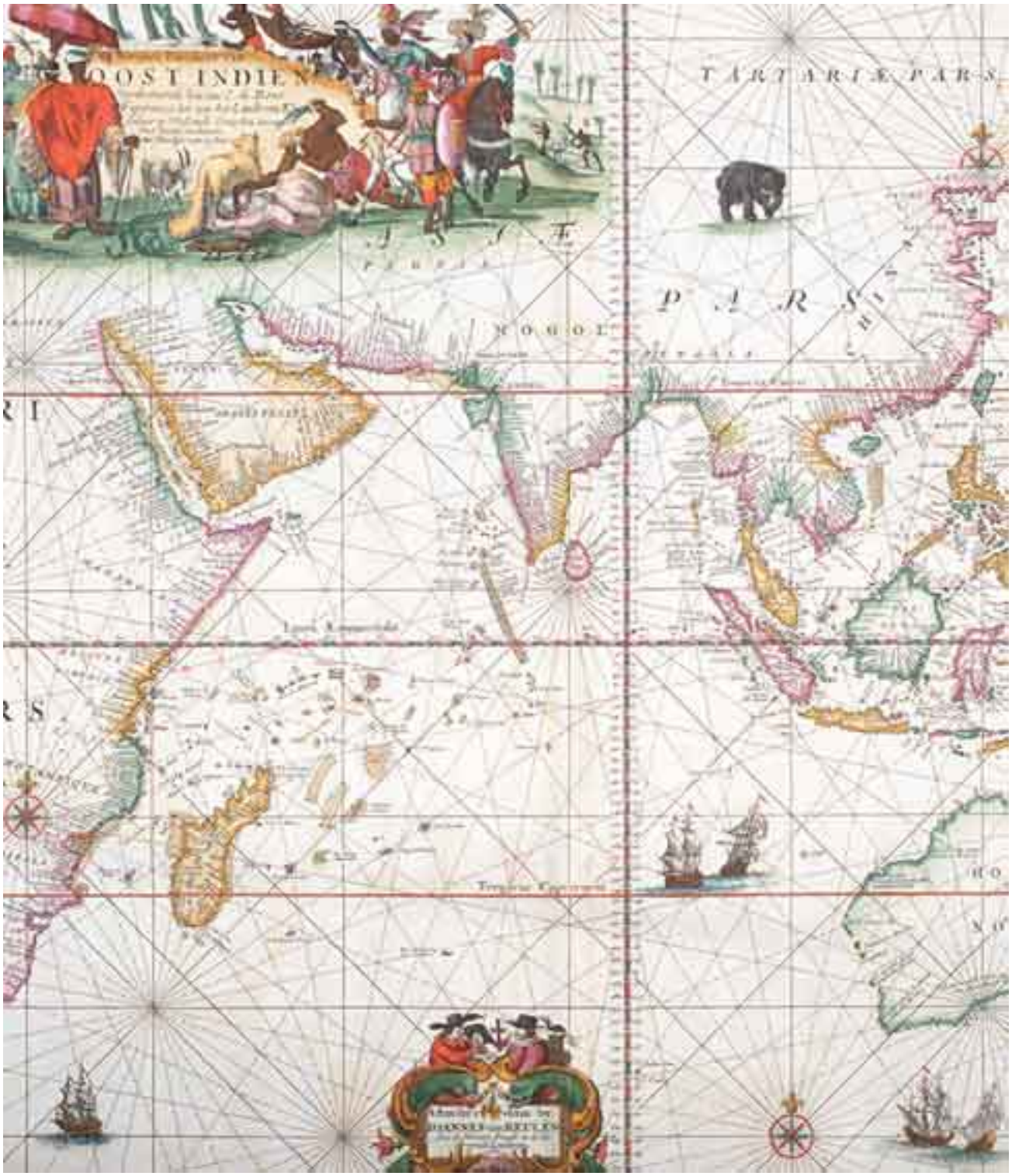


fig. 1, Nieuwe Paskaart van Oost Indien
by J. van Keulen (1680)
Amsterdam Historical Museum

1 Introduction

Sri Lanka is strategically located between Arabia and East Asia, at a natural crossroads of navigational routes, and has been a centre of trade and cultural exchange since ancient times. Sri Lanka's seafaring history, and the archaeological riches of her land sites, suggests that her underwater sites may prove comparably fascinating. In 2001 a Maritime Archaeology Unit (MAU) has been formed under the Mutual Heritage Centre, managed by the Central Cultural Fund in cooperation with the Amsterdam Historical Museum, the University of Amsterdam and the Western Australian Maritime Museum, and sponsored by the Netherlands Cultural Fund. The first major project is the excavation of the Avondster, one of several Dutch East Indiamen wrecked in and outside the harbour at Galle.

Galle harbour has an impressive number of heritage sites, some dating back many centuries before the Dutch (1640-1796). Underwater surveys of the Bay of Galle (since 1992) have revealed 21 archaeological sites dated from the 13th century up to modern times. Several stone anchors of Indo-Arabian pattern have been discovered. One of these weights almost a ton and is made of stone thought to originate from Oman. Its wooden stock has been dated around 500 years old. Such anchors imply they were designed for ships of considerable size. The wooden stocks would have been regularly replaced, so the anchor itself may be older. An anchor of Mediterranean pattern has been found, similar to those used in Roman times (fig. 10). A celadon bowl of the Southern Song dynasty (13th century) is one of our few relics of the early trade with China; the later blue-and-white Chinese trade ware is abundant.[1] While Sri Lankan archaeology is rich in treasures from much earlier periods, it is the combination of several Dutch East India Company (VOC) wrecks, with the VOC's extensive historical archives that makes Galle Harbour so interesting. The Dutch administrative records and maps are helping us to identify the shipwrecks and to understand their historical context. This report will present the excavation of the VOC-ship Avondster in the context of a broader field of research related to the role of Galle as an important port city in the Indian Ocean region.

Fig. 2, The remains of a 19th century steamer in Galle Bay.

fig.3, Shank of the stone anchor found in 1997

fig. 4, Cityscape of Galle, 17th century, Detail of map VEL 1054, The Netherlands National Archives

The Avondster was originally an English ship, captured and modified by the Dutch, relegated after a long career to short haul coastal voyages, and wrecked in 1659 while at anchor in Galle harbour. She lies close to shore, in only five metres of protectively murky water.
The hull has been well preserved and, apart from a torn-off stern section is complete on one side up to the gun deck. The exposed remains, and historical evidence that no salvage attempts were made at the time, indicate that there are many objects and significant structure beneath the sediment. The Avondster may shed light on the organisation of Asian trade by the VOC, about which little is known. Excavation of the Avondster is expected to continue until 2005.
The Avondster Project focuses not only on the archaeological excavation and conservation of the shipwreck itself, but also on; Sri Lankan-Dutch cultural heritage in Galle; training Sri Lankan underwater archaeologists and conservators; comprehensive archival research; and building a museum to display the excavated finds. The project is expected to yield new information regarding: Dutch East Indiamen involved in local maritime trade; seventeenth-century shipbuilding techniques; the nature of a mixed crew of Asians and Europeans aboard the ship; the organization and logistics of Dutch seafaring; as well as the development of Galle as a major port for the VOC. The results of the project will be presented in the renovated Dutch warehouse that currently houses the National Maritime Museum. This first report will present the goals of the project and the results of the research up to November 2002.

1.1 History of Maritime Archaeology in Galle Bay

In 1990 the Sri Lankan Archaeological Department adopted a resolution acknowledging the importance of maritime archaeology in the rich and extensive history of Sri Lanka. Up to that time, there had been only one occasion when an underwater site was explored. A wreck, which had been carrying a cargo of silver coins, was discovered by Arthur C. Clarke and studied by Peter Throckmorton in the early 1960s. Although this could have served as a wake-up call regarding protecting the underwater heritage, it did not; remaining an isolated incident. Even today, it remains

an example of the threat treasure-seekers pose to genuine archaeological investigation. The unfortunate spin-off was that it served as a model for local scuba divers who began to make a business of unregulated underwater tourism (since the 1970's when Sri Lanka began to be marketed as a "sea, sun and sand" tourist destination).

After 1990, and under the impetus of Cdr Somasiri Devendra, who was working towards the recognition of professional maritime archaeology in Sri Lanka, a more responsible and scientific approach was adopted. The Department of Archaeology, the Central Cultural Fund and the Post Graduate Institute of Archaeology sought the assistance of Jeremy Green of the Western Australian Maritime Museum to train a core group of archaeological students in Galle. An additional undertaking for the training team was to compile a data base of shipwrecks in the bay. This programme (The Galle Harbour Project) began in 1992 and continued on a seasonal basis for three years. After the discovery of a possible Dutch shipwreck in 1992, Robert Parthesius of the University of Amsterdam was invited to be involved in the archival research and the maritime archaeological work from 1993. In 1995 a plan was submitted to extensively develop the commercial port: a move that would disturb whatever lay on the seabed in the harbour area. In 1996-97, therefore, the training project was changed to a rescue archaeology project, which undertook to survey the entire bay, identify all possible sites by remote sensing and commence visual inspection of potential sites. Using side-scan sonar, a satellite-based differential global positioning system (DGPS), 48 east-west runs were completed covering a linear distance of 312 km and mapping a total area of 62.4 square metres of sea bed. Of the 160 potential sites noted, after visual inspection only 21 were identified as being of archaeological interest. The most significant of these were 11 iron wrecks of the 19th century, five European wooden wrecks dating back to the 17th century, several accretion sites where assorted artefact had gathered by wave and current movement and a stone anchor site dating back to the 14th century. The likelihood of the port development has, since, receded, but it was felt that this archaeological survey work should be completed.

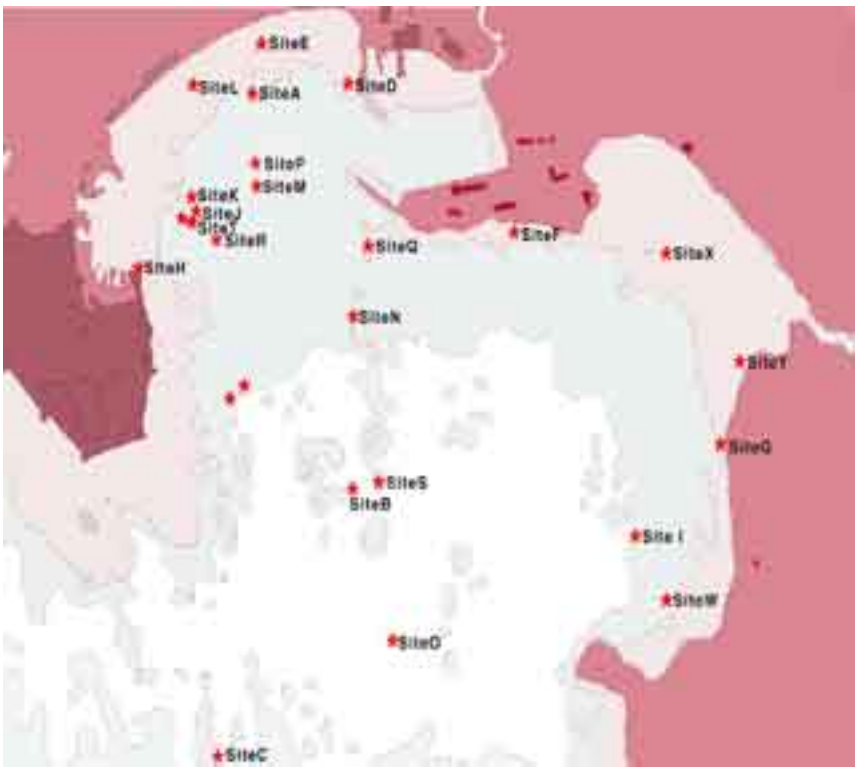


fig 5, Plan of Galle Harbour showing sites located

Site	Type
A	Large Iron wreck
B	Iron wreck
C	Iron wreck
D	Iron wreck
E	Wooden wreck
F	VOC-ship Hercules
G	Wooden wreck with ballast mound
H	Two iron cannons
I	Iron wreck
J	Large area of ceramic shards
K	Large iron wreck
L	Voc-ship Avondster
M	Iron anchor
N	Iron anchor
O	Iron wreck
P	Stone anchors site
Q	Wreckage
R	Iron anchor
D	Wreckage
T	Iron anchor
U	Iron anchor and wreckage
V	Wreckage
W	Iron wreck
X	Target possible wreck
Y	Iron wreck

fig. 6, The location of the Avondster site. Galle fort in the background

The problem, common to most developing countries, was the lack of funding. Serendipitously, a solution emerged. Sri Lanka's maritime provinces had, since the early 16th century, come under the control of the Portuguese, the Dutch and the British successively, till 1948.
In 2000 the Mutual Heritage Centre was established that would undertake and fund selected projects related to their shared heritage. One of the projects selected and, in fact, the largest, was the VOC-ship Avondster Project. This would involve a detailed exploration and excavation of the most significant of the sites identified.
After their training in survey and under water excavation techniques (accumulated during test excavation work in 1998-1999), it was considered that the Sri Lankan archaeologists (trainee maritime archaeologists) would benefit from the opportunity to conduct an all embracing excavation and research of a shipwreck. This would provide Sri Lanka with a team able to attend to the underwater cultural resource of their own country. The excavation and training was part of the project, the other included completion of a maritime archaeological conservation laboratory and establishment of infra-structure for maritime archaeology in Sri Lanka.[2]

1.2 The Avondster-project 2001 - 2005

The general aims of the Avondster project

1. Capacity building in maritime archaeology and conservation of artefacts found underwater (training a team and building-up infrastructure).
2. The conservation and investigation of the Avondster site through excavation and/or on-site conservation.
3. To conduct integrated historical-archaeological research on Dutch shipwrecks in the Bay of Galle. In this research, archaeological and archival sources will be combined.

fig 7, Galle Fort seen from the East.

4. To develop a research programme to study the role of Galle as an emporium and entrepot in the Indian Ocean region.
5. To gain public awareness through the establishment of a maritime archaeological museum.
6. To formulate a viable policy regarding the fight against looting to function as a role model for other countries in the region.

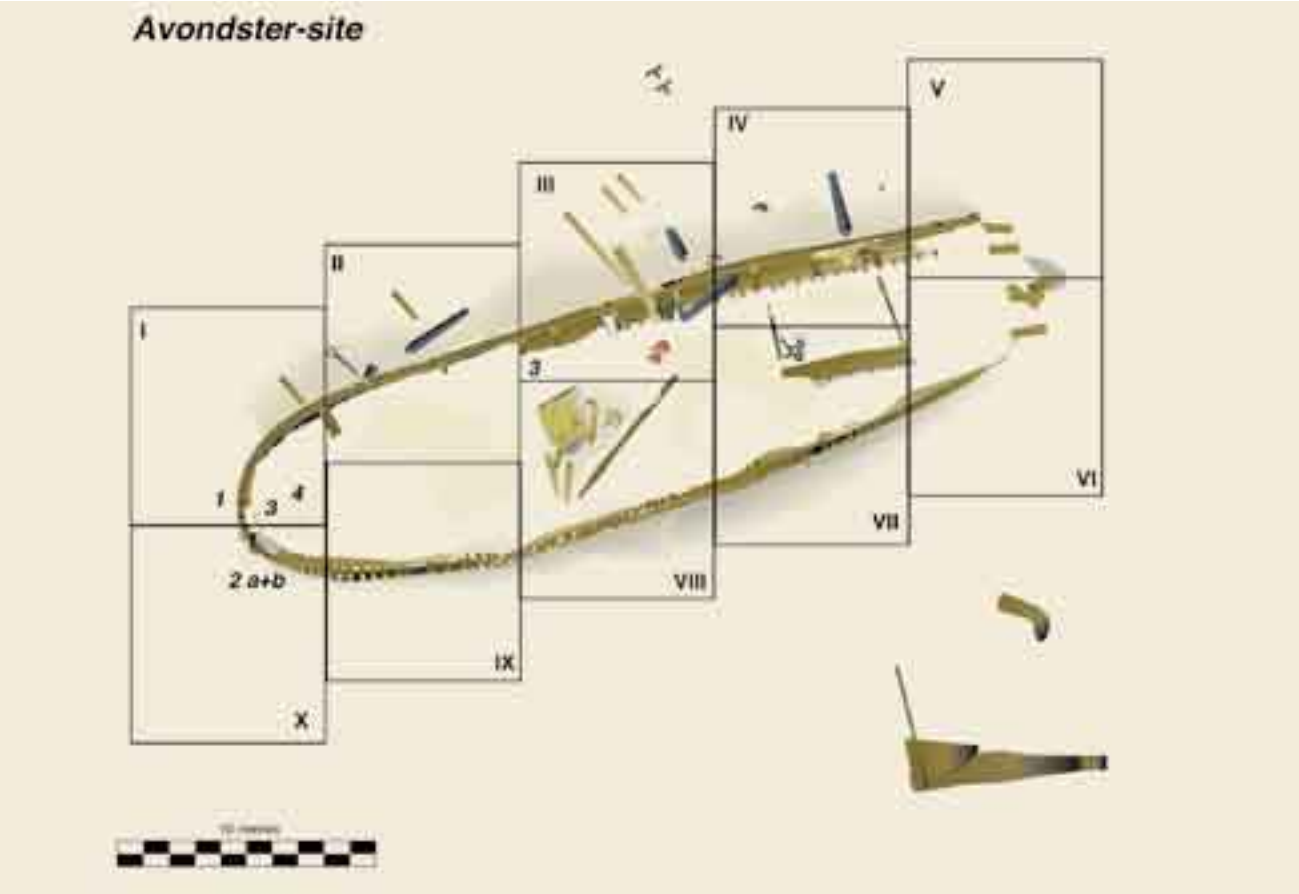
An ideal training site under threat

During the expeditions of 1993, 1996 and 1997 the wreck of the Avondster was discovered and identified.[3] A survey and test excavation in 1998 and 1999 revealed a site in an excellent state of preservation. A rich source of material finds and historical knowledge was anticipated.[4] The Avondster site is situated approximately 50 metres from the beach (off Marine Drive) and in a depth of four to seven metres. From a safety perspective, the site is ideal for trainees. The site is relatively easy to interpret when seen underwater, and will enable the trainees to understand construction and structure of a 17th century Eastindiaman. The Avondster is historically well documented, which allows the trainees to be introduced to historical-archaeological research.

The site is under treat. Due to changes on land, caused by the building of a sea wall, coastal erosion and the channelling of storm drains, the Avondster has become increasingly exposed over the last decade. Since 1993 inspections of the site have found progressively more of the shipwreck exposed. Once exposed, the structures deteriorate fast and degradation has been observed.

The prominent iron anchor originally had an intact wooden anchor stock, which has been eroding steadily over the years it was first discovered and has now disintegrated completely. Despite an official ban on diving in Galle Harbour, the site is also vulnerable to looting.

fig. 8, Avondster-site based on survey 1998-1999



The pressure of treasure hunting in all Asian countries is increasing and the opportunity to conduct a proper archaeological excavation using the highest possible standards will be an example to countries of possible alternatives to protect maritime heritage.
The proposal to develop a new harbour to the east of the Avondster site is likely to contribute an additional threat to the preservation of the Avondster. Construction of such a harbour might involve not so much direct as indirect changes of the environment. Changes in the marine environment is expected to cause changes in local currents that will affect the silting and erosion process in the area. Additionally, a new harbour will attract more sea traffic in the shallow bay, that may result in further difficulty for in situ preservation of the Avondster.
The Avondster project will aim for the artefacts within the wreck site to be recorded, recovered and preserved. Besides that a study to determine the feasibility of recovering and preserving the ship's timber will be carried out by the international specialists. If the recovering of the ship's hull is considered impractical, given the available funds, long-term planning and technical possibilities in Sri Lanka, the project will ensure that the hull structure will be properly recorded before covering the site (i.e. sandbagging) and ensuring that the structure is in a stable environment. In such a case a monitoring and maintenance programme will be formulated for the, then qualified, Maritime Archaeological Unit under the Mutual Heritage Centre Sri Lanka.

Participating institutions

The historical-archaeological research of the wreck of the VOC-ship Avondster is part of the broader Galle Harbour Project and a research programme investigating the establishment of a shipping network in Asia in the 17th century[5]. The Avondster project is a co-operation between the Mutual Heritage Centre (MHC), which includes the following institutes:

In Sri Lanka:

- Department of Archaeology (DA),
- Department of National Museums,
- Central Cultural Fund (CCF),
- Postgraduate Institute of Archaeology (PGIAR)
- University of Kelaniya.

In the Netherlands:

- University of Amsterdam: department of humanities (UvA),
- Amsterdam Historical Museum (AHM)

In Australia:

- Western Australian Maritime Museum (WAMM).

The Avondster project will be implemented by the Mutual Heritage Centre Sri Lanka. The main source of funding is The Netherlands Cultural Fund.

2 Historical-Archaeological Research

2.1 Introduction

The Avondster Project is an integrated historical-archaeological investigation. The combination of the archaeological assemblage of the remains of this East Indiaman, contemporary archival information about the ship and the organisation it was part of, will provide a dynamic set of research questions. The archival information will pose questions to be answered by the archaeological process and the archaeological results will, in turn, create questions to be clarified by historical research. Questions will be asked about the various ship types in service, the material culture on board a VOC ship, the technical development and the organisation of shipping during the relevant period. On a more general level we will also consider the position of Galle in the network of shipping and trade in Asia during the 17th century.
The Galle situation, in which archaeological material can be linked directly to the Dutch records in the National Archives of Sri Lanka and the VOC archives in the Netherlands, enables a unique and exciting multi-disciplinary research programme.

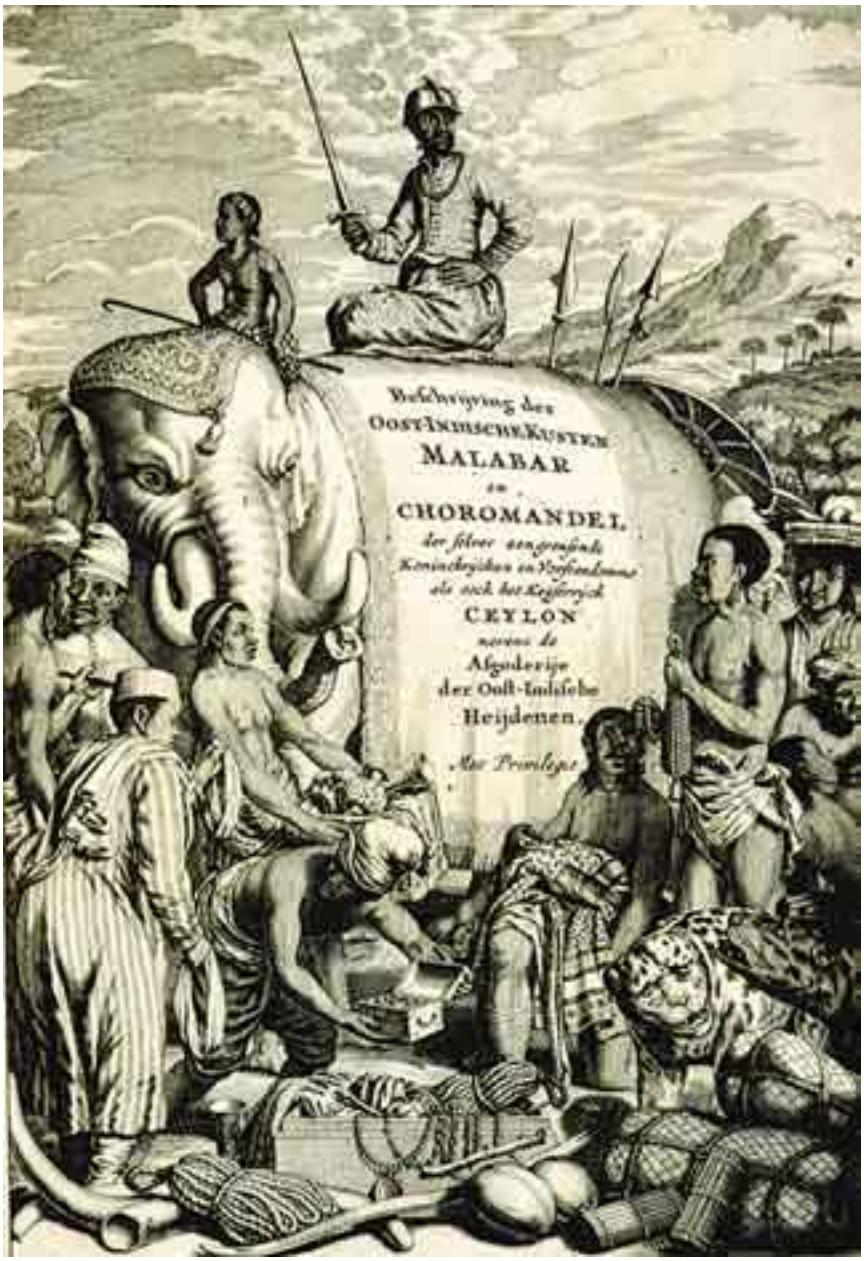


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fig. 9, Snorkle training in 1992

fig. 10, Measuring one of the stone anchors raised in 1997

fig. 11, Escavation of the Avondster site in 2002.

right page

fig. 12, Image of the merchandise from Ceylon and its region.
Title page of the description of Malabar, Choromandel and Ceylon by Phillippus Baldaeus (1672),
Amsterdam Historical Museum

2.2 Research in progress: 2001 - 2002

The starting point of the research is the historical context of the ship, the shipping and the trade. This includes subjects ranging from: the organisation of the VOC shipping and trade in Asia; Galle as important maritime centre; the background on the logistics of operating a ship in Asia; the roll of Dutch East Indiamen involved in local maritime trade; seventeenth-century shipbuilding techniques; the nature of a mixed crew of Asians and Europeans aboard the ship to detailed information on the Avondster itself.
The areas of research are expected to be adjusted and refined as new evidence and insights are revealed during the excavation. In order to publish a written account of our work during this process and to be able to exchange this knowledge in the early stages of the research, we will adopt a system of 'work in progress reporting'.
The following section will outline the 'active' fields of research. In some cases, the research is preliminary and has produced tables and inventory lists of consulted archival references. In order to have this information available for further analysis by a wide range of international researchers, we have strived to construct systematic documentation of relevant sources of information and publish those in the internet.

Development of Galle as an important maritime centre

The port city of Galle in the southwest of Sri Lanka has a reasonable safe natural harbour in the days of sail. The port was in use in pre-Christian times, but gained in importance after the 12th century. By the 14th century it was arguably the most important port in the country, and it retained this pre-eminence until 1873 when an artificial harbour was built in Colombo. The great Chinese admiral Zheng He commemorated his visit by leaving a trilingual inscription in 1411; the three languages were Chinese, Tamil, and Persian (incised in Arabic script), implying a cosmopolitan trading community. The Portuguese arrived in 1505, and later built a small fort; but it was after Galle was captured by the Dutch in 1640 that the city rose to its greatest prosperity. The Dutch rebuilt the town and strengthened the fortifications.
The English took over Galle from the Dutch in 1796 but made few changes to the infrastructure, since British commercial and imperial interests led to Colombo steadily gaining at the cost of Galle. Hence it is Dutch architecture of the 17th and 18th centuries which gives the town its present character and charm. Among the Asian ports of the VOC, Galle was second only to Batavia (now Jakarta).
For the VOC, Galle was a key trading hub. The warehouses were packed with trade items from all parts of Asia. Fleets of ships came to Galle each year for trade, supplies, and repairs. Although the internal harbour of Galle was considered safe during most of the year, the entrance of the harbour was not. (The port, in Dutch times, was the anchorage nestling in the shelter provided by the "hook", or promontory, on which the fort is built, and a single pier alongside which smaller boats secured.) Reefs and submerged rocky pinnacles were a danger to these ships. To enter the bay safely, skippers needed the services of a local pilot. While ships were at anchor outside the bay, they could communicate with the shore with flags and guns. If the skipper required a pilot, a Dutch flag was hung on the mizzen yard and a gun fired three times. The flagstaff guard would

fig. 13, Asking for the pilot
While ships were at anchorage outside the Bay they could communicate with the shore through flag signals and shooting guns. If the skipper required a pilot, a Dutch flag had to be hung on the mizzen yard and a gun fired three times. The flag-satff guard would indicate that the signal was understood by hanging the Dutch flag up side down.
Local dhoni were used to bring the pilot to the ships and then to guide the ships into the harbour. On this print one can see a dhoni sailing in front of the ship. They entered the Bay at the east side, near Unawatuna.
J.W. Heydt (1735),
Amsterdam Historical Museum

indicate that the signal was understood by hanging the Dutch flag upside down. Local dhoni (i.e. ourigger equipped sailing craft) were used to bring the pilot to the ships and then to guide the ships into the harbour.
It was common practice when ships were piloted into the harbour, to anchor small dhoni's as temporary buoys on the most dangerous spots. Ships were unloaded, revictualled and loaded by smaller boats, which operated from the jetty near the old town gate.[6] In British times, more jetties were built and one of these has recently been converted to serve as the diving base and conservation laboratory for the Maritime Archaeology Unit. Galle also had a small shipyard and skilled craftsmen, who could carry out necessary ship repairs.
Drinking water came from a well at the east side of the bay. Water was shipped in barrels to the town, and the ships. The water for the

fig. 14, Pilot Thonie is guiding a ship into the harbour
J.W. Heydt (1735),
Amsterdam Historical Museum

fig. 15, The return of the second fleet to Asia in Amsterdam in 1599. By Hendrick Cornelisz Vroom
Amsterdam Historical Museum

town within the fortified area was carried through a tunnel into the Black Fort, next to the great warehouse (now the Maritime Museum). Important trade items included textiles, pepper and yarn from South India, cinnamon, cardamom, pearls, gems and elephants from Sri Lanka. Some of the local products were exported only to destinations a short distance away (e.g. elephants from Sri Lanka to India); while others travelled further afield. Textiles were important in the trade to other parts of Asia, while most of the cinnamon was exported to Europe. The VOC was active in the trade of all of these goods, using an appropriate variety of ship types for each purpose. These are represented by the wrecks found in Galle harbour.

The organization of the VOC shipping and trade in Asia

When the Dutch first came to Asia, all of their ships made the long and dangerous voyage from Europe to Asia and then back again, but this was soon replaced by a 'hub-and-spoke' system. The Dutch captured Jakarta (Java) in 1619, renamed it Batavia, and made it the hub of their Asian trade. Small ships were dispatched to trading ports all over Asia, and the cargo they brought to the central storehouse was conveyed to Europe by large 'return-ships'. During the VOC's first fifty years, it developed different ship types suitable for the range of trading conditions i.e. depending on the type of cargo, the ports involved and sea conditions expected. A class of 'yachts' was designed for Asia.[7] There are two wrecks in Galle of ships specially built for the Asian trade. The Hercules was wrecked in 1661 as she departed with a cargo for Batavia, and the Dolfijn was lost two years later on arrival from Surat. The Avondster, in contrast, was a modified English ship, and had made several trips between Europe and Asia before being 'retired' to the Asian routes.

Smaller ships were required to transport goods from production fields to the trading hubs. The range of vessels included local dhoni and sloops which had to be built for the purpose. Older and less seaworthy yachts were relocated to the shorter routes. At an even more local level, the Dutch built a network

of canals in Sri Lanka for inland transport. The largest ships in service were the so-called 'return-ships' (retourschepen), designed for the lengthy voyage between Europe and Asia. These ships were usually of 500-1100 tons. Some of these ships sailed directly from Galle to Europe with a cargo of goods such as cinnamon and cardamom from Sri Lanka, and textiles, yarns and pepper from India. Other ships stopped at Galle on their way to and from Batavia. Two return-ships, the Barbesteijn (1735) and the Geinwens (1775), were wrecked in the bay of Galle.[8]

The History of VOC wrecks in Galle

The loss of the Avondster

The Avondster was wrecked on 2 July 1659. The ship had been anchored near the Black Fort. During the night, although the weather was fine, the vessel slipped her anchor and hit the shore northeast of the anchorage. The ship broke in two, and was soon submerged in the soft sand. An eyewitness account, found in the Dutch records of Colombo, tells how a sailor on deck discovered the vessel drifting and tried to wake the skipper. The skipper, however was slow in making his appearance, and by the time he ordered the warp anchor to be thrown out, it was already too late. After the disaster, the skipper and the first mate were arrested, convicted, and ordered to pay for the losses.[9]

The Avondster had been loading cargo for India. After the ship was lost, there were no other Dutch East India Company (VOC) vessels available to transport the rest of the cargo, which was still on shore. VOC officials decided that the burghers (free citizens) should be allowed to buy the cargo, but only on condition that it was sold for a fixed price; presumably they had existing contracts to meet with the Indian buyers.[10]

The Avondster's history

When she sank, the Avondster was in the service of the Dutch East India Company, however she had been, originally, an English ship - first recorded as the John and Thomas, and bought by the English East India Company in 1641. She was then renamed the Blessing, and despatched to Java.[11] Reflecting the general good fortune of the East India Company, she made two relatively straightforward out-and-back voyages (to Bantam in 1642-43, and to Surat and Bantam in 1644-45). Due to weak demand and intensifying trade competition, she was then deployed increasingly in the regional trade. She returned to England once more, in 1650.

In 1652 the First Anglo-Dutch War broke out, and although this conflict was ostensibly about local trade issues in Europe, it gave the VOC an excuse to attack its major competitor. It took a year for news of the war to reach parts of Asia, and meanwhile Cromwell had refused a request from the English East India Company to send warships to Persia. The VOC promptly captured five English ships: the Duyf near Batavia and the ships Roebuck, Leonoret, Supply and Blessing in the waters around Persia. (The name Avondster first appears in a letter from Batavia reporting this success to the VOC's directors.)

In Persia, the Dutch lay in wait from February 1653 for unsuspecting English ships arriving from India. After a month the Supply arrived from Surat and the Blessing from Coromandel. The English at Gombroon were looking out for these ships, but could not warn

fig. 16, Research in the Netherlands National Archives

fig. 17, Chart of the bay of Galle. The dangerous submerged cliffs in the entrance are indicated. VEL 1056 National Archives, The Netherlands

them, and a battle ensued. The skipper of the Supply surrendered, but not until he had managed to bring his cargo safely to shore, and negotiate that all officers and crew were to be housed comfortably and suffer no physical harm. At Gombroon the VOC allowed the officers to disembark with all their personal possessions and trade goods. The Blessing however, defended itself vigorously, according to Dutch accounts as well as the master's. Most of the sailors were kept as prisoners; however it was thought inhumane to keep them below deck in the hot Persian climate, and a captured Portuguese ship was used as a prison, anchored in the open sea with eight guards. Many of the prisoners escaped, the others were sent to Batavia along with the captured ships.[12] The Avondster was then sent to the Netherlands, and stayed for several months probably undergoing some refitting and modification at this stage.[13] (The galley of Dutch bricks, which we have found on the wreck site, is evidence of refitting. 'Hanging knees' - bracing timbers for the decks – have also been found, which show the ship's English origin, as they were not used by Dutch shipbuilders). In the English records she is listed as a ship of 250 or 260 tons, with a crew of about 65 for major voyages.[14]

In 1655 the Avondster returned to Batavia, and in 1656 she made trips within Asia. In 1657 she sailed again for Europe, but returned to Batavia due to severe leaking. The cargo for Europe was transferred to another ship, and the Avondster never sailed to Europe again. It was normal practice for ageing ships to be transferred to regional routes once they were no longer fit for the long and arduous trip to Europe. The VOC's directors discussed the condition and allocation of individual ships each year.

By 1659, after eighteen years in the service of the English and Dutch East India Companies and an undetermined prior history, VOC officials reported the loss of the Avondster as that of an 'old yacht'. She may already have been considered quite an old ship when captured in 1653. In 1645-6, the English East India Company had spent six months undecided whether to proceed with repairs, and then determined that her life could be economically extended for a further seven or eight years - which would have finished at around the time of her capture. It is possible that the name Avondster, which means 'Evening Star', refers to the ship's age, as ships were often given names appropriate to their function or qualities. The Duyfken, or 'Little Dove', was a yacht used for communication and survey.

By late 1657 the Avondster was in South India, where Commissar Rijckloff van Goens was campaigning against the Portuguese. In a letter from Van Goens to the Governor-General and the Council for India in Batavia, he expressed his disappointment about her condition:

Honourable, valiant, wise, prudent, and very generous Sirs,

We seize the first opportunity to inform you that after a perilous voyage we only reached Goa on 19th November [1657]. We were disappointed in finding things very different from what we were led to expect. Instead of the vessels we had hoped to find ready to join our intended expedition to Dui, we were obliged to exchange our strong war-yacht Vlielandt against the unseaworthy Avondster.[15]

Goens decided that the Dutch were too weak to attack the Portuguese immediately. A defeat would have left Ceylon unprotected, and he wanted first to assemble a larger fleet. He left several ships near Goa under the command of Adrian Roothaes. The guns of the Avondster and three other ships were transferred to bolster their firepower, and the fleet which stayed behind comprised 9 ships with 352 heavy guns and 1100 soldiers. The Avondster was sent to Ceylon, to inform Governor Van der Meijden about plans to attack the north coast, but could not reach her destination due to unfavourable weather. The Avondster accordingly waited off Cape Comorin for the arrival of Van Goens and further instructions. Eventually a small fleet under the command of Van Goens reached Colombo in early 1658. From here they successfully attacked the Portuguese in Jaffna, and by the summer Van Goens had captured the most important settlements on the northwest coast of Ceylon. It is not certain whether the Avondster took part in these actions, but later that year she was to transport the Portuguese prisoners to Batavia, and was evidently deemed seaworthy enough for this task. We do not yet know whether the Avondster actually made this voyage. We next hear of her a few months later, finding her last resting place in Galle harbour in June 1659.

The Avondster lies in the very heart of Galle harbour, 50 metres from the rocky shoreline of Marine Drive, opposite the market. Contemporary records mention that the Avondster sank in the mouth of a river. In an irritated report naming all those who might be held responsible, the VOC's officials recorded:

… the old yacht Avondster in Gallons Bay, after slipping her anchor rope… because of bad supervision was wrecked… struck ground and broke immediately in front of the garden of Marcus Lasseres, and the outcoming river on the side of the mountain.[16]

The soft sediment in the river outlet made the Avondster submerge deep in an anaerobic enviroment that kept the wreck well preserved for more than 350 years.

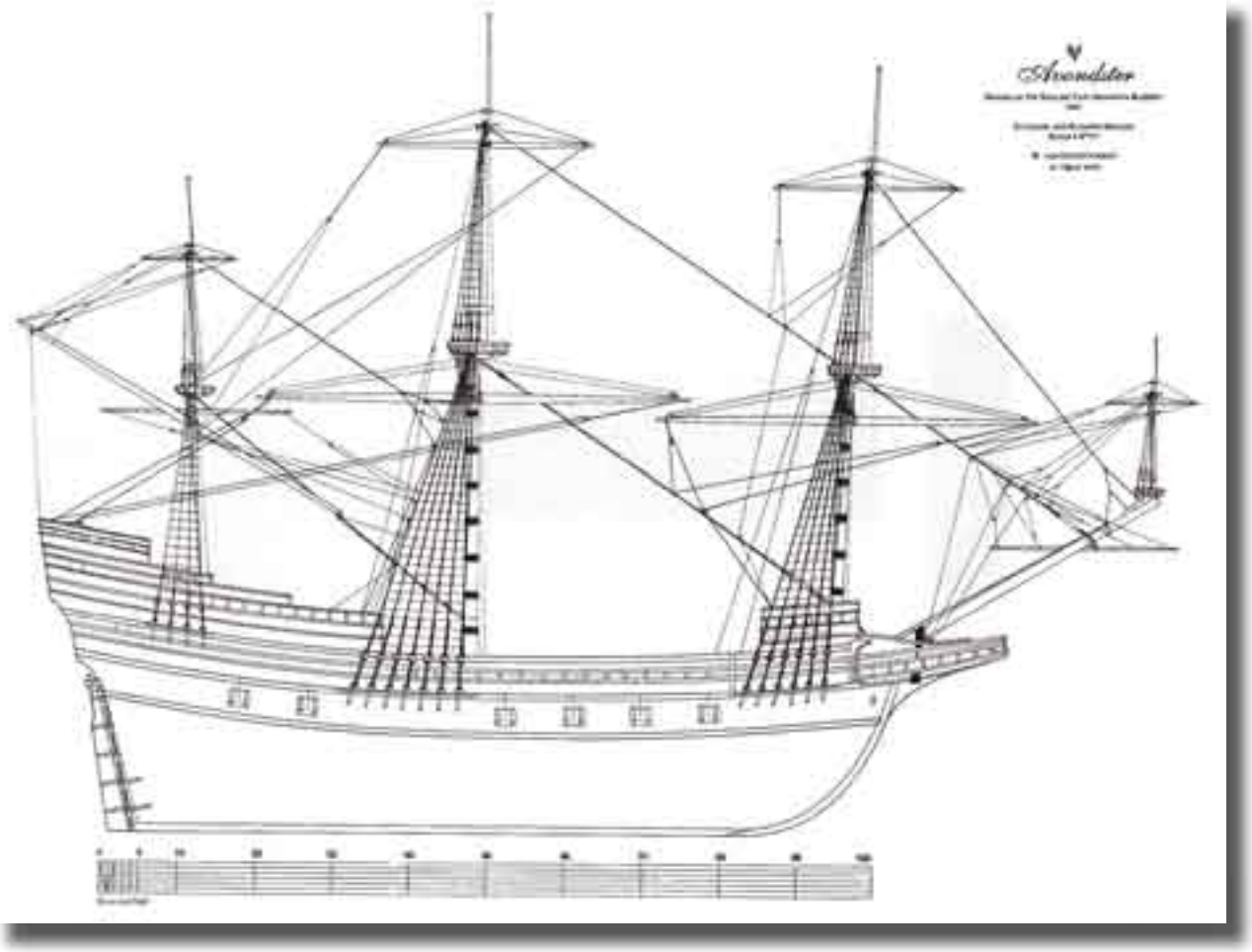


fig. 18, Reconstruction of the 'English Rigging' of the Avondster by Wendy van Duivenvoorde

The logistics of operating a ship in Asia

Ship types: Reconstruction of the ship and its rigging

During the 2001 - 2002 season, large quantities of spare rope and some blocks were found in the bow section of the Avondster. From archival sources we know that many spare parts were shipped from Europe to Asia in order to guarantee a quality standard. In some cases the VOC used local products. Analyses of the materials will cast more light on this practise. Research on shipbuilding will include English shipbuilding sources, since the Avondster was of English origin. This research will include an inventory of images of relevant ships and ship types. This documentation will help us to reconstruct features of the Avondster's hull and rigging. A tentative drawn reconstruction was made of the ship and its rigging based on the initial phase of the excavation made by Wendy van Duivenvoorde (see Appendix 2: The Rigging of the VOC Ship Avondster).

Ship construction techniques

Maintenance was one of the main issues for European ships operating in Asia for extended periods. Since the Avondster remained in Asia for many years without returning to Europe for major repairs, this vessel will provide information on repair methods in Asia, possibly revealing the integration of local materials and building techniques. We have already found evidence

of this, with the existing stock on one of the Avondster anchors being made from an Asian wood species.[17] The possible presence of workshops and stores on board will provide information about the organisational practise of the VOC to keep its ships sailing.
From a historical-technical perspective, the visible use of double-planking plus sheathing is an example of a building technique in practice during the late 16th and early 17th centuries, similar to that of the VOC ships Mauritius, 1609 and Batavia, 1629, and a recently found ship in the Waddenzee (Netherlands, dated around 1585). It has been suggested that in the case of VOC ships, this construction is an adaptation for the specific conditions encountered in sailing between Europe and Asia, and also within Asia. Both the Mauritius and the Batavia have minimal hull remains to work with. The Avondster, with its extensive structure, could reveal the overall concept of this building technique.[18]

Material culture of a maritime community at sea.

The Avondster was a European vessel sailing under a European company in the regional Asian trade. Historical sources provide much information about the logistics of shipping (food, crew, armaments etc) for the ships sailing to or from Asia. To date, most wrecks of VOC ships were either outwards or homeward bound vessels, sailing between Asia and Europe. Little, however, is known about the organisation of logistics on board ships involved in the regional Asian trade. In preliminary archival research into the administration of the VOC, a list of supplies, with partly Asian products, is shown for shipping conducted in Asia. It is also known that the VOC employed Asian sailors. Due to the complete nature of the site, the Avondster is expected to make a valuable contribution to our understanding of this important aspect of maritime history. To date, remains have been found of standard VOC equipment and packing materials, side by side with Asian jars, for example the big Martavans used for the storage of water and food.

lower left
fig. 19, The remains of the Batavia in the Western Australian Maritime Museum. The two layers of main hull planking are visible on the left

lower right
fig. 20, the port side of the Avondster. This part of the hull has also two main layers of planking.

Archaeological-Conservation Questions

fig. 21, the anchor with anchor stock in 1993.

fig. 22, finds exposed on the wreck site in 1999.

Classification of finds

Since the 1970's various authors have written about the classification of finds for VOC ships. The availability of extensive historical information about the material culture of the VOC would make it possible to adopt a functional classification model for the finds. Various models have been proposed.[19]
In order to be flexible in our choice of the final classification model, we have designed an artefact database that will allow us to organise the finds along various lines. This database contains the basic information on the artefact but will be connected with a database containing information on the historical context of the objects and their use on board and within the organisation of the VOC.

Site formation - wreck disintegration

From an archaeological perspective, it is rare to find a site as comprehensive as that indicated by the pre-disturbance surveys and test excavations on the Avondster. It is especially unusual to find ships in this complete state in tropical waters. Apart from the torn-off stern section, one side of the vessel is intact to above the main deck. Additionally, above this level, more of the superstructure has survived in the soft sediment north of the main structure. The presence of many objects exposed on the seabed, plus the historical evidence that no salvage attempts were made at the time, suggest the presence of objects and significant structure beneath the sediment.

In the first season of the excavation, the site formation and wreck disintegration process was the subject of research. The results will help us to understand the extent and character of the site and the reasons the ships timber survived so well. (See chapter 7 in particular section 7.3 which relates to the condition of the site.)

fig. 23, Cleaning of the underwater hull, the craft of the left makes the ship heave to one side. The Avondster wrecked under a similar list
17th century print by Reinier Nooms, Amsterdam Historical Museum

3 Understanding the wreck site

3.1 First speculative interpretation of the wreck forming process

From the archival sources it is known that the Avondster broke in two pieces after it hit the sea floor. The stern section is clearly separated from the main hull section. There is no record of attempts being made to save the ship, cargo or equipment after the accident. Directly after the loss the 'old yacht' was written off, and the officers were held responsible for the damage. It seems likely that because the wreck was exposed to the swell of the southwest monsoon, any salvage action would have been very dangerous and that the superstructure of the ship must have collapsed very soon after the ship submerged.
Based on this information and the surveys of the site between 1996-2001, the following theory has been proposed.

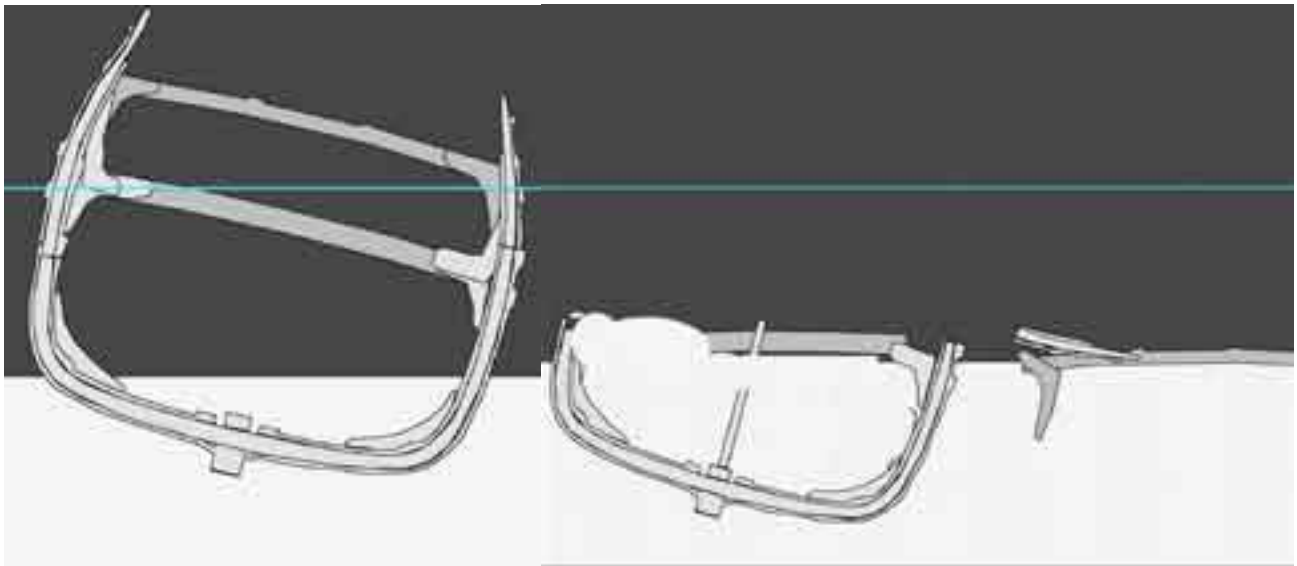


fig. 24, theory of the Avondster's wrecking process

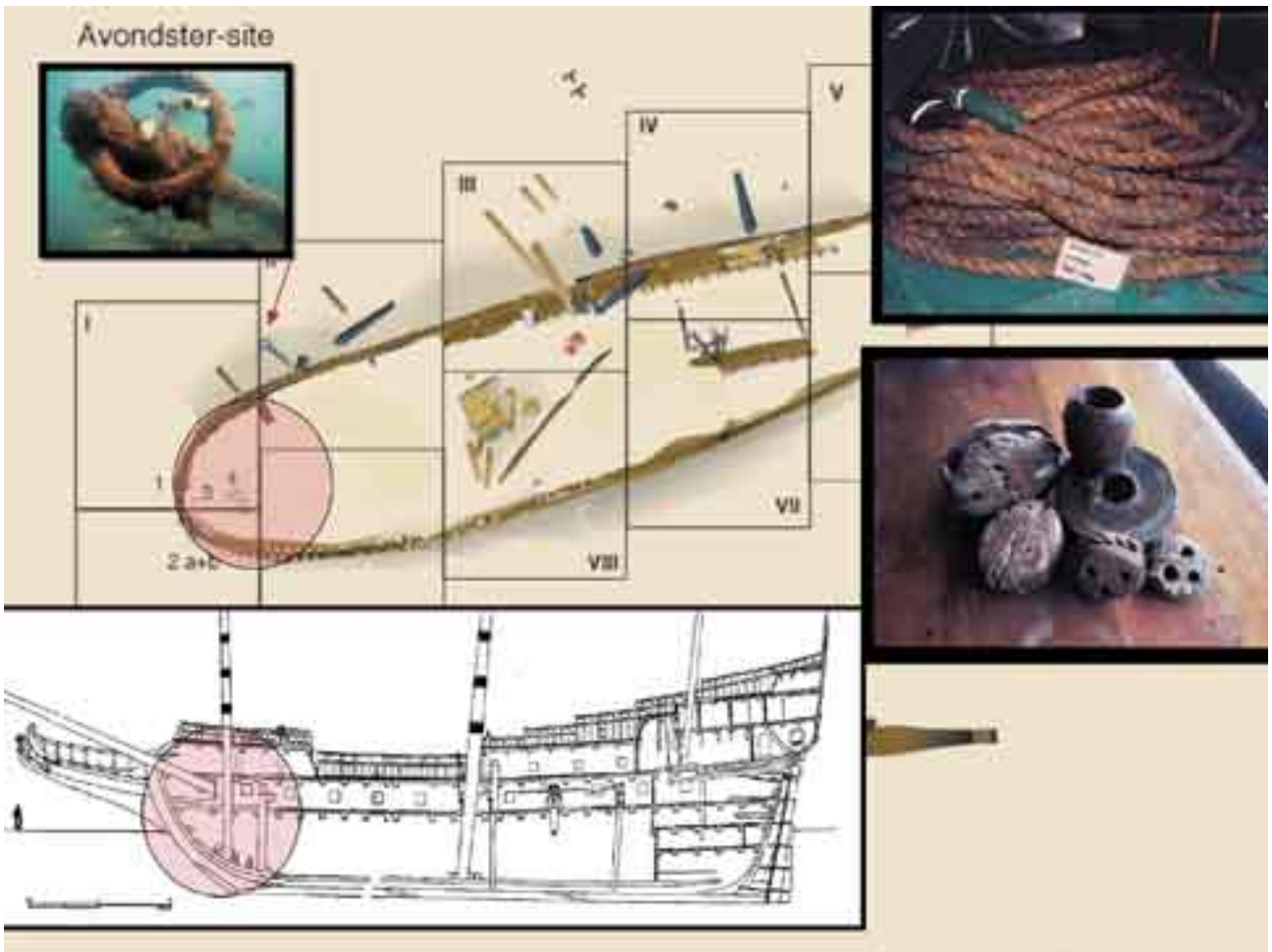
Phase 1:
The Avondster is stranded: sand flows in through the open stern of the ship, the ship submerges quickly in the soft sediment near the outlet of the river. After that, the superstructure of the ship breaks off in the swell, parts of the upper deck stay together and are washed north of the hull. What are possibly deck beams (found in this area) are in the same orientation, the deck of softwood has rotted away.

Phase 2:
The now partially buried wreck lies in 5 metres of water, on a gently shelving sea bed composed of sand and finer sediments, covered by organic detritus. The ship's remains cover an area about 40 metre long and 12 metre wide. The shape of the hull is outlined; with timber frames and planking protruding on average 50 centimeter above the sea bed. (The extent of exposure had been increasing year-by-year, and the timbers most exposed were eroding at a similar pace, until protective sandbags were laid in 1999.)
A section of the stern is broken away from the main wreckage which corresponds with contemporary accounts of the ship breaking in two. The stern section protrudes 2-2.5 metres above the seabed, with significant scouring around it.

3.2 Observations of the ship's remains till 2001

We know that the ship heeled on its starboard side toward the shore. The presence of the galley, supported by deck beams which run towards the remains of knees on the starboard site, indicate that the uppermost part of the wreck is most likely the remains of the main deck. On the north side of the ship between the bow section and middle of the ship, possibly five deck beam fragments were evident, all with the same orientation (330°). This may indicate that part of the orlop deck (or deck above it) became separated from the main ship whilst on the seabed. This suggestion is supported by the presence of objects and concretions washed shoreward. Future investigations are planned to include a detailed survey of this area. A typical concretion in the form of three or four iron fittings for the rigging (possible a channel from the chainwhale) can be seen 8 metres north of the main structure. Another potentially important area that requires detailed investigation is the area between the main ship structure and the separate stern section. Historical records indicate that the stern section broke away from the rest of the hull during the wrecking process. This is evidenced by the location of the sternpost, along with the under part of the stern section, including a deck beam and a possible knee, which is resting southeast of the main structure.

fig 24, Overview of various finds in the bow sector



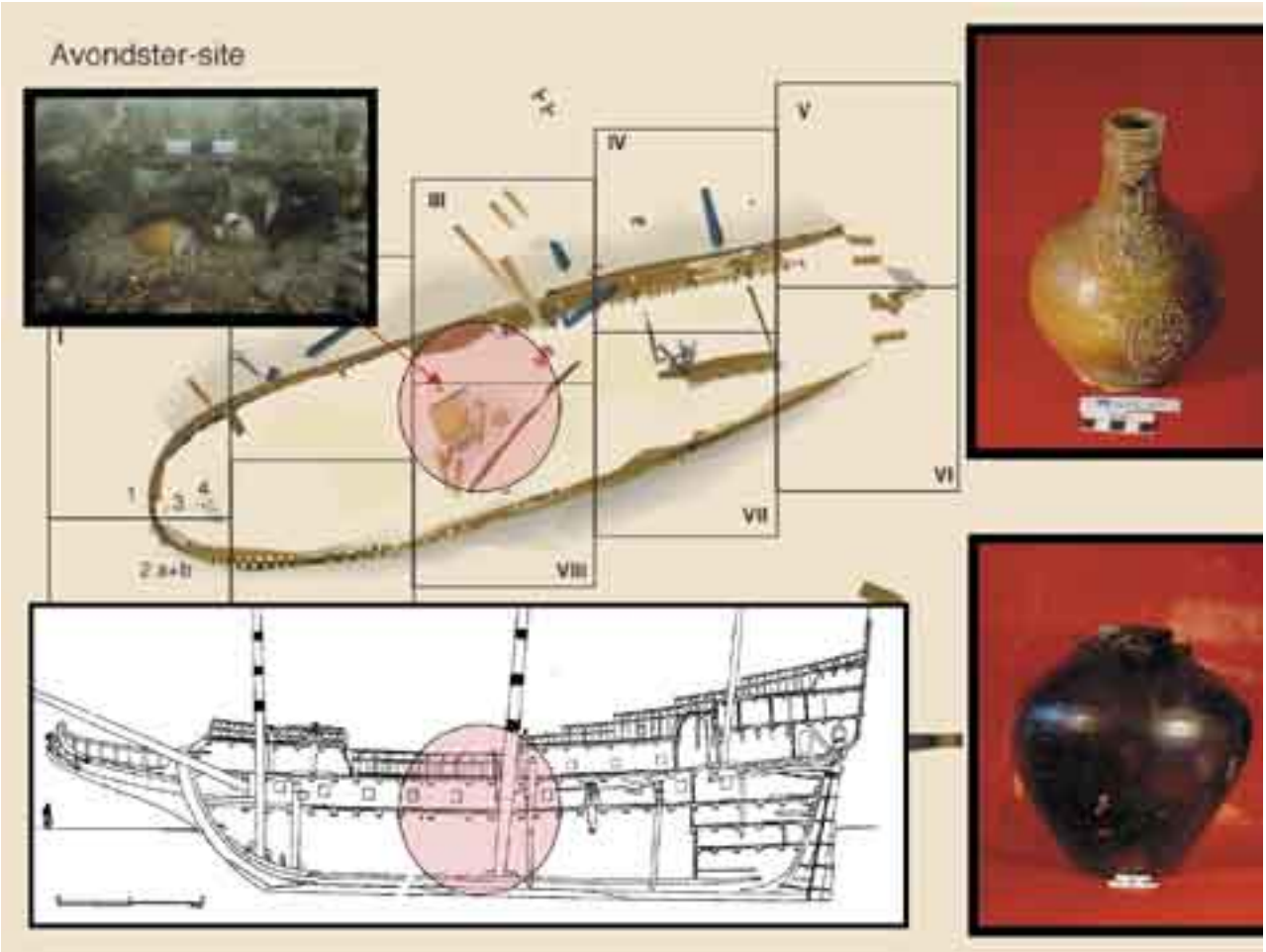


fig 25, Overview of various finds in the mid ship sector

At **the bow** one would expect to find artefact relating to rigging and ship maintenance since this was where the riggers had their workshops and related equipment was stored. Small anchors and a large amount of rope are exposed on the wreck site providing evidence of this.

The mid ship section is generally used for crew accommodation and food preparation and is proven so by the presence of the galley and an exposed barrel on the starboard side. During earlier surveys, and a probe excavation in 1996, fragments of lead, bricks and timbers were found around the galley. Now lead, bricks and timber have been seen exposed in areas where probe excavations did not show these features to exist. This indicates there are many objects in this region exposed from time to time by the underwater conditions. In 1998 - 1999 various objects related to the food production: stoneware, pewter and a grinder were found. North of the galley a large broken martaban was found.

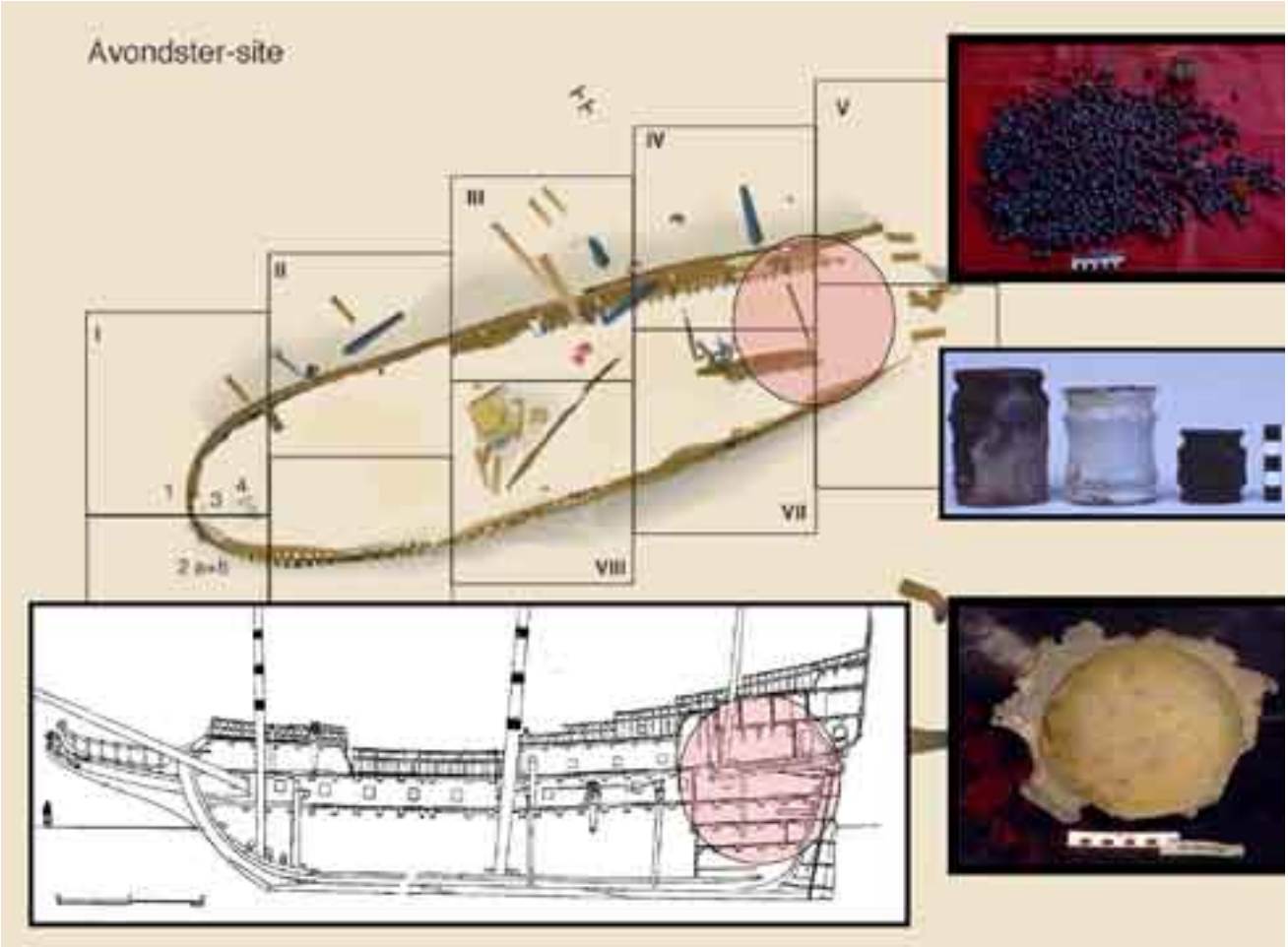


fig 26, Overview of various finds in the stern sector

The stern section functioned as the officers' quarters and the constables' workshop. Artefact such as navigation instruments, personal belongings, trade related objects and objects related to the maintenance of guns and weapons are expected to be found here. In 1998 - 1999 lead shot, a barber's plate and other artefact related to the ship's surgeon (ointment jars and leech combs) were found in this area.
A detailed survey should be conducted in the area between the stern section and southeast of the main structure, since the stern was separated from the rest of the vessel. During the preliminary survey a gun carriage axle was found on the seabed in this vicinity indicating the potential for more finds in this area.

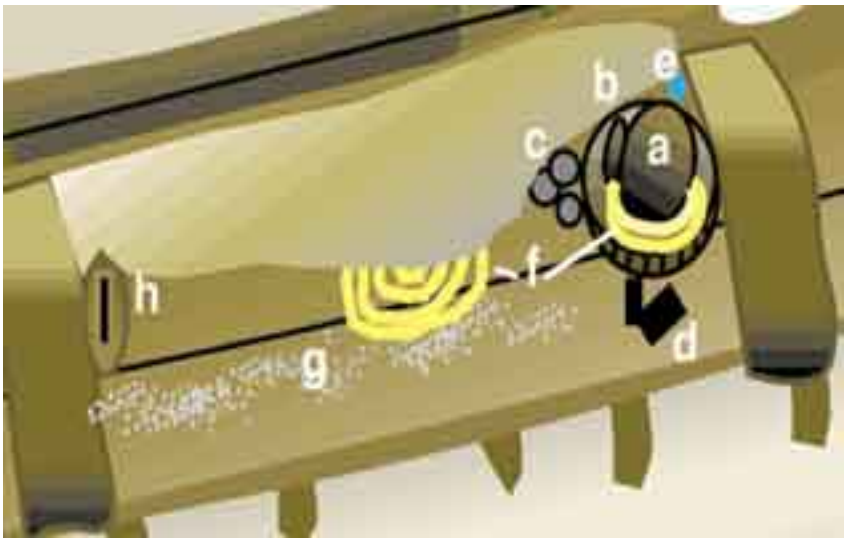
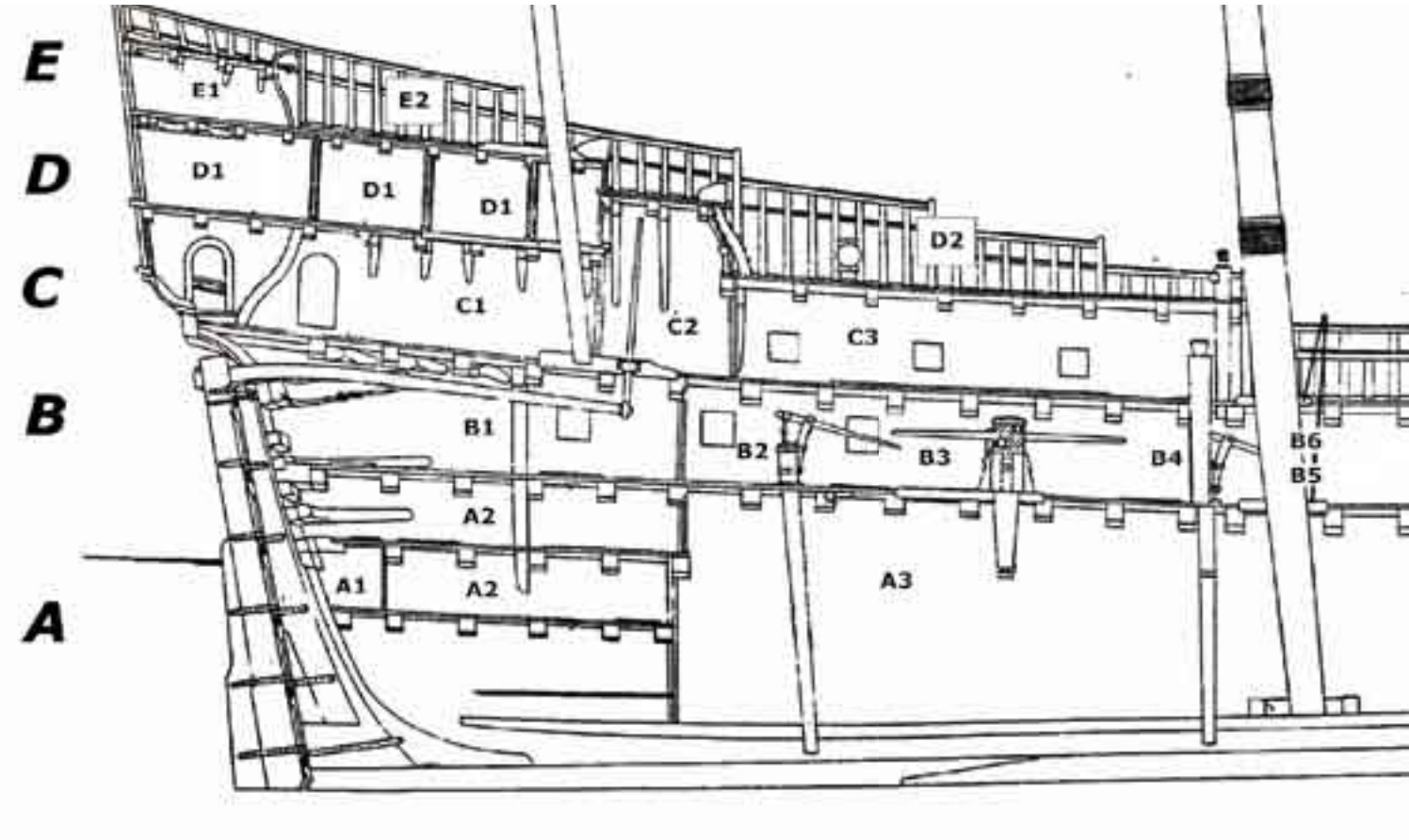


fig 27, Drawing of the exposed finds in the starboard stern section of the ship.
a. Asian jar,
b. small barrel,
c. three ointment jars,
d. two leech combs,
e. small porcelain vase,
f. rope,
g. lead musket shot,
h. pulley block

Right
fig 28, Maritime Archaeologist on the site

4. Understanding the wreck through historical information



4.1 A Dutch East Indiaman circa 1660

The availability of various documentary sources has made it possible to reconstruct the division of space in a mid 17th century VOC-ship.[20] This reconstruction is based on earlier research conducted for the reconstruction of the VOC-ship Batavia.[21] This layout, in the case of the Avondster, is tentative due to the 'dual parentage' of the ship. Additionally, this reconstruction is based on ships of about 40 to 50 metres in length. Since we do not yet know the exact dimensions of the Avondster (estimated to be between 30 and 40 metres) it is possible that the layout of the Avondster is somewhat different. During the excavation we hope to refine our knowledge on spatial division of the ship and be able to contribute to a more detailed knowledge of the layout of this multi-purpose ship type used for the Asian fleet.

Legend with the plan

A. Hold:

A1. Stern post with a little locker (helletje achterin).

Small store-room for ships' ammunition (canon balls and musket shot)

A2. Powder room and bread rooms.

Storage for the gunpowder, packed into small barrels. The powder room was located in a safe location in between the bread rooms, below the waterline. Bread was not stored as other provision in the hold, but in a special dry room. This space was lined with tin-plates. The bread rooms on either side of the powder room offered extra protection.

A3 Main hold.

The hold of an East-Indiaman was generally left empty. This space was the primary place for storage of cargo and equipment. Special planking and enclosures were constructed for vulnerable items or goods with a strong smell that could affect other products. Dunnage was used to secure chests and barrels in the hold. In the bow and stern, areas were allocated for special storage and workshops. Ballast was placed on the bottom of the hold. The ballast was separated from the cargo and the provisions by planking. In a 17th century East-Indiaman the water barrels were placed amidships.

A4. Cable locker & sail room.

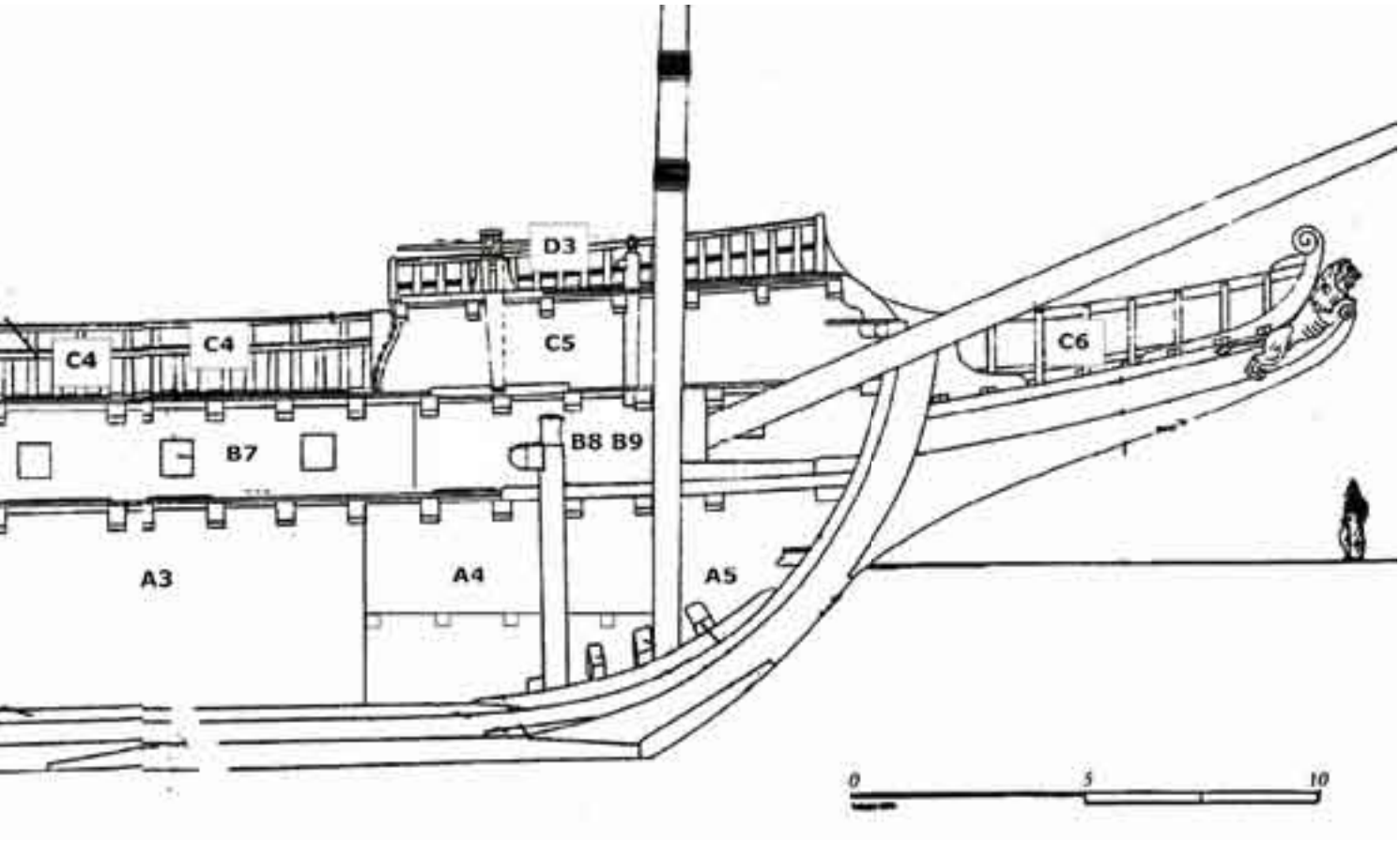
Anchor-cable comes through a hatch in the orlop deck and there it is coiled on a cable tier in the cable room. Store-room for spare sails with wide sliding-doors at the starboard and port. Besides a complete stock of spare sails, Also stocks of sail-cloth were stored here. This space could also be used for housing soldiers.

A5. Stem post with a locker in the bow (the hell)

The confined space in the bow of the ship was called the hell, possibly referring to the extreme movements in this part of the ship and the sound of the breaking water on the bow. The boatswain and his mate used this space as a maintenance workshop. Spare parts and spare rope for the rigging were stored here. This space was called hell because of its position in the ship. It must have been very unpleasant place to stay due to the ship's movements and the noise of the waves breaking on the bow.

B. Orlop:

Main work platform and accommodation for most of the crew. On this deck most of the cannons were placed behind the gun ports. Grates in the deck above provided ventilation and light.



B1. constable's room,
The constable is the person who takes care of the guns, weapons and related equipment and tools. His room was a quarters and workshop for the constable and his assistant, and as a weapons store.
B2. orlop behind the main mast
Quarters and workplace for the petty officers
B3 surgeon/barber's cabin
B4 sick-bay (sick-berth),
B5. steward's room,
Placed on the starboard where the steward managed the meals. Food is given to the cook and beverage is distributed to the mess's boys; everything had to occur according to strict rules.
B6 galley
The galley consisted of a brick fire place with an installation to hold cooking pots and to grill food.
B7 orlop in front of the main mast
accommodation for sailors and soldiers
B8 carpenter's cabin
B9 boatswain's room

C. Upper deck:
The upper deck with an open section in the middle: the waist.
C1. cabin: Spacious room for the higher ranked people on board. This space is divided into a meeting-eating room and sleeping room. Comfort was similar to that of a house ashore, and the decoration and ornaments were impressive.
C2 steering place,
Place of the helmsman at the whipstaff
C3. room underneath the half deck
Various functions (workshops, temporary cabins for passengers)
C4 waist,
Place for recreation of the crew. Storage for the boat on high seas. The smith and cooper worked in this area.
C5. room underneath the forecastle,
Shelter and recreation area for crew.
C6. beak head,
Work platform and crew's latrines

D. Superstructure:
On this deck officers had their cabins. From the open deck, 'behind the mast' they could supervise the crew.
D1. upper cabins
D2. Quarter deck
D3. Forecastle deck
Work platform and recreation area for the crew (smoking allowed here)

E. Poop deck:
E1 small upper cabin or hen coop,
For the trumpeter and drummer or used for chickens
E2. poop deck

4.2 A tentative reconstruction of the rigging of the Avondster[22]

To reconstruct Avondster's rigging, it was decided to base the rigging as it would have been rigged when purchased by the English East India Company in 1641 (still named Blessing). No records have survived describing the Blessing's rigging, and no contemporary documentation of the rigging of an English merchantmen is known to have survived from the beginning of the seventeenth century either. The four main sources (A Treatise on Rigging Written About 1620-1625, The Lengths of Masts & Yards, 1640; Manwayring, 1644, The Seaman's Dictionary, 1644; The Complete Modellist of Thomas Miller, 1655) were used to reconstruct the rigging of Blessing are treatises and documents mainly discussing warships in service of the Royal Navy.[23] However, Thomas Miller, probably a seaman on merchant ships, claims his model is 'for any ship or vessel, small or great.[24] In addition to these four documents, information from contemporary iconographic evidence and archaeological rigging material, e.g. deadeyes, pulley blocks, and a truck, from the Avondster shipwreck have been studied, and applied to the reconstruction. No mast steps have been located yet. Although it is Blessing's rigging configuration that is reconstructed, the ship will be referred to as Avondster in this paper except when cited in contemporary English documents. A reconstruction of the Blessing's rigging has been made because is is possible that the ship was still English rigged when it sank in 1659. (The full paper is presented as Appendix 2)

fig. 29, dead eye found in 2001

5 Site excavation: strategy and procedures

fig. 30, diver recording on the site.

5.1 Introduction

Observations made during earlier survey work and test excavations provided a basis for planning the current excavation. Between 1993 and 1999, a large variety of artefacts were found lying on of the seabed, some only slightly covered by sediment. The force of the sea movement on this shallow site creates a highly dynamic environment, especially during the Monsoon when the sea is very rough. Large quantities of sand can be washed onto, or scoured out of, the wreck in a few days. During fieldwork periods in 1998 and 1999 exposed artefacts, previously unseen, were found distributed across the entire site. These observations demonstrated how changeable the site can be and were crucial in designing the excavation approach.

5.2 Goals of the excavation

The main purpose of the first phase (2001–2002) of the project was:

- To devise an effective recording system for the site;
- to determine the extent of the site and to produce a preliminary site plan;
- to gain experience with the logistical problems of the Avondster site by conducting excavations in two areas of the ship;
- to instigate procedures for artefact registration and conservation.

5.3 First excavation period: November 2001-January 2002

1998 Site plan: Foundation for planning

It was obvious during the site inspection in 1998, that more of the site was exposed than had previously been seen. Considering this, it became clear that a pre-disturbance survey needed to be made to record the newly exposed features. Given the time constraints (the work had to be conducted during a two week workshop), the small team size, limited visibility and generally difficult underwater conditions, it was decided to aim for a "measured sketch" of the site. This would identify and illustrate the relative positions of objects and construction details of the entire site as opposed to a highly accurate survey of only a small section. The resulting site plan helped to assass the general rate of degradation and assisted in the development of a management plan. It formed the starting point for the work on the Avondster in 2001.

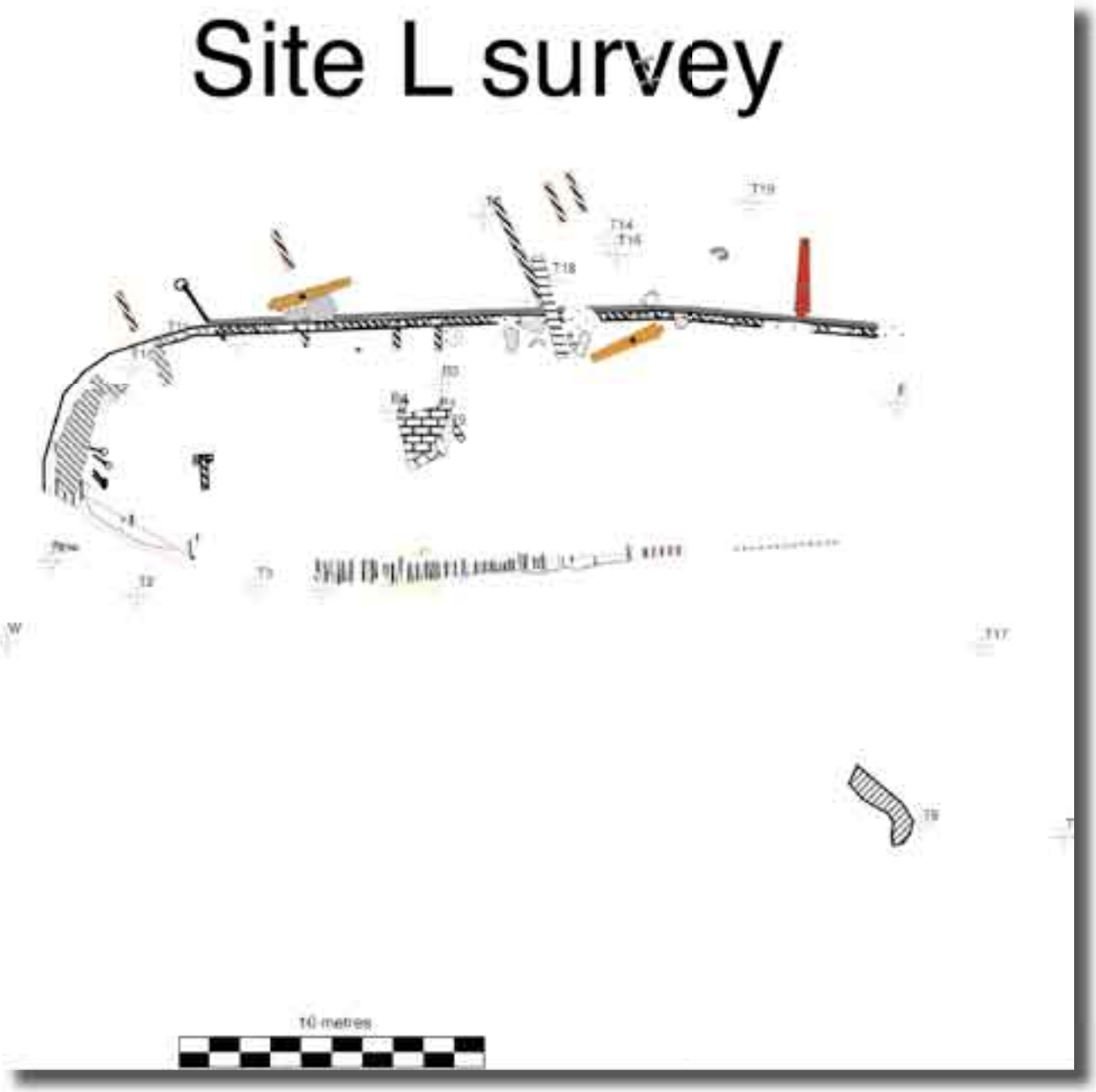
Techniques used in the "measured sketch" pre-disturbance survey

The site was arbitrarily divided into two sections with one buddy pair concentrating their survey on the starboard side and the other team the port side. Photography was undertaken independently of the two survey teams. The survey was conducted over a ten-day period with diving times planned to take advantage of the spring high tides. Rain (washing debris through storm water drains onto the site) and wind generated swell, exacerbated the already low levels of visibility.
The objective of this survey was to document in a short period of time, the features now more exposed than had been previously seen. A swim sketch of the site was considered to be too inaccurate to allow comparisons to be made with past pre-disturbance surveys. It was decided that a 'measured sketch' would be appropriate given the limited time and difficult site conditions. This would give positions of objects and construction features at a relatively low level of accuracy; it was considered that 15 cm accuracy would be accepted. The extent of the site was determined by the least squares survey conducted during an earlier survey in 1996. The 1996 data were used to compliment the measurements taken on site and to increase the overall accuracy of the final plan. Two baselines were established to allow both teams to work concurrently without affecting the others visibility. Three common survey points were used to relate each baseline to the other on the site plan. As a training exercise to compare accuracies, each team used a different survey technique. One team (working the port side) took detailed frame head measurements (outside, inside and widths) by triangulation from two survey points (tag 2 and tag 5). The team working the starboard side used a system of baseline and offsets to cover a larger area. The baseline began at tag 7 and extended toward the bow, terminating at tag 1. Another baseline was used from the bow (tag 2) to tag 1 to survey the bow section. Each team transferred their data directly from their dive sheets to the computer sketch using a CAD programme.

Recording system 2001

The first task was to install survey reference points which would serve as the basis for the survey and excavationwork. After an assessment of the quality of the ship's timber by the conservation consultants, it was decided to attach the survey points to the ship's structure. Stainless steel eyebolts with aluminium tags were made for this purpose. Starting at the bow, 33 numbered (0-32) tags were attached at two metre intervals to the hull and the broken off stern section. These survey points were 'surveyed in' to establish coordinate framework from which all the other points on the site could be measured.

fig 31, Site plan 1998



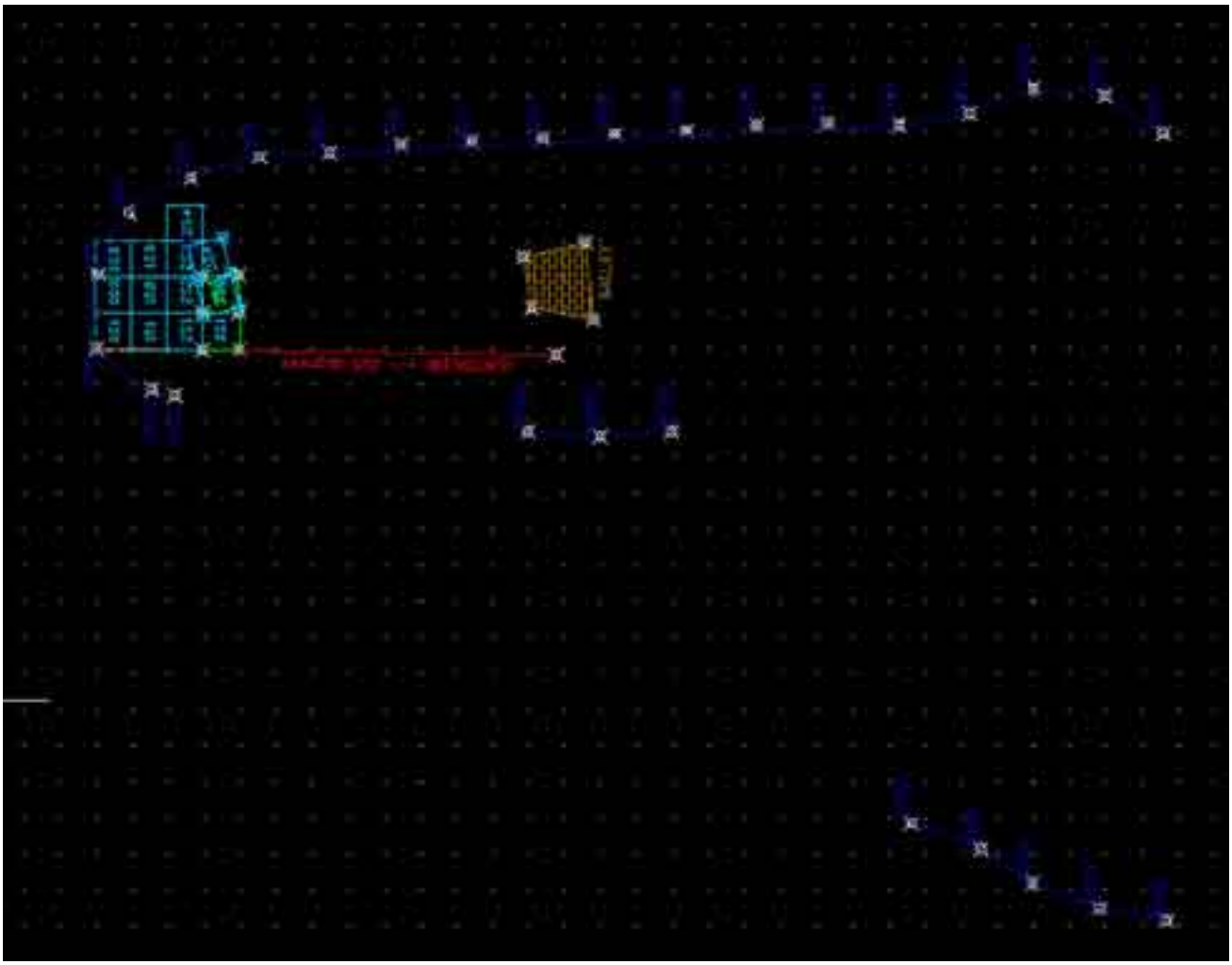
Site plan 2001-2002

For an updated and more accurate site plan, the relative distance between the new established recording system of all 32 fixed survey or datum points on the site was measured. Survey points were designated the letters 'SP' followed by their respective number in the sequence e.g. survey point 0 at the ship's bow would be SP0. Due to the poor visibility and site dynamics, it was very difficult to see whether the measuring tapes were bowing, twisted or snagged on something. To minimize the risk of erroneous measurements, which would require remeasurement later, measurements were taken in teams of three divers. The third diver continually checking the straightness of the tape before the measurements were taken. This proved to be surprisingly precise and efficient (in contrast to those taken by only two divers). Measurements longer than 20 metres were not taken because they would have been too inaccurate considering the current and other difficulties on the seabed.

Measurements were processed immediately after each dive. This made it possible to determine before the next dive, whether the measurements were within the allowed 15 cm error margin. If this was not the case, the measurements were retaken the same day.

Measurements were plotted on paper with pencil, dividers and beam compasses and the results checked on the computer using a software package WEB. Two members of the Sri Lankan team were trained to interpret the results and use the software. The 'pencil' site plan was drafted after a day's instruction with the Sri Lankan team,

fig. 32, The position of the survey or datum points placed on the site in 2001.



but was not completed in January 2002 due to a lack of time and manpower. Later in the project, these measurements will be exported to Rhinoceros or AutoCAD (3-D modelling programs) in order to obtain a computerized site plan. The Sri Lankan team have yet to be taught the latter program.
Both paper and computer plotting were used, to enable the trainees to learn the essentials of the techniques employed and understand the calculations made on the computer.

Excavation techniques

The first area to be excavated was at the bow. This section of the ship is well confined by the ships horizontal construction, and it was expected that the shape of the bow would confine the depth of the excavation pit. In the bow section we could test the appropriate excavation techniques and offer a training area for the team. The recording method chosen was to use a base line from the bow to the galley with 2 x 1 metre excavation grids at set positions along this base line. This system would be in keeping with the experience of the Sri Lankan team as land based archaeologists.
The grids were related to the fixed site survey points by trilateration. The close distance to the fixed survey points allowed us to make level measurements and determine the vertical position of the grid. The grid was designed to be adjustable so that it could be leveled over the excavation area. A sliding bar, in combination with a plum bob, allowed the exact position of the find or feature in the excavation pit to be determined. A water dredge, driven by a high pressure water pump powered by a 3hp engine, was used to remove the sand. Sandbag dams were used to restrict the fine sediment from refilling the excavation pit.

Site work

Excavation at the bow continued over a 7-week period (between 21 November 2001-9 January 2002), after the preparation phase of logistics and dive re-fresher course had been undertaken. In early December, work was interrupted for some days due to National elections. Since the MAU is located next to the Galle Elections office, the building could not be accessed when curfews were declared.
Dives were planned to be ongoing throughout the day with the dive boat returning for the second dive team around midday. Some days

above:
fig. 33, Preparing the excavation in the bow with a grid.

fig. 34, The 3 HP water pump to drive the water dredge.

fig. 35, waterdredge in operation on the site.

left:
fig. 36, The new dive boat and the inflatable carrying the excavation equipment

fig. 37, Taking measurements from the 2x1 meter grid.

or periods during the day, the visibility and conditions on the site deteriorated dramatically. There was no predictable pattern of the effect of wind, tide and sea conditions that would allow more efficient dive planning. In some cases dives had to be aborted due to poor conditions. All dives and tasks undertaken were recorded in the dive log.
Underwater work commenced with positioning the base line and delineating the excavation area. A row of sandbags were placed across the bow section, four metres from the bow running from survey point 4. The sandbags in the area, placed in 1999 to protect the ship and associated artefacts, were then removed. The first grid was placed north of the baseline at 2 metres (2S1-2). In this grid we expected to find the thick-served rope seen during earlier surveys (1998 - 1999).

Artefacts.

From historical sources we know that this was the place where the workshops of the boatswain, the second boatswain and the sail maker were located. We therefore expected finds related to the rigging of the ship. During the excavation, rope and blocks were the main finds, although we were hoping for additional finds related to the activities of the boatswain and the sail maker.

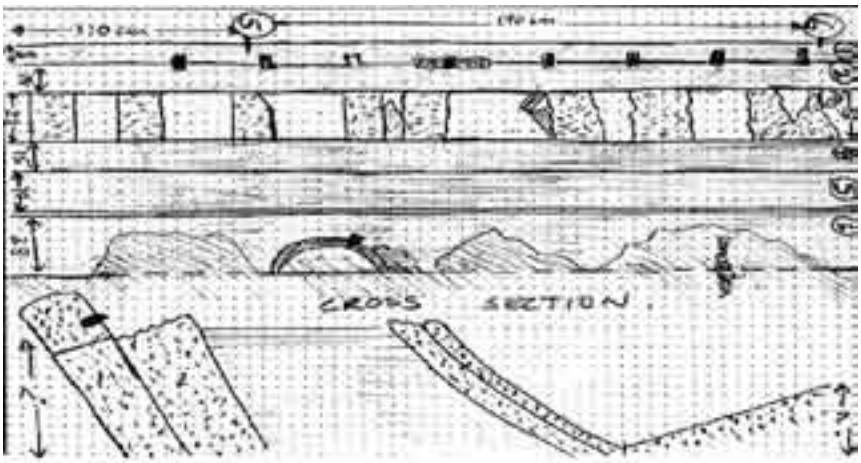


fig 38, Ship's construction in the bow section near the anchor (survey point 5-6)

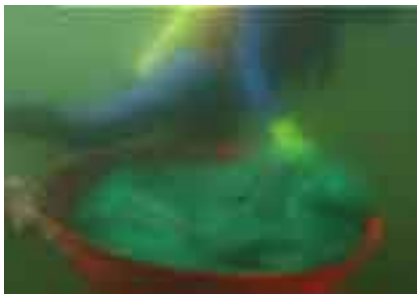
Directly underneath the protective layer of sandbags, a coil of rope was located in between thin vertical layers of planking. Toward the bow (1S1-3) a collection of pulley blocks, wheels, deadeyes and some thicker sheeted rope was discovered. In (3S1-4) bigger deadeyes, more rope and cannonballs were found. In grids (0S1-3) the construction of the ships bow section was exposed and recorded.

Conservation aspects: Condition of excavated finds

The rope appeared to be well preserved, but was in fact quite fragile. The swell and consequent surge on the Avondster site quickly caused the rope ends to unravel and fray. The wood of the blocks was badly degraded, being soft and vulnerable to surge damage also. The sheaves of the blocks appeared less degraded, probably because they were manufacture from a durable wood species. The poor preservation of the rope and wooden objects was possibly because they were located in sediments only half a metre deep.

The blocks recovered appear to be more deteriorated than those recovered from the same part of the ship in the late 1990's. This suggests a detrimental change in the burial environment conditions following the initial excavation. It was noted that the wooden items located at the greatest depth appeared to be in better overall condition. A concreted barrel hoop lay on the ship timbers with part of the base of the barrel inside; the rope and the wooden objects were possibly stored in a wooden barrel.

Artefact recovery



Only a very small quantity of rope was recovered in order to give conservators the opportunity to establish storage and treatment facilities for this material. The largest quantity of rope, appeared to be one contiguous length, comprised of numerious coils spilled over on its side. Several coils of the rope were isolated by careful excavation and this sample separated from the remainder, which was left undisturbed. Following separation, the rope coils were immediately wrapped in a fine mesh cloth to retain their overall intergrity and protect it from the surge. The rope was then transferred to a plastic mesh 'basket' (large food cover) which was supported by two divers and brought to the surface. All recovered artefact materials were transferred to the boat, kept wet, covered and transported to the nearby conservation facility. A diving conservator, familiar with degraded waterlogged organic materials, recovered the rope.

Excavation plan of the first season

The grid system was found to be accurate, however, it has major disadvantages when working on a site in such adverse conditions. Positioning the grids took a lot of effort and dive time. The surge often made it impossible to level the grid properly and made it difficult to use the plumb bob. Given the dynamics of the site, the accuracy of this recording system may need to be re-considered against the practicality of implementing it.

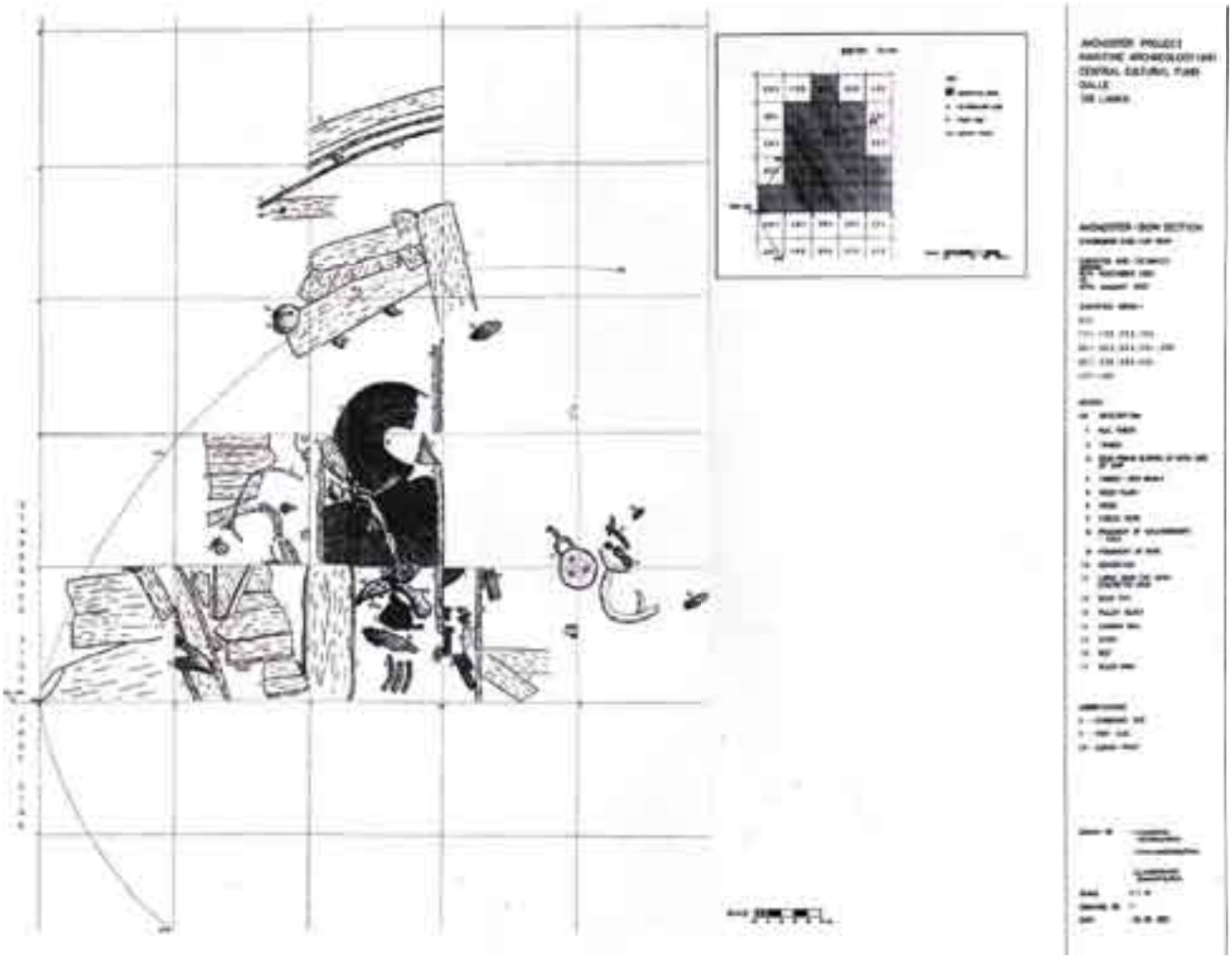
Another problem encountered was fine sediment spilling back into the working area. In order to work in deeper layers, sandbags have to be used to create an artificial dam on the sides of the excavation pit. The grids turned out to be too small to work efficiently given the required slope

fig. 39, Pulley block in the bow

fig. 40, Collection of finds relate to the rigging of the Avondster

fig. 41, The recovering of the rope

fig. 42, The coil of rope in the laboratory



of the sides. The system required reconsideration before the following fieldwork season.

The metal eyebolts used for the permanent survey points, fastened to the ship's hull looked like they may present a problem in the future. Survey point 0, 3 and 23 became loose a week after measurements were taken from them for the site plan. It is likely that more survey points will become loose in the future. The hull timber seems to soften significantly as it decays and the metal spikes loose their grip. Additionally, the stress caused to the hull when the survey points are used for measuring causes further damage. This is inevitable since divers grasp the bolts when holding the measuring tape. For this reasonin the future. datum points will be solidly fixed somewhere other than the remains of the ship.

fig. 43, The excavation plan of the bow sector.

Note: The contents of each grid do not appear to join the adjacent grid since they were not excavated to the same depth. In some areas, the excavation could not continue deeper since large amounts of coiled rope were found, that had to remain in situ. The conclusion was that, given the dynamic nature of the site, the use of smaller grids was not appropriate.

5.4 Second excavation period: March 2002

Site work

Diving operations were carried out over a three-week period during March 2002. There was a constant surge and visibility was generally poor for the whole period. Overall, the conditions were better during the first half of the day and on some afternoons it deteriorated enough to make it impossible to continue diving. As the fieldwork progressed, the starting time for diving became earlier and, with the increasing efficiency of the dive team, this resulted in more time on site. The results of each dive were recorded on paper on a newly developed 'Dive Report Form'. This provides an accurate and continuing record of all underwater activities and a track for raised artefact. This is particularly useful since foreign team members vary from season to season; however referring to the Dive Report Form will provide all the necessary information. While initially all the dive teams did not consistently follow this system , by the end of the work period it became an established practice.

Excavation of the area around the galley

The initial plan was to excavate an area toward the stern of the wreck on the port side, adjacent to survey points 13 and 14. This area had briefly been worked during the previous excavation season and had revealed some significant artefacts related to the ship's officers. The top of a timber barrel and a metal plate were located, however it was decided not to continue excavating in this area was made due to avery deep layer of sand that had been deposited over the area since the previous season.

The excavation was therefore moved to the area amidships, on the port side, between survey points 7 to 8, adjacent to the exposed ships galley. This area had a significantly shallower covering of sand. Excavation work concentrated on this area for the remainder of the March season. From 7 to 21 March, a total of eight days were spent excavating, three on recording, with four non-diving days.

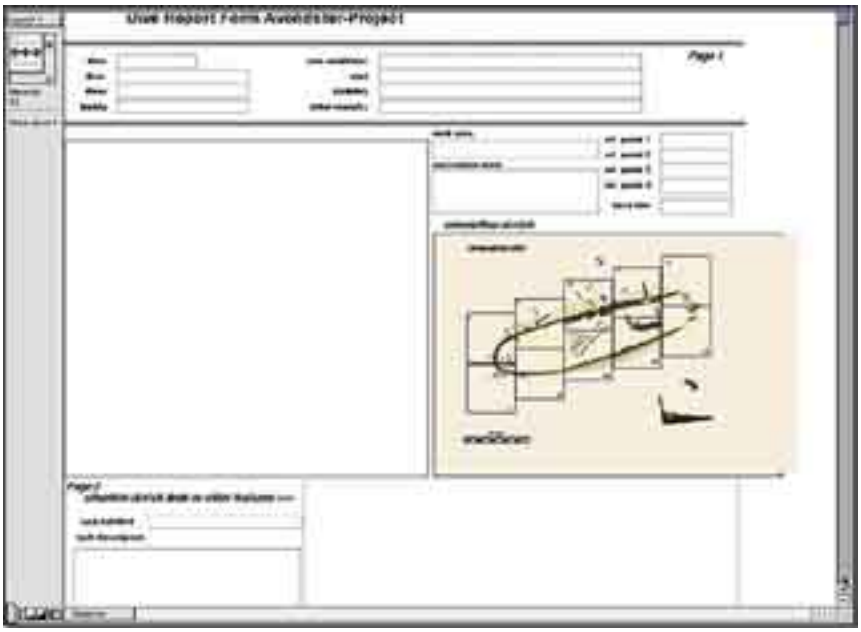


fig. 44, The Dive Report Form

The excavated area consisted of a four metre wide section of the ships hull and extended across the hull for a distance of approximately three metres to the edge of the ships galley. The deepest part of the excavation, adjacent to the ships hull timbers extended to a depth of approximately 1.5 metres. At the sternwards edge of the pit near survey point 9, the depth of the excavation was reduced because of the difficulty of preventing the sides of the trench from collapsing. The excavation was not taken up to the edges of the galley due to uncertainty on the stability of the supporting galley structure.
Apart from the sterile top layer of sand, the excavated area was very complex to work in because of the confused nature of artefact material located, i.e. fragile sections of timber barrels, collapsed structural timbers and tightly packed dunnage used for securing the ships cargo. Progress was also slowed by the difficult conditions caused by very low visibility and swell movement.
Recording locations of artefacts was carried out using tape measure trilateration from the known survey points. In many cases the positions of a group of associated artefact were recorded as a single location due to the difficulties and doubtful value of measuring each item. The location of large items, such as the barrels, was recorded by a number of measurements to points on the perimeter of the object. The structural timbers of the hull were sketched and measured with tapes.
At the completion of the excavation period the trench was reburied. A layer of green shade cloth was placed over the excavation area to delineate the boundaries for future work on the site. A quantity of packing timbers (dunnage) that had been removed from the trench was reburied and the excavated spoil was redirected over the trench using the water dredge. A number of sandbags were then placed back over the area to prevent scouring and to protect any exposed structure.

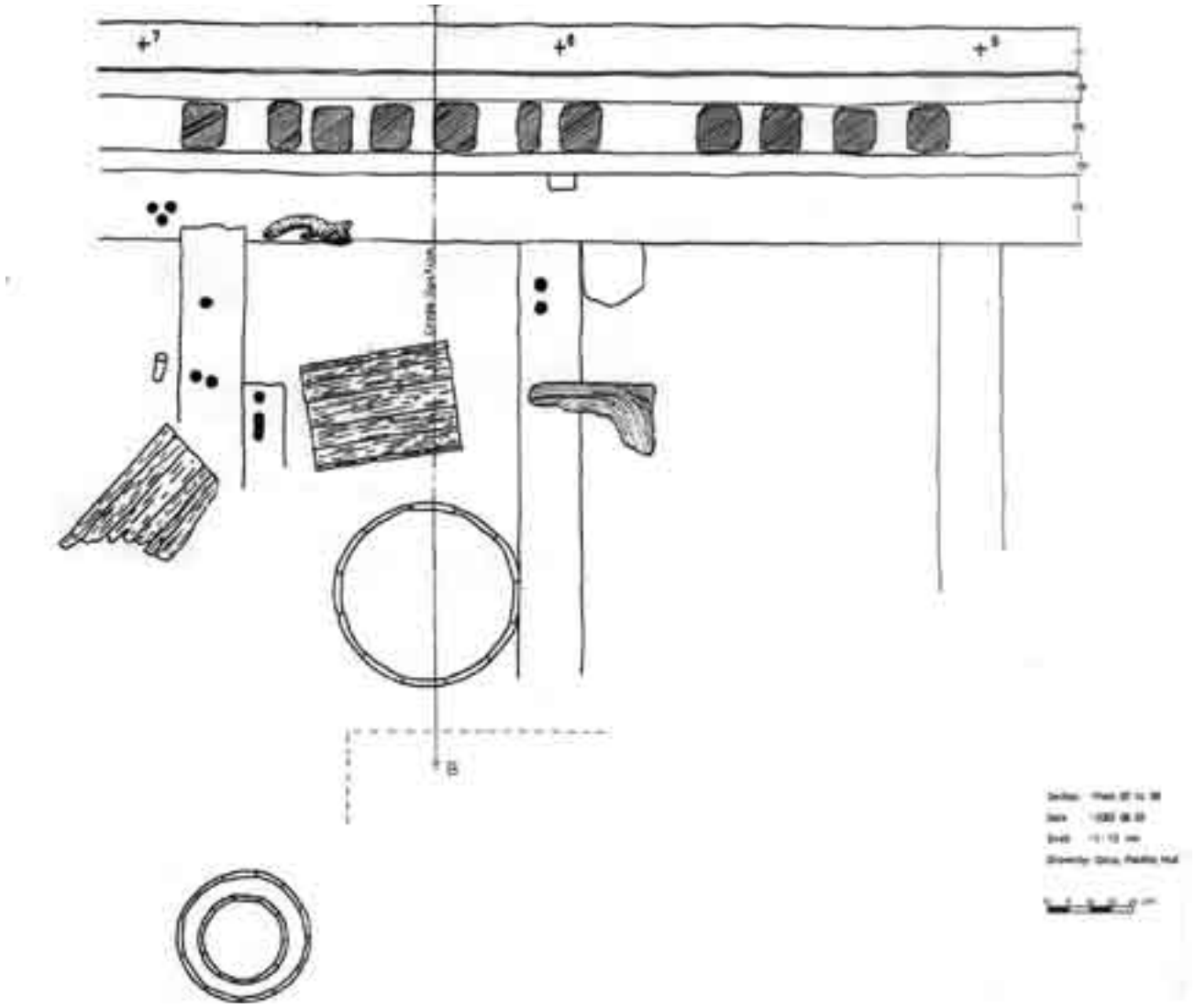
fig. 45, The remains of the galley floor

Artefacts

The artefacts raised during the March season were limited in number and variety. One of the largest numbers of items came from the two incomplete timber barrels that had fractured into individual components. The other major part of the artefact collection was a range of ceramics. These included loose examples of the distinctive 'yellow' bricks from the galley structure. There were a variety of fragments of crude earthenware pots and bowls – probably of regional manufacture. There was also a lesser number of examples of finer wares such as fragments of 'blue and white' Chinese export porcelain and three or four stoneware 'Beardman' jugs of German manufacture. Two small examples of these jugs were found intact, one was still corked and appears to contain its original contents.

Other finds included a small collection of animal bones, some bottle glass of both dark green and light green colour, areca nuts from the cargo, a copper alloy spoon, and samples of coal, possibly for use in the galley stove. Material from the ship construction itself included a loose timber lodging knee, examples of iron and timber fastenings, lead sheeting, and a sample of cordage from a three-stranded hawser cable. There was also a considerable quantity of cargo packing timber which appeared to have been originally laid horizontally following the long axis of the keel. This scrap timber varied in size from 30cm to 150cm. Six samples of the dunnage timbers were raised for analysis and/or display, the remainder was returned to the excavation pit at the end of the season and reburied in-situ.

fig. 46, The excavation plan of the mid ships sector.



Raising the anchor and gun

When first seen (in 1993) the anchor, located at the portside bow, had its wooden stock in place and was largely intact. The shaft and ring stood proud of the seabed and snared fishing net, line, plastic bags and any debris passing it. Considering its magnitude, ease of conservation and that a replica stock can be made for it, the potential that the anchor has to raise public awareness of the project will be considerable. The raising of the anchor was prepared by a qualified professional diver from the Western Australian Maritime Museum. The first part of the task was to examine the anchor to see if it was possible to raise it without difficulty.

Although it lay close to the hull structure, two days of excavation work cleared the sand and debris so that the anchor could be raised safely and without damage to the hull. One of the ship's cannon was found to be concreted to the shaft of the anchor, in an area approximately 10cm long, and in a smaller area to the side of the fluke. The anchor could not be raised until the gun was removed, and this join was considered to be small enough to free without damage to either artefact. As two large storage tanks were available at the conservation facility it was decided that both the anchor and the cannon would be raised.

The two items were separated; the cannon was raised with three 500kg lift bags and slowly towed to a shallow water jetty adjacent to the conservation facilities. Later in the day the anchor was also raised without difficulty and towed approximately 30 metre seaward of the wreck where its location was marked with a buoy. On 14 March the cannon was raised using a mobile crane from the end of the jetty and moved to an outdoor conservation tank near the entrance to the MAU. The anchor was then moved with lift bags to the jetty and raised, using two cranes, to a conservation tank on the end of the MAU's jetty.

fig. 47, The Anchor before raising in 2002

Ship Structure

The following explanation of the uncovered structure is given without the benefit of the final site drawings being completed at this stage. The timber structure recorded during the excavation consisted of a four metre length of the port side of the hull around the amidships area. The interior side of the structure was uncovered up to a maximum depth of 1.5 metres. From previous surveys the hull is known to be triple planked on the exterior of the hull with a single layer of ceiling planking on the interior side of the hull frames. There is some variation in the positioning and size of the frames, which range from 20cm by 20cm to 20cm by 32cm, sided by moulded.

Approximately 50cm below the surviving hull timbers, structure associated with one of the vessel's decks was located. Only a single line of deck planking, 35cm in width, remained in place and it was tilted upwards by an angle of approximately five degrees with a lean to the portside of the hull. A single deck beam remained in place but had collapsed downwards from the weight of the galley resting on top of it toward the centre of the ship. On each side of the deck beam there was a small timber-lodging knee; one loose example was recovered for conservation and analysis. It was not determined whether a hanging knee remained in place under the deck beam, as the area was not fully excavated. The discovery of at least two pairs of timber treenails protruding above the deck level indicates that some form of supporting timber, such as a knee, may have been secured in the angle between the upper side of the deck and the ceiling planking. A further feature of interest, at deck level, is what appears to be a drainage hole consisting of a triangular holecut out of the deck plank that leads to the mouth of a small metal pipe. It is assumed that this assisted the drainage of water from the deck downward to the ship's bilge.

Another unusual feature was the discovery of two large timbers secured vertically against the ceiling planking. These were positioned equidistant from the surviving deck beam and appear to be a form of internal framing. Measuring 40cm by 40cm these timbers are far larger than the ship's frames, and although they have been broken off it is obvious that they did run up the interior of the hull beyond the level of the surviving deck. Some 80cm below the deck level these internal frames are further supported on each side by an additional smaller frame. Further details of these additional frames were not recorded, as there was insufficient time to fully record more than a small section of them.

The presence of deck structure in the excavated area leads to the conclusion that this is the lowest surviving deck on the ship for the following reasons. As the Avondster was a relatively small ship of 300-350 tons it is unlikely that it had more than two decks, although there may be additional smaller decks at the bow and the stern and possibibly temporary decks. As the wrecking process in nearly all cases, would remove the upper works of the hull, it is extremely unlikely that the upper deck has been uncovered. The presence of structural elements and fastening extending beyond the level of the surviving deck would also support this supposition. Further evidence that the lower deck has been uncovered lies in the internal framing timbers that appears to have been designed to strengthen the lowest part of the hull. Additionally, the noticeable curvature of these frames suggests that they came from the lower part of the hull near the turn of the bilge rather than the upper sides. Finally, the location of large quantities of cargo packing timbers, immediately below the deck, leads to the conclusion that this is the lowest part of the hull where the large cargo items such as barrels were usually stored to aid the ship's stability.

fig. 48, Recording the anchor and the gun

fig. 49, The canon and anchor were raised with lifting bags

fig. 50, The anchor behind the laboratory

fig. 51, The canon raised from the 'swim jetty'

Recommendations concerning future site work and recording.

While the level of archaeological recording on the site was adequate, a more accurate system may need to be pursued. It was planned to install a three metre by three metre grid system over the excavation site, not just for accurate recording, but also for diver orientation in the relatively low visibility. We were not able to install this system due to the late arrival of the container from the Netherlands with the aluminium pipe and fittings. When an attempt is made to continue the present trench right across the site, it will be far more efficient to devote excavation time to achieving this in one season, rather than excavating small sections. It is anticipated that the excavation in this area will need to be at least two metres deep if the hull timbers are to be completely uncovered.

The issue of allocating artefact numbers to divers for attaching to objects on site was also considered but not pursued, as the numbers of artefacts were low. Small numbers of artefacts for registration and conservation does not create a problem for the system as they can be dealt with quickly. However, with large numbers of artefacts, if a backlog builds up in registration this may become a problem and during excavation periods the number of staff devoted purely to registration of finds may have to be increased.

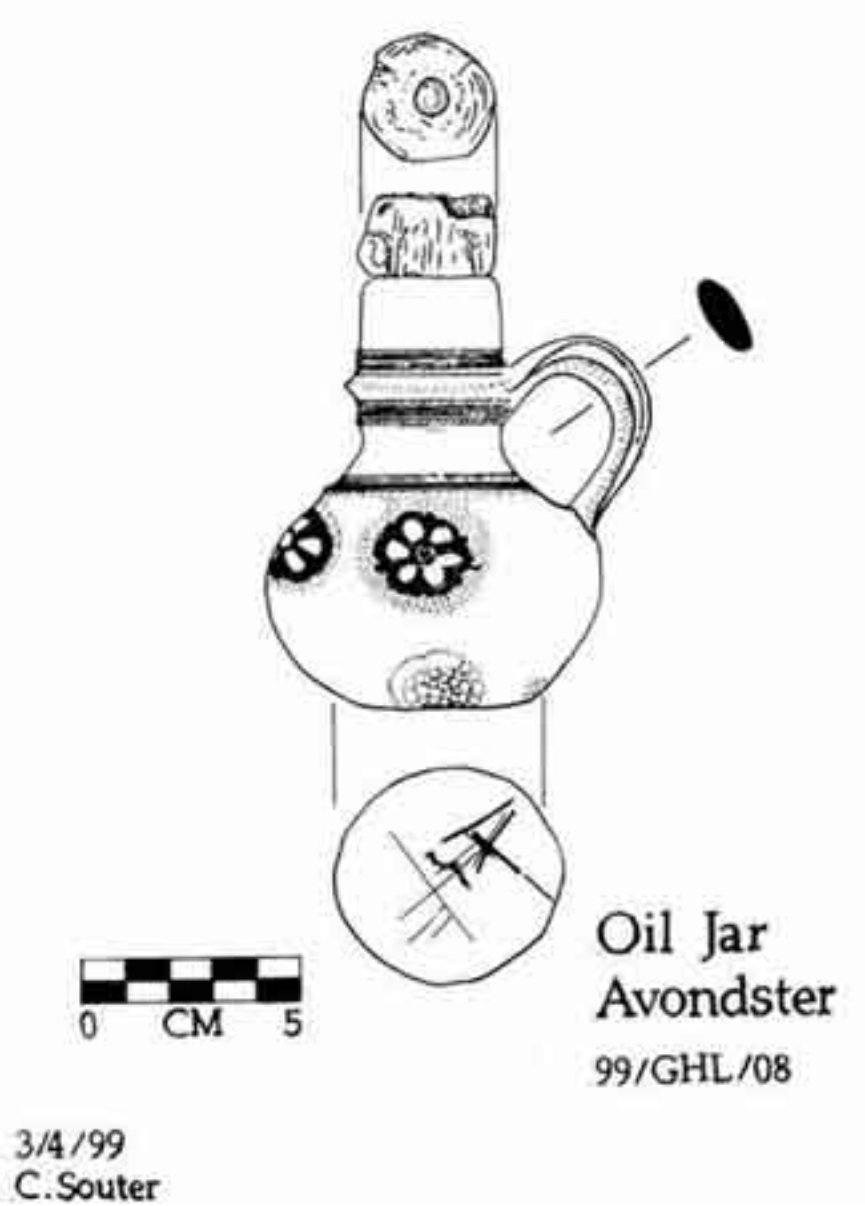


fig 52, Jar 99-GHL-08

6 Finds

A cross-section of finds to 2002

The catalogue of finds for 2001 and 2002 is available as Appendix 5.

Beardman Jugs

Beardman jugs were in common use for storing liquids. They were produced along the river Rhine in Germany. The jugs sometimes have heraldic decorations on the body, such as the coats of arms of European cities. The much smaller jug on the right has a similar shape and glaze. Two such small jugs were found together amidships: one was undecorated, the one shown here had an unusual face, and its original stopper.

fig. 53, Beardman Jug. 99-GHL-07; medallion; face

fig. 54, Beardman Jug. 96-GHL-07; medallion; face

fig 55, Beardmand Jug. 02-GHL-161; face

Storage Jars

Storage jars are always found on ships of this period. They were used as containers for sugar, salt, tea, salted fish, candied fruit, butter, oil, wine, spirits, opium, and even holy water and mud from the Ganges. More prosaically, they were used to store drinking water. Jars like that on the right are known as martabans (in Dutch, martavan), after Martaban in Burma where they were originally made; the word came to be used for similar jars from all over Asia.

fig. 56-57, Storage jars of Asian origine

fig. 58, medice jars

Medicine Jars

Medicine jars were found in the stern. One contained mercury, used in the seventeenth century for treating a range of ailments. The contents of another jar are currently being analysed.

fig. 59, Fragment of a ceramic vessel

Blue and White Ceramics

Blue and white ceramics abound in Galle harbour, mostly low-grade trade ware. None of our wrecks were carrying ceramics as official cargo, but many employees of the Dutch East India Company were small-scale traders on their own account. One porcelain vase was found in the stern of the Avondster, where the officers lived, and may have been part of such a collection, or for ship use.

Lead Shot

Lead shot of this type would have been used for a handheld firearm like a pistol, carbine or musket. It could also be packed in a bag and fired from cannon. Shot connected with a copper wire has also been found. This is very effective for cutting through rope and wounding people

fig. 60, musket shot on the site

Cannon balls

Cannon balls have been found both loose on the site and also inside the raised cannon (along with the associated wadding). One grenade has been found: with a hole 1.7cm in diameter but with no associated insert or fuse. Its contents, thought to be gunpowder, is currently being treated with caution, since there can be still risk for explosion even after many years on the seabed.

fig. 61, Canonballs concreted, as found on the site
fig. 62, After deconcreting

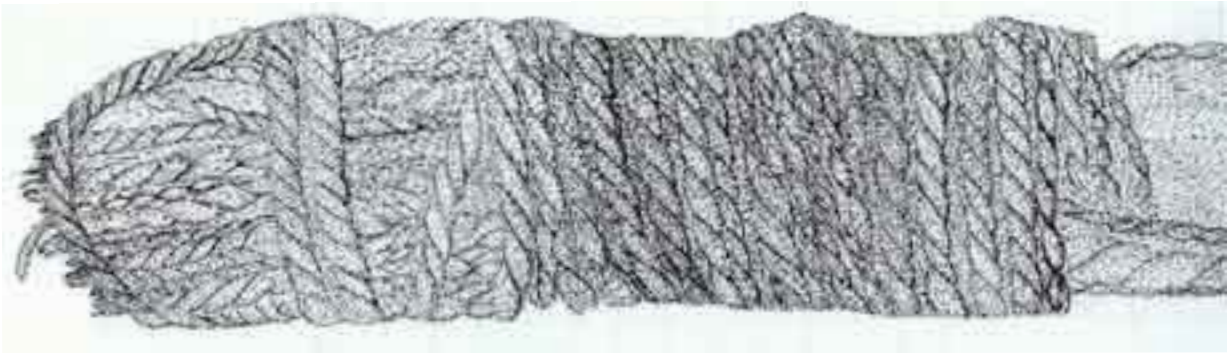


fig. 63, served rope

Rope

A great deal of rope remains, much of it neatly coiled below decks in the bow section, the normal place for storage. The rope is of varying diameter; some is 'served' (bound with a smaller rope for protection; the binding could be replaced when necessary, protecting the main rope). A variety of pulley blocks, deadeyes and other rigging elements have been found, and may in due course tell us more about how the ship was rigged.

Areca Nuts

According to the historical records areca nuts were an important part of the cargo which the Avondster was loading for India, and they have been found on the wreck site. Areca nuts come from the areca palm, the most graceful and delicate of Sri Lankan palms. Chopped areca nuts, often incorrectly known as betel nuts, are mixed with betel leaf and lime for chewing. The resultant mixture is a mild stimulant, popular in many Asian countries. It stains the mouth and saliva red, and regularly alarms overseas visitors. (The Sinhalese were equally disconcerted in 1505 by the Portuguese with their red wine, reporting to the King of Kotte that the foreigners were drinking blood.)

fig. 64, Dutch Bricks
Yellow bricks on a wreck site are often the first identifier of a Dutch ship. The bricks were carried as ballast to Asia, and used there for construction.

Wooden Barrels

Many wooden barrels (and the iron concretions left by barrel hoops) have been found near the galley. So far all have been broken, with no indication of contents. They are surrounded on the site by a variety of wooden branches and off cuts, believed to be dunnage for packing the spaces between barrels to prevent movement. In this area, some timbers show traces of matting or sackcloth, and other timbers show traces of hair (sometimes mixed in a tar-like substance).

fig. 65, Comb

Personal Items

Two lice combs were found together, in the same area as the medicine jars. Another find was a barber's bowl, with a recess on the rim to fit the neck during shaving. The ship may well have had a barber-surgeon; this was a common combination of roles.

Plate and Spoons

A plate and two spoons have been found amidships. The plate and one of the spoons appear to be pewter or tin. One of the spoons is of copper alloy; it has an interesting shape and remarkably good balance, and was found close to the galley.

fig. 66, Pewter spoon

Human Remains

A human skull was found in 1999, in what appeared to be an undisturbed 17th century layer. This was a surprise, as eye-witness accounts of the shipwreck recorded no casualties. We are now wondering who may have been omitted from the official account - a stowaway, a lady of the port, or an early salvage diver? Forensic, archaeological and archival research may provide answers to the mystery.

fig. 67, The skull found on the site in 1999

7 Conservation

7.1 Introduction

The overall aim for conservation is to have a fully operational conservation facility at Galle that is staffed by Sri Lankan conservators with the knowledge and technical skills to effectively treat the range of artefact and material types that are typically recovered from historic shipwreck sites.

To achieve this overall aim the following are essential:

- Trained conservation staff
- A fully equipped laboratory and treatment facility
- A reliable supply of conservation chemicals for consolidation of waterlogged artefact
- Access to reference materials and advice (email facilities and reference library)

A progressive improvement has occurred with the conservation laboratory building and facilities since its inception. The commitment to properly staff, equip and fund the laboratory started the process for establishing a functional working unit. Provided with direction, a plan of approach and the means to access information, laboratory personnel will be able to provide proper conservation support for maritime archaeological work undertaken in Sri Lanka.

7.2 The condition of the Avondster site

Site appearance and condition 2001-2002

The Avondster site appeared much as it had in the past but with some redistribution of sand and sediment. As a consequence the anchor shank on the starboard bow was more exposed than before, as was the muzzle of a cannon in close proximity. A plywood board, presumably from a wrecked fishing boat, lodged under the anchor shank, may have promoted scouring. The brickwork structure of the galley hearth seemed to be less isolated from the starboard side of the wreck suggesting that sand movement had also occurred in that location. Sand bagging of the site, introduced in 1998 - 1999 to control increasing exposure of structural timbers, appears to have been effective. However the new profile created by the sand bagged timber is likely to have altered the water flow and therefore the sand distribution. Exposed timber surfaces had acquired a greater coverage of sessile marine growth compared to previous site inspection periods. This may reflect seasonal conditions, changes in the wood condition or indicate a natural development in the establishment of fouling organisms. The degree of degradation of the timber was nominally tested with a sharpened metal probe. The exposed timber is robust and appears to be in quite good condition. Additional protection may be afforded the ship timbers if sand bags are placed to cover the exposed edges completely. This may be necessary if fouling organisms prove to be detrimental to these timbers.

Site stability

Disturbance of an archaeological site will inevitably alter the prevailing environmental conditions. In the case of the Avondster changes attributed to, undefined, but probably natural forces is uncovering the wreck. Archaeological investigation of the site has permitted a measure of control to be implemented, which is intended to slow the natural exposure process, maintain the environmental conditions for as long as possible and allow excavation to take place. Prior to and following excavation the exposed structure of the wreck is covered with bags of sand. Sand and sediment naturally accumulates around these bags, which eventually break down and release their contents. Over time it is anticipated that the environmental conditions, which originally prevailed will be restored on the wreck site. Sandbagging has undoubtedly saved the Avondster from extensive exposure but it is evident that a sandbag maintenance procedure must be instigated to ensure the vessel remains covered as much as possible

Management of the site will involve an annual inspection to ensure the measures taken to protect the site are working. Netting (normally used to shade nursery plants) will be placed over unstable areas of the site and sand bags used to hold it in place. Vulnerable structure, such as ships timber will be sand bagged also. During the inspection additional sandbags may need to be installed subject to the extent of the vessel's exposure or to prevent exposure.

7.3 Artefact treatment: 2001- 2002

Treatment in general

Over this period artefact management procedures at the laboratory have mostly comprised of decontamination, deconcretion and desalination activities. The desalination process is monitored with a conductivity meter.

Items stored inappropriately in the period between 1999-2001 (ceramic, wood, concretions and rope artefact) were placed in fresh water in new containers. These objects are currently being physically cleaned and desalinated.

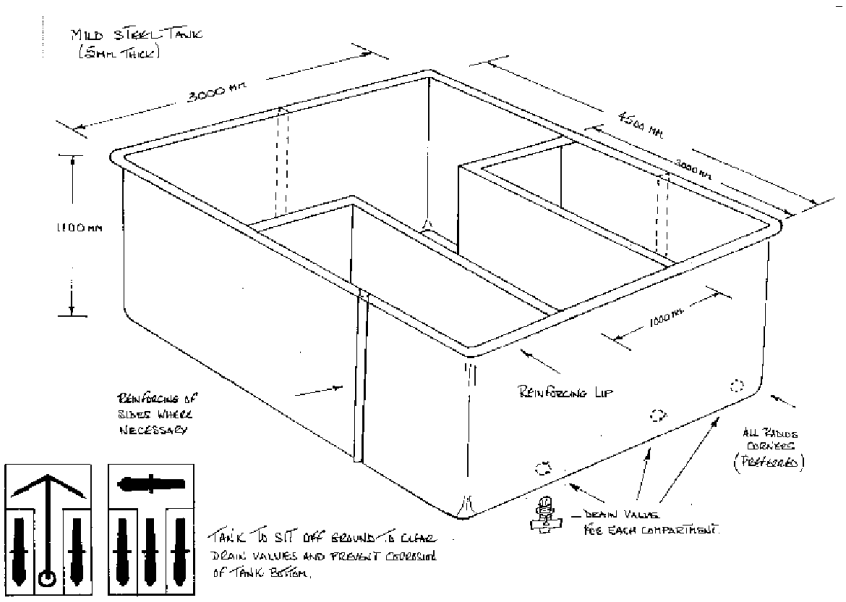


fig. 68, design of conservation tanks for the anchor and canon

Samples of storage solutions have also been collected for salt content analysis. At this stage the selection of conservation treatments (for mainly organic materials) requires an assessment to determine suitability with respect to the climatic conditions anticipated for the proposed shipwreck museum. Bulk treatment of some artefact materials may now proceed but as always depends on availability and provision of an appropriate range of chemicals.

fig. 69, drawing the sheeted rope

Anchor and cannon

The cannon and anchor recovered from the Avondster in March 2002 were stored in freshwater. The concretion encapsulating these two objects was not removed as it maintained a buffer to the storage conditions, which are not optimal (a steel storage tank is required in order to add caustic soda to the storage solution). Proper storage and treatment procedures are presently being established. An additional 100 kg of caustic soda and a second transformer will be required to initiate electrolysis treatment. Planning for this treatment was initiated during this period.

Rope treatment in situ

Recovery of rope was intentionally limited due to the sheer quantity present and to give conservators the opportunity to establish storage and treatment facilities for this material. The greatest quantity of rope, appearing to be one contiguous length, comprising a grouping of many coils spilled over on its side. Several coils of the rope were isolated by careful excavation and this sample separated from the remainder that was not disturbed. Following separation, the rope coils were immediately wrapped in a fine mesh cloth to retain its overall configuration and protect it from the surge. It was transferred to a plastic mesh 'basket' (large food cover) which was supported by two divers and brought to the surface. All recovered artefact materials were transferred to the boat, kept wet, covered and transported to the nearby conservation facility. A diving conservator, familiar with degraded waterlogged organic materials, recovered the rope.

7.4 Conservation procedures

The conservation of objects from the seabed requires specific procedures. Apart from the requirements of maritime archaeological work (excavation work is often condensed in short field work sessions), the nature of the artefact raised will determine the conservation procedures which follows. Specific procedures for the conservation of various artefact are included in Appendix 3.

Procedures in general

Diving conservators conducted environmental pre-disturbance assessments of the Avondster site prior to formal excavation. Components of this work, which relate to the original assessment, are ongoing, essentially noting the vessels rate of exposure and monitoring the deterioration of exposed wood. Conservators will directly assist the archaeologists underwater. For example, the material condition of an in-situ artefact or object may warrant the prompt attention of a conservator.

fig. 70, Placing the anchor in the temporary conservation tank

In this instance the archaeologists will usually ask a diving conservator to prepare it for recovery and/or actually recover it.
Conservators will provide containers and make recommendations with respect to initial storage and the safe transport artefacts from the excavation site. At the laboratory conservators will ensure artefacts are kept immersed in seawater or freshwater. Extraneous seabed material and marine biota will be removed and the artefacts cleaned. At the first opportunity the artefacts will be sorted into material type and stored in appropriate solutions.
At this stage conservation treatments will be determined for each of the artefact materials. As much as is possible, common materials will be treated in bulk to minimize the number of containers to be managed and to reduce the number of solution samples required for analysis. Depending on material type, material condition and the treatment process required it will often take several months, or even a few years, to stabilize a selection of artefacts.
Conservators will advise on proper storage of conserved artefacts including the conditions acceptable for exhibition. Conservators will provide assistance with transfer and install artefacts at any exhibition venue. The condition of each artefact must be assessed prior to installation (a condition report prepared) and an annual assessment performed for each artefact displayed or kept in storage. Appropriate funding and support for the Galle Conservation Laboratory will eventually permit the laboratory staff to perform all of the above functions. The aim is to achieve independent operation of the facility. Appendix 3 details the laboratory systems and the flow of work designed in consultation between the international consultants and the conservation staff of the MAU.

Access to reference materials and advice

Since treatment of maritime archaeological objects is a new field of conservation in Sri Lanka it was essential to set up communication with the international consultants. To provide the conservation staff with background information a reference list was compiled. Email contact with laboratory staff has greatly facilitated communication between the consultants and conservation staff during the interim periods when the laboratory is operating independently. Prompt response to conservation problems and issues is now possible and conservation progress reports are emailed, on a regular basis, to all persons concerned.

7.5 Recommendations

There are still a number of issues related to the building, facilities, equipment and chemicals that need to be dealt with. Of these some are currently being addressed. Appendix 3: (Conservation Guidelines for the Galle Project) lists some of the basic equipment and chemicals needed to allow the laboratory to service the needs of the materials likely to be excavated from the Avondster site. This list is not exhaustive and is something that needs to be built on as the excavation proceeds and as any deficiencies of the building and facilities become evident.
Further conservation guidelines are also provided in Appendix 3. These guidelines cover such things as the organization of work spaces, the possible specialisation of duties for conservators, maintenance of the laboratory and equipment, documentation of treatments, the assignment of duties and areas of responsibility, information on appropriate fungicides and a formulation that should be used for the consolidation of waterlogged rope.

Most important recommendations:

- The lack of humidity control (air-conditioning), and general ingress of dirt and dust, in room two of the conservation lab has contributed to the corrosion and general deterioration of expensive laboratory equipment. Priority should be given to installing a ceiling, passage doors and air conditioning to this section of the lab. Equipment presently undergoing repair or replacement will not work for long if this is not made a priority.
- Conservators experienced in the treatment of wet metals and wet organic materials should be part of each expedition program so that conservation training will be provided continuously.
- We aim for a permanent team of six conservators who are engaged with the MAU for the long term. This is essential especially when the volume of recovered artefacts increases and conservation treatments are underway.
- The laboratory has not received all of the necessary chemicals. Since it is our aim is for the conservation lab to be self sufficient after the Avondster project ends, we can not purchase chemicals that are standard consumables. If chemicals are not used to treat unstable objects they can only be stored in freshwater. Treatments will be delayed and we will need to be very cautious that objects will not deteriorate by this practice.

- Specific responsibility for the treatment of particular artefact or material types will be assigned to each conservator. This will allow conservators to become expert in the treatment of particular material types and will ensure that artefact are not neglected while in storage or undergoing treatment.
- Organise work spaces so that specific areas are set aside for particular purposes (eg keep one area for working on wet objects, one area for dry objects and for clean work, one area for recording conservation processes etc)
- Organise treatment areas so that similar materials are kept in the same area – eg keep all ceramics, glass and stone artefact together – in separate containers but in the same area; store iron objects in the same area, store wooden objects together etc
- The storage of chemicals within the laboratory building is not advisable. To address safety concerns the chemicals should be housed in an enclosed structure to be located in the yard alongside thelaboratory.

fig. 71, The buidling of the Maritime Archaeological Unit. In the background the Dutch Reformed Church

8 Establishing infrastructure for the Maritime Archaeological Unit

8.1 Achievements up to 2000

The objective of the Galle Harbour Project, which the Avondster Project is part of, has been to train and establish a group of Sri Lankan maritime archaelogists. These archaeologists will help the Sri Lankan authorities to manage their cultural resource into the future. Thus in 1992 and 1993 the focus was on training: the choice of Galle as a training site was due to the complementary need to compose a database of wrecks before the new harbour was constructed. In the period 1996-97, the focus shifted from training to survey and 'rescue archaeology' because the construction of a port was imminent. The work was therefore conducted with some urgency and without a training component. In 1998 and 1999 training in the basic skills of practical maritime archaeological work was conducted. During this phase, most of the trainees were scattered around the country doing land archaeological work. The group could not be kept intact to focus purely on maritime archaeology because of a lack of funding to set-up a permanent maritime archaeological unit. The collaborating institutes were not able to allocate budget for the infrastructure and the permanent staff. This situation changed when the Mutual Heritage Centre (MHC) accepted a programme for maritime archaeology and actively sought support for external funding.

8.2 The Situation in November 2001

The Mutual Heritage Centre (MHC) devised a programme that aimed to;

- establish an on-going programme, initially with input from foreign experts, with a local team that was identified to be given formal training to continue the work;
- develop institutional infra-structure with cooperation by the CCF and MHC with the Archaeological Department on a work - responsibility sharing basis;
- have the CCF and the Archaeological Department fund local administrative and coordination costs while operational costs would be funded by MHC.

In 1998, the Archaeological Department's area of control was extended to cover Sri Lankan territorial waters and an additional Act of Parliament, to regulate the Underwater Cultural Heritage, was drafted. In addition, the initial team trainees were made available to start on the project. Given these positive steps and the successful granting of funds from the Netherlands Cultural Fund, the Avondster Project was launched in 2001.

To establish a good functioning Maritime Archaeological Unit the following areas of capicity building were identified:

- Project management.
- Maritime archaeology on all levels: directorship, field archaeologist, technical staff, research work.
- Conservation on all levels: directorship, middle level staff, technical staff.
- Scientific skills through university linkage: A network will be build up between the institutes and universities in Sri Lanka, including the PGIAR of the University of Kelaniya, with foreign counterparts.
- Museology: training of curators (middle level staff).

In order to meet the goals of establishing a team and infrastructure for maritime archaeology and conservation in Sri Lanka, a training programme was designed where several consultants in various fields will link up with one or two Sri Lankan team members for advanced training. This mentoring system will create an intensive working relationship and will also facilitate an advisory network (via internet communications) during the inter-season period and into the future.
Continuity of maritime archaeology will be safeguarded by the integration of the discipline within the existing government institutions and by the 'on-going' programme, discussed above. The Mutual Heritage Centre has obtained a base for practical fieldwork activities, which comprises a laboratory, an office and a workshop. A director's position will be created to allow supervision of the maritime archaeological and conservation activities.
An important aspect of organizing the new Galle Maritime Museum will be the practical in-service training of a number of carefully selected, middle level staff members that have a background in museum work. This museum-based training will also include a diving maritime archaeologist and all aspects of working in a museum will be introduced. The organization of the museum display and the in-service training, will be coordinated by consultant Roelof Muneke.

8.3 Progress on capacity building and infrastructure 2001-2002

Staff

Maritime Archaeological Unit Staff Permanency

The Central Cultural Fund (CCF) had the task of gaining permission for each of the core team members to become permanent employees of the MAU (both in Maritime Archaeology and Conservation). This has not, as yet, been accomplished. The Director General explained that a Board Paper was approved at a meeting in April 2001. Due to national issues the Board of Management has not met again in over a year. It is expected that the Board will meet before February 2003 to give the final approval. Once this is achieved the MAU will be a valid entity and the staff will be afforded permanency. This will ensure that the knowledge and training invested in each individual will benefit the Unit, and the country, in the longer term, in its management of underwater cultural heritage.

Maritime Archaeological Unit Leadership

A fundamental part of the project is to develop systems which can be followed after the completion of the project in 2005. This requires a full time, Sri Lankan director/manager to be at the unit to monitor progress and ensure the team is following agreed procedures between consultant visits. Additionally, this person will be accountable for the work of the team and improve communications between the various Sri Lankan groups involved with the project. Saman De Silva was appointed to the position of "Officer in Charge" of the Maritime Archaeological Unit in August of 2002. This appointment has enabled consultants to direct preparations for the coming fieldwork period from a distance. Saman's abilities and his proactive approach have facilitated the activities of the team between consultant visits.

Conservation leadership

The conservation area has a similar leadership requirement. While there are staff members allocated to administrative functions, very few have been allocated to hands-on conservation, and there is no apparent leadership at the Unit. Attempts by consultants to instigate systems to manage large quantities of artefact have been viewed with reservations by the MAU conservation staff. Difficulties faced in bringing the same conservation consultants for every fieldwork season has compounded the problem. It has become obvious that this sort of initiative needs to be endorsed by a senior conservation person involved in the training and committed to the Unit. To overcome this problem in the short term and to ensure continuation of the project, a communication network has been set-up with the overseas consultants to address urgent practical matters. We hope that in the near future, a senior conservator will be appointed to implement the proposed systems.

fig.72, Part of the team in November 2001

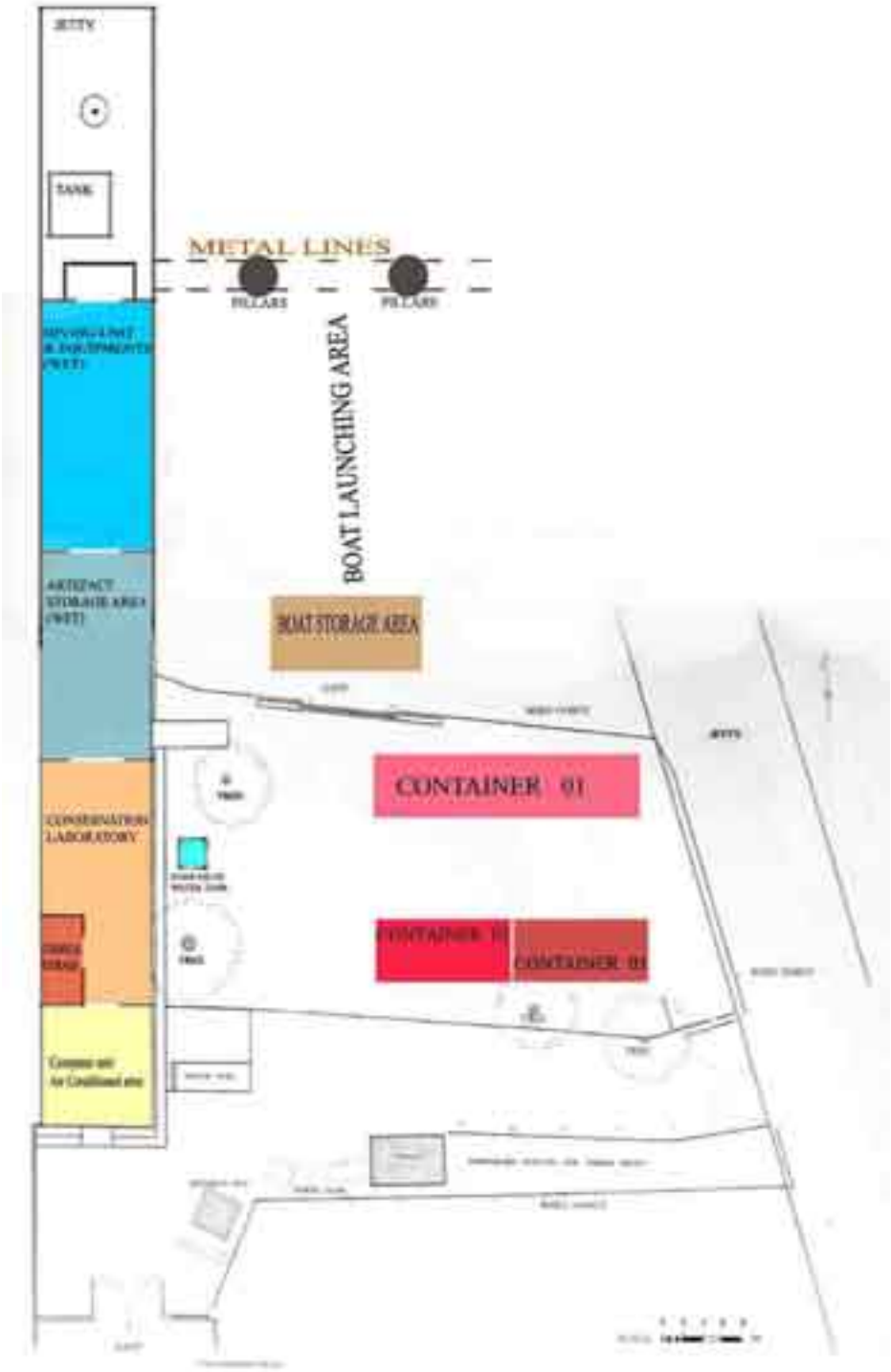


fig. 73, ground plan of the Maritime Archaeological Unit

M A U facilities and equipment

Building and storage

The major building renovations were completed shortly before the beginning of this project in November 2001. Spaces were assigned to specific tasks and storage facilities arranged. Workspaces are organised from dry to wet. The street entry area being a dry area, flowing to dry conservation then wet conservation. Followed by the dive storage and preparation area this is the seaward end and opens onto the jetty.

Shelving, cupboards, hooks and other storage solutions were built or bought as required. The main issues to consider when storing equipment in this climate were to keep the items secure from vermin and, in the case of paper materials, free from mould and mildew.

It was obvious that the computer equipment was suffering due to the high humidity and needed to be in an air conditioned space. Air conditioning was installed in the 1st office space which is now allocated to computer work and will be home for the reference library and other paperwork. Camera equipment is also stored in this area. Installation of a ceiling in the rest of the unit is needed (only the front office has a ceiling) to prevent vermin and dust from falling onto work surfaces.

The 40-foot freight container shipped from the Netherlands was placed on level ground on the southern perimeter of the yard. It is anticipated that the container will provide additional storage for artefact when required and could also be converted into accommodation or workspaces. The MAU Officer-in-Charge explored the possibility of a detachable structure that can be moved for use by the MAU on other Sri Lankan sites in the future. The building will comprise three freight containers with an arch-shaped roof over a yard. A Dutch firm, active in Sri Lanka for some years, have successfully utilised this system of building.

In September 2002 a basic design for the extension of the conservation facilities was made to enable storage of large objects. Priority was given to the construction of conservation treatment tanks for large metal objects, namely the anchor and canon raised earlier. The Conservation Department of the Western Australian Maritime Museum designed the tanks and the treatment method. (See fig. 68).

The jetty and the dive boat launch area require some modification for safer and easier access. An application has been made to the Galle harbour master to remove the iron rails that are the remains of a former footbridge, which the dive boat must be guided under to come ashore.

Health and Safety

Fire extinguishers have been installed in the laboratory building and safety shower and a reliable water supply has been provided.

1st Aid Training

All team members, (conservation and archaeology) attended a St.John's Ambulance First Aid Course, which included 24 hours of tuition by a senior officer from theGalle branch. The course provided basic first aid training and knowledge to enable each individual to respond appropriately to medical emergencies at the MAU while waiting for professional medical attention. At the end of the course the participants underwent a practical and written test which they all passed. Since the beginner's level requirements have been successfully completed.

fig 74, The location of the M.A.U. at the end of the 19th century,

fig 75, Presentation of the plans 1999.

fig 76, Start of the construction 1999.

fig 77, Framework of the building is ready 2001.

Life Saving Course

This water based course was intended for all divers or those who will undertake dive training in the future. This course enables the participants to respond appropriately to medical emergencies in or near the water. It provides training in in-water rescues and resuscitation techniques. The Life Saving Course was conducted by a Life saving officer from the 'Sri Lanka Life Saving Association' and was run from May to October 2002. It provided excellent swimming practice, life saving techniques and first aid instruction. A practical and written test was required to be passed for certification; all of the participants passed the tests successfully.
Participants included: Conservation Team - Janake Warusavithana;
Archaeology Team –Dashani Samanthilaka, Chandana Weerasinghe, W.M. Chandrarathna, A.M.A.Dayananda, Kumarasinghe Thennegedara, Palitha Weerasinghe, Rasika Muthulumara

Chemicals

The storage of chemicals within the laboratory building is not advisable. To address safety concerns the chemicals should be housed in an enclosed structure to be located in the yard alongside the lab. A chemical and laboratory safety course is currently being investigated.

Mosquito Control

Dengue Fever became a major issue for the staff and consultants of the MAU during this period. The breeding of mosquitoes in the conservation area has been brought under control with the provision of net covers for storage containers and the introduction of fish, which consume the larvae. A programme of regular spraying around the MAU building, clearing of the gutters and keeping the grounds clear of debris are now part of the MAU procedures.

Power and Water

Electricity was connected to the building at the beginning of the project; however lengthy power cuts and surges interrupted work regularly. Surge protectors are an essential preventative measure to protect computer equipment from the regular and significant fluctuations in the electricity supply.

fig 78, Hands-on training on the site.

Until the Unit was connected to mains water supply, a collection tank on the premises holds a two day supply. When this ran out a request for the tank to be refilled had to be submitted and the delivery waited for. By January 2002 the unit was connected to mains water supply, a telephone line was also installed around this time.

Dive equipment

The dive equipment inherited from past work was collected from its various storage locations around the country and found to not be in good condition. The compressor and pumps required servicing and major repair work. The scuba cylinders were out of test, the regulators were free flowing and needed servicing. Rubber components had perished or been chewed by rodents. A major part of the preparations before the first excavation season, was to determine the condition of the existing equipment and what needed to be bought in order to begin excavation work on the site. In choosing equipment, the ability to maintain and service it in Sri Lanka was of utmost importance. The most robust and easy to repair equipment was chosen over more technically advanced items designed for the same purpose. To encourage better maintenance practices, it was decided that each Sri Lankan team member would have a set of dive gear to use and take care of.

One of the first tasks was the instigation of a programme for regular maintenance and correct storage of all equipment. The project funding enabled tools to be purchased to maintain and service the dive and excavation equipment on-site.

A fibreglass work boat was built using the same mould as the local fishing vessels. It was adapted to include upright storage for scuba cylinders, shade and bench seats. The specifications included consideration for carrying large tubs for artefact retrieval, photographic equipment as well as diver entry and exit from the water.

Computer Equipment

The M.A.U. now has a desktop computer, a printer and scanner. The computer is connected to the Internet. Through email communication the consultant team is able to continue providing guidance from a distance. Computer equipment is vulnerable to high humidity and electricity flow variations, which are both issues for concern at this location. Surge protectors, air-conditioning and regular backups are used to protect against damage.

Conservation issues

Space has been allocated for receiving, storing and treating waterlogged artefacts in the MAU building. However, during the reporting period, conservation practices were confined to correctly storing artefact in water, pending;

- the arrival of the required chemicals, and monitoring tools,.
- control of humidity in room two of the conservation laboratory. The exposed conditions have contributed to the corrosion and general deterioration of laboratory equipment which is expensive and difficult to repair or replace.
- an increase in the number of conservators allocated to maritime archaeology.
- reinforcing desalination recording procedures to accurately determine when objects have completed the desalination process.

fig 79, Classroom training

fig 80, Preparation for a dive

fig 81, Conservation

The management of artefacts which had been previously held in storage (1992-99) was found to be inadequate. As there had been no operational laboratory or staff in the period 1999-2001, the artefacs had not received systematic treatment. Organic artefact stored in water had been stored out of sight, in a locked cupboard. As a result, some of the objects had been allowed to dry while other solutions had developed extensive mould growths. Some of the storage containers did not have proper lids, a fault that led to evaporation of the water and warping, shrinkage and cracking of their contents. In addition, evaporation of water from the open containers produced high humidity levels in the cupboards, conditions that can be damaging for other artefact that were stored in the same cupboards.
Biodeterioration was also a factor in the deterioration of these stored objects. A sample of rope, in particular, was found in very poor condition. The storage solution was green with large amounts of mould growth in and on the surface of the solution, fibres were dislodged from the body of the rope and the rope itself was very soft and 'mushy'. To remedy this situation, all artefact that required wet storage were transferred to open storage and fresh solutions were prepared for all of these materials
In addition to the above situation where objects were stored in locked cupboards, many ceramic pieces were stored in containers on the laboratory floor. In almost all cases the containers were too small to allow all of the pieces to be completely submerged. Two significant pulley blocks were found immersed in tubs of water. On inspection however, both showed severe damage (radial cracks) that is typical of waterlogged wood that has been allowed to dry out without conservation treatment. After this damage had occurred the blocks were put back into water. Unfortunately damage of this type is irreversible but, equally unfortunately, unavoidable as there was no operational conservation laboratory in place before the commencement of the current project.

fig 82, The dive team makes preparations for the excavation

Capacity building logistics

Each and every activity undertaken by the maritime archaeology and conservation consultants included an educational component. Much of the initial season (November - December 2001) involved refresher dives and reinforcement of safety procedures. The dive team grew to focus more on the work being undertaken underwater rather than the technicalities of diving. Each phase of the survey and later the excavation work was described, the alternatives explained and a step-by-step strategy outlined with the Sri Lankan team. The team was given the opportunity to carry out each part themselves after a consultant had demonstrated the task. In this way the team has gained valuable experience and is contributing positively to the underwater work.

Dive Team Assessments

In order to identify which team members had abilities or preferences in doing specific tasks, an assessment was undertaken. The intention was to develop skills and individualize training within the group, to cover all aspects of maritime archaeological work. Specialist areas might include underwater photography, artefact drawing, computing, research work etc. The long term goal being that this team will form the basis of the MAU and hold the necessary skills to undertake this work. It was discovered that some members had particular skills and experience that will be very useful to adapt to this field. Others had very strong preferences that would have inhibited their training if not taken into consideration. In this way we are coming to understand the individual components of the team and how best to steer, train and educate the individuals to function as a complete team which possesses a combination of skills. To enable the CCF to employ each of the team members and allocate appropriate salary levels, a certificate of their training and abilities will be developed in the coming period.

Training Recommendations

Language difficulties pose the greatest barrier to further in-depth archaeological work. Artefact drawing, equipment maintenance and simple underwater recording tasks are the extent of work that can comfortably be undertaken without consultant supervision. Written work is currently not possible which severely limits the potential for research work or academic pursuits of any sort at this stage. A very simple reporting system is currently in place which covers the most basic aspects of the work being done. An English language course was undertaken in the interim period (January - February 2002) and was followed by an intensive course in the April to November 2002 period. It is anticipated that this will continue for the duration of the project.

Conservation training

Minimal training was given to conservation staff during the first season. This was initially due to the lack of suitable artefact that could be used to demonstrate conservation techniques and the lack of appropriate conservation chemicals. Treatments were also inhibited by the lack of a reliable supply of good quality water. In the March - April 2002 period the limiting factor was the small number of Sri Lankan Conservation staff assigned to do hands-on conservation treatments.

The presence of Dengue Fever mosquitoes breeding in the desalination tanks stalled productive work whilst a solution was found to eradicate the larvae and prevent re-infestation.
A program of activities for the Conservation staff was prepared for the inter – season period (April to November 2002). Activities range from the immediate issue of controlling mosquito breeding, to preparation of work areas, object desalination and treatments, a short written assignment and reporting requirements.

fig.83, Exhibition 'Diving into the Maritime History of Galle. Held in the Maritime Museum 1999.

9 Public Awareness, the Galle Maritime Museum and museological training

9.1 Introduction

The museology programme will be centred on the programme of excavation, research and conservation of the Avondster. A team consisting of a diving maritime archaeologist/curator and at least one other qualified curator will be trained in the design of a permanent display in this field. The Avondster project will contribute a clear spin-off to the museology branch. The decision to expand the National Maritime Museum, which at this point mainly focuses on marine biology and fishery, with a maritime historic-archaeological collection, will also serve the purpose of public awareness on maritime archaeology, history and mutual heritage for present and future generations. Galle formed, next to Batavia, the most important harbour of the VOC of the Far East. The exhibition in the former VOC warehouse will make an important contribution to the tourist infrastructure of Galle. Especially the combination of the well preserved fortified city, which recalls the heydays of the VOC, and the information and artefacts acquired from the Avondster will form an unique presentation of past maritime activities.

9.2 The Galle Maritime Museum

As part of the general programme of the Mutual Heritage Centre for the preservation of Galle Fort the Central Cultural Fund will establish a museum and information centre in the 17th century VOC warehouse. This museum project will be carried out in close cooperation with the Department of National Museums and the Department of Archaeology and is aiming at creating a wider public awareness, not only in the field of maritime archaeology, but also in the sphere of mutual heritage questions.

Renovation phase

Presently a plan is being formulated for the renovation of a space of approximately 400 m^2 on the first floor of the warehouse building. The Central Cultural Fund will take the initiative for the organization of this renovation project and will also bear the financial consequences:
Part of the roof structure will be renovated, the electrical system will be completely renewed to fit the requirements of a flexible museum display, a lowered egg-crate ceiling will be fixed, and the walls and the floor will be given an appropriate treatment.
An old stone staircase will be put into use again; it will create a direct access to the new Maritime Gallery. Apart from that the climatic conditions for the displays will be scrutinized as well; one serious option is to close the windows of the museum section of the building in order to exclude dust, humidity, ultraviolet light and the sea breeze. This means that positioning of one or two layers of (dark-coloured) glass is being considered and that suitable air-conditioning facilities (fans, eventually combined with a split AC system) are under consideration.

9.3 Display programme

Apart from this constructional phase, which is planned to be finalized towards the end of 2002, the next stage will be to produce an introductory display. For the sake of public awareness of this mutual heritage project the CCF, the Department of National Museums and the Department of Archaeology are all keen to organize some kind of a preliminary display as soon as the renovation process is over. Based on a number of discussions the conclusion was reached that the final display should be organized in three sections, related to a clear story line.
The first section on the maritime history of Galle / Sri Lanka, related to other parts of South. Southeast and East Asia (the maritime silk road) and to the extra Asiatic maritime forces, active in the regional maritime theatre like the Portuguese, the Dutch and the British. The second section focussing on excavation and conservation techniques and practices and on maritime archaeology as a specialized discipline. The third section focussing on the Avondster.

Section 1

After climbing the staircase to the first floor and on passing the reception the visitor will be confronted with a general introduction. Here the story of Galle's special relationship with the sea will be introduced, situated on an island (Taprobane, Serendib, Ceylon, Sri Lanka) centrally positioned in the Indian Ocean, with trade winds shaping maritime contacts for the major part of history. Apart from this special location Galle was also endowed with another gift of nature, a natural harbour in a strategic location. It was frequented by Arabs traders over many centuries, and at a later stage it became a stronghold of the Portuguese, the Dutch and the British. And now, once again, the harbour of Galle is a crucial link in Sri Lanka's trade contacts with the outside world.
The most lasting historical mark in present-day Galle was left by the Dutch, however: Galle Fort. The visit of Joris van Spilbergen to Ceylon in 1602, the establishment of the VOC, the complete expulsion of the Portuguese from the coastal zone in 1658 and the development of a special relationship over a period of 140 years, resulted in the creation of Galle as a (Dutch) emporium in the Indian Ocean.

fig. 84, The former Dutch Warehouse.

fig. 85, Part of the future gallery for the New Maritime Museum.

Galle was visited by all kinds of (Dutch) ships. Ships plying the high seas between Europe and Asia, ships involved in the intra-Asiatic trade and ships for local and regional commerce. These ships had to be built, equipped and repaired, not only for trade but also for war. The complex organization involved in this wide range of activities will be presented in this general introduction. But also the story of life on board VOC ships will be presented, as well as the logistical requirements on shore: warehouse facilities, the loading and unloading of cargo, loading of food and drinking water and medical care. And what was the inventory / equipment on board VOC ships and what kind of merchandize was being transported and where did this come from? But purely local aspects of sailing will also be presented in this general section, which will seek to answer such questions as: What kind of instructions were available for the ships to enter Galle harbour? What about pilot assistance and how to anchor in the Bay of Galle? What were the causes of the shipwrecks like the one of the Avondster?

Section 2

This section will present the technical story, intermediate between the general introduction (section 1) and the material an immaterial results based on the excavation of the Avondster (section 3). It will present the Galle Harbour Project research, resulting in a database of maritime heritage sites. Apart from that, a variety of technical maritime archaeological activities will be shown in this part of the display. This section will pose such questions as:
How to proceed to implement out a scientifically sound excavation? How do maritime archaeologists operate when they discover new structures or objects that can add to the story, which they are trying to unravel? The specific problems of maritime conservation will also be introduced in this part of the display.

Section 3

The organization of this part of the display will very much be dependant on the results of the maritime archaeological excavation as it proceeds. Apart from objects to be added on the basis of the Avondster excavations, there will be a clear parallel between parts of the presentation in section 1 and this section. Many aspects of the presentation introduced in the storyline of section 1 will be presented once again in section 3, in one way or another, together with a wealth of new contextual information. The Avondster display will show to the general public how the past can be reconstructed by using the techniques and scientific disciplines of the present.

9.4 Time schedule

The plans for organizing the preliminary display in the Galle Maritime Museum have already started at an initial stage. The basic objects, data and documents will be assembled during winter 2001 - 2002 and the concrete implementation of the initial presentation will start as soon as the renovation of the building has been finalized, in the course of 2002. Basically the general introduction (section 1) will be presentable to the public in the course of the second half of the year of 2002. The same holds true for parts of section 2. In the course of the years of 2003 and 2004 the display will be further developed. Depending on the results of the maritime excavation campaigns and the time component of the consecutive conservation requirements.

9.5 In-service training

An important aspect of organizing the new Galle Maritime Museum will be the practical in-service training of a number of carefully selected, middle level staff members / officers with a background in the field of museum work. In this practical training programme also a diving maritime archaeologist / curator will be involved. During the practical training all aspects of working in a museum will be touched on. The organization of the museum display as well as the in-service training as such will be coordinated by the consultant Roelof Muneke

9.6 Progress 2001-2002

In December 2001 a continuation of the discussions about the future use of part of the first floor of Galle VOC warehouse as the new National Maritime Museum resulted in a preliminary technical check-list. A number of questions regarding the renovation of the building and the requirements for the new museum facilities were formulated. This included major structural issues such as; reinforcing the roof, making good the ceiling, achieving climate control, completing the wall plastering, installing new electrical wiring and renovation of the entrance and exit facilities, amongst other issues.
The renovation activities began at the beginning of the year 2002 and were discussed once again in March. Another progress discussion will take place in the course of June. The renovation programme will have to be fully underway during the second half of this year to meet our goals.

10 Appendices

Appendix 1:

List of Participants of the Avondster-project

Avondster Project
Maritime Archaeological Unit Sri Lanka

Project supervision
Project co-director: Dr. W.H. Wijepala
Director Conservation: Dr. Mohan Abeyratne
Advisor: Lt-Cdr Somasiri Devendra
Project director: Drs. Robert Parthesius
Coordinator: Karen Millar
Manager of the MAU: Saman de Silva
Advisor: Jeremy Green

Conservation
Indrani Fernando
Anusha Kasturi
Senarath Liyanapathirana
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Appendix 2: The rigging of VOC-ship Avondster.

The rigging of VOC-ship Avondster. A reconstruction of the masts, spars, standing rigging from the time Avondster (named Blessing) was in service of the English East Indoa Company 1641-1653, by Wendy van Duivenvoorde

A tentative reconstruction of the rigging of the Avondster[1]

To reconstruct Avondster's rigging, it was decided to rig the ship as it was rigged when 0purchased by the English East India Company in 1641 (still named Blessing). No records have survived describing Blessing's rigging, and no contemporary documentation on the rigging of merchantmen is known to have survived from the beginning of the seventeenth century either. The four main sources (A Treatise on Rigging Written About 1620-1625, The Lengths of Masts & Yards, 1640; The Seaman's Dictionary, 1644; The Complete Modellist of Thomas Miller, 1655) used to reconstruct the rigging of Blessing are treatises and documents mainly discussing warships in service of the Royal Navy.[2] However, Thomas Miller, probably a seaman on merchant ships, claims his modellist is "for any ship or vessel, small or great."[3] In addition to these four documents, information from contemporary iconographic evidence and archaeological rigging material, e.g. deadeyes, pulley blocks, and a truck, from the Avondster shipwreck have been studied, and applied to the reconstruction. No mast steps have been located yet. Although it is Blessing's rigging configuration that is reconstructed, the ship will be referred to as Avondster in this paper except when cited in contemporary English documents. A reconstruction of the Blessing's rigging is made for it may be possible the ship was still English rigged when it sank in 1659.

Masts: Number and Proportions

According to A Treatise on Rigging (1620-1625) every ship had a mainmast, foremast, mizzen and bowsprit, and "commonly" a main topmast, main topgallant, fore topmast, fore topgallant, mizzen topmast and a spritsail topmast.[4] Some ships had a flagstaff on every topgallant (they could also serve as topgallants).[5] All ships of the Royal Navy listed in The Length of Mast and Yards of 1640, had topgallants. Topgallant sails were more steering sails than driving sails and would probably be more effective on warships than merchantmen. It is unlikely that smaller merchantmen, like Avondster (260 tons) were rigged with fore and main topgallant sails, for they were probably more absent than present throughout the seventeenth century. Most contemporary paintings of ships of approximately the same size, date and type as Avondster do not seem to carry topgallant sails (I+II). Most merchant ships have a foremast, mainmast, and mizzenmast, fore topmast main topmast, and a bowsprit.[6] The sprit topsail and mizzen topmast are also not frequently carried, although some ships were outfitted with them (III) but they do not have main and fore topgallants as warships or large ships, e.g. Bontekoe's Nieuwhoorn of 700 tons, of the seventeenth century.[7] Large Indiamen obviously did carry topgallant sails, but according to Bond they left their topgallants, spritsail topmast and mizzen topmast ashore when sailing in wintertime.[8]

Jeremy Green, however, published a reconstruction made by an artist of the Dutch East Indiaman Vergulde Draeck based on an etching by Reinier Nooms (Zeeman).[9] Nooms had drawn the ship Vergulde Dolphijn with topgallant sails, but this ship must have been a much larger ship than the 260-ton Vergulde Draeck, judging from the number of gunports seen in the drawing (IV+V). It is possible that ships like Vergulde Draeck and Avondster had topgallants, but not very likely. Avondster, therefore, is reconstructed with a mizzen, mizzen topmast, mainmast, main topmast, foremast, fore topmast, spritsail and sprit topsail. In a court minute from the English East India Company of March 3, 1647, it is written that the East Indiamen Mary would export foreign coin or bullion with a value of 66,000 pounds the same year, and would be accompanied by Eagle and Blessing until they got beyond the Canaries. "The Court orders Captain Mynors to carry the flag in the main-top and be admiral, the Eagle to be vice-admiral and carry the flag in the foretop, and the Blessing to be rear admiral and carry the flag in the mizzen."[10] If the ship Mary carried the flag of the company in its maintop and Eagle in its foretop, it suggests that both ships did not have topgallants. The East Indiaman Eagle (1627-1649) is listed in the book Lords of the Past as a ship of 400 tons, and thus is larger than Blessing.[11] This would also mean that Blessing or Avondster would not have had a mizzen topsail, and should, therefore be reconstructed without a mizzen topsail. East Indiamen or merchantmen did not need to be rigged with extra steering sails for manoeuvrability like warships.Topgallant sails required extra men to work the rigging as well. Blessing had a crew varying from 60 to 65 men, whereas warships of approximately the same size in service of the Royal Navy in 1640, e.g. Marirose (1623, 321 tons), Adventure (1598, 287 tons), Providence (1637, 304 tons), and Expedition (1637, 301 tons), had 100 to 110 men at sea.[12]

Placement and Rake of Masts

Manwayring describes in his Seaman's Dictionary how "The masting of a ship is of much importance to the sailing and conditions of a ship; for if she be over-masted, it will overcharge the ship and make here lie down too much by a wind and labour too much a-hull; If under-masted (this is too small, or too short) then she looses the benefit and advantage of spreading so much more sail to give her way."[13] In addition the proportions of the masts differ according to the use of the ship, e.g. ships setting out on long journeys were carrying smaller masts than normal to reduce the risk of damaging them while at sea for a extended time having no possibilities to repair them easily.[14]

The proportions for the mast and the yards given in Miller's Modellist are used for the reconstruction of the mast and spars of Avondster (Table 1). The mainmast was two and a half times the length of the beam, the foremast eight ninth of the mainmast, the topmast half the lower masts, the bowsprit the same length as the foremast, and the mizzenmast is the height of the main topmast from the quarterdeck .[15] The thickness of each mast is one inch per three feet for both English and foreign ships.[16]

The beam of Avondster is unknown because the reconstruction of the ship's hull has yet to be made. The dimensions of the outline of the shipwreck are approximately 100 by 20 feet. The hull of the ship is not completely preserved, but taking its deadrise into consideration, an estimated beam of 26 feet is used to reconstruct its rigging (this means the length of the mainmast was 65 feet).

According to Anderson, the diameter of the deadeyes of the lower masts should be half that of the mast.[17] In the excavation season of 2001, a deadeye was found in the starboard bow of the Avondster shipwreck (registration number 02/GHL/56). Because this deadeye still has its iron strap attached, it is definitely one of the deadeyes set into the edge of the chain wales of Avondster. Its diameter is 9.74 inches, and if it is half the diameter of the mast it belongs to the mast should have had a diameter of 19.49 inches. This diameter is too thin for a mainmast of a 260-ton ship and, therefore, it was more likely a deadeye of the foremast.[18] The location of the deadeye in the ship also suggests it belonged to the foremast, although it was found just aft of the spare rigging locker and could have been a spare part as well. If the diameter of the foremast, based on the diameter of the deadeye was 19.49 inches and the thickness of each mast is one inch per 3 feet, the length of the foremast should have been 58.46 feet (3x 19.49 inch). If the foremast was 8/9 of the mainmast as Miller has written, then the mainmast was 66 feet (66 feet x 8/9 = 58.46 feet). If we go one step further and divide the length of the mainmast by 2.5 (mainmast = 2.5 x beam), then the beam of Avondster would have actually been 26 feet. This calculation may seem a bit farfetched, but it does give an accurate estimation of the masts' dimensions and the beam of the ship (Table H).

The ship's overall length was probably a 100 feet or slightly longer, and, therefore, a tentative keel length of 80 feet was used to reconstruct Avondster's rigging. Miller emphatically insists that the mainmast is placed in the middle of the keel.[19] In Steel's Elements of Mastmaking, Sailmaking and Rigging, it is written that ships in "Merchant Service, they are not so strictly confined respecting the position of the mainmast, though it was generally placed near hardships.[20] Therefore, the mainmast of Avondster is placed aft of the middle of the gundeck at a distance equal to its own diameter, as was sometimes done according to Anderson.[21]

Miller's Modellist does not describe the placement of the mizzenmast or foremast, nor do the other sources from the first half of the seventeenth century. Anderson has a model dating no later than 1660, and maybe even earlier, in which the mizzenmast is placed 2/5 the distance from the taffrail to the mainmast.[22] Plans dating around 1670 show the foremast placed halfway between the end of the keel and the head of the stem.[23] The mizzen and foremast are positioned as described, and to indicate the end of the keel for the placement of the foremast in Avondster's rigging plan, the scarf between the keel and stem is drawn. The rake of the masts and the steeve of the bowsprit (Table 1) are not specifically addressed in contemporary sources. According to Anderson, the plans of William Rex, of 1698, demonstrate the foremast raking 1 in 28, the mainmast 1 in 16, and the mizzen 1 in 20.[24] Avondster has been reconstructed with this rake, except for the mainmast, which does not rake at all. In Deane's plans of 1670 the bowsprit has an angle of 30 degrees, which is used for Avondster's reconstruction.[25]

Trestletrees and Mast Caps

None of the seventeenth century documents used to reconstruct Avondster's rigging gives detailed information about the size of mastheads, caps, trestletrees and hounds. To reconstruct their dimensions the standard calculations given by Anderson or Lees are followed (Table IV).[26] The masthead of each mast is l/ 15 of the mast in all periods.[27] According to Lees, the hounds of the main-, flare- and mizzenmast are two third of the length of the masthead, and those of the fore and main topmast half the size of the masthead.[28] In addition, he states that the mizzen topmast did not have hounds until 1745-50.[29] This makes it virtually impossible to house the sheaves through which the ties of the mizzen top yard ran. In Avondster's reconstructed rigging plan, the mizzen topmast does have hounds for this reason. The heel of all masts is square, and their length is two and a half times the diameter of its mast up to 1745-50, and 4 feet for the main and foremast.[30]

In the seventeenth century, the trestletrees were half the length of the masthead, their height 1/ 13 of their length, and their width 7/8 or 9110 of their height (Table V).[31] The mast caps of English ships were more or less "brick"-shaped from the beginning of the seventeenth century onwards.[32] They are half the length of the masthead or a little less. The width of a mast cap was 6/11 of its length, and its height 3/7 of its width (Table V).[33] According to Anderson, the cap of the foremast was level with the lower side of the trestletrees of the mainmast, which is evidently not the case in Avondster's reconstruction of mast and spars. The bowsprit has its spritsail topmast placed on its end, as was usual for English ships up to about 1670 or 1675.[34] The bowsprit trestletree is half the size of the mainmast's trestletree.[35] The spritsail topmast is supported by a knee, which is placed a little inboard. As Andersons describes it, the dimensions of the knee are half the size of the mainmast head in length and height. Its top is attached to the mast cap.[36] The main-, fore-, and mizzenmasts taper according a ratio of mast diameters at the partners, which is typical up to 1719 (specified in Table V1).[37] The topmasts taper 7/10 (for the lower part of the head), and 11/20 (for the upper part of the head) of the diameter of the mast at the top above its heel (Table VI).[38]

Yards

The dimensions of the yards of Avondster are, like those of the masts, reconstructed following Miller's Modellist (Table Ill). The main yard measures 6/7 the length of the mainmast, the fore yard 8/9 of the main yard and the mizzen yard somewhat shorter than the fore yard. The top yards are half the length of the lower yards. The spritsail yard and crossjack have the same dimensions, and the crossjack yard is half the mizzen yard. The sprit topsail yard is half the spritsail.[39] The dimensions given by Miller for the mizzen yard are rather vague and its length is, therefore, roughly estimated. None of the sources from the first half of the seventeenth century specify how much each yard tapers from its center. According to

Lees, the main, fore and crossjack yards taper 1/3 from their slings to their arms up to 1719.[40] All other yards narrow 1/2.[41]
The yards have no cleats to prevent the lifts and the braces from working themselves too far onto the yards and the earliest evidence for cleats does not appear, according to Anderson, until the very end of the seventeenth century, e.g. ship models of William Rex (1698) and St. George (1702).[42]

Wooldings

Wooldings are placed only around the mainmast and foremast, and not around the mizzenmast and bowsprit. Seven are placed around the mainmast and one less on the foremast of Avondster, as can also be seen in the reconstruction of the Mayflower.[43] According to Anderson, the mizzen was not woolded and the bowsprit was on occasion, but not always, woolded.[44] This can be seen clearly in a pencil drawing of the English warshipProvidence by Willem van de Velde the Elder (VIII), for the ship has no wooldings around the mizzenmast and bowsprit.[45] Providence, built in 1637, is one of the four warships mentioned in the Length of Mast and Yards, 1640, which was approximately the same size and date as Avondster.[46] The iron hoop above and below the rope is 1/8 times the size of the woolding itself.[47]

Footropes

Early seventeenth century ships had no footropes on the yards, and it is a mystery how sailors managed to furl the sails. On engravings, paintings, and drawings of the late sixteenth and early seventeenth century, seamen sat on the yard with a leg on each side.[48] This, however, seems to be a scary practice in foul weather. It is unknown when footropes exactly appear, but they do not come into common use until after the 1650's.[49] According to Anderson, footropes or actuallyhorses are mentioned in Bond's The Boatswain Art of 1642.[50] On the other hand, none of the sources used from the first half of the seventeenth century mentions footropes.[51]

STANDING RIGGING

Chain wales

According to Anderson, the main channels or chain wales of English ships were affixed below the upper deck guns between 1620 and 1740 .[52] He also notes that the mizzen channels were usually a deck higher than those of other masts.[53] The engraving of the English man-of-war Providence (VIII) shows clearly the fore and main channels placed at its lower wale, below the upper gundeck. However, in depictions of ships with one level of guns, the main and fore channel are also seen on the upper wale below the weather deck. In an engraving depicting a battle in 1603 between two English East Indiaman, and four Portuguese galleons and 24 frigates, the main and fore channels are placed at the upper wale, and the mizzen channel at quarterdeck level.[54] The same configuration is seen in a pencil drawing of the Dutch warship Ster (Star) drawn by Willem van de Velde the Elder (IX), and a flute ship drawn by Salomon Savery (III).[55] In contemporary aft depicting ships, the main and fore channels are often affixed to the upper wale below the main deck, and the mizzen channel to the quarterdeck, as can also be seen in th reconstruction of Avondster.[56] The pencil drawings of Ster and Providence by Willem van de Velde the Elder show very clearly that the channels are imbedded in the upper part of the wales.[57] Miller places the channels halfway between the main and gundeck, which seems to be a strange place for there is no support from a wale, which is therefore not taken in consideration.[58] The lengths of the channels are 215 the distance between the channel and the trestletree above it in Avondster's reconstruction as suggested by Anderson.[59]

Shroud and Their Deadeyes

The number of shrouds varies with the size of the ship.[60] The number of shrouds of the four English ships Marirose, Adventure, Providence, and Expedition are listed in The Lengths of Mast and Yards, 1640 (Table VII). Because Avondster is slightly smaller than the four ship listed, it is given five lower fore shrouds, six lower main shrouds, three lower mizzen shrouds, three fore topmast shrouds, four main topmast shrouds and two mizzen topmast shrouds on each side of the hull.
In addition, all masts had a pair of standing backstays. These two standing backstays are listed in The Lengths of Mast and Yards, 1640, and are also described in 711 detail in A Treatise on Rigging (1620-1625).[61] In Miller's Modellist, backstays are not mentioned at all.[62] The backstays of the lower mast usually had the same diameter as the shrouds and were fastened to the head of the mast over the trestletrees above the shrouds, and at the lower end they were fastened to the chain wale by a deadeye. There was one on each side.[63] The shrouds were fastened in the same manner.[64] The topmast shrouds were fastened to the topmast head, and at their lower end, to the so-called "puttockes" (futtock shrouds) of the lower mast with deadeyes and lanyards.[65] There seems to be hardly any difference in size and function between backstays and shrouds in the early seventeenth century. The backstays of the lower masts were basically the aftermost shrouds. The total number of deadeyes seen on the rigging plan of Avondster including backstay and the shrouds is six for the foremast, seven for the main, and four for the mizzen.[66] On a pencil drawing of Providence by Willem van de Velde the Elder (VIII), seven deadeyes can be accounted for at the main channel and six at the fore channel. Again, the latter deadeye represents one of the two backstays.[67] The ship drawings and paintings of the van de Veldes are considered trustworthy documentation, and the number of deadeyes seen on Providence attests to this for it corresponds exactly with the numbers listed in the The Lengths of Mast and Yards, 1640.[68]
Shrouds, stays and tackle pendants were often cable-laid, which means the rope is laid left handed unlike normal laid rope.[69] All stays and shrouds visible on the reconstruction plans of the standing and running rigging of Avondster are drawn cablelaid. When shrouds are cable-laid, their ends go around the upper deadeyes and lay forward of the shrouds on the starboard side.[70] The spacing between ratlines varies according to Anderson from 12 to 16 inches, and to Lees from 13 to 15 inches.[71] For Avondster's rigging plan the median of the dimensions given by both authors (14 inch) is used.The number of deadeyes on each channel is spaced evenly over its distance from the foremost deadeye, which is placed level with the after side of its mast.[72] The diameter of the deadeyes is half of that of the mast.[73]
The lowest deadeyes were fastened by chain-plates in the early seventeenth century. According to Anderson, Dutch ships had longer loops to their deadeyes than English ships in the seventeenth century, which formed links lying parallel to the hull. However, the deadeye with an iron strap around it, found in the starboard bow of the Avondster shipwreck, shows a short loop (VII).[74] This may suggest an English origin for the chain-plate found on the Avondster shipwreck. Anderson remarks that deadeyes in ship's models are often too flat when seen from their side, and suggests that they should be made more rounded.[75] A number of small deadeyes, found in the spare rigging locker on the Avondster shipwreck are, however, very flat (Table VIII), (X+XI). In addition, they are not as nicely rounded as the larger deadeye with its iron strap still attached, which was found on the site (VII). Deadeyes were teardrop-shaped in the sixteenth century and the very beginning of the seventeenth century.[76] Avondster's deadeyes are not teardrop-shaped but are not perfectly circular either because they were fastened to spliced ropes of the shrouds. If they

were completely rounded the rope would probably work itself off the deadeye more easily when it loosened up. The deadeyes found on the Avondster shipwreck are used as the model for the all topmast and sprit topmast shrouds in the rigging plan of the ship.

The circumferences of the shrouds are listed in Miller's Modellist and in The Lengths of Mast and Yards, 1640 (Table VIII). The circumference of shrouds of all ships in service of the Royal Navy in 1640 are recorded, but only those of the four English ships Marirose, Adventure, Providence, and Expedition are used for Avondster's rigging reconstruction. Anderson gives formulas to calculate the thickness of the shrouds and stays. The circumference of the mainmast forestay is half the diameter of the mainmast, that of the mainmast shrouds 1/2 the forestay, the mizzenmast and main topmast shrouds 1/4 the mainstay, fore topmast shrouds are 115 and the foremast shrouds 2/5 the mainstay. If Anderson's calculations were used, the shrouds of Avondster would be slightly thinner than those of Marirose, Adventure, Providence, and Expedition, and differ slightly from the dimensions listed in Miller's Modellist.

Avondster was slightly smaller than Adventure, Marirose, Providence, and Expedition, and it is unlikely that its rigging was of a larger diameter. It would also have been easier to make a standard size rope instead of working with fractions of inches. The calculations given by Anderson give a good estimation for the circumference of the shrouds and stays for all periods, but for the reconstruction of Avondster's rigging plan, the dimensions of the four English ships are used with the exception of the mizzen topmast stay.

Stays

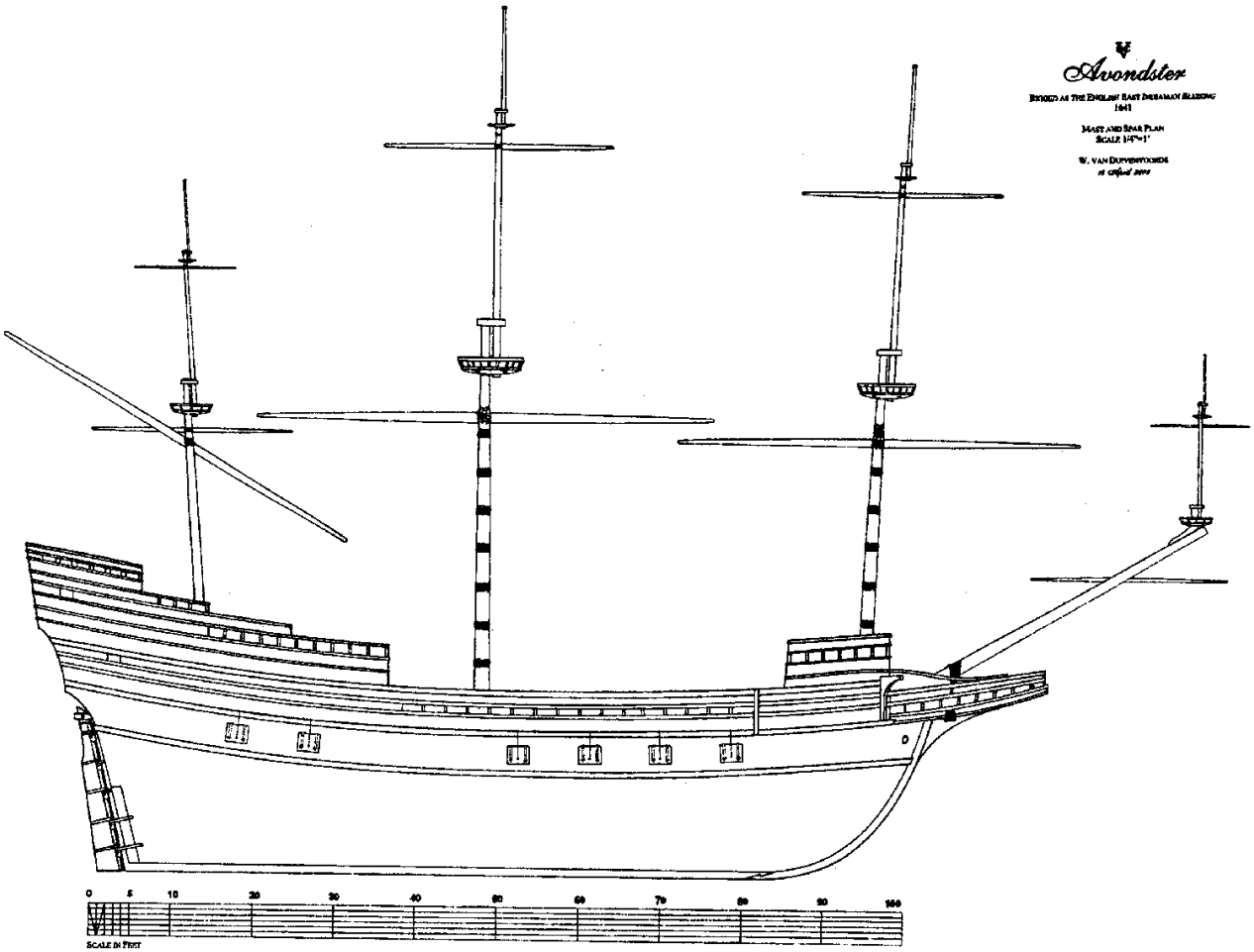
According to a description in A Treatise on Rigging (1620-1625), the mainstay is fastened on one end with a collar to the lower end of the ship's head, and above the trestletrees to the masthead on the other end.[77] The ship's head is probably the beakhead, which is fastened to the stem of the ship and supported by a knee. Manwayring points out more specifically that the collar of the stay was fastened to this knee.[78] The collar of the mainstay was spliced 3/4 the thickness of the stay.[79]

All masts had a forestay, which ran from the masthead above the trestletrees, with the exception of the bowsprit.[80] The top spritsail only had a backstay that ran from the masthead to the stay of the foremast and was split into six parts connected to each other with blocks; three of which were fastened to the forestay of the foremast.[81]

The main topmast forestay is, according to A Treatise on Rigging (1620-5), fastened to the head of mast above the trestletree and to the heel of the foretop. The lower part of the stay is connected to a collar by two deadeyes and lanyards.

The foremast and fore topmast stays were fastened to the bowsprit.[82] Manwayring describes how the stay of the mizzen was fastened to the mainmast at the height of the second deck.[83] The lower end of the mizzen topmast stay is fastened to the swifter (or most aft shroud of the mainmast) with crowfeet.[84] All forestays are fastened and rigged as described in A Treatise on Rigging (1620-5).[85]

According to Manwayring, the topmasts had standing ropes to secure them.[86] The Length of Mast and Yards stated that all ships in service of the Royal Navy in 1640 had two standing backstays. These backstays were secured to the chain wales by two deadeyes and lanyards; one on each side of the hull. They were the size as the shrouds.[87] In addition, the fore and main topmasts had so-called running backstays, which were pendants and whips. As described in A Treatise on Rigging (1620-5) the pendants came down to the level of the maintop or foretopmast and had blocks spliced into them. The fall started from a timberhead or the rail just abaft the shrouds



and came back to the same place on the other side of the hull.

In A Treatise on Rigging (1620-5) blocks are mentioned to secure the running backstays, whereas the standing backstays were secured with deadeyes.[88] Manwayring, on the other hand, only describes the use of deadeyes to fasten the lower end of the backstays.[89] The running backstays were probably set up with blocks on Avondster, and according to Andersons these backstays were more like topsail halyards than true stays.[90] In the Length of Mast and Yards, 1640, the circumference of the mainmast stays of the ships Adventure, Marirose, Providence, and Expedition is listed as 10 inch.[91] Using the calculation given by Anderson (circumference of mainstay equals half the diameter of the mast), the mainstay of Avondster must have been 10-5/6 inches, which is slightly larger than the stays of the four contemporary English ships (Table IX).[92] The foremast stay is 4/5, the main topmast stay 1/4, the foretopmast stay and mizzen stay 2/5, and mizzen topmast stay 115 of the mainstay. Avondster was slightly smaller than Adventure, Marirose, Providence, and Expedition, and it would therefore be unlikely that its rigging would have had a larger diameter. It would, also, have been easier to make a standard size rope instead of working with fractions of inches. The calculations given by Anderson, again, give a good estimation for the circumference of the stays in all periods, but for the reconstruction of Avondster's rigging plan, the dimensions of the four English ships are used with the exception of the mizzen topmast stay.

The diameters of the deadeyes used for the forestay in the reconstruction of Avondster are based on the ratio between the diameter of the shrouds and its deadeyes, respectively, of the main-, fore- and mizzenmast (Table X). The ratio of the deadeyes of the lower masts to its shrouds (diameter deadeye/ diameter of shroud) is 1:6.12. According to Lees the thickness of the deadeyes should be 1.6 times the diameter of the rope.[93] He also states that the thickness of deadeyes was slightly more than half their diameter, which was one and a half times the circumference of the shroud or stay.94 The dimensions of the four deadeyes excavated in the bow of the Avondster shipwreck in December 2001, show a larger ratio between the diameter and thickness of the deadeyes. The diameter of the deadeyes is 2.5 to 2.8 times their thickness (Table X1). For the deadeyes of the main-, fore-, and mizzen-stay a ratio of 2.8 is, therefore, used and for the topmast stays a ratio of 2.5 in the reconstruction of Avondster's rigging plan.

Parrels

According to A Treatise on Rigging (1620-5) every yard was fastened to its mast by the "parrell," which consists of a rope, trucks and ribs.[95] The rope runs three times around the mast, and has trucks and ribs strung to it. Each truck has one opening and it looks like a large bead, and each rib has three holes in it (XII+XIII).[96] The lower yards on Avondster's mast and spar plan are fitted in this manner, and the topmast yards have only two rows of trucks. During the excavation season of December 2001, one truck was found in the spare-rigging locker in the bow of the Avondster shipwreck. This spare-truck (0 1 /GHL/ 16) is definitely unused and lathe marks are evident on its surface. Its dimensions are 4.33 inch by 3.74 inch and it is 0.86 inch thick (XIII). It is drawn to scale on the mainmast of Avondster's 'Mast and Spar Plan' only, and is not to scale on the 'Standing and Running Profile'.

RUNNING RIGGING

On Avondster's reconstruction plan of standing and running rigging, only lifts, ties, and braces are drawn. To reconstruct its running rigging, A Treatise on Rigging (1620-5) is mainly followed because of its detailed descriptions.

Lifts

The pendant blocks of English ships at the beginning of the seventeenth century were simply spliced into the end of the pendants.[97] The lifts of the early seventeenth century started at their standing ends by being seized to the collar of the forestay, as described in A Treatise on Rigging.[98] The lifts ran from the collar to a block fastened on the end of the yardarm, from where they ran to another block fastened with a strap to the masthead. From the block attached to the masthead, the lift ran down to the deck where it was belayed to the gunwale underneath the shrouds.[99] The lifts of the topmast were secured to the lower masthead.[100] The size of the blocks should be the maximum diameter of the mast yard.[101] The lifts should be 3/8 of the thickness of the lower shrouds.[102]

Ties and Halyards

In English ships up to 1650, ties and halyards hoist the yards.[103] The ties have the same thickness as the shrouds, and the halyards are 2/3 of the thickness of the shrouds.[104] One end of the tie is fastened to the middle of the yard, and the other end runs through one of the hounds. It then goes through a hole in the upper part of a block and runs back in the same way on the other side of the yard. Here, it is fastened in the same manner as the first end.[105]

The halyards are fastened to a knight and pass through three sheaves inside the knight and through three sheaves in the lower end of the block through which the ties pass.[106]

Braces

The braces of each yard are fastened to pendants with an eye spliced in their ends, which is fitted over the end of the yardarm on each side.[107] The pendants were two or three fathom in length, and they had the same thickness as the shrouds.[108] On the other end the pendants had a block spliced into them.[109] The size of all blocks was 2/ 3 of the maximum diameter of the yard.[110] All braces are drawn in a 10 degrees angle and their thickness is 3/4 of the thickness of the shrouds.[111] The standing part of the braces of the mainmast is belayed to the aftermost timber of the ship, and the running part to the timber next fore of that.[112] The brace of the main topmast runs from the mizzen masthead to a block spliced in its pendant and then runs back to a block fastened to the mizzen shrouds. From this block, it runs back forward and passes through another block on the aft most shroud of the mainmast before it finally goes down to the deck where it is belayed.[113]

The fore braces run through a block attached with a strap to the mainstay towards the forecastle.[114] The brace of the foreyard is attached to the mainstay about 2/5 of the way from the foremast to the mainmast along the forestay.[115] The braces of the fore top yard pass through a block fastened to the forestay, another block fastened to the mainstay (below the foremast brace) and is belayed to the after end of the forecastle.[116]

The bowsprit had braces and garnets, which are braces running in the same fashion but they do not start from the yardarm but halfway in between the sling and the arm.[117] The standing part of the braces and garnets are belayed to the forestay and run through the block spliced to the pendant and then back to the forestay. Here they pass through a block, fastened below their standing parts, and run through another block on the ship's head to the forecastle where they are fastened.[118] The sprit top~ braces are fastened to the forestay, and run through their pendants back towards the forestay, and then follow the same course as those of the bowsprit.[119]

The mizzen lift led to the mizzen topmast head from 1625 onwards.[120] Attached to the mizzen topmast, there was a pendant with a block at its end. This block was fastened halfway between the mizzen topmast and the top of the mizzen yard. From here, one side passed through a block

fastened below the mizzenmast head and ran to the deck.[121] The other side of the brace ran through a series of blocks to the top of the mizzenyard and finally towards the deck. 139 The bowling was secured to the lower end of the mizzen and ran through a block attached to the most aft shroud of the mainmast towards a cleat on the bulwarks.[122]

The mizzen crossjack braces run forward to the aft most shrouds, through a block and from there to the deck where they were secured.[123]

Pulley blocks

The blocks used for the braces on the plan of Avondster's rigging reconstruction are to scale following the average dimensions of the blocks found at the Avondster shipwreck excavation.

Footnotes

1 An abstract from the paper by Wendy van Duivenvoorde 'The Rigging of VOC-ship Avondster, a reconstruction of the masts, spars, standing and running rigging from the time Avondster (named Blassing) was in service of the English East India Company 1641-1653.
2 Salisbury and Anderson, 1958; Laird Clowes 193 1; Manwayring 1972; Miller 1957.
3 Miller 1957, 1.
4 Salisbury and Anderson 1958,47.
5 Salisbury and Anderson 1958,47.
6 Deuchar 1988, 35, BHC101 1, 335, BHC0334, BHCO954, BHCO956, BHC0957, BHC0960-7,458,
BHCO825, BHCO267; Giltaij and Kelch 1996, 366, cat. 85; 404, cat. 95; Keyes 1990, 180- 1, cat. 43.
7 Bontekoe 1996, 27-9; Giltaij and Kelch 1996, 358-9, cat. 83; 391-3, cat. 92; 454-5, cat. 108; 459, cat. 109;
Keyes 1990, 124-5, cat. 19; 316-7, cat. 119; 232-3, cat. 7 1; Moore 1913, 7.
8 Moore 1913. 7; Bond 1642,19.
9 Green 1977,22.
10 Sainsbury 1906b, 192.
11 Sutton 2000, 148.
12 Laird Clowes 1931, 31
13 Manwayring 1972, 67
14 Manwayring 1972,67.
15 Miller 1957, 2. Manwayring indicates the foremast was four fifth ofthe mainmast (Manwayring 1972, 67). Lees gives a dimension of O.6 of the mainmast in all periods, but the dimensions given by Miller are
vrobably more accurate for the first half of the seventeenth century (Lees 1984, 183).
16 Anderson 1982, 20; Lees 1984,183.
17 Anderson 1982, 7 1
18 Laird Clowes 1931, 17 and 18 (See dimensions of Adventure, 287 tons; Marirose, 321 tons; Providence, 304 tons, and Expedition, 301 tons.
19 Miller 1957, 5.
20 Gill 1970, 3
21 Anderson 1982, 3-4.
22 Anderson 1982,8.
23 Anderson 1982, 6.
24 Anderson 1982, 13.
25 Anderson 1982,14.
26 Anderson 1982, 30-1.
27 Anderson 1982, 17
28 Lees 1984, 2-3.
29 Lees 1984, 5
30 Lees 1984,4, 6-7.
31 Anderson 1982, 30.
32 Anderson 1982, 40.
33 Anderson 1982,41.
34 Anderson 1982, 27 and 34.
35 Anderson 1982, 34.
36 Anderson 1982, 33.
37 Lees 1984,2.
38 Lees 1984,4.
39 Miller 1957,2-3.
40 Lees 1984,13-4.
41 Lees 1984,15-6, and 18.
42 Anderson 1982, 56-7.
43 Baker 1983, 53.
44 Anderson 1982,28-9.
45 Keyes 1990, 256, cat. 84
46 Laird Clowes 1931, 3 1
47 Anderson 1982, 28-9.
48 For example the man sitting on the mizzen yard on an engraving, by Frans Huys, after Pieter Breughel, depicting an armed four master sailing to sea (Groot and Vorstman 1980, 3).
49 Anderson 1982, 152; Baker 1983, 52.
50 Anderson 1982,152
51 Salisbury and Anderson, 1958; Laird Clowes 193 1; Manwayring 1972; Miller 1957.
52 Anderson 1982, 63-4.
53 Anderson 1982, 65.
54 Sutton 2000, 56.
55 Keyes 1990, 257, cat. 85, 316, cat. 119.
56 Keyes 1990, 18 1, cat. 43, 183, cat. 44,.233, cat. 71, 320, cat. 12 1
57 Keyes 1990, 256, cat. 84; 257, cat. 85
58 Miller 1957, 4.
59 Anderson 1982,66.
60 Anderson 1982, 67.
61 Manwayring 1972, 94; Laird Clowes 1931, 26 and 28; Salisbury and Anderson 1958, 48.
62 Miller 1957.
63 Manwayring 1972, 101; Salisbury and Anderson 1958,48.
64 Salisbury and Anderson 1958, 48.
65 Anderson 1982, 110-1; Manwayring 1972, 94; Salisbury and Anderson 1958,48.
66 Keyes 1990, 257, cat. 85.
67 Keyes 1990, 256, cat. 84.
68 Moore 1913, 7. Laird Clowes 1931, 28.
69 Anderson 1982, 94.
70 Anderson 1982, 94.
71 Anderson 1982, 130-1; Lees 1984,44.
72 Anderson 1982, 66.
73 Anderson 1982,71.
74 Anderson 1982, 68-9.
75 Anderson 1982, 93.
76 Anderson 1982, 70-1.
77 Salisbury and Anderson 1958,48. See also: Manwayring 1972, 101.
78 Manwayring 1972, 6 and 101.
79 Anderson 1982, 100.
80 Salisbury and Anderson 1958, 48 ; Manwayring 1972, 6 and 101; Miller 1957, Pl. 1.
81 Salisbury and Anderson 1958, 57.
82 Manwayring 1972, 6 and 101
83 Salisbury and Anderson 1958, 48; Anderson 1982, 118.
84 Manwayring 1972, 6 and 101.
85 Salisbury and Anderson 1958, 57-9.
86 Salisbury and Anderson 1958, 52.
87 Salisbury and Anderson 1958, 48.
88 Salisbury and Anderson 1958, 52.
89 Manwayring 1972, 101.
90 Anderson 1982, 118.
91 Laird Clowes 1931, 26 and 28.
92 Anderson 1982, 86.
93 Lees 1984, 189.
94 Lees 1984, 168-9
95 Salisbury and Anderson 1958, 47
96 Anderson 1982, 140- 1; Salisbury and Anderson 1958, 49.
97 Anderson 1982,144-5.
98 Anderson 1982, 134; Salisbury and Anderson 1958, 50.
99 Anderson 1982, 134; Salisbury and Anderson 1958, 50.
100 Salisbury and Anderson 1958, 53.
101 Anderson 1982, 144-5
102 Anderson 1982, 148.
103 Anderson 1982,134.
104 Anderson 1982,136.
105 Anderson 1982, 134-5;
Salisbury and Anderson 1958, 50, 53, 58-9.
106 Anderson 1982, 136; Salisbury and Anderson 1958, 50, 53, 5 8-9.
107 Anderson 1982, 148.
108 Anderson 1982, 148; Salisbury and Anderson 1958, 50.
109 Salisbury and Anderson 1958, 53.
110 Anderson 1982, 148.
111 Anderson 1982, 148 and 150.
112 Salisbury and Anderson 1958, 50.
113 Salisbury and Anderson 1958, 53..
114 Anderson 1982, 148
115 Anderson 1982, 149.
116 Anderson 1982, 190.
117 Salisbury and Anderson 1958, 56.
118 Salisbury and Anderson 1958, 56.
119 Salisbury and Anderson 1958, 59.
120 Anderson 1982, 235.
121 Anderson 1982,236; Salisbury and Anderson 1958, 59-61.
122 Lees 1984, 111; Salisbury and Anderson 1958, 59-61.
123 Anderson 1982, 245-6; Salisbury and Anderson 1958, 59.

Tables

Table I: Dimensions Masts Avondster

Bases on Miller´s Modellist

	Lenght (feet)	***Lenght (inch)***	***Diameter (1/3 inch per foot)***	***Rake (degrees)***
Mainmast	*65*	*780*	*21.67*	*90*
Main Topmast	*32´6´´*	*390*	*10.83*	*90*
Foremast	*57´9´´*	*693*	*19.25*	*87*
Fore Topmast	*28´5´´*	*346.5*	*9.63*	*87*
Bowsprit	*57´9´´*	*693*	*19.25*	*30*
Sprit Topmast	*15´5´´*	*184.8*	*5.13*	*90*
Mizzenmast	*40´3´´*	*483*	*13.42*	*94*
Mizzen Topmast	20´1,5´´	241.1	6.71	94

Table II: Dimensions of Avondster Reconstucted According to Deadeye

Based on Diameter Deadeye (02/GHL/02), 9,74”

Description	***Calculation used***	***Dimensions (inch or feet)***
Diameter of Foremast	*= Twice the size of its deadeyes*	*19,49”*
Lenght of Foremast	*= Three times the diameter of foremast in inches*	*58,46”*
Diameter of Mainmast	*= Three times the diameter of mainmast in inches*	*21,92”*
Lenght of Mainmast	*= Length of formast divided by 8/9*	*65,77’*
Beam Amidships	*= Lenght of Mainmast divided by 2,5*	*26,31’*

Table III: Dimensions Yards Avondster

	Lenght (inch)	***Lenght (feet)***	***Diameter = 1/4 inch per foot (inch)***	***Taper***
Main Yard	*668.57*	*55.71*	*13.93*	*to 1/3*
Main Topsail Yard	*334.29*	*27.86*	*6.96*	*to 1/2*
Fore Yard	*594.29*	*49.52*	*12.38*	*to 1/3*
Fore Topsail Yard	*297.14*	*24.76*	*6.19*	*to 1/2*
Spritsail Yard	*292*	*24.33*	*6.08*	*to 1/2*
Spit Topsail Yard	*146*	*12.17*	*3.04*	*to 1/2*
Mizzen Yard	*584*	*48.67*	*12.17*	*to 1/2*
Mizzen Top Yard	*146*	*12.17*	*3.04*	*to 1/2*
Cross Jack	*292*	*24.33*	*6.08*	*to 1/3*

Table IV: Lenght Mastheads, Hounds and Heels Avondster

	Masthead	***Hounds***	***Heel***
	Inch	*Inch*	*Inch*
Mainmast	*81.23*	*54.15*	
Main Topmast	*26*	*13*	
Foremast	*72*	*48*	
Fore Topmast	*23.1*	*11.55*	
Bowsprit	*46.2*		
Sprit Topmast	*12.32*		
Mizzen Mast	*37.5*	*no hounds*	
Mizzen Topmast	*16.1*		

Table V: Dimensions of Trestletrees and Mast Caps

	Trestletree Lenght (*1)	Trestletree Height	Trestletree Width	Cap Lenght (*2)	Cap Height	Cap Width
Mainmast	81.23	6.25	5.47	40.61	9.49	22.15
Foremast	72	5.54	4.98	36	8.42	19.64
Mizzenmast	37.5	2.88	2.6	18.75	4.38	10.23
Bowsprit	40.61	3.12	2.81	20.31	4.75	11.08
Sprit Topmast	27.45			13.73	3.21	7.49
Main Topmast	36	2.77	2.49	18	4.21	9.82
Fore Topmast	30	2.31	2.08	15	3.51	8.18

(*1) Lenght in trestletree is equal to the lenght of masthead, except for the bowsprit. The bowsprit trestletree is half the size of the mainmast´s trestletree (Anderson 1982, 30-1, and 34), (*2) The mast caps are half the lenght of the masthead (Anderson 1982, 41)

Table VI: Taper of Main-, Fore- and Mizzenmasts

	Taper Ratio		Mainmast	Foremast	Mizzenmast
	Fractional	Decimal	Diameter (inch)	Diameter (inch)	Diameter (inch)
Heel	5/6	0.83	18.06	16.04	11.18
First Quarter	42/43	0.98	21.16	18.8	13.1
Second Quarter	14/15	0.93	20.22	17.97	12.52
Third Quarter	5/6	0.83	18.06	16.04	11.18
Hounds	9/13	0.69	15	13.33	
Head	4/7	0.57	12.38	11	7.67

Taper Fore, Main and Mizzen Topmasts

	Taper Ratio		Fore Topmast	Main Topmast	Mizzen Topmast
	Fractional	Decimal	Diameter (inch)	Diameter (inch)	Diameter (inch)
Lower Part Head	7/10	0.7	5.95	7	3.15
Upper Part Head	11/20	0.55	4.675	5.5	2.475

Table VII: Number of Shrouds

Number of … on each side of the hull	Marirose *1) (1631, 321 tons)	Adventure *2) (1594, 287 tons)	Providence *3) (1637, 304 tons)	Expedition *4) (1637, 301 tons)
Foremast Shrouds	5	5	5	5
Mainmast Shrouds	6	6	6	6
Mizzenmast Shrouds	4	4	4	4
Fore Topmast Shrouds	4	4	3	3
Main Topmast Shrouds	5	5	4	4

In addition, there is one backstay aft each row of shrouds.

*1) Laird Clowes 1931, 26, *2) Laird Clowes 1931, 26, *3) Laird Clowes 1931, 28, *4) Laird Clowes 1931, 28

Table VIII: Dimensions of Shrouds

	Marirose and Adventure *3)		Providence and Expedition *3)		Miller´s Model-list *5)		Blessing *6)	
Shrouds	Circumfer-ence (inch)	Diam-eter (inch)	Circumference (inch)	Diam-eter (inch)	Circumference (inch)	Diam-eter (inch)	Circumfer-ence (inch)	Diam-eter (inch)
Foremast	5	1.6	5	1.6	4.5	1.43	4.34	1.38
Mainmast	5.5	1.75	5.25	1.67	6	1.9	5.4	1.72
Mizzenmast	3	0.95	3	0.95	2.5	0.8	2.7	0.86
Fore Topmast	3	0.95	2.5	0.8	2	0.8	2.2	0.7
Main Topmast	5	0.95	3	0.95	2.5	0.64	2.7	0.86

*3) Laird Clowes 1931, 26., *4) Laird Clowes 1931, 28, *5) Miller 1957,6, *6) Based on calculations given by Anderson (Anderson 1982, 86)

Table iX: Circumference Forestays

	Providence, Expedition, Adventure and Marirose *5)		***Avondster *6)***	
	Circumference (inch)	*Diameter (inch)*	*Circumference (inch)*	*Diameter (inch)*
Mainmast	*10*	*3.18*	*10 5/6*	*3.45*
Main Topmast	*4*	*1.27*	*2 3/4*	*0.86*
Foremast	*7*	*2.23*	*8 2/3*	*2.76*
Fore Topmast	*3*	*0.95*	*4 1/3*	*1.38*
Mizzen	*3*	*0.95*	*4 1/3*	*1.379*
Mizzen Topmast	*Not listed*	*not listed*	*2 1/6*	*0.69*

**5) Laird Clowes 1931, 28-8, *6) Based on calculations given by Anderson (Anderson 1982, 86)*

Table X: Dimensions Deadeyes from Avondster Shipwreck

Description	***Grid square***	***ID. Number***		***Diameter (cm)***	***Thickness (cm)***	***Ration Diameter To Thickness***
Deadeye with metal concretion of its strap	*4S2, 3S1, 3S2*	*02/GHL/56*		*24.75*	*8.7*	*2.8*
Description	***Grid square***	***ID. Number***	***Lenght (cm)***	***Width (cm)***	***Thickness (cm)***	***Ration Length To Thickness***
Small dead eye	*2S2*	*01/GHL/11*	*9.5*	*9.2*	*3.8*	*2.5*
Small dead eye	*2S2*	*01/GHL/12a*	*9.7*	*9.3*	*3.9*	*2.5*
Small dead eye (very worn)	*1S2*	*01/GHL/06c*	*9.4*	*9*	*3.5*	*2.6*

Table XI: Diameter Deadeyes of Forestays

Deadeye of	***Ratio x Diameter Forestay =***	***Diameter Deadeye***
Main mast stay	*6,12 x 3,1831 =*	*19 5/12*
Main topmast stay	*6,12 x 1,2732 =*	*7 5/6*
Foremast stay	*6,12 x 2,2228 =*	*13 2/3*
Fore topmast stay	*6,12 x 0,9549 =*	*5 5/6*

Appendix 3 Systems Introduced for Artefact Conservation. Galle Maritime Archaeological Conservation Laboratory. March 2002.

Overview

Artefacts will be treated as Individual Objects and also in Groups.
The conservator working on the individual object is the Object Conservator.
The conservator working on the group of objects is the Group Conservator.
The Object Conservator and Group Conservator will need to work together to treat artefacts.
Treatment Reports will be filled in for Individual and Group treatments.
When complete they will be filed in the filing cabinet in the office

The Head of Conservation nominates a conservator to maintain the Conservation and Groups Register. The conservator responsible for these duties shall be referred to as the "Register Officer"
The attached flowchart shows the procedure for current and new treatments.
In simple steps:

1. An object comes to the lab
2. It is allocated to an Object Conservator
3. If appropriate it is distributed to a group
4. A treatment is devised
5. The Group Conservator carries out the approved treatment.
6. When group treatment is complete, the Group Treatment Report is filed.
7. The Object Conservator finishes the treatment for each object.
8. The Object Treatment Report is filed.
9. The Object Conservator shall pack and store the object appropriately.

A. Allocating Artefacts to Conservators

1. On arrival into laboratory all finds will first be be registered.
2. All maritime finds will be placed in a suitable storage solution
3. The Register Officer to immediately register all new finds in the Conservation Register.
4. Within 2 days artifacts should be distributed into Treatment Groups1.
5. Treatment Groups should be finalised2 within 2 days (particularly during fieldwork season).
6. Head of Conservation to oversee groupings of artifacts
7. A record should be kept of the artifacts in each group. This will be the Group Register.
8. The Register Officer to maintain the Group Register.
9. The Register Officer to record in the Group Register, the Artefacts within a Group and the total number of objects within the group3.
10. The Register Officer to also record the appropriate Group Number in the Conservation Register
11. Head of Conservation to allocate Individual Artefacts and Treatment Groups to Conservators. The conservator maintaining registers may nominate conservators for each object. The Head of Conservation may approve these allocations.
12. The objects must be allocated as soon as possible once they are received in the lab.
13. The Conservator is to acknowledge responsibility of the find in the Conservation Register [Signature and Date] and responsibility of the Treatment Group in the Group Register [Signature and Date].
14. The Register Officer is to ensure all objects and all treatment groups are allocated to a Conservator
15. The Register Officer to ensure all objects are allocated to a Group (in the Conservation Register). If an object is to be treated individually, a note is to be made in the register. For example a cannon or anchor.
16. Head of Conservation to ensure all Finds and Groups are allocated to a Conservator
17. Head of Conservation can re-allocate objects and groups to another conservator. The change is to be noted in the Conservation Register or Group Register and signed by both conservators. (If the original conservator is not present, then only the new conservator will sign).
18. The treatment time or effort required for objects and materials varies. Re-allocation of Individual Artefacts and Treatment Groups by the Head of Conservation may be necessary from time to time to make the workload in Conservation fair and equal.
19. If there are changes in the conservation staff (staff leave, or new staff arrive) the Treatment Groups and Individual Artefacts must be re-allocated immediately by the Head of Conservation.
20. A list will be provided on the notice board detailing the objects and groups allocated to each conservator.

B. Responsibilities of the Conservators

General

1. The Conservator is responsible for recording all information on the treatment record sheets as work is carried out.
2. If a conservator is to stop working at the laboratory they are required to hand over all their Treatment Reports to the Head of Conservation.

Conservators must record all work they have carried out. In some cases, damage may occur to an object or a treatment may be unsuccessful

Group Treatment

1. every Conservators can work on more than one Group Treatment at a time. The number of Groups allocated to any Conservator is at the discretion of the Head of Conservation.
2. The Conservator must maintain a Group Treatment Report for all groups allocated to them.
3. One Conservator is allocated the responsibility of a Group. The Conservator Responsible is to be noted on the Group Treatment Record. Other Conservators may carry out work on the group. The conservator must record their name against each entry on the Group Treatment record4
4. The Conservator responsible for a Group must work together with the Conservators responsible for the Individual Objects, when determining treatment.
5. The Group Conservator should inform the appropriate Conservators of changes in object condition.
6. The Group Conservator must inform the Object Conservator when an object requires attention or has completed the wet treatment phase. For example, ceramic desalination is complete, or an object is actively corroding.

Individual treatment

1. A Conservator is not expected to immediately carry out treatment on all the objects allocated to them. However, the Conservator shall maintain all the objects in a stable condition (to the best of their abilities and the facilities available).
2. The Conservator is to maintain and complete an Individual Treatment Report for every object worked on by them.
3. Conservators can work on more than one object at a time. The workload is to be determined by the Head of Conservation.

C. Recording and Treatment Processes

General

1. A Treatment Report is to be completed for every object

2. A Group Treatment Report is to be completed for every Group.
3. Completed Individual Treatment Reports and Full Conservation Registers are to be filed in the lab. The Reports are to be filed by Registration Number.
4. Completed Group Treatment Reports and Full Group Registers will be be filed in the lab. The Reports are to be filed by Group Number.
5. Some Treatments and Reports will be brief, others more complicated. (e.g. a ceramic fragment compared to cannon balls)

Treatment and reports

Pre-Treatment Assessment Phase

Individual Treatments

1. The Basic Fields are simple to fill in (registration number, site, object name, materials, date of photography; drawing; x-radiography).
2. The Treatment Group Number is to be entered. If the artefact is not part of a group, then record so.
3. The following can be completed for every artefact before photography takes place:
   Description
   Condition
   Archaeologists Recommendations (when via email a digital photo will be required)
   Proposed Treatment

Group Treatments

1. The Group Number, the Total Number of Objects and the Object Numbers are recorded on the Group Treatment Record. These entries should match those in the Group Register. Any Differences should be fixed (Check with The Register Officer).

Treatment Proposal

Individual Artefacts

1. A treatment proposal is to be prepared for every artefact before treatment can commence.
2. Before treatment can commence the Proposed Treatment must be Approved by the Head of Conservation. Approval of the Proposed Treatment will be given by Signature and Date on the Treatment Record.
3. Desalination treatment in water is exempt from treatment approval. Other desalination methods are to be approved first.
4. For any treatment that will alter the object in any way approval from the archaeologist is required.
5. Conservators are encouraged to complete all Treatment Reports to the Treatment Approval Stage.

Group Treatments

1. Treatment Proposals for objects are to be recorded and approved on the Individual Treatment Reports.
2. The Group Conservator should work with the Individual Conservator to devise a proposed treatment.
3. The proposed treatment should be recorded in point form on the Group Treatment Report.

Treatment

1. If an object has changed appearance dramatically during the course of treatment a During Treatment or After Treatment photo is required. Archaeology should be notified.
2. Any problems that occur during a treatment should be reported to the Head of Conservation and the Conservation Consultant.
3. If a conservator cannot proceed with a treatment for any reason they should:
   1. Seek advice/instruction from fellow Conservators and/ or the Head of Conservation. Seek advice from the International Conservation Consultant
   2. Carry out work to solve the problem, such as research, arranging equipment repair etc.
4. The Head of Conservation is to Approve Completed Treatments. And may require further work to be carried out.
5. When any treatment is determined to be complete the Conservator is responsible for filing the Treatment Report.

Individual Treatment

1. When approval had been given, treatment can commence.
2. Artefact numbers are to be applied to object when treatment is complete
3. The Object Conservator is responsible for the suitable packing and storage of an object.

Group Treatment

1. Conservators are encouraged to plan in advance for the all the stages of the Group Treatment.5.
2. Treatment is to be recorded on the Group Treatment Report, as treatment progresses.
3. Some Group Treatments will be quick and simple, others will be longer and more complicated. Each page of the group treatment records should be numbered.
4. Approval for treatment to be given by the Head of Conservation [Signature and Date on the Group Treatment Record]. Desalination in freshwater does not require Approval.
5. Each conservator is responsible for measuring chloride levels and pH for their groups
6. The Conservator must record all information on the Group Treatment sheets as it occurs or is observed.

Notes on Group Treatment of Artefacts

1. Examples of standard Group Treatments are desalination in freshwater, desalination in other solutions (particularly metal objects), and impregnation in polyethylene glycol.
2. The treatment time for groups is relatively unpredictable. And the work required to maintain groups varies over the duration of the treatment. Re-allocation of groups may be necessary to make the workload in Conservation fair and equal.
3. Group Treatment Records can be kept in point form. Full sentences are not necessary.
4. Information regarding the treatment of the Objects in the Group should be recorded.
5. Samples to be labeled with the Group No, the Date the sample was collected, the Solution (e.g. freshwater, or NaOH) and Concentration.

The following must be recorded on the treatment reports:

6. Type of solution and concentration (in the correct format).
7. Standardised abbreviations if the full term has been defined on the Treatment Report.
8. Units of measurement must be specified.
9. Changes in solution must be recorded, with the date. (Replacing water must be recorded). Samples of the new freshwater should be taken for comparison purposes.
10. Desalination graphs are to be completed and maintained. Chloride levels are also to be recorded on the Group Treatment Record against the date the sample was taken. If measurement occurs at a later date, this can also be recorded. (Treatment solution samples can be retained and measured at a later date).
11. Notes are to be kept on the Group Treatment Record of the treatment solution and object condition.
12. The tank volume should be recorded (estimated for large volumes).
13. All calculations and workings are to be shown.

(Endnotes)

1Like materials are to be stored with like. . wood with wood, glass with glass, etc. i.e. do not group iron and ceramic in the same group together, or dissimilar metals. Composite objects require special storage situations.

2 Finalising groups refers to : Group Identifying Number and Artefacts within the group. For a period of time (depending on material and treatment, maximum 1-2 months) new objects can be added to the group. This must be recorded in the Group Register, the Conservation Register and on the Group Treatment Report

3 In some cases it may be necessary to record the total number of objects and also the total number of pieces (eg for objects that have not been subnumbered)

4 Any task may be undertaken. Standard tasks would be changing the solution, measuring chloride levels or noting condition entries, etc.

5 For example, prepare for a PEG treatment before the wood has completed its desalination treatment. If a PEG treatment has been approved, ensure supply of PEG in lab, determine quantity required initially, and over the course of treatment. Determine process for discarding used solution or possibly reusing solution. Make steps towards determining the drying stage of the treatment.

Appendix 4 Designing a licensing system for maritime archaeology. The Sri Lanka experience.

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UNESCO adopted the Convention very shortly after the commencement of Sri Lanka's first maritime excavation. By that time we did not have established procedures for licensing such an excavation. The adoption, therefore, made it possible to link the Convention Annex, the prevailing licensing requirements for land archaeology and the emerging new thinking on this subject together and to design the necessary licensing system. This process, which is yet far from complete, is my subject today. I shall be presenting this in three parts: Part 1, an introduction to archaeology in Sri Lanka; Part 2, the emergence of Maritime Archaeology in Sri Lanka, principles and procedures prevailing, legal precedents and emerging new thinking and Part 3, the process and experiences in designing a licensing system.

Part 1

Pre-history

Sri Lanka is an island of approximately 25,000 square miles, situated in the middle of the northern Indian Ocean, a few miles south of India. It has a written history of over 2500 years which takes, as its starting point, the settlement in the island by Aryan settlers from India in the 6th. Century BC. The inhabitants of the country at this time were the Veddahs, hunter-gatherers, the last of whom are yet to be found in particular areas. Recent discoveries have revealed traces of settlements dated to over 130,000 BP by TL and skeletal remains of anatomically modern man Carbon-14 dated to 37,000 years BP. These dates considerably pre-date the last separation of this island from the Asian mainland around 7,000 BP and evidence from Dental Morphological analysis and other anthropological tools as Discrete Morphological Analysis have linked the latter remains to the Veddahs.

Location and sea-borne influences

The country's situation, off the southernmost tip of the Indian peninsula, made it inevitable that all the sea-routes in the northern Indian Ocean rounded the island. The country was therefore always open to sea-borne influence from east and west. This cosmopolitanism is particularly evident in the south of the island where the east-west sea-routes touched, while the north, which is separated from India by only a few miles, has been open to largely south Indian influences, and those of sea-routes coasting down the eastern and western shores of India.

Archaeology

Since the Aryan settlements, Sri Lanka enjoyed a very materially advanced civilization particularly characterized by a sophisticated irrigation system featuring man-made lakes covering several square miles and canals many miles long, and massive brick constructions, arguably the largest in the world, some larger than all but the highest pyramids. Consequently there are about 100,000 monuments alone above ground level and these have always dominated the interest of antiquarians. An Archaeological Department was established in 1890 and today there are seven designated World Heritage sites in the country.

Part 2

Maritime Archaeology

In the overwhelming presence of these monuments, maritime archaeology was not even thought of until the centenary of the Archaeological Dept., in 1990, when a resolution was adopted that this new area should no longer be neglected. Till that time, there had been only one occasion when an underwater site was explored. This was when a wreck which had been carrying a cargo of silver coins was discovered by Arthur C. Clarke and studied by Peter Throckmorton in the early 1960s. Although this could have served as a wake-up call it did not, remaining an isolated incident. Even today, it remains an example of the threat treasure-seekers pose to genuine archaeological investigation. An unfortunate spin-off was that it served as a model for local scuba divers who began to make a business of unregulated underwater tourism since the 1970s, when Sri Lanka began to be marketed as a "sea, sun and sand" tourist destination. After 1990, however, a more responsible and scientific approach was adopted. The Department of Archaeology, the Central Cultural Fund and the Post Graduate Institute of Archaeology sought the assistance of Jeremy Green of the Maritime Archaeological Dept. of the Western Australian Maritime Museum to train a core group of archaeological students at Galle, an ancient port city in the south of the island dating back to over eight hundred years. An ancillary undertaking for the training team was to compile a data base of shipwrecks in the bay. This programme was begun in

1992 and continued on a seasonal basis for three years. In 1995 it was decided to extensively develop the commercial port: a move that could do much harm to whatever lay under the waters of Galle. In 1996-97, therefore, the training project was changed to a rescue archaeology project, which undertook to survey the entire bay, identify all possible sites by remote sensing and commence visual inspection of potential sites. Using side-scan sonar, DGPS and a satellite-based differential system, 48 east-west runs were completed covering a linear distance of 312 km and mapping a total area of 62.4 mn square meters of sea bed. Of the total of 160 potential sites noted, only 21 were identified as of archaeological interest after visual confirmation. The most significant of these were 11 iron wrecks of the 19th. century, five European wooden wrecks dating back to the 17th. century, several accretion sites where assorted artifacts had been gathered by wave and current movement and a stone anchor site dating back to the 14th. century. When I was, subsequently, called upon to conduct a cultural environmental impact survey prior to the development work, this survey helped locate the new structures with minimal impact on the underwater archaeological sites.

The likelihood of new construction has, since, receded, but it was felt that the work begun should be carried forward. The problem, common to most developing countries, was the lack of funding. Serendipitously, though, a solution emerged. Sri Lanka's maritime provinces had, since the early 16th. Century, come under the control of the Portuguese, the Dutch and the British successively, till 1948. The Dutch now took the lead in establishing a Mutual Heritage Centre that would undertake and fund selected projects related to the shared heritage. One of the projects selected and, in fact, the largest single one, was the "Avondster Project" which was to undertake a detailed exploration and excavation of the most significant of the sites identified earlier, namely, the wreck of the East Indiaman, Avonster. The excavation would be part of the project only: the other parts being –

- further training of the core group of maritime archaeologists,
- completion of the maritime archaeological conservation laboratory and
- setting up the infra-structure for maritime archaeology in Sri Lanka.

All this was to be accomplished in three years. The project, which commenced in November, 2001 is Sri Lanka's first maritime archaeological excavation project.

It was timely that the UNESCO Convention was also finally adopted that very month. To me, personally, this appeared a golden opportunity to give the correct start to our maritime archaeology efforts, by following the ICOMOS Charter and the Annex to the UNESCO Convention. We had no specific procedures in place for issuing a license for an excavation at sea, but there were procedures followed by the Archaeological Dept. in regard to land archaeology for over a hundred years and which are now in the process of revision. The requirement was to

- follow the principles embedded in these procedures,
- include the new thinking with regard to their revision and
- bring about a synthesis with the ICOMOS/ UNESCO concerns.

Principles and procedures: Land Archaeology

In land archaeology, Sri Lanka proceeds from certain baseline criteria that are enunciated in the Antiquities Ordinance of 1940, as amended by Acts of 1955 and 1998. Originally described as "An Ordinance to provide for the better preservation of the Antiquities of Sri Lanka", this description now reads "An Ordinance to provide for the better preservation of the antiquities of Sri Lanka, and of sites and buildings of historical or archaeological importance in Sri Lanka." Important principles enunciated therein are the following:

- There is a distinction drawn between "Antiquities" and "Ancient Monuments."
- All Ancient Monuments which were not owned by anyone on the date the Ordinance came into force are the absolute property of the State.
- All undiscovered Antiquities, whether above or beneath the surface of the ground, in any river or lake or within the territorial sea are the absolute property of the State.
- No Antiquity discovered upon privately owned land is the property of the owner of the land.

With regard to excavation for discovering Antiquities:

- Excavation can only be undertaken upon the issue of a license by the Director-General of Archaeology, even if the excavation is to be on private land.
- An application to excavate must be made to the Director-General who may grant or refuse to grant a license at his discretion.
- The Director-General will make certain that the owner of the land has given his consent, that the proposed excavation will not cause inconvenience or harm to persons in the vicinity, the community and public utilities and that the applicant can pay any compensation claims and furnish any security required.
- The Director-General shall stipulate the terms of supervision of the excavation and payments to be made for such supervision.
- The applicant shall keep a register of all discoveries.
- The Director-General may withdraw the license without compensation and shall not be liable for any loss resulting from cancellation.
- If an Antiquity is discovered that is not covered by the license, the license holder shall report it to the due authority

With regard to Ancient Monuments:

- Any Monument dated to before 1815 are designated "Ancient Monuments" while those which has existed for a period not less than a hundred years may be so declared if worthy of being protected and preserved.
- Any tree of historical or archaeological interest can be declared an Ancient Monument to secure, preserve and protect it.
- Ancient Monuments on private land may be restored only if the Director-General issues a permit and provides for its supervision by persons appointed by him.
- Where no permit for restoration has been applied for and granted, the Director-General shall carry out restoration and the owner of the land shall give him all necessary assistance.
- No mining, quarrying or blasting shall be carried out within a prescribed area around an Ancient Monument.

With regard to archaeological reserves:

- The Director-General is empowered to declare as "Archaeological Reserves" any specified area of State-owned land and it shall be an offence for anyone to clear it for cultivation, erect any building upon it, fell or destroy any tree within it and encroach upon it in any other way.

With regard to Archaeological Impact assessments:

- Whenever a development scheme or project is proposed, whether by Government or other institution, which entails the use of, encroachment or submergence of any land falling under the purview of the Ordinance, no work shall be undertaken until the Director-General submits a report on its impact.
- The Director-General shall carry out

the impact survey at the expense of the sponsors of the project within a specified period.
- The sponsor of any such scheme shall set apart up to one percent of the total cost of the scheme for this purpose.
- Non-compliance with the above conditions will constitute an offence and the Director-General may stop the scheme or project forthwith.

Definitions:
"Monument" – any building, structure or erection, tomb, tumulus, place of interment or similar immovable property, or remains of any such; any other site where the material remains of historic or prehistoric settlement or activity may be found.

"Archaeological Heritage" – that part of the material heritage of mankind in respect of which archaeological methods provide primary information; all vestiges of human existence and places relating to manifestations of human activity; abandoned structures and remains of all kinds (including subterranean and underwater sites), together with all the portable cultural material associated with them.

"Territorial sea" - the area declared as such by Proclamation made under the Maritime Zones Law, No.22 of 1976.

(Note: Those matters that have, or have had, a specific bearing on maritime archaeology in Sri Lanka have been placed in italics)

Duties of the Director-General:
- To formulate a national archaeological policy and to co-ordinate and implement such policy after it is approved by the Government
- To maintain inventories of the archeological heritage, to conduct research into the archaeological heritage and specially into the prehistoric, protohistoric, early historic, middle historic and late historic periods and into general or specific theory, method or practice
- To enhance public awareness and levy entrance fees where considered necessary
- To conduct archaeological impact assessments.

What is not evident from the foregoing is that, within the last forty years, a major shift in focus took place in the Department's self-image.. The major changes, initiated by the last Director-General, Dr.S.U.Deraniyagala in 1998, are:
- The shift in focus from "Antiquities" and "Monuments" to the "Archaeological Heritage".
- The shift of the Department's role from that of a "Caretaker" responsible for excavation, conservation and recording to that of a "Protagonist" involved in formulating national policy.
- The shift of the spectrum of interest away from the historic period to even earlier times, notably the prehistoric, protohistoric and early historic periods.
- The extension of the Department's span of concern beyond terrestrial borders, to include territorial waters
- The combating and mitigation of possibly disastrous effects of uncontrolled economic development by undertaking archaeological impact assessments and by empowering the Department to control such ill-effects through pre-emptive action.
- Financing these new activities by tapping the very forces that pose a threat, namely the sponsors of the development schemes and projects and those who are fined for committing offences against the Ordinance.

Dr. Deraniyagala's area of specialization is pre-history while my own area of interest is maritime archaeology. Engaged as he was in defining the new horizons for archaeology in Sri Lanka, he was appreciative of the area I was promoting and, thus, I was able to follow in his slip-stream and benefit by his formidable presence.
More of Dr. Deraniyagala's ideas on the need for greater control over archaeological activity were embodied in his outgoing Presidential Address before the Sri Lankan Council of Archaeologists last year. Among the major issues he dealt with were:
- Excavation "…must be controlled by norms that dictate the maximum preservation……in situ for future generation to research with increasingly non-destructive techniques."
- Emphasis on proper published site reports, with a recommended format.
- Invasive sampling (i.e.excavation) should only be undertaken for Research with objectives and their formulation clearly defined ("Availability of funding is no excuse for….unprofessional activities"); Archaeological Impact Assessments; and: Exceptional circumstances where a site needs to be excavated prior to restorative conservation…"
- "…No excavations….to be undertaken without the direct participation of professional field archaeologists (excavators). Training excavations may not be conducted in their own right."
- The need for a Project proposal involving: Justification of the project; Justification of methods and techniques in Field operations, Post-excavation analyses, Compilation of site reports and Compilation of project archive; Justification of the proposal in terms of Human, Financial and Infra-structural resources, with Human Resources being given the highest priority; All revisions necessary to be justified.
- Emphasis on keeping excavation down to a minimum – not more than 25% of a site.
- "…the key to organizing archaeological evidence lies in its dating. This point is (and cannot be) contested."
- Sampling to be as exhaustive as possible and in keeping with project objectives.
- Curative conservation to be done under specialist conservators.
- "…architectural conservators (should) be present so as to maintain a dialogue between excavator and conservator to secure a seamless continuum ……. Divergent strategies between excavator and conservator could harm the authenticity of the monument."
- Every aspect of field operations should be documented since excavation is an irreversible procedure. Written, photographic and digital documentation are necessary.

- "Post-excavation assessment of potential for analysis should be undertaken before any detailed analysis is undertaken."
- "Relative dating is best achieved against a stratigraphic succession through typological analysis of features and artifacts."
- Environmental data analysis is of special significance for prehistoric and protohistoric investigations.
- "Technology is central to archaeological assessment of cultural evolution…… it is an essential component of post-excavation analysis"
- Emphasis on subsistence data analysis, on settlement analysis on a regional scale and on bio-anthropology.
- The need for a project archive

Whatever is indicated in italics above is my own emphasis. What is indicated is, however, parts of his address only.

Legal Precedents
It is not only archaeologists who have been pushing back the frontiers in regard to the practice of archaeology. An increasingly

pro-active Judiciary and Courts system have also been willing to intervene and mediate when such matters as economic development versus archaeological heritage come before them. One land-mark judgement of the Supreme Court of Sri Lanka needs mentioning.

The judgement is in the matter of a dispute between Bulankulame and six others v. Secretary, Ministry of Industrial Development and seven others, Supreme Court Application No.884/99 (F/R), commonly referred to as the "Eppawela case" The Government entered into an agreement with a private company for rapid exploitation of rock phosphate reserves in the agriculture rich north central province. The petitioners were six residents of the area whose agricultural lands stood to be affected and the resident Buddhist monk at an ancient temple which was at risk along with the paddy fields that sustained it. The petitioners claimed that the project was not for a public purpose but for the benefit of a private company, and that the Government was so heavily committed to it that no unbiased environmental impact assessment would be carried out once the agreement was signed. They claimed imminent infringement of their fundamental rights under the Constitution, and an attempt to contract out of the obligation to comply with the law by by-passing the provisions of the National Environment Act relating to Environmental Impact Assessments. Both the National Academy of Sciences and the National Science Foundation had been critical of the project. On behalf of the Government the Attorney-General claimed that the intention to comply with the law was always there and that the petition was, therefore, premature and took the position that the Government was the "trustee" of natural resources and that the mere fact that the Court may not agree with the Government's decision did not give it the jurisdiction to intervene.

The three-member panel of Judges arrived at a unanimous finding that there was an imminent danger of fundamental rights being infringed, and that a comprehensive exploration and study of named aspects be carried out and published. The Attorney-General's position re the Government's "trustee" status was rejected. The Respondents were directed to desist from entering into any contract regarding this phosphate deposit till the study and the Environmental Impact Assessment had been completed, and to pay each of the petitioners a specified sum. From an archaeological perspective, the relevant sections of the Judgement were the following:

"The public trust doctrine as applied in the United States was too restrictive in scope and the present matter should be looked at in the light of Sri Lanka's ancient traditions and its present Constitution which placed a shared responsibility for safeguarding the environment on the Government and the people"

Quoting from the Mahavamsa, Sri Lanka's historical chronicle:

"In my kingdom are many paddy fields cultivated by means of rain water, but few indeed are those which are cultivated by perennial streams and great tanks.

By rocks and by many thick forests, by great marshes is the land covered.

In such a country, let not even a small quantity of water obtained by rain, go to the sea, without benefitting man."

Quoting from Judge C.G.Weeramantry, Vice President International Court of Justice in the Gabcikovo-Nagimoros Project (Hunary v. Slovakia (1) – the Danube case) who also quoted the Mahavamsa:

"O great King, the birds of the air and the beasts have as equal a right to live and move about in any part of the land as thou. The land belongs to the people and all living beings; thou art only the guardian of it…"

in his separate opinion, referring to the "imperative of balancing the needs of the present generation with those of posterity"

Adopting, from her comments on another project, the words of an archaeologist, the late Martha Prickett-Fernando:

"Unless developmental activities in areas like this project are accompanied by proper EIS studies and (proposals for) for mitigation of (the adverse impacts on) archaeological resources that will be damaged, vast numbers of sites – in fact, much of Sri Lanka's unrenewable cultural heritage and the raw data for all future studies on ancient Sri Lanka will be destroyed without record, and an accurate understanding of life in ancient Sri Lanka will remain forever wrapped in myth and hypothesis."

This is but another example of the willingness of our Courts to refer and draw from our cultural heritage lessons for the future. Martha Prickett-Fernando's quotation from D.D.Kosambi's "The Culture and Civilization of Ancient India" is apposite: "To learn about the past in the light of the present is to learn about the present in the light of the past."

Part 3

Drafting a Licensing System

The draft system envisaged for maritime archaeology follows the existing one in that it comprises three stages, i.e, Application, Stipulating conditions and Granting approval, but only the first of these have been attempted so far. I decided to and stick as closely as possible to the ICOMOS/ UNESCO guidelines, as I was familiar with them. The Avondster project is a multi-faceted one, in which excavation is but one facet. Consequently, when the Project Proposal was drawn up neither the Mutual Heritage Centre nor the Amsterdam Historical Museum had seriously contemplated the question of an excavation project design. However, buoyed up by the euphoria of the adoption of the Convention and the success of ICOMOS, I was anxious that the first Sri Lankan maritime archaeological excavation should serve as a model. I am not certain whether we were biting off more than we could chew and I must admit that the draft, inclusive all its weaknesses, is entirely mine and that I must take full responsibility for it. I am here today in the hope that I would get some ideas from all of you to evolve a better one

The Annex to this paper gives the format I designed. In print the layout it may become different but the cages will be substantially the same. It is intended that it will be an Application for the grant of a License, to be completed by the project proponents for submission to the Department. In its final form it will become a standard Departmental form. For this reason I thought it helpful if guidelines for filling it were indicated: general guidelines indicating non-negotiable parameters as well as cage-by-cage guidelines indicating the information required by the Department to help consider and evaluate the Application. The Department will next critically review the Application that, in essence, would be the Project Design, and ask for more information and undertakings. I took the position that the applicant must first commit himself to a project design, as envisaged in the ICOMOS Charter and the Convention. The applicant thereby voluntarily indicates to what extent he/she is willing to conform to the Department's general requirements. At this stage no negotiations have taken place and the applicant's bona fides are being shown. After the Application is assessed, discussion and negotiation will follow. The Department will then seek the applicant's agreement to terms specific to the project and, should the applicant be willing, a License will be granted. Let me now indicate certain experiences we have undergone in this process and explain why we have treated certain sections in a particular way these are indicated in italics.

General guidelines.

Identifies the Application as, in fact, the Project Design (Vide Convention and Deraniyagala).

A problem surfaced that became a reason

for designing this form. The Avondster Project already existed as a Project Proposal involving training, capacity building, integrated archaeological research, infra-structural development and establishment of a museum in addition conducting an excavation as part of the training component. It was not so focused as a Project Design should be and there was an initial feeling that there was no need for this differentiation. However, the facts that an excavation cannot be conducted without a license and that a license would be forthcoming only if a proper Project Design was submitted, helped matters to be resolved. The root of the problem was that we did not have a licensing system for maritime excavation in place at the time the Project Proposal was prepared: with a system now in place such an error need not occur again.

Sets out the need for project implementation to follow the project design as set out in the application; the imperative to treat human remains and religious sites with due reverence; the Sri Lankan position that cultural artifacts are not to be used for commercial trade; and stresses the primacy of Sri Lankan law.

In the past, both at land and sea, artifacts have been sold. This prior notification to an applicant hopes to commit the applicant to "good behaviour" beforehand.

There is reason to believe that applicants, however well-meaning and qualified they may be, are unaware of Sri Lankan law. Here the Applicant is reminded of the need to familiarize himself with it.

Cage 1 – Name and description of the Project

Requires identification of the site

The exact location, expressed in GPS coordinates, is required for declaring the area around it protected. More importantly, the question of title to the site needs to be addressed. In the 'Avondster' project such a question did arise which was settled before it became a question. This revolved round a Netherlands' claim to the wreck, based on that Government's position as successor to the Dutch East Indies Company, or V.O.C. Although this position can be maintained in several parts of the world (i.e. the case of the 'Batavia' in Australian waters) it is not sustainable in Sri Lanka. Apart from the Sri Lankan claim to title to all property lying in its territorial sea (vide the Maritime Zones Law of 1976 and the Amendment to the Antiquities Ordinance of 1998), when the Netherlands ceded Ceylon to the British under the Treaty of Amiens of March 17th.1802, the British restored all her conquests in the war to the Netherlands and Spain, respectively, save for Sri Lanka (Ceylon) which, under Clause 5:

"The Batavian Republic cedes and guarantees in full property and sovereignty to his Britannic Majesty all the possessions and establishments in the Island of Ceylon that before the war belonged to the Republic of the United Provinces and to their East India Company."

Since British possessions were transferred to Sri Lanka in 1948, all these one-time possessions of the V.O.C. became Sri Lankan property. I believe the same treaty made similar arrangements with regard to Trinidad. Another matter of some importance is that, the wreck lies in Sri Lanka's internal waters. The point made is the need to examine title before venturing into excavation.

The Department also requires information of prior studies of the site and the environment, as well as on whether the Applicant has considered the long-term effect on stability of the site of the proposed excavation. This falls within the broad ambit of 'Justification'

Cage 2 – Persons and institutions responsible for the project

Requires full disclosure of the academic/ professional standing of the project leader and other qualified excavators (vide Deraniyagala) and the institution/s backing the project.

Enables the Department to carry out background checks on Applicants' track record (vide Deraniyagala on archaeologists with a backlog of unpublished reports)

Cage 3 –Mitigatory and research objectives

Requires justification for the project (vide Deraniyagala).

Cage 4 – Methodology to be used and techniques to be employed.

Requires specific commitment by the Applicant, as Applicant will be held answerable for non-compliance with undertakings given here. Department's preferences are indicated and Application will be examined for suitability of methodology and techniques

Due to the initial error of not appreciating the difference between the Project Proposal and the Project Design, a faulty decision was made about the raising of a cannon and an anchor. The raising of these artifacts had been planned, but at a later stage in the project. In March, there was a celebration of a milestone in Sri Lankan-Netherlands relations and it was felt that there could be no objection to bringing forward the raising these artifacts to coincide with the celebrations, and they were brought up successfully, but it was discovered only then that the two artifacts were concreted together. After they were brought up, their conservation has posed quite a few problems as the necessary facilities were not available for proper conservation out of the water. No major problems have arisen but this is seen as an example of the need to place archaeological considerations above all others in making decisions of this nature. Had a proper, detailed Project Design been prepared, such ad hoc decisions would not have been taken

Cage 5 – Anticipated Funding

To assure the Department that sufficient funding is available and that contingency plans are in place.

Department could ask for demonstration of facts.

Cage 6 – Time-table for completing the project.

Detailed time schedule needed for monitoring, and also what contingency plan has been prepared for unforeseen delays.

The Department would grant a license for a standard time- period only, and not till the whole of the anticipated work is completed. The License would be renewable after the work done during the initial period has been examined to ensure compliance with the undertakings given at the time of issue.

Cage 7 – Composition, Qualifications and experience of investigators.

Details of personnel involved

Information required for Department to do background checks. Project leader to be named (vide Deraniyagala)

Cage 8 – Material Conservation

Conservation plans, facilities and personnel.

To judge availability and competence of Conservation team at different levels, and availability of conservators competent to work alongside the excavators

Cage 9 – Site management and maintenance.

The protection and management of site upon completion of fieldwork and in-between seasons

This is of prime importance in Sri Lanka where, in-between field seasons, monsoonal sea conditions and inter-monsoonal cyclonic weather will prevail. The sites will have to be properly secured before fieldwork ends.

Public access has to be borne in mind, both in the short and long terms, and plans submitted. The Possibility of turning the site into an underwater park must to be investigated, and planned for.

Cage 10 – Collaboration with Museums and other institutions

Prior arrangements should be made for keeping the artifacts and records in at an institution where the entire collection

would be available for post-project study.
Suitability of the chosen museum, or other institution, needs to be checked by the Department. Deraniyagala has stressed this.

Cage 11 – Documentation
Arrangements for maintaining a comprehensive record of the site, including movement of artifacts moved during investigations, and of all other forms of documentation.
At Galle, where survey and sampling has gone on for a neat ten years, some material has been misplaced due to the non-continuity of the different stages of the work. The need for documentation has thus been acutely experienced here.

Cage 12 – Health and safety
Arrangements for safeguarding the health and safe working conditions on-site and also the health concerns of the community and the environment.
A safety policy covering all team members which conforms to statutory (health) and professional standards needs to be set in place. In the Laboratory, especially, systems need to be put in place to ensure maximum protection against chemical and biological risks. In Sri Lanka, the diving team undergoes preliminary physical tests. The laboratory staff is provided with clothing and other protective gear, although all standards have not yet been met.
National standards for disposal of harmful material (i.e. chemicals) will be adhered to, both for team safety and for protection of the environment.
An unforeseen danger that surfaced was an epidemic of Dengue fever. Several team members contracted the disease as did several persons in work-places close by. The conservation team found that the tubs, in which artifacts were stored in fresh water, had become breeding places for mosquito larvae. The Public Health authorities were asked to assist and several solutions were tried out which would meet the needs of both conservation and community health. The most successful was the simplest – the introduction of fish who feed on the larvae. The problem is presently under control but better means of control (from the point of view of conservation) will be tried out.

Cage 13 – Report Preparation.
The importance Deraniyagala places on this has been commented on: "A project may not be directed by a person with a backlog of reports of projects already directed by him." He also says: "The site report requires peer review, and thereafter approval of the authorities prior to submission for publication or digital dissemination".
Lyndell Prott, has commented on this draft format in a personal communication: "Many Depts. of Archaeology, at least in respect of landsites, have printed their own forms of licence applications, rather than guidelines (but perhaps you aim to do that?). For example, under your Article 13, it is up to the applicant to set the time-table. Some countries required a preliminary report at the end of each season. If it does not arrive x months (? weeks) before the next season, the licence is not renewed (i.e. a licence is only given for one year and is renewable). Provisions on the final report are also often tight e.g. if final report not published within 5 years, the Dept. of Antiquities of the host country will publish itself."
It is our intention that this format is for the Application stage only. The matter of a time-schedule for reporting will be seriously considered.

Cage 14 – Deposition of archives, including underwater cultural heritage removed during investigation
Requires all places at which the archival material and artifacts to be divulged

Cage 15 – Dissemination, public access and public participation.
To encourage placing information in the public domain, and to involve the community, schools and institutions in the process of discovery.
It is still early days in Sri Lanka, but very wide publicity is being given to this project by the media. Public access has been encouraged, although with controls in the interests of the project activities.

Establishment of a Maritime Cultural Heritage Authority

In this final section of this paper I will touch upon the next stage of the plan for Sri Lanka. It has been so long in the making and I have seen so many Governments, Ministries, Secretaries and Directors-General come and go that I remain, perhaps, the only one who remembers where we began more than twelve years ago. In Sri Lanka we have a large number of governmental institutions with interests and functions covering the different maritime zones but particularly the territorial waters. No one institution can, therefore, make a decision about a particular area in these waters without, in some way, stepping on the toes of another institution. This is particularly so in the case of granting a license to excavate. So far, the only site we are working on has caused no controversy, but we have to be prepared to face problems when the next Application arrives. For that reason it was decided that there should be a body comprising representatives of all the institutions concerned which could look at an Application to excavate in the light of its impact on the interests of each of these institutions. The Director-General of Archaeology, who will head this body, will be responsible for granting the license after it has been vetted by the body, to monitor the Applicant's performance and to take any corrective action as necessary. The other members of the body would be:
• The Director of National Museums
• The Director of the National Archives
• The Chairman of the National Aquatic Resources Agency
• Representatives of the Ministries in charge of the subjects of –
- Fisheries and Aquatic Resources
- Coast Conservation
- Foreign Affairs
- Defence
- Ports and Shipping
- Tourism
- Environment
- UNESCO National Commission
- Science and Technology

Five members from among people with adequate expertise and experience in maritime archaeology.

There is no need to go into the details of this draft Act other than to say that this Authority will, finally, be that which will be responsible for approving the issue of a license to excavate and to carry out Maritime Cultural Impact Assessments. All the work we are doing is to have a system in place for this body to administer. With the adoption of this Act by Parliament, I would have completed the task I had voluntarily borne these fifteen years and I look forward to a new generation which will take Sri Lanka into the future.

Appendix 5 Catalogue of finds 2001-2002

2001			
Reg. No.	**Material**	**Object Name**	**Description**
2001GHL1	Fibre	Rope	Coiled Rope of 20mm diameter with a thin rope sheeting. May be used as spare stay
2001GHL2	Fibre	Rope	Tar sheated Rope fragment , possibly Rigging element
2001GHL3	Wood	Fragment of timber	Small fragment of Wood
2001GHL4	Clay	Rim Sherd	Pot , exterior- line design on neck
2001GHL5a	Wood	Pulley Block	Complete , length - 175mm , width - 150mm , thickness - 75mm
2001GHL5b	Wood	Fragment of timber	possibly small stanchion
2001GHL5c	Wood	Fragment of timber	possibly small stanchion
2001GHL6a	Wood	Pulley Block	Complete , Sheave still in place , length - 118mm , width - 97mm , thickness - 46mm
2001GHL6b	Wood	Fragment of Pulley Block	Very worn , with peg and sheave, length - mm , width - 98mm , thickness - mm
2001GHL6c	Wood	Dead eye	Worn , length - 94mm , width - 90mm , thickness - 35mm
2001GHL7a	Wood	Fragment Pulley Block	can join with 01/GHL/07c, length - 182mm, width - 66mm
2001GHL7b	Wood	Fragment of Pulley Sheave	
2001GHL7c	Wood	Fragment of Pulley Block	can join with 01/GHL/07a , length - 178mm (may be little larger), width - half 70mm , thickness -17 mm
2001GHL8	Ceramic	Fragment of Ceramic Vessel	Base with part of body, footring diameter-37mm , hight- mm , interior-white, exterior-blue design on white surface,
2001GHL9	Clay	Neck fragment of Clay object	coarse ware, inside - barnacles attach
2001GH10		Concretion	
2001GHL11	Wood	Dead eye	Complete , length - 95mm , width - 92mm , thickness - 38mm
2001GHL12a	Wood	Dead eye	length - 97mm , width - 93mm , thickness - 39mm
2001GHL12b	Fibre	Fragment of Rope	around 01/GHL/12a dead eye, diameter-15mm, length-120mm
2001GHL12c	Lead	Musketball (possibly)	Complete
2001GHL13a	Wood	Fragment of Pulley Block	peg and sheave still attach to one cheek , length - 122mm , width - 75*2mm , thickness - about 85mm , Very worn
2001GHL13b	Wood	Fragment of Pulley Block	Part of one cheek , can join with 01/GHL/13a
2001GHL13c	Wood	Fragment of Pulley Block	very worn , possibly a cheek
2001GHL14	Wood	Fragment of Pulley Block	One Cheek still with peg and sheeve attach to it
2001GHL15	Wood	Pulley Sheeve	diameter - 180mm , hight - 55mm , diameter of the hole in the middle - 54mm
2001GHL16	Wood	Parrel Bead	hight - 120mm , diameter of the hole -differ 48mm to 55mm , concretion attach on the middle
2001GHL17a1	Wood	Fragment of Pulley Block	Cheek of a pulley , two scores can see slight , length - 96mm , width - 84mm , diameter of the hole in the middle - 16mm
2001GHL17a2	Wood	Fragment of Pulley Block	possibly a Cheek , length - 86mm , width - 72mm , three small holes near to edge , very worn
2001GHL17a3	Wood	Fragment of Pulley Block	possibly a sheeve with ahole in the middle , diameter - about 60mm , uneven edge , very worn
2001GHL17a4	Wood	Fragment of timber	
2001GHL17a5	Wood	Fragment of timber	
2001GHL17b	Wood	Fragment of timber	possibly fragment of a pulley block
2001GHL18	Wood	Fragment of Rope	
2001GHL19a	Lead	Metal Sheet	rectangular shape , length - 150mm
2001GHL19b	Lead	Metal Sheet	length - 75mm , slightly rounded
2001GHL20	Wood Iron	Composide Object	
2001GHL21	Ceramic	Fragment of Ceramic Tile	design in blue on white background

2001GHL22	Concretion	Concretion	with conch
2001GHL23	Glass	Glass Fragment	
2001GHL24a	Concretion	Concretion	
2001GHL24b	Concretion	Concretion	
2001GHL25	Ceramic	Fragment of Saucer	off-white , glaze cracked
2001GHL26	Fibre	Fragment of Rope	
2001GHL27	Wood	Pulley Block	
2001GHL28	Coarse ware	Rim sherd	Pot , coarse ware
2001GHL29a	Coarse ware	Body sherd	Pot , coarse ware
2001GHL29b	Coarse ware	Body sherd	Pot , coarse ware
2001GHL30	Coarse ware	Body sherd	Pot, surface in black
2001GHL31	Fibre	Rope	
2001GHL32	Fibre	Rope	
2001GHL33	Clay	Fragment of Tile	
2001GHL34	Concretion	Concretion	one end-ring shaped
2001GHL35	Concretion	Concretion	
2001GHL36	Concretion	Concretion	
2001GHL37	Concretion	Concretion	
2001GHL38	Concretion	Concretion	
2001GHL39	Concretion	Concretion	
2001GHL40	Concretion	Concretion	possibly nail fragment inside the concretion
2001GHL41	Concretion	Concretion	
2001GHL42	Concretion	Concretion	rectangular shaped sheet
2001GHL43	Concretion	Concretion	
2001GHL44a	Wood	Fragment planking	
2001GHL44b	Wood	Fragment planking	
2001GHL45	Wood	Fragment planking	With Caulking material or hair still present on one side and possible remains of iron nails all over the plank ,length - 780mm
2001GHL46a	Wood	Fragment planking	with scarf one side , length - 490mm
2001GHL46b	Wood	Fragment planking	length - 300mm
2001GHL47	Wood	Fragment planking	length - 410mm
2001GHL48	Wood	Fragment of timber	
2001GHL49	Wood	Fragment planking	length - 295mm , original surface still on all sides
2001GHL50a	Wood	Fragment of timber	possibly fragment of rigging element , traces of hole, diameter- 10-15mm , very worn small hole possibly nail holes
2001GHL50b	Wood	Fragment of timber	possibly fragment of rigging element , traces of hole , diameter - about 15mm
2001GHL50c	Wood	Fragment of timber	with holes , very worn
2001GHL50d	Wood	Fragment of timber	with holes , worm riddle or nail holes
2001GHL50e	Wood	Fragment of timber	with holes and porous surface , very worn
2001GHL50f	Wood	Fragment of timber	with holes and porous , worn
2001GHL50g	Wood	Fragment of timber	with holes
2001GHL50h	Wood	Fragment of timber	squre shape porous / hole on one side, worn
2001GHL50i	Wood	Fragment of timber	with porous and holes ,worn
2001GHL50j	Wood	Fragment of timber	on one side about 7 squre shaped holes in order, possibly nail holes
2001GHL50k	Wood	Fragment of timber	concretion attached , worn
2001GHL50l	Wood	Fragment of timber	
2001GHL50m	Wood	Fragment of timber	
2001GHL50n	Wood	Fragment of timber	
2001GHL50o	Wood	Fragment of timber	

2001GHL50p	Wood	Fragment of timber	part of covered by concretion
2001GHL50q	Wood	Fragment of timber	
2001GHL50r	Wood	Fragment of timber	on flat surface still caulking material attached , on uneven surface worm riddle holes and barnacle attached
2001GHL50s	Wood	Fragment of timber	worm riddle , barnacles attached on flat surface layer of metal corrosion
2001GHL50t	Wood	Fragment of timber	with holes
2001GHL50u	Wood	Fragment of timber	
2001GHL50v	Wood	Fragment of timber	on uneven surface worm riddle and barnacles attached ,
2001GHL50w	Wood	Fragment of timber	
2001GHL50x		Fragment of timber	worm riddle ,on one side concretion attached
2001GHL50y	Wood	Fragment of timber	worm riddle , very worn
2001GHL50z		Composide Object	possibly metal sheet , one side covered with concretion , on other side traces of wooden planking and traces of 10 bolts in order
2001GHL50aa	Wood Metal	Composide Object	some places covered with concretion
2001GHL50ab	Fibre	Yarn	
2001GHL50ac	Fibre	Yarn	
2001GHL51	Clay	Body sherd	Pot , coarse ware , blackish surface
2001GHL52	Clay	Body sherd	Pot , coarse ware , yellowish red
2001GHL53	Ceramic	Fragment of Ceramic Object	exterior - leaf design in blue
2001GHL54	Clay	Rim sherd	Pot , coarse ware
2001GHL55	Concretion	Concretion	
2001GHL56a	Bone	Bone Fragment	
2001GHL56b	Bone	Bone Fragment	
2001GHL56c	Bone	Bone Fragment	
2001GHL56d	Bone	Bone Fragment	
2001GHL57a	Coal	Peice of Coal	
2001GHL57b	Coal	Peice of Coal	
2001GHL57c	Coal	Peice of Coal	
2001GHL58a	Wood	Fragment planking	
2001GHL58b	Wood	Fragment planking	a hole near to one end
2001GHL58c	Wood	Fragment planking	
2001GHL58d	Wood	Fragment of timber	covered with thin layer of iron corrotion, concretion attached
2001GHL58e	Wood	Fragment of timber	
2001GHL58f	Wood	Fragment of timber	
2001GHL58g	Wood	Fragment of timber	concretion attached
2001GHL58h	Wood	Fragment of timber	
2001GHL58i	Wood	Fragment of timber	worm riddle , barnacles attached
2001GHL58j	Wood	Fragment of timber	
2001GHL58k	Wood	Fragment of timber	
2001GHL58l		unidentified	thin whitish layer on surface
2001GHL58m	Wood	Fragment of timber	porous surface
2001GHL59	Fibre	Rope	
2001GHL60	Concretion	Concretion	
2001GHL61	Glass	Fragment of Glass	
2001GHL62a	Clay	Body sherd	Pot , reddish brown
2001GHL62b	Clay	Body sherd	Pot , coarse ware, blackish
2001GHL63a	Coal	Piece of Coal	
2001GHL63b	Coal	Piece of Coal	

2001GHL64a	Wood	Fragment planking	length - 170mm , thickness - 35mm
2001GHL64b	Wood	Fragment planking	length - 110mm , thickness - 20mm
2001GHL65a	Wood	Fragment of timber	possibly fire wood
2001GHL65b	Wood	Fragment of timber	still tree bark attached
2001GHL66	Wood	Fragment of timber	worm riddle
2001GHL67	Wood	Fragment of timber	caulking material or hair attached on one side , with sevaral nail holes , length - 440mm , width - 80mm
2001GHL68	Wood	Fragment of timber	length - 370mm , thickness - 50mm
2001GHL69	Iron	Cannon Ball	covered with concretion , possibly 3 cannon ball covered with concretion ,fragment of rope attach to the concretion
2001GHL70	Bone	Bone Fragment	possibly modern
2001GHL71	Clay	Fragment of Tile	
2001GHL72	Wood	Fragment of timber	square shape , length - 50mm , width - 42mm , thickness - 22mm , a hole in the middle - diameter-13mm
2001GHL73	Wood	Fragment of timber	possibly Tree Nail or Wooden Peg
2001GHL74		Cannon Ball	covered with concretion
2001GHL75	Wood	Fragment of timber	possibly Fire Wood , concretion attached
2001GHL76	Iron	Cannon Ball	covered with concretion , possibly 5 cannon ball inside
2001GHL77	Wood	Fragment of timber	worm riddle
2001GHL78a	Stone	Boulder	Possibily ballast stone
2001GHL78b	Stone	Boulder	Possibily ballast stone
2001GHL78c	Stone	Boulder	Possibily ballast stone
2001GHL78d	Stone	Boulder	Possibily ballast stone
2001GHL78e	Stone	Boulder	Possibily ballast stone
2001GHL79	Concretion	Concretion	
2001GHL80	Concretion	Concretion	
2001GHL81	Ceramic	Fragment of Ceramic Lid	
2001GH82a	Concretion	Concretion	possibly iron bolt inside, fragment of wood attached
2001GH82b	Concretion	Concretion	
2001GHL82c	Concretion	Concretion	traces of wood attached
2001GHL82d	Concretion	Concretion	fragment of wood attached
2001GHL82e	Concretion	Concretion	possibly metal object inside
2001GHL82f	Concretion	Concretion	possibly metal object inside
2001GHL82g	Concretion	Concretion	
2001GHL82h	Concretion	Concretion	fragment of wood attached
2001GHL82i	Concretion	Concretion	
2001GHL82j	Concretion	Concretion	
2001GHL82k	Wood	Fragment of timber	worm riddle , barnacles attached
2001GHL83	Bone	Fragment of Bone	
2001GHL84	Wood	Fragment of timber	worm riddle
2001GHL85	Concretion	Concretion	
2001GHL86	Concretion	Concretion	
2001GHL87	Concretion	Concretion	possibly corroded bolt head inside the concretion
2001GHL88	Concretion	Fragment planking	with concretion , 6 iron fasteners
2001GHL89	Wood	Fragment planking	length - 260mm , width - 135mm
2001GHL90a	Wood	Fragment of timber	possibly Fire Wood, length - 520mm
2001GHL90b	Wood	Fragment of timber	possibly Fire Wood , still tree bark attached , length - 220mm
2001GHL91	Wood	Fragment of timber	cylindrical , tree bark still attached, possibly fire wood, length 80 mm
2001GHL92	Wood	Fragment planking	with nail hole and possible metal concretion

2001GHL93a	Wood	Fragment planking	possibly timber brocken from the Bulk Head , with scarf on one side , length - 520mm
2001GHL94	Metal	Fragment of Metal Sheet	covered with concretion
2001GHL95	Concretion	Concretion	
2001GHL96	Wood	Fragment planking	
2001GHL97	Wood	Fragment planking	thin , ridge along the edge one side
2001GHL98		Composide Object	Metal Concretion of an Iron Balt with fragment of wood attached
2001GHL99	Fibre	Caulking	Caulking material or hair
2001GHL100	Concretion	Concretion	
2001GHL101	Concretion	Concretion	
2001GHL102	Concretion	Concretion	
2001GHL103	Concretion	Concretion	
2001GHL104	Coarse ware	Body sherd	Pot , coarse ware
2001GHL105	Coarse ware	Body sherd	Pot , coarse ware
2001GHL106	Coarse ware	Rim sherd	Pot , coarse ware
2001GHL107	Ceramic	Fragment of Saucer	
2001GHL108	Wood	Fragment of timber	with hole
2001GHL109a	Wood	Fragment of timber	
2001GHL109b	Wood	Fragment of timber	
2001GHL109c	Wood	Fragment of timber	
2001GHL109d	Wood	Fragment of timber	
2001GHL109e	Wood	Fragment of timber	
2001GHL110	Clay	Smoking Pipe	
2001GHL111	Clay	Smoking Pipe	
2001GHL112	Clay	Fragment of Smoking Pipe	
2001GHL113	Ceramic	Base sherd of Ceramic Vessel	decoration on exterior and interior in blue on white surface
2001GHL114	Ceramic	Fragment of Ceramic Vessel	decoration in blue on white surface
2001GHL115	Ceramic	Fragment of Ceramic Vessel	Floral decoration in blue on white surface
2001GHL116	Ceramic	Fragment of Ceramic Vessel	blackish graydecoration on white surface , interior and exterior surfaces cracked
2001GHL117	Ceramic	Base sherd of Ceramic Vessel	white glazed , surface -slihgtly getting brownish, cross mark near to middle of the out side of base,interior and exterior surface glaze cracked
2001GHL118	Ceramic	Base Sheard of Ceramic Vessel	inside glazed , leaves pattern in between relief band
2001GHL119	Iron	Cannon Ball	coverd with concretion , more calcarious deposits
2001GHL120	Iron	Cannon Ball	coverd with silty concretion
2001GHL121	Concretion	Concretion	
2001GHL122	Concretion	Concretion	
2001GHL123	Concretion	Concretion	
2001GHL124	Concretion	Concretion	
2001GHL125a	Wood	Fragment planking	with fresh break, length - 160mm , width -100mm , thickness - 20mm
2001GHL125b	Wood	Fragment planking	length - 70mm
2001GHL126	Wood	Fragment of timber	Possibly fire wood
2001GHL127a	Wood	Fragment of timber	length - 154mm
2001GHL127b	Wood	Fragment of timber	length - 90mm
2001GHL127c	Wood	Fragment of timber	length - 100mm

2001GHL127d	Wood	Fragment of timber	length -42mm
2001GHL128	Coal	Charcoal	
2001GHL129	Coal	Coal	
2001GHL130	Concretion	Concretion	Possibly 3 cannon ball inside
2001GHL131a	Iron	Cannon Ball	
2001GHL131b	Iron	Cannon Ball	
2001GHL132	Concretion	Composite object	Concreted Bolt with piece of wooden planking attach
2001GHL133	Concretion	Concretion	
2001GHL134	Concretion	Concretion	
2001GHL135	Concretion	Concretion	
2001GHL136	Concretion	Concretion	
2001GHL137	Wood	Fragment planking	
2001GHL138	Wood	Fragment planking	
2001GHL139	Wood	Fragment planking	
2001GHL93b	Wood	Fragment planking	possiblt timber brocken from the bulk head , length - 230mm

2002			
Reg. No.	**Material**	**Object Name**	**Description**
2002GHL1	Fibre	Fragment of Caulking or hair	
2002GHL2	Coarseware	Body sherd	interior- wheel striation , exterior- paddle marks
2002GHL3	Concretion	Concretion	Unidentified
2002GHL4	Concretion	Concretion	Unidentified
2002GHL5	Concretion	Concretion	Unidentified
2002GHL6a	Wood	Fragment of Wooden Planking	
2002GHL6b	Wood	Fragment of Wooden Planking	
2002GHL7	Wood	Fragment of Wood	
2002GHL8	Coarse ware	Body Sherd	
2002GHL9	Ceramic	Fragment of Ceramic vessel	both sides -glazed , cracked
2002GHL10	Bone	Bone fragment	
2002GHL11	Coarse ware	Body Sherd	
2002GHL12a	Coarse ware	Body sherd	
2002GHL12b	Coarse ware	Body sherd	
2002GHL12c	Coarse ware	Body sherd	
2002GHL12d	Coarse ware	Body sherd	
2002GHL13a	Coarse ware	Body sherd	blackish brown , exterior - line design
2002GHL13b	Coarse ware	Body sherd	blackish brown , exterior - line design , can fit with 02/GHL/13a
2002GHL13c	Coarse ware	Body sherd	blackish brown , exterior - line design , can fit with 02/GHL/13b
2002GHL14a	Coal	Piece of Coal	
2002GHL14b	Coal	Piece of Coal	
2002GHL15	Stone ware	Fragment of Beardman Jar	
2002GHL16	Unidentified	Fragment of Stone or Glass object	orange colour
2002GHL17	Concretion	Concretion	Unidentified
2002GHL18	Concretion	Concretion	Unidentified
2002GHL19	Concretion	Concretion	Unidentified
2002GHL20	Concretion	Concretion	Unidentified
2002GHL21	Concretion	Concretion	Unidentified
2002GHL22	Concretion	Concretion	Unidentified

2002GHL23	Concretion	Concretion	Unidentified
2002GHL24	Concretion	Concretion	Unidentified
2002GHL25	Concretion	Concretion	Unidentified
2002GHL26	Concretion	Concretion	Unidentified
2002GHL27a	Coarse ware	Rim sherd	body thickness- 20mm
2002GHL27b	Coarse ware	Rim sherd	body thickness- 20mm near to neck , 02/GHL/27a and 02/GHL/27b can fit
2002GHL28a	Coal	Piece of Coal	
2002GHL28b	Coal	Piece of Coal	
2002GHL28c	Coal	Piece of Coal	
2002GHL28d	Coal	Piece of Coal	
2002GHL29	Wood	Fragment of Wood	
2002GHL30	Wood	Fragment of Wood	possibly fire wood
2002GHL31	Coarse ware	Body sherd	exterior - yellowish brown
2002GHL32	Coarse ware	Body sherd	exterior - blackish brown
2002GHL33	Coarse ware	Body sherd	exterior-
2002GHL34a	Coarse ware	Body sherd	
2002GHL34b	Coarse ware	Body sherd	
2002GHL35	Coarse ware	Rim sherd	
2002GHL36	Clay	Fragment of Brick	
2002GHL37	Concretion	Concretion	possibly musket ball inside the concretion
2002GHL38	Concretion	Concretion	possibly musket ball inside the concretion
2002GHL39	Concretion	Concretion	possibly iron nail inside
2002GHL40	Concretion	Concretion	possibly iron nail inside
2002GHL41	Concretion	Concretion	possibly fragment of metal sheet inside the concretion
2002GHL42	Concretion	Concretion	with a hole aside and traces of wood attached
2002GHL43a	Concretion	Concretion	
2002GHL43b	Concretion	Concretion	with a rectangular shape hole
2002GHL44	Concretion	Concretion	possibly iron nail inside
2002GHL45	Concretion	Concretion	wood attached
2002GHL46	Concretion	Concretion	
2002GHL47	Concretion	Concretion	with a hole
2002GHL48	Concretion	Concretion	possibly iron nail inside
2002GHL49	Concretion	Concretion	possibly musket ball inside
2002GHL50	Concretion	Concretion	
2002GHL51	Concretion	Concretion	
2002GHL52	Concretion	Concretion	
2002GHL53	Concretion	Concretion	with traces of wood attached
2002GHL54	Concretion	Concretion	possibly 2 cannon ball inside
2002GHL55	Concretion	Concretion	possibly cannon ball
2002GHL56	wood concretion	Composide Object	EyeBolt and Dead Eye , metal part covered with concretion
2002GHL57	Concretion	Concretion	possibly bolt
2002GHL58	Concretion	Concretion	posssibly bolt
2002GHL59	Concretion	Concretion	possibly bolt

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